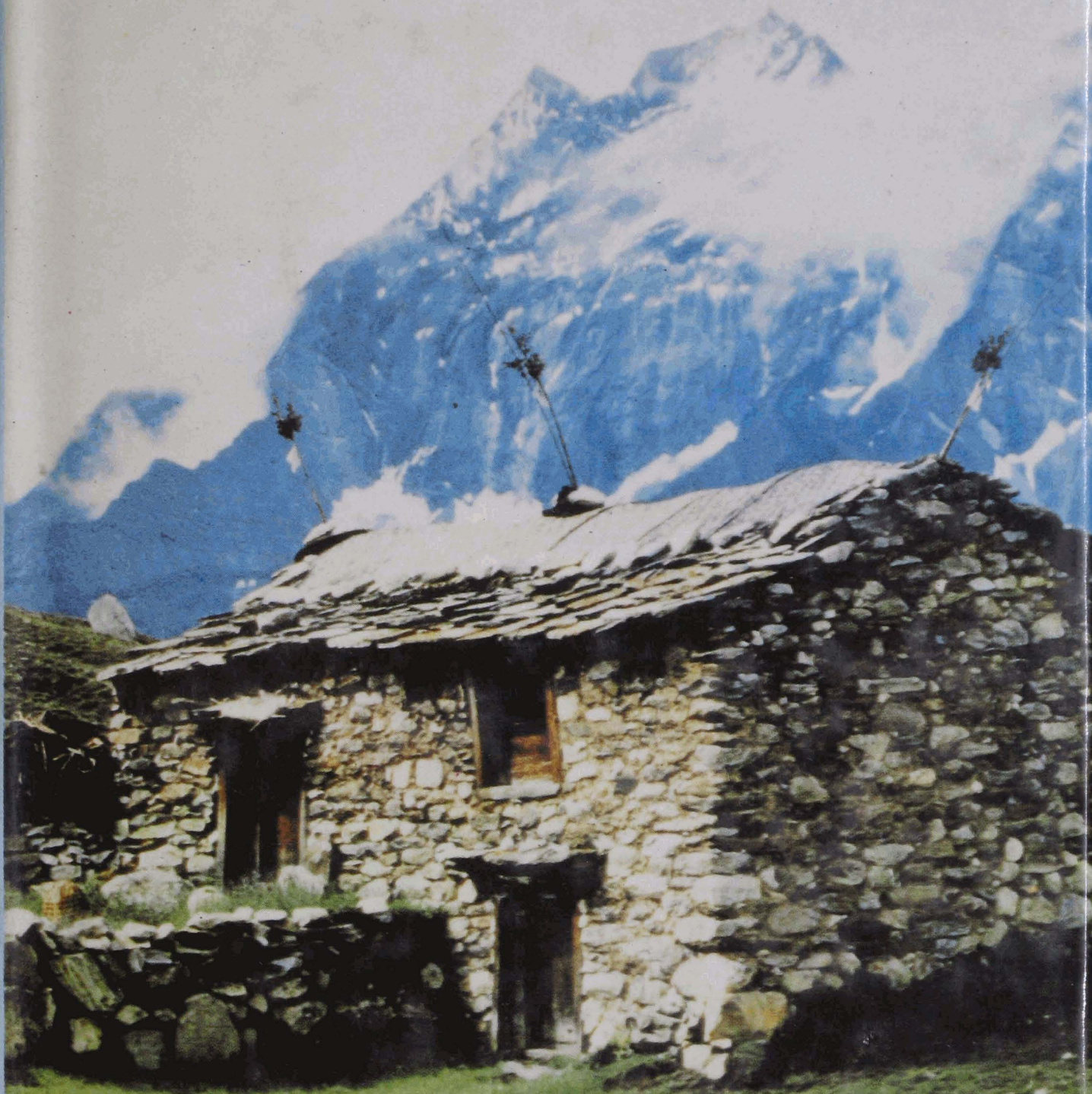


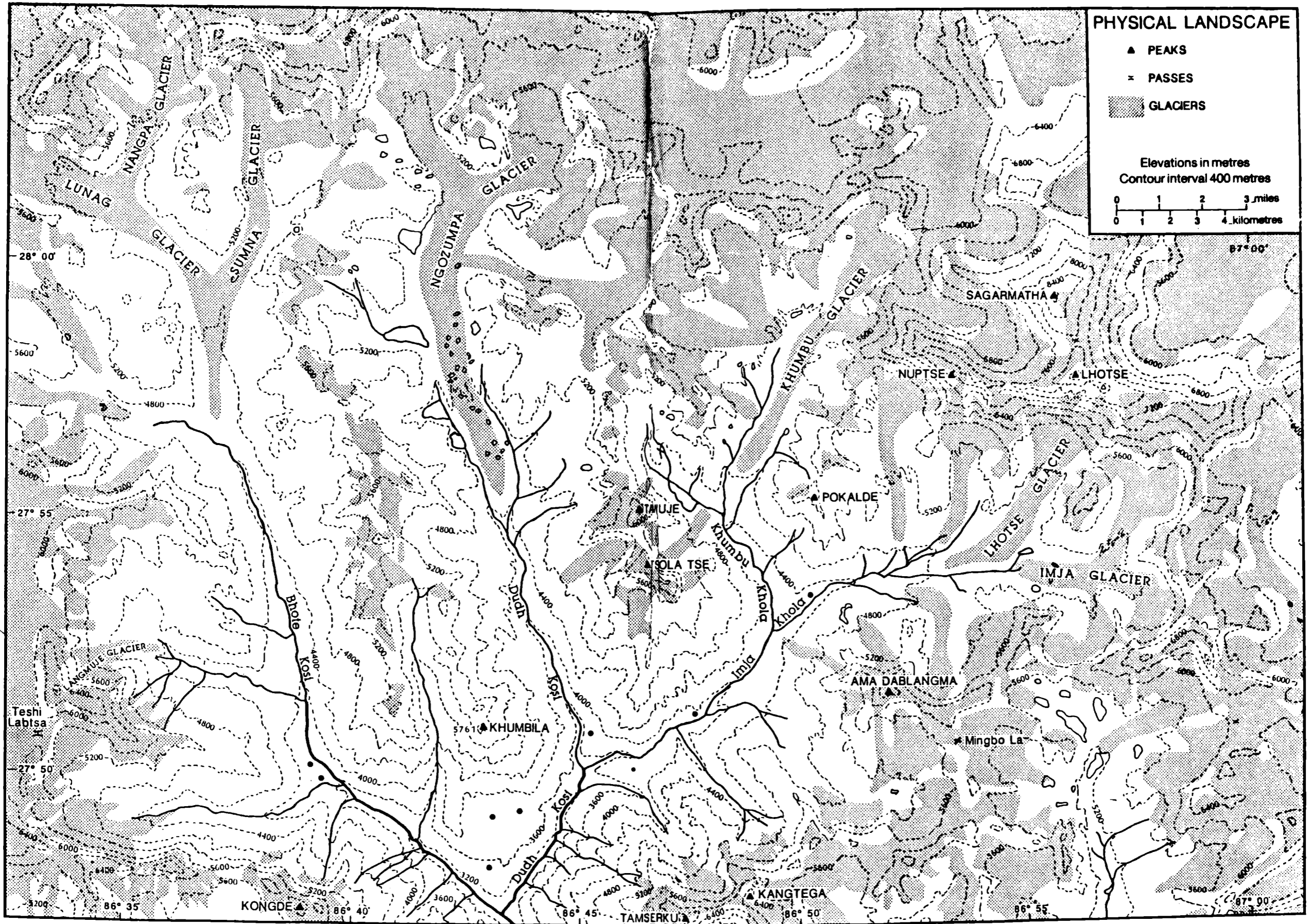
# *Sherpa of Khumbu*

*People, Livestock, and Landscape*



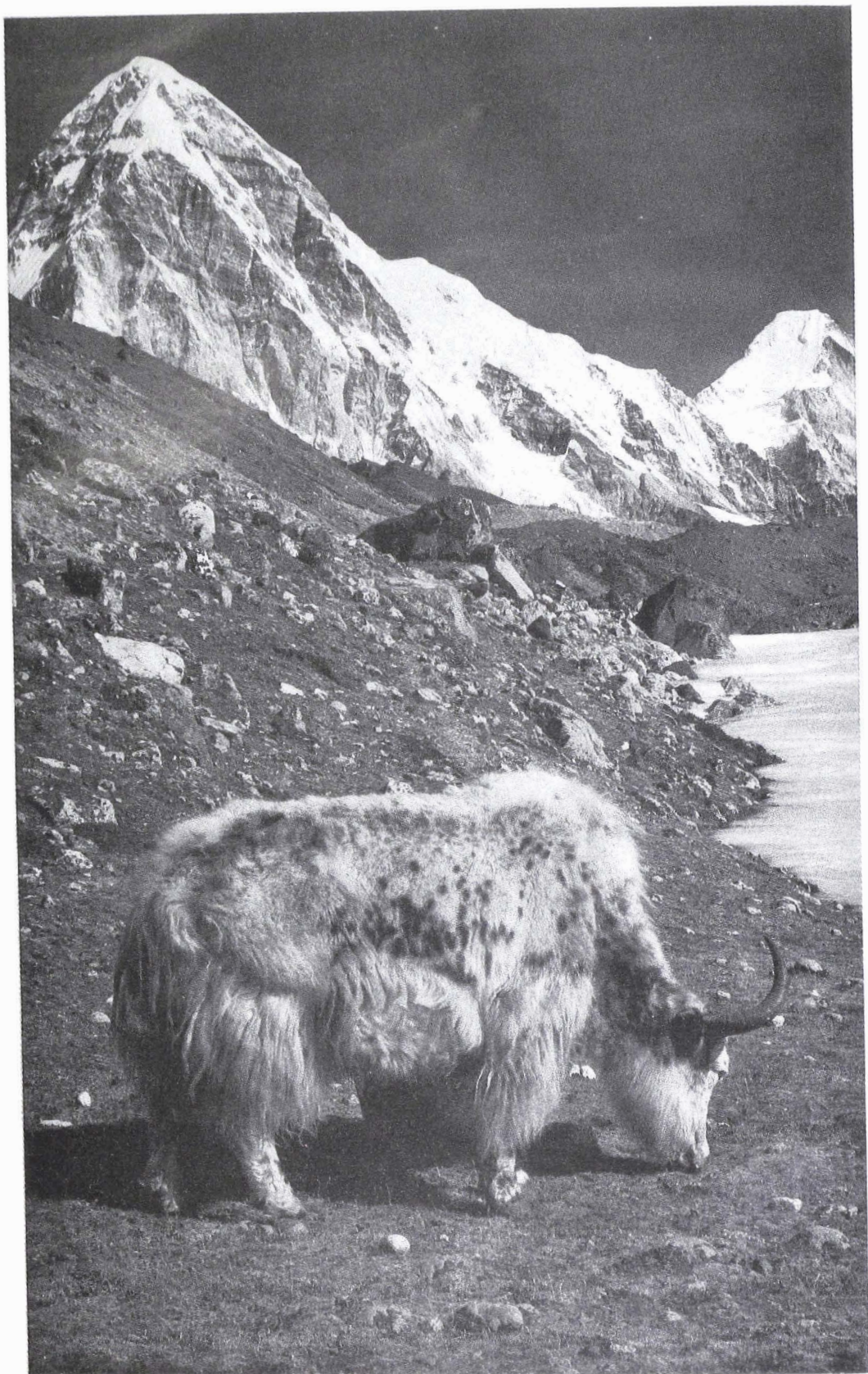
*Barbara Brower*





Physical Landscape of Khumbu





Yak in alpine range at 5,000 m. in January.

Studies in Social Ecology and Environmental History

**SHERPA OF KHUMBU**  
People, Livestock, and Landscape

**BARBARA BROWER**

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## *Series Editors' Preface*

**T**HE accelerating pace of environmental degradation in South Asia has highlighted an area of research gravely neglected by historians and social scientists, viz. the interactions between the human social world and the natural world that humans share with other species. The environmental debate is rapidly making social scientists aware of this neglect, and a small but growing number have begun systematic research on different aspects of the human–nature relationship. In recognition of the importance of the field, the Oxford University Press has decided to start a monograph series entitled ‘Studies in Social Ecology and Environmental History’.

On both intellectual and pragmatic grounds, the convergence of ecology and the social sciences is especially appropriate for South Asia. From an ecological perspective, South Asia is unique in its diversity of environmental regimes. More strikingly, this ecological diversity is matched by a comparable cultural diversity in which one can find representative examples of every form of natural resource use in human history—from Stone Age hunter-gatherers at one end of the spectrum to thermal and nuclear power plants at the other. The interactions of these different modes of resource use, in the present and in the past, are of keen interest to historians, social scientists, and ecologists. Again, the wide range of nature-based conflicts in contemporary South Asia has given rise to a vigorous debate on the relationship between economic development and environmental sustainability. Questions of scale, of traditional, modern and ‘appropriate’ technology, and of the socio-environmental costs and benefits of development options are likely to be of



vital significance in the intellectual and political agendas of the countries of the region.

The primary goal of this series will be the publication of thoroughly researched and theoretically informed monographs under the broad rubric 'Social Ecology and Environmental History', whether written by historians, anthropologists, geographers, ecologists, or others. Although some of the studies may have policy implications, that will not be a major focus. Among the forthcoming books in the series are a study of the sociology of common property, a collection of seminal articles on the arid zone by the economist N. S. Jodha, a study of the forest-farm frontier in the Nepal terai, and an interpretive ecological history of India.

We are delighted to begin this series with a study, by a geographer, of the cultural ecology of the Sherpas. The author has combined a careful analysis of indigenous forms of resource use with a critical appraisal of a 'modern' conservation effort, viz. The Sagarmatha National Park. This study of conservation issues in Nepal is of considerable relevance to India, where the management of national parks has likewise led to unresolved conflicts between social groups with different priorities regarding resource use and conservation.

MADHAV GADGIL

RAMACHANDRA GUHA

## *Preface*

**I**NFORMATION on which this study is based comes from a variety of sources including published writings, less formal written works, discussion and exchanges with a number of other researchers, and twenty months of field investigation.

I first visited Khumbu on a two-month trek in 1976, in the course of which an unquenchable interest in the place and its people was born. I returned to live and learn in Khumbu between autumn 1982 and summer 1986: October to March 1982–3, January through November 1984, May to September 1985, and May and June 1986. A diverse range of research methods came into play during the period of study, reflecting the broad focus of the study itself on environment, including environmental history, on the Sherpa cultural milieu, and on the particular practices of animal husbandry.

Research on Khumbu's culture was a mix of observation, independent inquiry, and interpreter-assisted discussion that varied from the formal and systematic to the casual and spontaneous. In general, the most useful interactions were the least formal, and the reliability and utility of information increased with a longer acquaintance with Khumbu and growing familiarity and friendship with Khumbu people.

There are major constraints on effective field research in Sagarmatha National Park, the consequence, I think, of several factors. There is a great deal of suspicion among Sherpas of outsiders inquiring into local economics and land use. This is apparently attributable largely to the presence of the national park. In the past, inquiries by Westerners about such matters have led to national park regulations restricting Sherpa freedoms. Particular incidents have fuelled special anxiety about the potential actions of park officials. 'Why do



you want to know how many *zopkio* I have? Last time someone asked questions like this, park officials came and took away the goats. Now maybe they want my *zopkio*.' This sort of anxiety is not unfounded. People were perhaps not unwise in their reluctance to part with information about animal numbers and movements when I asked them, for indeed my study does suggest that *zopkio* (male hybrid of yak and cow) are a potential problem to the Sagarmatha National Park environment.

There are other reasons for Sherpa reticence in the face of questions. Tourists, mostly Westerners, descend on Sagarmatha National Park in large numbers every year—two for every Sherpa resident of Khumbu. One must be pleasant to them so that they, too, will tell their friends about the wonderful, warm, hospitable Sherpas of the Everest area, but it can be something of a strain. These tourists, although they have strange and sometimes offensive ways, at least bring tangible benefits to most Sherpas through the economic opportunities they provide. Where is the return on time and information given a researcher? This population has been poked, bled, weighed, measured, and queried by a parade of researchers over the past ten or fifteen years. Many are uncertain of the purpose of such probing, tired of the intrusion, and increasingly impatient and angry with aliens who feel that the title 'researcher' is a licence to pry into Sherpa bodies and business. Acute awareness of this inhibited my investigation for many months, and prevented me from ever asking for much of the information that would have been most useful to my study. As I became a more familiar figure in Khumbu, many people traded in initial suspicion for friendliness, but no one was ever very happy when I began asking for particulars of animal ownership.

An important objective of the research I have conducted in Khumbu is to provide extensive, ongoing analysis of vegetation designed not only to describe the range resources available to Sherpa stock-keepers and to assess the effects of livestock use on the composition and distribution of vegetation but also to reconstruct environmental transformation in the period of Sherpa tenure in the Everest area. This research

continues; initial results are discussed here. Substantial data collection was undertaken which represents the most extensive and long-term analysis of vegetation in the Everest area yet made.

The core of this information is a set of 300 line-intercept transects made throughout Khumbu on representative sites selected according to altitude, aspect, dominant vegetation cover, and inferred degree of livestock use. Slightly more than half these transects I personally performed between 1982 and 1985; the balance were made by two groups of volunteer field assistants working under my supervision in the summer of 1986. Identification of plants occurring on and near transects was made where possible in the field, using *The Flowers of the Himalaya* (Polunin and Stainton, 1984) as the dominant reference; verification for field designations and identification of unknowns were obtained from Kew Garden for grasses, and from the collection and staff of the British Museum of Natural History for other plants. Data from the transects are still being analysed; preliminary interpretations are the basis for the observations of vegetation patterning and dynamics reported here.

University of Texas at Austin  
Austin, Texas  
15 March 1991

BARBARA BROWER





## *Acknowledgements*

**T**HIS study has benefited enormously from the assistance of a great many individuals and institutions; to all I offer my thanks.

Research was underwritten in the main by a Fulbright-Hays research fellowship which provided both financial assistance and, through the office of the United States Educational Foundation in Nepal, considerable moral and logistical support in 1984 and 1985. The Man and Biosphere—Mountain Hazards Mapping Project sent me to Nepal in 1982 for the first five months of preliminary research; the final data-collection period, May and June 1986, was supported by the University of California Research Expedition Program (UREP), not only financially but also in the form of able-bodied field assistants.

The Natural History section of the British Museum has an extensive collection of Himalayan plants and a staff with a considerable depth of expertise in Himalayan flora, both of which I consulted in December 1984; my thanks for the use of those facilities and for personal assistance. Dr Thomas Cope of Kew Garden undertook to identify grasses collected, and I thank him for his list. While at the British Museum I was fortunate in encountering J.D.A. Stainton, pre-eminent Himalayan flora expert, who was also good enough to advise me.

The success of my field experience in Nepal owes a great deal to His Majesty's Government Department of National Parks and Wildlife Conservation, which permitted my study to proceed. Special thanks are due to General Director B.N. Upreti and ecologist Hermanta Mishra for their time and information. Both Acting Warden Mingma Norbu Sherpa

and Acting Senior Warden Lhakpa Norbu Sherpa, senior administrators in Sagarmatha National Park during the years of my research, and their staffs, provided invaluable personal help and access to the park's library and other facilities.

Other representatives of His Majesty's Government who assisted my study and are due my thanks include D.D. Joshi, now of the Department of Health Services, and the staff of the Shyangbuje Livestock Development Project, particularly Sarad Neupane, for their time and information.

The Himalayan Trust made my life in Nepal easier and pleasanter by granting me the use of their mail system and helping with an infinity of other arrangements. Lavish thanks are due to Liz Hawley, the Trust's Kathmandu presence. The Himalayan Trust hospital at Khunde was a refuge of friendship, pikelets, and showers during most of my study in Khumbu; Elly and Keith Buswell, the Khunde doctors, were two of the best things about Khumbu, followed closely by the hospital staff, Mingma Temba, Kami Temba, and Dromalley, all extraordinarily warm and helpful people. Relief doctor Joan Ford and her sister Laura Hamilton have also been sources of medical advice, hospitality, and friendly companionship.

Special mention is due to Bill Shaeffer, Peace Corps volunteer stationed in Nauje and at Tengbuje in 1984. In addition to his contributions to the well-being of Sherpas, he added a great deal to my pleasure in and understanding of Nepal. There is no doubt that he would have continued such contributions to the welfare of the rest of us had he not been killed in a last Nepalese venture, a trek in Langtang, in October 1984.

Sanford Schemnitz, wildlife ecologist from the University of New Mexico, came to Khumbu in the early days of my research and helped with the methodology and logistics of an ill-fated exclosure project.

Other researchers who shared Khumbu, tea and *chaang*, information and argument, and are due acknowledgement include Anne Stettler, Marcus Bicksell, Hans Kienholz, Marcus Zimmerman (1982-3); Khadga Bhasnet, Narendra Raj Khanal, Guy Pawson, Stanley F. Stevens, and Daniel

Vuichard (1984). Special thanks go to Inger-Marie Bjonness for her companionship, Danish sausage, and research insights (1982), and to Alton and Elizabeth Byers. Brot Coburn lent his house in 1982–3, and shared many stimulating arguments then and since; I thank him for both.

I owe thanks to the Rinpoches of Thami and Tengbuje, both of whom were generous contributors of interview time and information. Frances Klatzel, who is assisting the Tengbuje Rinpoche in a long-term Sherpa cultural history project, has been a good friend and informant.

The list of residents who were essential contributors to my research should include nearly everyone. I am grateful to the many who fed and housed me, to those who consented to be interviewed, and to all the people of Khumbu who showed me friendliness and tolerance. The chronicle of helpful neighbours, storekeepers, and acquaintances is a chapter in itself, and I can only express my gratitude to the community for its acceptance and help, while acknowledging a few who stand out for their essential contributions to my welfare and research.

I would have got nowhere without the special help of Sonam Hishi Sherpa, Nauje, my field assistant in 1984, and of Pemba Nuru Sherpa, Thangmite, whose companionship, friendship, information, and intervention on my behalf in 1985 and 1986 made for the most fruitful period of investigation. Tenzing Gyazu Sherpa, Nauje, kept my home fires burning (only as necessary, and with due regard to Sagarmatha National Park's fuel-wood problems), carried tons of water, swept floors, washed dishes, made tea, and taught me a great deal about what it means to be an adolescent in a world of change. He and his mother, Passang Yangjee, were friends whose warmth and hospitality made Khumbu a homey place.

Other special friends in Nauje include the family of Lhakpa Dorje and Lhakpa Diki, who provided *momos* and insights for all the years of my research; Passang Kami and Namdu and their children, particularly daughters Mingma and Dawa Phuti, for meals, stories, translation assistance, child-care advice, and a lot of good talk. My neighbour and friend



Tsing Droma taught me to make *tsampa* and let me into the Sherpa woman's world. Ang Phurba, Pradhan Pancha of the Namche-Thami panchayat, was a source of information and support, and interceded with great effect during some legal unpleasantness in 1986. Ang Phurba, sirdar, and his extended family were good to me, and I thank them; so were Tawa and Ang Lhemi, who lent heirloom finery for a celebration in 1984.

In Khunde the family of Ang Tsering, particularly sons Passang Temba and Mingma Temba, put up with many questions and extended the hospitality of their home in Dingbuje. An excellent source of information, accommodation, and logistical assistance was Ang Tsering, proprietor of the Buddha Lodge at Lukla, a good friend to many Westerners who must regret his untimely death and owe thanks to him and his widow for many kindnesses. Tengbuje hotelier and Pangbuje resident Passang Thondup and his family have also been continuing sources of both information, friendship, and creature comforts, for all of which I thank them.

I owe an ongoing debt of gratitude to a Thangmiteng householder, already acknowledged for his assistance as Warden of Sagarmatha National Park: Lhakpa Norbu Sherpa. Lhakpa and his wife Helen were extraordinarily helpful in Khumbu, and I continue to exploit them for last-minute corrections and emergency telephoned information (Lhakpa is currently a Fulbright scholar studying forestry at the University of Washington).

The closest thing in Khumbu to family, and the source of an unceasing supply of kindness, tea, potatoes, assorted delicacies, advice, information, assistance, and love, came from the Nauje household of Ang Kinu and Ai Daki. When I think of the best times in Khumbu, they are the times with these women and their family. I can't begin to thank them for making me feel really welcomed and cared about, in addition to their infinity of contributions to my physical well-being.

My own family has been a source of support throughout the protracted period that I've been working on this project. My parents and two brothers came to Sagarmatha National

Park at various times during my research tenure to provide sorely needed companionship and moral support. Once I was home, my editor-parents continued their efforts on behalf of my prose, and my non-travelling brother assisted with electronic logistics.

My husband, Jan Olsen, did not type this manuscript, but he has put up gracefully with all the traumas of dissertation preparation, for which I thank him. Our daughter Anne Kathryn is due a large measure of gratitude and credit for the timely completion of the dissertation on which this book is based: her gestation was as enjoyable and uninterfering as any gravid graduate student could hope for.

Other technical help has come from several directions. The maps are the collective work of Adrienne Morgan, cartographer at Berkeley, who generously laboured over the contour base map on which many of the thematic maps are based, John Cotter, and Elaine Bargsley at the University of Texas at Austin. Further cartographic help has come from Cherie Semans, successor to Mrs Morgan, and her intern Derrick Mar. My thanks to all. The graphs in chapter Four are the work of Daniel O. Holmes who has assisted this project in many other ways, beginning with the visit he and wife Robin Spencer made to Khumbu, where they provided moral support and field assistance. Plain thanks are grossly inadequate for all Mr Holmes' assistance during my years as graduate student; I offer my warmest thanks.

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interest in Khumbu and critical eye for error has kept this account freer of mis-statements than it might otherwise have been; Jack Ives of the International Mountain Society and Geography Department at the University of Colorado, who sent me on my way to Khumbu with the 1982 Mountain Hazards Mapping Project; Richard Palmieri, Mary Washington University, another geographer and one-time yak aficionado; and George Smith, 'amateur' botanist who was very generous with his extensive knowledge of high Himalayan flora. At the University of California, Berkeley, I have benefited enormously from the time and attention of Gerald Berreman in Anthropology, Ted Oberlander in Geography, and Jeff Romm in Forestry. While on the faculty of the Geography Department at the University of Texas, Austin, I have exploited the expertise of colleagues Francisco Perez and Stephen Hall, and I thank them too for their help.

Last on the list are the members of my doctoral committee. Their willingness to let me follow my curiosity wherever it led, their strategic offers of advice, and their unflagging faith in this enterprise, permitted an experience of exploration and discovery that has been the most absorbing and rewarding of my life. To James Bartolome, Robert Reed, and above all to James Parsons I offer my thanks.

Texas

15 March 1991

BARBARA BROWER

## *Note on Transliteration*

**T**HE language spoken by the Sherpa people of Khumbu is from the Sino-Tibetan family of languages. Syntax and vocabulary are very close to the Tibetan dialects spoken on the north side of the Himalayan barrier, and Sherpa pronunciation is sufficiently like that of many other Tibetan language groups to enable speakers of different dialects to more or less comprehend each others' speech. But Sherpa is not a written language. Various approaches to the English spelling of Sherpa words and place-names have been taken in the past. Some (such as Schneider, 1978) attempt modified Tibetan transcriptions, while others opt for transcriptions based on transliteration of the Nepali languages' Devanagari script. Neither of these schemes, in the opinion of Sherpas who know English, is very successful in conveying the pronunciation of the Sherpa language.

A closer phonetic approximation of Sherpa words is the object of the spellings developed for this study. The tones, nasalized consonants, and other distinctive elements of Sherpa do not lend themselves to ready transcription. But an effort has been made to make the English transliteration conform to Sherpa sounds within the limits of written language.

Lhakpa Norbu Sherpa collaborated in the development of the transliteration used in this text, and any resemblance to true Sherpa is his doing. Nevertheless, the transcriptions represent non-linguists' crude approximations only; they are offered in a spirit of experimentation, and in the hope that ultimately the transliteration of Sherpa language will reflect Sherpa speech more closely.





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# Introduction

## THE SHERPA WORLD

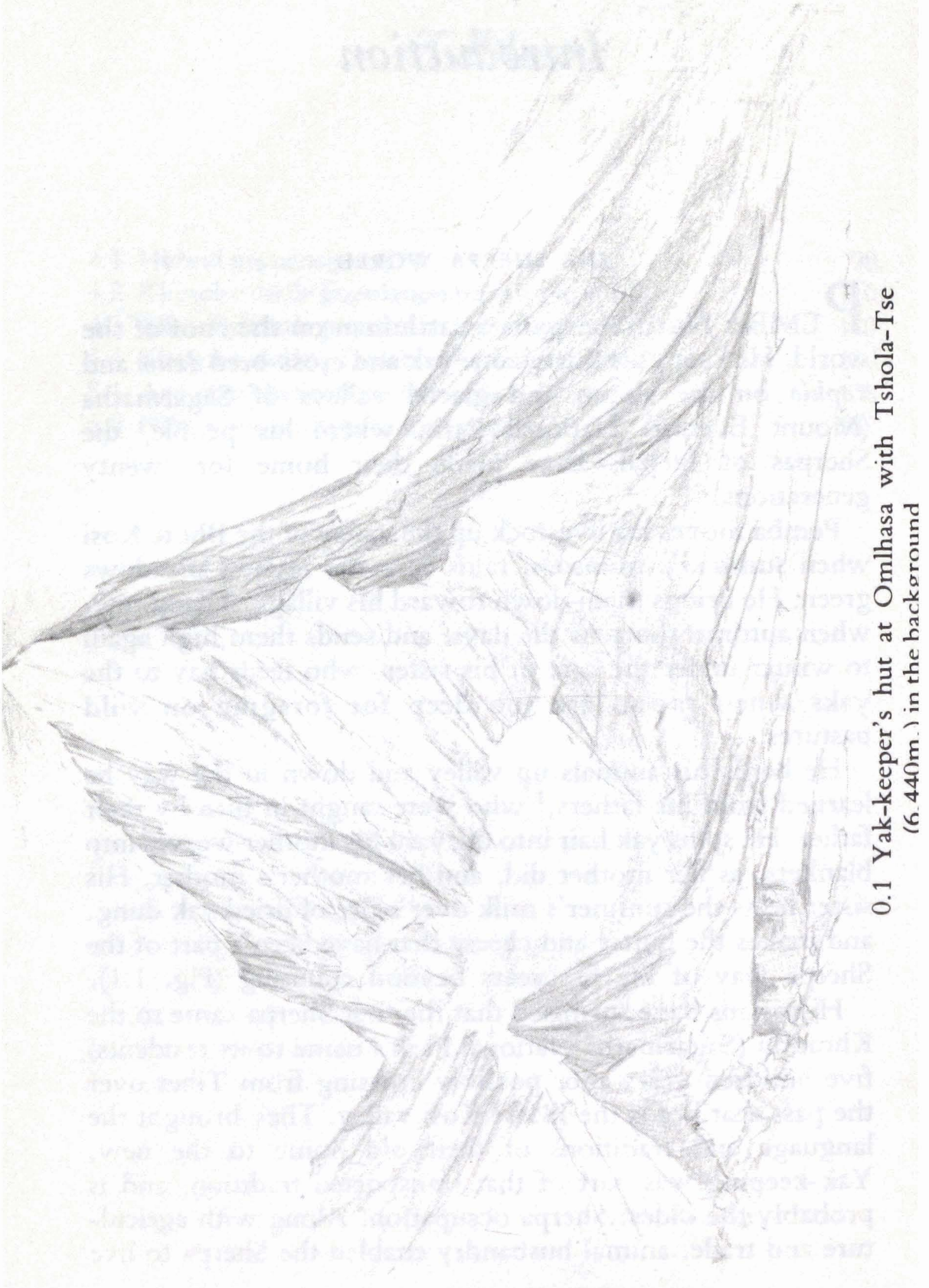
**P**EMBA Nuru Sherpa is a cattleman on the roof of the world. He keeps his thirty-nine yak and cross-bred *dzum* and *zopkio* on the slopes and glacial valleys of Sagarmatha (Mount Everest) National Park, where his people, the Sherpas of Nepal, have made their home for twenty generations.

Pemba moves his livestock up the valley of the Bhote Kosi when summer's monsoon rains turn the highest meadows green. He brings them down toward his village, Thangmite, when autumn shortens the days, and sends them high again to winter under the care of his sister, who feeds hay to the yaks when snows are too deep for foraging on wild pastures.

He herds his animals up valley and down in the way he learned from his fathers,<sup>1</sup> who were taught in turn by their father. He spins yak hair into the yarn his mother weaves into blankets, as her mother did, and her mother's mother. His sister heats the summer's milk over a fire of dried yak dung, and makes the butter and cheese that have been a part of the Sherpa way of life for years beyond counting (Fig. 1.1).

Historians have surmised that the first Sherpa came to the Khumbu (Sagarmatha National Park's name to its residents) five hundred years ago, possibly crossing from Tibet over the pass that heads the Bhote Kosi valley. They brought the language and traditions of their old home to the new. Yak-keeping was part of that transported tradition, and is probably the oldest Sherpa occupation. Along with agriculture and trade, animal husbandry enabled the Sherpa to live





0.1 Yak-keeper's hut at Omlhasa with Tshola-Tse  
(6,440m.) in the background

in a forbidding environment, mostly of rock and ice.

Today, the Sherpa of Khumbu have added to their traditional occupations, those of expedition climber, hotel-keeper, tourist guide, government worker, globe-trotting trader, politician. These new jobs reflect the major changes that have come to the area over the last few decades. In the thirty years since Pemba Nuru was born, the relative isolation of Khumbu has given way with the opening of Nepal's long-locked borders. Climbers and other tourists visit Sagarmatha National Park by the thousand. Sherpas leave Khumbu for jobs in Kathmandu or schooling in other countries, and the once-remote world of Khumbu becomes increasingly involved in the society, economics, and politics of the outside world.

Being part of the rest of the world and defined as a national park has had a major impact on the environment of Khumbu and on the society and economy of the Sherpa. There are new pressures on people and land, new expectations about what Sagarmatha National Park ought to look like, whom it is for, how and by whom it should be managed. These pressures and expectations are having a profound effect on the animal husbandry practices of cattle-keepers like Pemba Nuru. Western visitors come to see a national park like Yellowstone or Yosemite and are shocked to discover instead a park with 3000 residents making full use of the place; they lobby for restrictions to make Khumbu more like their imported vision of a *natural* park. Jobs in trekking or mountaineering draw young men and women away from the care of their family's herds. Not only Sherpas find such employment; expeditions and trekking groups hire Sherpa cattle too, to transport their equipment, and thus intensify trampling and grazing on tourist routes. The high returns on the labour of these beasts of burden encourage more Sherpas to invest in the most versatile *zopkio*, adding to the incentives for others to breed these yak/cow crosses. The result of these and a host of other new developments is an alteration of a centuries-old system of animal management that affects both the traditional life of the Sherpa people and the fragile high mountain environment of Khumbu.

#### 4 THE SHERPA OF KHUMBU

The ecological effects of livestock-related land use are among the environmental problems of concern to some Khumbu visitors. The 'national park' designation, first applied in 1976, has attracted considerable international attention to the area; indeed, it was largely international effort to establish the park that led to its creation in the first place. Much of this attention has focused on the perceived environmental impact of human use of the Everest area. An array of regulations has been established by national park administrators and His Majesty's Government of Nepal in an attempt to ameliorate this impact, which includes unsustainable felling of trees, littering, and over-use by livestock.

The national park idea comes from the West, and it is a concept that needs adjustment to fit the Third World context. The attitudes of visitors from the West to national parks like Sagarmatha also need adjustment; visitors too often bring their preconceptions about natural parks to Khumbu—home to twenty generations of Sherpa people.

This study looks at animal management in Sagarmatha National Park in the context of Sherpa subsistence, demonstrating the intricacy of the man-land relationship, the adaptability and resilience of traditional peoples, and the range of considerations that must be taken into account in any attempt to modify traditional land-use practices. An analysis of the pastoral system of a people like the Khumbu Sherpa, who are substantially dependent on products and profits from livestock, provides a key to understanding the situation of a people caught between tradition and change. The cattle economy is a microcosm of the Khumbu economy; transitional forms of livestock management are a response to the forces of change that operate on the society as a whole; the environmental responses to these new management forms exemplify the changing relationship of people to land. For the Sherpa, tradition is the powerful, persistent, yet fluid tenet of the Tibetan-Buddhist cultural world of which they are a part. The resilience of this cultural heritage has helped the Sherpa meet the flood of visitors bringing novel ideas, values, expectations, products, and plans to their national park home with less loss of ethnic identity, less

erosion of traditional values and practices, than that suffered by other Himalayan peoples in the face of the invasion of the Western world. But for all this resilience, the Sherpa world has changed substantially and irreversibly in the three and a half decades since Nepal opened its borders and Edmund Hillary stood with Tenzing Norgay on the summit of Everest. An understanding of the forms and meaning of this change, derived from the study of Sherpa animal husbandry, can provide the basis for planning that allows a continuation of a generations-old pattern of subsistence while providing protection for the environment that is simultaneously the home of 3000 Sherpas and a park for the world.

This book undertakes to document the wide range of elements that make up the Sherpa pastoral system. The Khumbu environment itself is described in some detail, and the human role in modifying the natural landscape is explored. Sherpa history, society, and economy are discussed, as are the substantial changes that the traditional life of Khumbu has experienced in the last few decades. Livestock provide a focal point for this wide-ranging investigation, and the cattle economy particularly is described. The goal is a comprehensive portrayal of conditions in Sagarmatha National Park today, and an understanding of the processes at work, both in the environment and within society itself, which shape the patterns we find here.

This account has implications which reach beyond Khumbu to inform both the scholarly study of mountain peoples and contemporary concerns about environmental crisis in the Himalaya.

### *The Himalayan Crisis Scenario*

A prevailing view of the status of the environment in the Himalaya is nicely expressed in this passage from an address by a prominent Nepalese environmentalist:

The fabric of the Himalaya, although it projects magnificent strength, is nothing more than a fragile cobweb that has been wrought delicately but which is supported very carefully only by a few strands of thread, which when cut could cause the entire intricate system to fall apart [Sakya, 1985, p.1].

Karna Sakya's touch of hyperbole, which casts the earth's thickest accumulation of lithosphere as 'fragile cobweb', is quite in keeping with the widely held and communicated beliefs about the environmental condition of the world's highest range. Eric Eckholm warned,

... without a massive effort to preserve and restore the ecological integrity of the mountains, within a few decades they will not be idyllic vacation spots but, rather, barren eyesores that perennially present the lowlands with devastating torrents and suffocating loads of silt [Eckholm, 1975, p. 764].

Eckholm identifies the cause of environmental crisis in the Himalaya as population growth among traditional agriculturalists, whose increasing demands for fuel-wood and fields create deforestation and consequent erosion with regionally devastating effects.

At stake, according to this assessment, are not only the few million hill people whose maladaptive practices bring ruin on themselves, but also the many millions more living downstream in the raging Ganges' path.

Eckholm's interpretation of environmental crisis in the Himalaya appeared in *Science* in 1975, and has served as something of a call to arms ever since. His warning followed those of other mountain scholars, explorers, and national and international agencies, and is continually echoed by journalists, visitors, scholars, resource and development agencies, and many others including concerned officials and residents of the Himalayan region itself. As drawn, repeatedly, in such a form, this Himalayan Crisis Scenario provides a comprehensible, plausible, *intuitively correct* picture of mountains and man in disharmony. A problem of calamitous proportions becomes graspable—and thus manageable—given the terms of the explanation.

But this broadly embraced interpretation of desperate crisis is increasingly suspect as a comprehensive explanation for the relationship between people and environment in the Himalaya. Misgivings about the magnitude, mechanisms, and applicability of this formulation have led to questioning of the crisis hypothesis. (Questions about the 'theory of Himalayan degradation' provocatively articulated by

Thompson and Warburton, are summarized in Ives, 1987, and Ives and Messerli, 1989).

Analysts exploring the slight but much-recycled documentation for environmental catastrophe have found substantial uncertainty in numbers and methods of analysis. Students investigating the history of resource extraction in the Himalaya note a widespread pattern of commercial and state-sanctioned deforestation, indicating a long-term process of forest removal involving other culprits in addition to today's hill villagers and contemporary practices. Field researchers find that the interactions they observe of people and environment fail to meet the expectations of the crisis model. For instance, landslides, ostensible signposts of environmental disaster, may be reworked into stable, productive terraces; farmers may even deliberately engineer slides to produce new land for cultivation. It may therefore be that the larger picture of man-environment interactions in the Himalaya-Ganges system has been misread. The inherent instability of the rapidly rising, monsoon-sluiced Himalaya appears to produce a substantial proportion of surface disturbances without the assistance of any human agency; man's tinkering in high mountain watersheds, although it may have significant local effects, seems to have no measurable effect on flows and floods in the greater Ganges system.<sup>2</sup>

If the premises underlying the scenario are off the mark, if the form and process of problems have been misidentified, what is going on in the Himalaya? How do the experiences of the Sherpas of Khumbu exemplify the processes of change of landscape in the Himalaya as a region, and how have assessments based on the precepts of the Himalayan Crisis Scenario led to misperceptions of and inappropriate responses to the interactions of people and environment in the area of Mount Everest?

More fundamentally, what *is* the impact of these residents of the high Himalaya on the natural landscape? What were traditional land use practices? What are the historic effects of human occupation on the mountains? What forces are at work in reshaping older cultural traditions? What patterns of

land use, with what social and environmental consequences, emerge from these transforming forces?

A comparison of this study of Khumbu Sherpas with accounts of other Himalayan peoples argues against any all-encompassing explanation for the state of people-environment relations in this diverse region. Whatever commonalities there may be in the lives of mountain peoples the world over, including such widely shared cultural elements as Orlove and Guillet have enumerated,<sup>3</sup> each association of a people, place, and their shared history makes for a singular situation, a unique interaction of man and landscape.

### *Mountain People and the Ritual Regulation of Resources*

The fine-tuning of Sherpa subsistence to the rigours and rewards of high Himalayan conditions, to be described in later chapters, reflects the sort of cultural adjustment we increasingly expect to find among peoples with many generations' experience of an environment less altered from its 'natural' state than the landscape in which industrial cultures are embedded. The approach to the exploration of man and environment known variously as cultural or human ecology is alert to those aspects of culture that mediate between people and nature. My study draws on this approach, but probably lies closer to the ideological territory of a less methodologically and theoretically refined—or burdened—relative, plain cultural geography.

Awareness is growing of the sophistication inherent in 'traditional' people's understanding and accommodation of an environment's complexity and dynamics. This increasing appreciation by scholars parallels—or perhaps follows?—an evolving environmental consciousness, a recognition of the limits and consequences of the earth-use patterns of the industrial nations, which has been accompanied by a search for alternative, less destructive ways of dealing with the planet. Traditional peoples can provide such models for environmental visionaries while at the same time demonstrating the forms and processes of human adjustment to



particular environments for students of cultural ecology.

Among especially important examples of such analyses of cultural behaviour are those regulating consumption of natural resources. Sustainable use of naturally provided resources seems to be regarded as a certificate of successful adaptation. The contemporary, codified, formal regulatory systems familiar to most of us (such as federal or state controls over forest, grazing, hunting and fishing, minerals) represent relatively recent (and often ineffective) efforts at a function human societies have in all likelihood set for themselves from very early in our species' history. As exploiters of nature and its resources we *Homo sapiens* are too efficient, too potentially destructive to be without culturally mediated controls over our use of resources. Our evolutionary success has often depended on balancing our appetite for resources with their sustainable production. One may find examples of such controls among traditional peoples in environments as diverse as South-east Asia and Indonesia, the Pacific, the Arctic, South and Central America, and the deserts of South Africa.<sup>4</sup> It is perhaps especially incumbent upon mountain peoples to regulate their exploitation of a circumscribed environment characterized by its low productivity. Cultural practices of Khumbu Sherpa exemplify such regulation.

For members of such small-scale societies, regulation of resources is likely to be *de facto*, not explicitly designed and designated conservation practice. For Sherpas, rituals explicitly intended for other purposes operate to lessen and restrict the impact on range resources. But regardless of articulated intent, traditional practices such as those to be described in Khumbu often function as effective conservation.

### *Cultural Disruption and the Survival of Traditional Systems*

In an earlier day, perturbations in the milieu of isolated mountain people like the Sherpa may have had their origins mostly in natural events: glacial-lake burst and consequent flood, earthquake, drought, and the like. Caught sometimes in a cross-fire between Kathmandu and Lhasa or Peking,

squeezed by advancing Mongols, or introduced to the productive possibilities of New World potatoes, Sherpas have also been affected by disturbances with a human origin. Sherpa society has been called upon to adjust to such factors of interference, reorienting production and social systems to accommodate the changed conditions which follow such disturbance. But no source of cultural change is likely to have operated with the penetrating efficiency of modern forces of disruption. The flexibility of traditional mechanisms of cultural adjustment are clearly strained by so radical a reordering of older ways. An analysis of the Sherpas' response to change is a central theme of this study.

But whatever they may have in common with other traditional mountain peoples and small-scale societies undergoing development, in many respects Sherpas make a poor model of the forms and processes of contemporary cultural change. Khumbu is perhaps unique. At any rate, its story is very different from that of other regions of South Asia and the developing world. The nature of the dominant cause of change here, tourism, and of a barely accessible, high altitude environment with limited extractable resources, means the impacts on the Sherpa world have been of a different kind and magnitude from those characterizing development elsewhere. Further, Sherpas themselves remain in control of their lives and their environment to a greater extent than traditional peoples in many situations. The effect of a colonial heritage, so important in the recent history of many parts of the region, are muted here. The reach of the Raj did not stretch so high; traditional Sherpa institutions were never preempted as were those of Paharis in the Indian Himalaya, for instance. Kathmandu's exercise of control over forest resources in Khumbu was usually mediated through Sherpas who remained accountable to their fellows. Until very recently, Sherpas did not experience the same sort of usurpation of land and resource control by the state, whether for commercial or conservation purposes, that afflicted the indigenous resource-control practices of groups easier to reach and in possession of more coveted resources.<sup>5</sup>

## NOTES

1. Fraternal polyandry is commonly encountered among Sherpas, as among other people of Tibetan culture (Goldstein, 1981) and other Himalayan groups (Berreman, 1962). Pemba Nuru's two fathers are brothers who share one wife, an arrangement that offers economic advantages to the woman and her children, reduces land fragmentation, and shows the rate of population increase in an environment of well-defined limits such as Khumbu.

2. Among a growing number of studies casting doubt on the Himalayan Crisis Scenario are those by Donovan, 1981; Carson, 1985; Thompson and Warburton, 1985; Thompson *et al.*, 1982; Johnson *et al.*, 1987; Bajracharya, 1983; Mahat *et al.*, 1986-7; Byers, 1986, 1987; Brower, 1983b, 1986. Additional reports are included in *Mountain Research and Development* 7:3, a special edition of 'The Himalaya-Ganges Problem', which reports the proceedings of a seminal conference by that name in Mohonk, New York, in April 1986.

3. The distinctive, even unique limitations and opportunities of mountain environments appear associated with patterns of survival and adaptation shared by mountain peoples in different areas, with dissimilar cultural traditions and regional histories. These include striking similarities in subsistence practices and comparable systems organizing land tenure, labour, and society. Thus mountain groups from the Alps to the Andes are supported by agro-pastoralism and trade. Fields are privately owned, and grazing makes use of commonly owned and controlled pasture. Collective decision-making guides both land use and labour, and there is reduced differentiation by gender, caste, and class. These are among widely shared attributes of mountain subsistence systems as Orlove and Guillet, among others, identify them.

4. The list of scholars who illuminate the discussion of ritual regulation of resources includes Rappaport, 1967; Nietschmann, 1971; Reichel-Dolmatoff, 1982; Johannes, 1981; among many others.

5. An exploration of the implications of colonialism and the neo-colonialism of development for the more vulnerable peoples of the Himalaya can be begun with Berreman, 1979; Blaikie *et al.*, 1980; Blaikie and Brookfield, 1987; Guha, 1985; Bajracharya, 1983; Mahat *et al.*, 1986-7.

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# *The Physical Landscape*

## *The Himalayan Region*

THE Himalaya mark the collision of a wayward chunk of continent, the Indian Shield, with the less yielding mass of the Eurasian plate. The process began about sixty million years ago at the beginning of the Tertiary, and continues; the reverberations of the forced descent of the Indian plate under the master continent still shake the region (Molnar and Tapponier, 1985). The landscape engineered by the unimaginable power of plate tectonics is distinctive: the earth's crust here is at its thickest, and forms the vast, high Tibetan plateau; the most extensive array of high ranges is found here, and includes the Hindu Kush, Karakoram and, highest of all, the Himalaya. But there is more to this part of the world than big peaks. Lowlands of India, Pakistan, and Bangladesh abut the Himalaya to the south. Major and minor valleys parallel the ranges extending East and West. Some of the world's most powerful rivers cut across the mountains. It is a landscape of great diversity, encompassing the highest frozen mountains and flat fertile plains, sacred rivers and secret valleys.

The variety of the physical landscape is echoed in the living environment. In Nepal alone there are more than 6500 species of seed plants (Polunin and Stainton, 1984) and over 800 species of birds (Fleming *et al.*, 1979). The richness and diversity of plant and animal life is a response to the combination both of a constellation of different environments and of the intersection of several distinct biomes brought into proximity by the Tertiary collision of the Indian subcontinent and the main mass of Asia.

Nepal encompasses much of the variety found in the Himalayan region. A small country, roughly 150 by 700 kilometres in area, it lies along the centre of the Himalayan arc (Figure 1.1). Nepal's topography is typical of much the larger region. Along the southern boundry is a narrow strip of the Ganges plain, very deep and relatively recent (Pliocene and Quaternary) accumulations of wasting mountains. This Terai was once densely forested and the home of tiger, elephant, one-horned rhinoceros, and the malaria-resistant Tharu people. Today this lowland area is the fastest growing part of Nepal. In the lands here, newly opened to settlement, tropical forest is rapidly being cleared to accommodate commercial enterprises and the thousands of immigrants fleeing stringent Indian taxation, drawn by Nepalese government resettlement programmes, escaping the crowding of the hills, or simply looking for new opportunities.

Inward from the Terai lies the Churia Range (called the Siwaliks in India), a relatively low (800 to 1500 metres) line of wooded, sparsely-populated hills constructed from Miocene to Pliocene formations called 'Siwalik molasse'. These are backed to the north by a higher range, the Mahabharat Lekh, built of meta-sediments and other metamorphic rocks and aligned east and west like the Churia Range but separated from the lower front range by a discontinuous valley system known as the Inner Terai (Vuichard, 1986).

Behind the Mahabharat Range in central Nepal lie the large mid-montane areas, including the Kathmandu and Pokhara valleys, where the region's densest population, most intensive agricultural production, and political power have been concentrated.

The high Himalaya, largely Precambrian basement formations of the 'Tibetan slab', rise behind the mid-montane area to elevations greater than 8000 metres, and yield in their turn to the valleys of the inner Himalaya. These share Tibet's cold, arid, high altitude environment, and are occupied by people of the Tibetan cultural tradition.

## KHUMBU HIMAL: SHERPA HOMELAND

Mount Everest, the highest point of the earth's surface at 8848 metres, rises from the border between Nepal and Tibet. 'Everest' is after Sir George Everest, surveyor-general of India from 1830, but the peak has other names. *Chomolungma* is what Sino-Tibetan language speakers call it; *Sagarmatha* is its Sanskrit—and Nepali—name, and the name given the national park delineated on the slopes of the Nepal side of the peak (Figure 1.2).

*Terrain*

Sagarmatha National Park lies along the Nepal–China (Tibet) border in north-eastern Nepal, about 90 kilometres as the crow flies and almost three times that distance by trail from Nepal's capital, Kathmandu. The park is centred on the intersection of 86 degrees 45 minutes east longitude, 27 degrees 55 minutes north latitude: a sub-tropical situation in which climate is tempered by altitude and the sweeping mechanisms of monsoon circulation. It is an area of approximately 1110 square kilometres, a rugged landscape of great mountains, interdigitating glaciers and ridges, glacial debris-burdened streams, hanging micro-valleys and constricted fluvial terraces. The landscape is something like a three-fingered palm outstretched: sub-parallel valleys are the interstices between the knobby fingers of peaks (Figure 1.3). Within the park are found most of the upper catchments of three tributaries of the Sapt Kosi system: the Dudh Kosi and its feeder streams the Bhoté Kosi and Imja Khola. These rivers begin as glaciers formed on the flanks of massive peaks, including four of the world's seven highest: in addition to Sagarmatha, Lhotse (8501 metres), Lhotse Shar (8383 metres), and Cho Oyu (8189 metres). They gather strength, coalesce, and flow southward, incising a path to the Ganges. Above about 4000 metres, the valleys have been scoured into the broad U that is a glacier's imprimatur; lower, the rivers run in some of the deepest, most precipitous gorges found on the planet. At 2845 metres, the lowest

elevation in Sagarmatha National Park, the river flows 4000 metres below the summit of the adjacent peak, Tamserku. Today, the big valley glaciers are dying, rotting away to milky melt-water under a burden of till. The smaller, higher, newer glaciers clustered around the summits above about 5500 metres are still lively. Twice in the last eight years, lakes associated with these young glaciers have ruptured and caused destructive floods which washed away bridges, houses, fields, a hydroelectric power station, livestock, and human lives.

### *Climate and Weather*

The Himalaya and its sister ranges are climate makers. These highest of all mountains stand as a barrier between South and Central Asia, deflecting the moisture-bearing winds of the summer monsoon, intercepting any return flow from the cold Tibetan High in winter, and sometimes intervening in the westward flow of the mid-latitude and sub-tropical jets. Air forced to rise into the mountains precipitates some moisture as snow above about 6000 metres in summer; the high reflectivity of the permanent mountain snow cover serves to further modify the regional climate (Mani, 1981).

This interaction of global circulation patterns with the barrier peaks makes for distinctive Himalayan climates. In the eastern reach of the range, the south-east monsoon brings about eighty per cent of the annual precipitation between June and September. These rains arise from the Bay of Bengal and fall most heavily on the south-facing slopes of the eastern part of the Himalaya. The western Himalaya and the leeward slopes of each of the succeeding ranges—Siwaliks, Mahabharat Lekh, and great Himalaya—are thus drier, and the high inner valleys and much of Tibet are desert.<sup>1</sup>

Summer monsoon brings most precipitation to most of the eastern Himalaya, but rain and snow arrive in other seasons as well. In April and May increasingly frequent thunderstorm activity in the mountains is spurred by the convection created during the hottest months of the lowland dry season. Winter snowfalls arrive with frontal systems borne on the



westerlies. Whereas in the western Himalaya these can be the most important sources of annual precipitation, winter precipitation is much less significant as far east as Khumbu (Mani, 1981).

Within this broad regional framework, weather in Sagarmatha National Park is subject to a number of local factors. Diversity and unpredictability are guaranteed by seasonal, annual, and topographic variability; according to some Sherpa informants, supernatural forces are also at work in shaping Khumbu's weather (Brower, 1983d).

There are major limitations in the weather data available for Sagarmatha National Park. Those most familiar with history of acquisition of the one long-term record—twenty-three years of data collected at Nauje and published by the Department of Hydrology and Meteorology (reported in D. P. Johi, 1982)—are most sceptical of its reliability. Weather stations have been installed and sporadically maintained at three primary locations: the villages of Nauje and Khumjung, and at Tengbuje monastery. Weather data were collected in conjunction with the Japanese glaciological expeditions; summer data for their station at Lhajung (at the junction of the Chukkhung and Pherije valleys) seem likely to be substantially more reliable than most other weather statistics for Khumbu (Ageta, 1976; Yasunari, 1976; Higuchi *et al.*, 1977). Another short-term station producing reliable data was the one established at Khumjung for most of 1984 by the Mountain Hazards Mapping Project team headed by Alton Byers (Byers, 1986). A station established at Nauje in the course of my study was monitored daily from early in 1984 by Tenzing Gyazu Sherpa, and provided over two and a half years of data of, unfortunately, limited usefulness.<sup>2</sup>

But despite the shortcoming of the available data, something can be said about general weather patterns in Khumbu based on the distribution of vegetation and agricultural land use and on the experience of locals and others, as well as on these imperfect weather records.

Temperatures in Sagarmatha National Park are more temperate than one might expect from the appearance of this high mountain landscape. Joshi concludes that the mean

temperature in Nauje's coldest month, January, is  $-0.4^{\circ}\text{C}$ , with a minimum mean of  $-7.9^{\circ}\text{C}$ . The July mean is  $12^{\circ}\text{C}$  (Joshi, 1982). These values would decrease with increasing altitude.

Precipitation peaks in the monsoon period, June to September, in Sagarmatha National Park as elsewhere in the eastern Himalaya; about 80 per cent of the annual total arrives with the summer monsoon (Garratt, 1981). An additional 10 per cent falls in May and October giving the area a climatic classified as 'cold-humid and tropical' (c.f. Joshi). According to the official record, Nauje at 3440 metres has an annual average precipitation of 1048 mm, with a range from 708 to 1710 mm (Joshi, 1982). Both the fifteen-year official record and 1984 measurements by Byers show July to be by far the wettest month for Khumjung (Byers, 1986), a pattern of precipitation concentration likely to apply throughout Khumbu: it is in *Dawa Duinba*, the sixth month (mid-July to mid-August) that rivers and lakes are reported to be at their fullest. According to Sherpa informants, the monsoon period is often preceded and ushered out by episodes of extraordinarily intense precipitation, known as *yerjhug* ('summer rain') and *tenjhug* ('autumn rain') respectively.

Topography introduces considerable variation into total precipitation values. In general, there is a decrease in monsoon precipitation with altitude. Summer rains that drum on Nauje roofs dissolve into drizzly mist at higher elevation grazing grounds. Aspect and siting with respect to prevailing winds are also important. According to one report (Garratt, 1981), annual precipitation is 984 mm for Nauje, 733 mm at Khumjung, and 1043 mm at Tengbuje—a higher elevation than the other locations at 3867 metres, but exposed on a moraine crest jutting above a valley that channels a considerable flow of moist air. This local variation in precipitation patterns is apparant in other places as well. The seasonally occupied settlements of Dingbuje and Pherije, lying at about the same elevation (4200–4300 metres), less than a kilometre from each other, experience significantly different weather. Clouds travelling up the Imja Khola invariably appear to veer north-west towards Pherije, rather

than east to Dingbuje, when they reach the confluence of the Khumbu and Imja Kholas. Pherije in all seasons is much more often cold, drizzly, and windy than Dingbuje, a difference reflected both in natural vegetation, which indicates drier conditions around Dingbuje, and in land use: Dingbuje is the only place in Khumbu where one finds the cultivation of barley, a crop which requires both irrigation and a reliable post-harvest drying season. Comparable irrigation potential and field space exists at Pherije, but the only barley cultivated is a lowland variety harvested for hay before maturity. Further evidence for significant local variation from year to year comes from hay yields. Hay is cultivated and wild hay harvested in each of the three principal highland areas used by Sherpas: the Bhote Kosi headwaters, the Ngozumpa Glacier's valley (Gokyo), and Imja Kholas's twin tributaries. In any given year, hay production from one area may be substantially better than the others, a difference that primarily reflects the amount and timing of rainfall.

Weather on the high Himalayan peaks themselves has always been a matter of crucial importance to mountaineers venturing onto them; most major expeditions keep records, some extremely systematic and detailed. That the weather on Sagarmatha National Park summits responds to a different set of forces is clear when looking up from the lowlands. At 5500 metres on a ridge below Everest, it might—in any season—be tee-shirt weather. The snow plume blowing off the world's highest mountain 3300 metres above gives evidence of very different conditions. The primary climbing season is early autumn, when the monsoon has played itself out, but before the storm-towing jet-stream descends to the latitude of the Himalaya, and before winter temperatures add a further risk factor to an already deadly undertaking. A secondary climbing season is in the spring, when major expeditions are launched on Everest and other big peaks. The heavy demand for an opportunity to try a Sagarmatha National Park peak, coupled with the urge to climb an old route in a new season, has pushed attempts into nearly every other month as well.

A distinctive diurnal pattern of precipitation and tempera-

ture is superimposed over the broader seasonal distribution. Summer rain, brought by up-valley winds, generally falls during the night. Throughout the year, mornings are likely to be clear (although in summer, this morning clearing may not last past daybreak), and late-morning temperatures seem highest in Khumbu as they are elsewhere in the Himalaya (Hooker, 1854). Morning is the time when old people bask against the walls of village houses, babies are bathed, and when grain, sliced potatoes, and washed wool are spread to dry on woven mats of yak-hair laid out in the yards of the houses. In winter, mornings before the clouds come are the only time when a researcher's typewriter, given the chance to bask like the old folks, thaws sufficiently to be usable.

Further variability is introduced into Sagarmatha National Park's weather and climate by both cyclic and erratic departures from the usual patterns. Joshi deduces from the Nauje record that the rainfall regime varies between tropical (summer rainy season, occurring in 56 per cent of the years of record), and 'bixeric' (dry periods flanking the summer rains: 35 per cent of the record). Irregular rain/dry season patterns make up the remainder of the record period since 1948. According to Joshi, this makes for a moderately stable climate (D. D. Joshi, 1982). Yet there is evidence from the big valley glaciers for increasing temperatures and reduced precipitation in the last decades, an observation reinforced by the recollections of some Sherpas, who explain the wasting of glaciers that makes high valley travel increasingly hazardous with milder weather. But others refute this appraisal, and argue that storms and cold weather have increased in the years since Khumbu was opened to tourism (Tengbuje Rimpoche, personal communication, 1982). The Rimpoche attributes deteriorating weather to a decline in Sherpa morality and values, offensive to powers of nature, which has followed affluence and the opportunities of development). Many Sherpas report a three-year recurrence interval for particularly severe storms, although such a cycle is not universally acknowledged (Brower, 1983d).

The areal and temporal distribution of Khumbu snowfall is essentially unstudied. Observation and data from Lhajung

suggest a summer snow-line above 6000 metres. Winter snows are extremely erratic. There may be several successive years with long, precipitation-free periods in winter with just an occasional snowfall. At other times high settlements and even villages at a lower elevation may be snow-bound for weeks together. Sherpas consider that heavy snowfalls have a recurrence of about five years. There is one account offered by several informants of a storm about forty years ago that piled snow to the second storey windows of houses in Nauje: 'People scooped up snow out the windows to melt for water.' This same snowfall triggered an avalanche that destroyed several houses in the village and reportedly filled the Dudh Kosi gorge so that people could walk across from Tengbuje to Fortse (a depth of 500 metres!).

These daily, seasonal, annual, and longer-term patterns in Khumbu's climate and weather are critically important to both human use and patterns in the natural landscape.

### *Rivers*

Khumbu is the headwaters of an important tributary of the Sapta Kosi, itself a significant contributor to the Ganga, and a river that carries more bed-load than any other (Das, 1968).

. . . the Cosi river enters the Ganges, bearing (considering its short course) an enormous volume of water, comprising the drainage of the whole Himalaya between the two giant peaks of Kinchinjunga in Sikkim, and Gossain-Than in Nepal. Even [in the dry season] . . . the enormous expanses of sand, the numerous shifting islets, and the long spits of mud betray the proximity of some very restless and resistless power. During the rains, the scene must indeed be extraordinary, when the Cosi lays many miles of land under water, and pours so vast a quantity of detritus into the Ganges that long islets are heaped up and swept away in a few hours; and the latter river becomes all but unnavigable. [Hooker, 1854, p. 66.]

Interest in hydroelectric power development has spurred most hydrological research in Khumbu as elsewhere in Nepal, where 'untapped' hydro-power is seen as the nation's greatest resource (Ministry of Water Resources, 1983; Sharma, 1987). Hydrologic studies in Sagarmatha National Park include some optimistic stream-flow measurements

by an Austrian group laying the groundwork for the Namche Micro Hydro Project at Thamo, Broughton Coburn and others' short-term measurements of a spring in Nauje (Coburn, 1985), and other small-scale studies of the power-generating potential of Sagarmatha National Park streams, such as that by Bill Shaeffer working with the Peace Corps in 1984. The most extensive work to date on Khumbu rivers is that of Elizabeth Byers. Her stream-flow data, collected in conjunction with the Mountain Hazards Mapping Project in 1984, will provide the first systematic information of seasonal variation in discharge for Imja Khola and its tributaries.

Stream flow is strongly seasonal. Precipitation is concentrated in the monsoon period, June through September; discharge correspondingly peaks during the summer monsoon. Sherpa informants report that Khumbu's rivers and lakes reach maximum levels in the sixth month (July–August), and that in many years a later surge in river flows follows the intense end-of-monsoon rains. In the summer months a diurnal fluctuation in stream levels reflects the effect of insolation on the glaciers that head nearly every Khumbu stream. A river easily fordable in mid-morning becomes a scary torrent by afternoon, clouded with the upstream glacier's signature silt.

Evidence from the Kakani–Kathmandu area of Central Nepal suggests that the Himalaya's lower latitude rivers exhibit essentially the fluvial dynamics—channel morphology, sediment transport, discharge—of mid-latitude streams (Caine and Mool, 1981). Sagarmatha National Park's rivers are exceptionally high energy systems, relaying massive amounts of material into the Sapt Kosi and Ganga, yet they are substantially like the mountain streams of lower altitude ranges in higher latitudes.

The effects of historic human actions on Sagarmatha National Park hydrology are intriguing and largely unexplored. It is claimed that recent deforestation has disrupted village water supplies (Lucas *et al.*, 1974, and others). Evidence for one such occurrence comes from villagers' reports of reduction and increased unpredictability in the

flow of the spring system that supplies Nauje, which is thought to have followed clearing above Nauje for the Shyangbuje airstrip built in 1972 to serve the moribund but reviving Everest View Hotel (Brower, 1983d).

### *Glaciers*

Compared to Sagarmatha National Park's rivers, the area's glaciers have attracted far more extensive analysis (Müller, 1958; Miller, 1970; Benedict, 1976; Fujii and Higuchi, 1977; Mayewski and Jeschke, 1980; Williams, 1983). According to the work of Fujii and Higuchi, glaciers here are of two classes based on location, dimensions, and dynamics: big, dirty, dead valley glaciers; clean, little, lively mountain glaciers.

The massive wasting valley glaciers are the landscape dominants. These include the Imja, Lhotse, and sister glaciers that feed the Imja Khola; Khumbu, which initiates a tributary of Imja Khola to be called Khumbu Khola in this study; Ngozumpa, heading what is known as the Gokyo Valley and beginning the Dudh Kosi; and the Lunag, Nangpa, and Sumna glaciers which coalesce as the headwaters of the Bhote Kosi. The advances and retreats of these glaciers have profoundly influenced Khumbu living space, gouging and rounding the valley bottoms when conditions are favourable and the glaciers have moved forward, leaving piled detritus as massive moraines and outwash deposits when they retreat. Above about 3800 metres the fluvial 'V' valley cross-section is obscured by scouring from the periodic passage of these glaciers.

At present, the termini of the retreating big glaciers lie at 4400 to 4800 metres (Schneider, 1978), where the stagnant ice of the glaciers' snouts lies under a thick, insulating mantle of debris. There is some debate about the status of these glaciers: are they stable, as the termini suggest, or dying invisibly beneath the accumulated till?

There is widespread evidence of several glacial advances since the late Pleistocene. Iwata (1976) identifies four major episodes: 'Lobuche', 'Tuglha', 'Pheriche', and 'Thyangboche'; others have assigned different names. He suggests



that these correspond to the glacial sequences of North America and Europe. Two terminal moraine complexes rest down valley from the present glaciers, believed by Iwata to represent Pleistocene maxima and the most extensive periods of glaciation (the 'Pheriche' and 'Thyangboche' stages). The Khumbu Glacier, most extensively studied, is flanked by a series of nested lateral moraines. The older features, with greater soil development, more extensive vegetation, and other indicators of greater age, probably derive from the Pleistocene advances and lie farthest from the glacier body (Iwata, 1976). The innermost moraines are thought to reflect Holocene glaciations. Radio-carbon dates of 1200 and 500 years are associated with these deposits (Williams, 1983), raising some interesting questions—to be discussed later—about the extent and implications of glaciation at the time of arrival of the first Sherpa in Khumbu.<sup>3</sup>

In contrast to these Pleistocene relicts are the younger, smaller, high mountain glaciers of the big peaks. These glaciers, apparently thriving at present in contrast to the dying valley glaciers (Fujii and Higuchi, 1977), are significant as sculptors of the highest mountain scenery. But although they lie at elevations greater than 5000 metres and far from permanent habitations, these glaciers, too, are important to human users of a dynamic landscape because of their role in the lake bursts that inject tremendous amounts of material into Khumbu's fluvial systems and disrupt the more usual stream regimens—with catastrophic results. Rivers and glaciers are major features of Khumbu. They have sculpted the Sherpas' world, and although they are awesome and extraordinary to a visitor, to Sherpas they are simply givens of the physical environment. But when rivers and glaciers collaborate to produce the periodic cataclysm of a *tshoserup* (the Sherpa term applied to such 'lake ruptures'), this *does* intrude into the Sherpa consciousness.

*Tshoserup* Known in common geomorphology parlance by the Icelandic 'jokulhlaup', *tshoserup* are an inevitable response to the instability of glaciers everywhere. The Himalaya, with its proliferation of glaciers of all sizes undergoing

the gamut of dynamics from rejuvenation to death, is perhaps especially likely to experience such glacier-triggered disturbance on both sides of the range crest (Ives, 1988). An agent of the British Raj, Lt. Col. F. M. Bailey, described the onset and aftermath of such an event encountered in his 1913 explorations of south-east Tibet:

. . . the Tralung formed a dam higher up the valley and for three days ceased to flow. . . Those living in the valley were frightened, because they knew that the water was building up behind the dam and the time would come when it would break through . . . On the third day in the afternoon the dam broke and rushed down the Tralung valley in a great avalanche of water, earth, and rocks, which continued for one hour. Earth and stones were carried right across the Yigrong valley in a fan some three miles wide on the right bank of the river and some 350 feet thick as we measured it by aneroid. On the left bank of the river three villages were buried . . . and on the right bank [two others]. [Bailey, 1950, p. 106.]

Within the memory of middle-aged Khumbu residents there have been a number of substantial floods created by the sudden rupture of glacier-dammed lakes. One such lake associated with the Thengpo Glacier in the Bhote Kosi's drainage, up-valley from the permanent settlements of Thamichok, broke through its dam, resulting in a substantial flood perhaps thirty-five years ago (Brower, 1983d). More recently, in 1977, a *tshoserup* burst from the Nare Glacier of Ama Dablam creating a surge of flood water that shook and rumbled like an earthquake, according to villagers in Pangbuje which lies across the Imja Khola from the source of the flood. Fields and houses too close to the river were washed away by the ensuing flood, which also destroyed all bridges for thirty-five kilometres from the source (Brower, 1983d; Zimmerman *et al.*, 1986), and killed several people.

On 4 August 1985, a *tshoserup* estimated at two to four times the magnitude of the 1977 event re-engineered the riverine landscape of the Bhote Kosi and of the Dudh Kosi beyond the rivers' confluence.

A mass of ice broke loose from a hanging glacier on the north-east face of Tangi Ragi Tau, a peak heading the Langmuje Valley. The ice dropped into the lake below, formed in a basin dammed by moraines left by the retreating

Langmuje Glacier. The impact of the ice triggered a wave that breached the moraine, damming the lake at its lowest point, and permitted the sudden and catastrophic drainage of the lake (Vuichard and Zimmerman, 1986).

It has been estimated that six to ten *million* cubic metres of water with massive amounts of accompanying debris drained from the lake over a four-hour period. 'The head of the flood was more like moving mud and slush pushed by a bulldozer than a swift flowing body of water' (Lhakpa Norbu Sherpa, 1985b). For Khumbu witnesses, it was an awesome spectacle:

I heard what I took to be thunder and looked out and was surprised to see blue sky. Within minutes boys came running yelling it was the river. We all dashed outside to take a look. A huge volume of mud and water was crashing around in the gorge. An old shingle fan below Kongde with large forest on it was rapidly collapsing into the river. Huge waves were crashing up the rock cliffs. Each time another group of large trees collapsed into the river all the villagers viewing from numerous vantage points would gasp. Towards Tashi Lung dirty spray was being thrown way into the air . . . the trees were being broken into match sticks within minutes . . . the ground was vibrating as during an earthquake. [Helen Sherpa, personal communication, 1985.]

The flood and subsequent undercutting and erosion of the rivers' banks was extraordinarily destructive:

The flood swept away twenty houses, ten bridges, and many potato fields in Namche Panchayat alone . . . in the lower valley . . . the flood gained momentum and destroyed more houses, fields, and bridges . . . Many houses were left precariously hanging over the edge, ready to tumble down at any time as the river cut into its banks. [Lhakpa Norbu Sherpa, 1985.]

Yet despite this devastation, very few people died. Khumbu Sherpa were celebrating *Phangnyi*, a festival during which all villagers congregate in a few houses for feasting and entertainment. Thus, although the flood began in mid-afternoon at a time when many people would normally have been at work, at home, or on the trail, and at risk on the river terraces destroyed by the flood, the celebration kept them safe.

*Vegetation*

Sagarmatha National Park's plant life provides the support base for all the area's living things (even those aeolian zone organisms dwelling beyond the highest rooted vegetation). Vegetation, of course, is a critical component in this study of the Khumbu livestock and landscape. The following discussion introduces the flora of Sagarmatha National Park.

The history of western exploration of the Himalaya is full of the names of naturalist-explorers who have sought to document the Himalayan flora.<sup>4</sup>

Hamilton and Wallich were among the first to make significant collections and to leave their names attached to an array of Himalayan species (Stainton, 1972). Charles Darwin's confidante, Sir Joseph Hooker, undertook a collecting exploration in the eastern Himalaya in 1848, and was the first westerner permitted to travel beyond the Kathmandu Valley in Nepal. The British resident in Kathmandu of that period, Brian Hodgson, although restricted to the confines of the valley and without any scientific training, nevertheless made significant second-hand collections of Nepalese plants (Hooker, 1854).

After Hooker, the Nepalese flora remained off-limits to the first-hand investigations of foreign scientists, and it was not until the opening of Nepal's borders in 1948 that freer access was granted to curious botanists interested in discovering what grew between Sikkim and Garhwal. In the ensuing period, botanists and ecologists from Britain, France, and Japan, as well as Nepal's own scientists, have been prominent in floristic explorations of Nepal. Probably the most extensive and comprehensive ecological analysis is that undertaken by the French, primarily by Jean Francois Dobremez and the long-term project begun in 1969 and sponsored by the Centre Nationale des Recherches Scientifiques (Dobremez, 1974, 1976). Maps and monographs from this series of studies illustrate broad plant distribution patterns and ecological relationships throughout most of Nepal. This work represents an elaboration of the first Himalayan vegetation mapping produced by Ulrich Schweinfurth (1957), who has

helped to elucidate the striking zonation of plant communities by altitude. British botanists, in addition to making the earliest collections, have also been particularly interested in the horticultural possibilities of Himalayan flora, and are largely responsible for the many Himalayan natives that have found their way into the world's gardens. Nepal's flora is the particular province of J.D.A. Stainton, whose *Forests of Nepal* is a classic that details the composition of the country's varied forest and describes the forest dynamics the author has observed in the course of extensive journeying through Nepal. Japanese interest in the vegetation of the Nepal Himalaya dates at least from the beginning of this century, when the Zen priest Ekai Kawaguchi made several visits to Nepal, collecting plants as he travelled (Numata, 1983). More recent Japanese botanical and ecological work includes Kawakita's studies in the 1950s (Kawakita, 1956), Numata and others' continuing analyses of eastern Nepal (Numata, 1983), and Hara's team's extensive studies of Rara Lake (Lhakpa Norbu Sherpa, personal communication, 1985). In collaboration with the British Museum (Natural History), Hara has produced the definitive work on Nepal's plants: *An Enumeration of the Flowering Plants of Nepal* (Hara *et al.*, 1978–82). Nepal itself, particularly through the Department of Medicinal Plants, is responsible for a considerable body of work on the country's flora.

Sagarmatha National Park has been the site of several botanical investigations. The British tradition of curious naturalist–botanists has contemporary expression in the 1984 explorations of George Smith, who set out to document undisturbed alpine vegetation—only to find no place in Khumbu 'unyakked'. The 1984 Mountain Hazards Mapping Project headed by Alton Byers conducted the most systematic and intensive study of Sagarmatha National Park vegetation to date, examining the composition of seasonally changing vegetation and slope characteristics of a number of sites, primarily in the Imja Khola drainage. This research, begun in 1982 by Lee MacDonald and Anne Stettler as part of the Mountain Hazards Mapping Project, includes the most careful and controlled examination of forest that has been

done in Khumbu. The present study involved extensive analysis of range vegetation, carried out over several years; its implications are discussed in later chapters.

*Zonal Distribution of Vegetation Types* Altitude, aspect, history, and to lesser extents other edaphic factors control the distributions of vegetation types here as in any landscape. The great variety in these controls and their respective influences makes for considerable complexity in the patterning of vegetation. The following stratification based on altitude and life form is an effort to make this complexity usefully intelligible in the context of the use and management of livestock. The endpaper map Vegetation Zones illustrates an idealized stratification of vegetation based on elevation.

Vegetation of the highest zones, ranging from about 4000 to 6000 metres and even beyond, can be roughly aggregated into three categories by growth form and habitat: ground-hugging alpine tundra; woody scrub consisting of dwarf shrub and tree species intermixed with forbs and grass-like plants; riparian habitats in which a distinctive shrub assemblage coexists with moisture-favouring forbs and sedges.

At the very highest elevations where plants are found, vegetation consists of a few hardy forbs, grass-like plants, and lichens and mosses with low growth form and high resistance to the constraints of wind, insolation, temperature, and a short growing season imposed by altitude. This upper alpine zone, extending upward from about 5200 metres, is restricted to surfaces capable of supporting plants: glacier-smoothed shoulders, the older and more stable segments of talus slopes and moraines, troughs adjacent to moraines, and other surfaces not occupied by glaciers, nor too steep or rocky to permit plants to establish themselves. The cushion-form *Arenaria bryophylla* and *Stellaria decumbens*, which grow higher than any other flowering plants at 6180 metres and 6135 metres, respectively (Polunin and Stainton, 1984), are relatively common throughout this upper alpine zone. Other characteristic forbs include many *Saxifraga* and *Pedicularis* species, *Cremanthodium nepalensis*, *Phlomis rotata*, the umbel *Cortiella hookeri*, several *Primulas* and *Gentianas*, and strangely

cobwebbed members of the genus *Saussurea*. Grasses in this zone are confined to favourable micro-habitats, such as the shelter provided by boulders, where opportunists from the genera *Oryzopsis*, *Poa*, *Festuca*, *Stipa* and *Agrostis* are among those present. Hardier sedges including especially *Kobresia pygmaea* are more conspicuous and commoner than grasses in the highest vegetated areas. They are abundant in the sub-type designated *pangtsa* (meadow) in Sherpa, which is found in a variety of situations ranging from wind-desiccated high alpine-zone ridges to flat, infilled sites between moraines in lower zones. Shrubs are rare so high, but there are a few sites, such as the Changri Nup Glacier's north-facing right lateral moraine, where *Rhododendron nivale*, *Cassiope fastigiata*, and even the slightly tenderer *R. anthopogon* set root among the lichens and other flowering plants at 5200 metres. It is the cryptogams that appear to dominate these highest sites: a very diverse and showy collection of lichens and mosses occupies most of the vegetated surface of the high alpine zone.

The constraints operating on these highest plants appear to be imposed with a surprisingly even hand on all slopes. Micro-habitat factors and perhaps the history of the site rather than aspect seem to control plant distributions to a greater extent in the highest alpine zone than in lower zones, perhaps because of the spatially and seasonally complex interactions of wind direction and insolation.

The low-growing tundra assemblage becomes increasingly diverse with decreasing altitude, and begins to share growing space with shrub types which are an important component of the lower reaches of this high zone. Scrub distribution is enigmatically linked to slope exposure. *Juniperus indica*, for instance, growing as low (30 to 80 cm) mats at these elevations, can be found on slopes of all orientations, although with an apparent preference for south and south-western aspects.<sup>1</sup> Other woody plants making up the high alpine scrub include the rhododendrons mentioned above, *R. nivale* and *R. anthopogon*, and a third hardy azalea, *R. setosum*. *Cassiope* and *R. anthopogon* form a relatively consistent sub-type of scrub, characterized by a paucity of

intermixed herbaceous plants, which appears to respond to imperatives of the aspect in any given locality, yet may be found on virtually all slope orientations but south: north-east near Machermo; west between Tuglha and Dzonglha; north-west above Phulung Karpo; north near Chukhung. The often showy flowering plants of the lower parts of the flora of the high zone exhibit similar tolerance. *Meconopsis horridula*, two *Bistortas*, many gentians, several primroses, edelweiss, *Potentillas*, including the cosmopolitan *P. fruticosa* and any number of Himalayan endemics, asters, orchids, and saxifrages are a tiny part of this spectacular high mountain flora, which is rarely seen in bloom by visitors who avoid the misty monsoon months.

Riparian plant communities of the sub-alpine elevation zone include stiffly woody shrubs of the genera *Caragana* and *Lonicera*, *Myricaria rosea*, as well as the armoured *Hippophae tibetica* and several willows. This wetland flora occupies the outwash front of some smaller valley glaciers or grows among braided stream channels (as above Lhabarma or Pherije). Such habitats are more extensive above 4000 metres—the approximate lower limit of significant Pleistocene glaciation—where glaciers have provided flat surfaces with impaired drainage. The browse-resistant shrubs are joined by a high diversity of grassy plants including a flowery rush (*Juncus thompsonii*) and such damp-habitat forbs as *Primula sikkimensis* and several *Pedicularis* species.

Sagarmatha National Park's middle elevations, from 4000 to 3200 metres, support vegetation of two broad types: forest and scrub. In the lower valleys, forest on the cooler side is a mix of many broad-leaf trees including *Betula utilis*, *Rhododendron campanulatum*, *R. campylocarpum* and *R. cinnabarium*, *Sorbus*, *Prunus*, and several others. *Abies spectabilis* is an important component of this forest, which harbours other conifers, including *Juniperus recurva* and yew. The understorey is rich under birch-dominated expanses of forest and somewhat depauperate beneath rhododendrons. Forest shrubs include several roses, *Spirea*, *Piptanthus nepalensis*; herbaceous plants are extremely diverse. This complex, cool-side assemblage, characteristic of north, north-east,



north-west, and even some south-facing slopes in sufficiently damp, shadowed valleys, differs from drier locations where the double factors of naturally xeric conditions and increased human use produce a less varied forest type. Many of the same species may be present on such sites, but overall diversity declines, the relative importance of juniper increases, and at lower elevations pine becomes dominant.

On many slopes in the vicinity of villages, forest is reduced to isolated trees, and scrub becomes dominant. Settlements in these as in other mountains of the northern hemisphere are established on south-facing sites. The natural stresses of such exposures inhibit forest establishment and persistence. Human interventions, including felling of trees, grazing, and especially fire make these sites particularly tenuous for forest in the Himalaya; these related factors explain the inferred replacement of 'natural' forest with hardier shrubs. These include many of the species of shrub already noted, but at these lower elevations others become more important. *Cotoneaster microphylla* is an extraordinarily durable component of the scrub flora below about 4200 metres. The compact, stiff form which has made it useful in garden landscaping gives it resistance against damage from browsing; although extremely palatable to most livestock, this cotoneaster holds its own on the most heavily-used slopes, where its extensive root system anchors soil and substantially diminishes the erosive effects of human and animal trampling. *Rhododendron lepidotum* is another important component of this mid-elevation shrub flora, which contributes in its own way to the maintenance of slope stability and floristic diversity. In these heavily grazed environments, shrubs provide a nursery where more tender and palatable grasses and forbs can become established, allowing quick recovery of diversity when grazing and other pressures are reduced. Such *refugia* offer a more favourable micro-climate as well as physical protection, a function of established plants in other high-stress environments as well, including desert and Andean paramo (Pérez, personal communication, 1987). Pressure of livestock has probably influenced the distribution of herbaceous flora substantially. Unpalatable or poisonous

plants are conspicuous among the forbs intermixed with shrubs in this mid-elevation scrub, and include *Euphorbia wallichii*, *Iris kumaonensis*, *Delphiniums*, *Aconitum*, and others.

In Sagarmatha National Park's low elevation zone, below 3200 metres, the basic patterns of site-related composition and vegetation which are evident at middle elevations persist. High stress sites are scrubland; damp, protected locations support high-diversity mixed broad-leaf conifer forest; intermediate sites are occupied by dry forest types dominated by pine and are characteristically less complex. At 2800 metres, where the park's boundary reaches its low point, constraints of the cold season on vegetation growth are reduced and the flora includes more tropical and tender species. Oak and larch are among the additions to the arboreal flora in the low zone. Epiphytic orchids and bamboo-type grasses are components of the very lowest forest. Shrubs found below 3200 metres include the extremely widespread *Pieris formosa* and a pink-flowered form of *Rhododendron lepidotum* which has white blossoms and a different growth form above 3400 metres. The relatively limited area in Sagarmatha National Park below 3200 metres and the steepness that characterizes the slopes of these lower elevation, unglaciated valley areas reduce their significance in the overall picture of Khumbu range resources, although such areas are critically important to livestock operations in Nauje for both grazing and fodder collection.

*Seasonal Dynamics* The changing seasons bring radical transformation to the vegetation of Sagarmatha National Park. Greening begins with the first pre-monsoon rains. Vegetation peaks in cover and diversity about the sixth month of the lunar calendar (July–August); blooming of some hardy, late-appearing plants, such as the showy gentians, continues into late autumn. The maturational sequence of Khumbu plants appears to have more to do with taxonomy than altitude, at least in the higher zones. The earliest to bloom at middle elevations, including primulas, *Androsace*, and *Polygonatum*, appear almost simultaneously at the highest parts of their range. When azaleas of the variety

*R. lepidotum* begin to flower around Nauje, at 3440 metres, they can also be found in bloom three and four hundred metres higher. The end-of-season gentians and saxifrages, although of different species, begin to bloom during the same weeks of summer, whether at 3200 metres or 5200 metres.

### *Fauna*

The high biotic diversity that is characteristic of the Himalaya as a region is less apparent in the highest environments. This is particularly true of Sagarmatha National Park animals. The demands of a high altitude habitat force specialized adaptations of physiology and/or behaviour on mountain-dwelling animals and exclude unadapted forms; relatively lower rates of biomass production further limit the numbers of animals that can be sustained (Webber, 1979).

It is difficult to make definitive observations on the animal life of Khumbu, for it is an astonishingly unstudied field here as in most of the Himalayan region. 'Spectacular' species—the Bengal tiger, the snow leopard—attract considerable research attention, but the bulk of the Himalaya's interesting and diminishing fauna remains largely unknown.

Khumbu's designation as 'national park' conjures visions of abundant wildlife to those with Yellowstone as precedent, but the population of wild animal species, particularly of big mammals, is with a few exceptions, quite small. Human presence, coupled with the rigours of the environment, is undoubtedly a factor in the scarcity of big animals. It is probable that competition from livestock limits the resources available to wild ungulates (Bailey, 1957); forage and habitat pre-emption by cattle and sheep has probably reduced the number of wild cousins that can be supported in Sagarmatha National Park. Centuries-old efforts by Sherpas to diminish the risk of livestock losses to predators have probably sharply reduced the populations of cat and canine predators. A further significant factor in low wildlife numbers comes from hunting pressure, particularly at the hands of soldiers stationed at an Indian Army post in Nauje during the 1950s.

Soldiers out for sport are claimed to have been responsible for massive reductions in bird and mammal populations.<sup>5</sup> Khumbu also supports several species of commercial interest, including pheasants and musk deer, which have been trapped extensively.

Animals to be found in the park include a fairly abundant and diverse insect fauna, a very few reptiles and amphibians, a lavish array of (particularly migratory) birds, rodents, lagomorphs, goat-antelope and other ungulates, and predators ranging from a weasel to the snow leopard and yeti.

The diverse and vividly flowered Sagarmatha National Park flora demands a diverse lot of pollinators, which is provided in a host of butterfly, moth, bee, and fly species. The butterflies have attracted some attention, and twenty-six species have been identified in the park.

There are two species of toad in Sagarmatha National Park, and possibly some snakes as well, although neither snakes nor lizards have actually been recorded within the park's boundaries (Jeffries and Clarbrough, 1986).

Sagarmatha National Park's avifauna does not appear as constrained by altitude and other conditions as other animal orders. There are many conspicuous and spectacular birds, both transient and resident, in addition to a wide array of less showy species. Pheasants are well represented and include Nepal's national bird, the monal or Impeyan pheasant, and the endangered Tibetan snow cock (Bland, 1985). Soaring birds, including eagles and big vultures like the Himalayan griffon and lamergeyer, take advantage of some of the planet's ultimate thermals.

Among small mammals, the pika or coney, familiar to frequenters of more temperate mountains, is fairly abundant in the rocky terrain of much of Khumbu. *Tehyakpa* is the Sherpa name for pikas; the industrious hay-making pika's winter fodder consists of a high percentage of fescues and other high alpine grasses called *tehyakpi tsa*, 'pika's grass', by Sherpas. Marmots, the highest living mammals, are said to be common in Sagarmatha National Park.

In addition to the sought-after musk deer (classed as rare, but seen fairly frequently), the ungulate fauna includes the

Himalayan *goral serow*, and *tahr* whose numbers have reached pest levels.

A sufficiency of species of prey, both wild and domestic, means that Khumbu can support a fairly diverse predator population. Weasel and yellow-throated marten are among the most frequently seen, the Himalayan black bear one of the least often encountered. There are stories of unfortunate woodcutters who have stumbled on these bears, which move up into the dense lower elevation forest with the warm season. Although, like most animals, these big bears avoid contact with people given the chance, there are one or two badly scarred Khumbu residents who surprised a bear in thick undergrowth.

There are other predators as well. The forest leopard, a lower elevation species, was once known for patrolling Nauje's streets after dark for stray dogs. Increasing urbanization means a less inviting hunt for leopards in Nauje, and the dogs bark all night without fear. The snow leopard may still be found in the park. There are occasional reports of sightings of the cat or its spoor. Certainly it has recently been part of the faunal landscape.

There is a variety of canine predators in Sagarmatha National Park, including fox, jackal, *dhole* (*khatumbu* in Sherpa), and wolf.

The best known component of the Himalayan fauna is perhaps the abominable snowman or yeti. Science remains unpersuaded of its existence, but there is near-universal belief in these creatures among the people of Khumbu and among those who have listened to enough yeti stories while sitting by a smoking fire in a high altitude herder's hut.

## NOTES

1. Other factors, including insolation, local winds, and cloud cover, interact with these forces to control the distribution of moisture in an environment as topographically complex as these mountains.

2. At this station, temperatures were read daily at six in the morning and four in the afternoon (before and after school for the attendant); a rain gauge was checked once a day. The thermometer began to malfunction

sometime in early 1986, which was only the most overt failing of a primitive system that was nevertheless more reliably administered than the official government station.

3. A less prosaic interpretation of the eastern Himalaya's glaciated landscape comes from Hooker's *Himalayan Journals*, in which he speculates on the origin of a 700-foot high moraine at 10,000 feet (analogous to Iwata's Tengboche Stage?) in the Yangma Valley near Kanchenjunga:

I had never seen a glacier or moraine on land before, but being familiar with sea ice and berg transport from voyaging to the South Polar regions, I was strongly inclined to attribute the formation of this moraine to a period when a glacial ocean stood high on the Himalaya, made fiords of the valleys, and floated bergs laden with blocks from the lateral valleys, which the winds and currents would deposit along certain lines. [Hooker, 1854, pp. 161-2]

4. Antecedent to the western tradition had been other botanically-minded scholars, and Himalayan species were among those cultivated in the lovely and elaborate gardens that the Mughals introduced into India.

5. In recent years park wildlife has prospered. According to reports by residents and returning visitors, the numbers of both tahr and Impeyan pheasant have increased spectacularly within the last two decades, to the point where both are considered by villagers to be pests.

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## *The Cultural Landscape*

THE place that has been described hardly sounds an inviting human habitat. Yet Khumbu has supported Sherpa residents for at least 500 years, and was probably used by other groups for grazing livestock and perhaps even some settlement and agriculture before the Sherpas arrived. How is it that this apparently forbidding mountain landscape is home to the Sherpa? What is the fit of people to land in Sagarmatha National Park?

The following discussion introduces the Khumbu cultural landscape and describes the broad patterns of occupation and use.

### *Settlement History*

Khumbu's first occupants were probably not the predecessors of today's Sherpa population. Man's residence in South Asia has been almost as long as our residence on the planet; it seems likely that wanderers made their way to Khumbu over the millenia since the region's uplift and incision. More modern travellers left stories and even some tangible evidence of their presence.<sup>1</sup>

According to versions of one story, the first human residents of Khumbu were Kiranti Rai (in the usual version, one of feuding brothers) who arrived via the Amphu Labtsa (the pass connecting Khumbu with the Hungu Valley to the east), and settled first in Dingbuje on the upper Imja Khola unknown generations ago (Rimpoche and Klatzel, 1986). They built houses and farmed for a while before moving south out of Khumbu. One informant speculated that apparently ancient stone rings high in the Dudh Kosi valley

were relicts of pastoralist Rais; whether these were the first settlers or subsequent transients is unknown.<sup>2</sup> Similar features in the Bhote Kosi valley are attributed to Tibetans who historically brought livestock over the Nangpa La for seasonal grazing in a pattern that may have predated Sherpa residence in Khumbu.<sup>3</sup>

The stories of the arrival of Sherpas to Khumbu vary from village to village, family to family. By some accounts, Sherpas came north from Solu 200 years ago; by others, 800 years ago via the Tashi Labsta (the pass to the Rolwaling Valley west of Khumbu). Alternatively, Sherpas were led to Khumbu by a hunter who discovered it while pursuing a goat (sometimes sheep or musk deer) across the Nangpa La from Tibet. There are clearly mythical tales of origin as well, which consider Khumbu to be one of three *beyul*: hidden valley refuges reserved for worthy Buddhists (Rimpoche and Klatzel, 1986).

There is another account with perhaps a sounder historical base, derived by Micheal Oppitz from analysis of Sherpa documents found in Solu. These writings recount clan histories. There are points of comparison between people and events in these documents with those described in other histories; this permits some cross-checking of the Sherpa accounts. On this basis Oppitz reconstructs a Sherpa arrival in Khumbu via the Nangpa La in about 1533. These first Sherpa were fleeing first Mongol-induced tensions in Kham, their homeland in eastern Tibet, and then Mughal conflict in their intermediate stopping place in central Tibet (Oppitz, 1973). Most tales of Sherpa origin agree with Oppitz on a Kham homeland, and there is also other evidence. 'Sherpa' (or 'Shar-wa' as the people themselves pronounce it) translates as 'east-people' ('shar' meaning east in Tibetan, 'pa' or 'wa' meaning man). Linguistic parallels between the Sherpa language and the Kham dialect of Tibetan further argue the link, particularly the Sherpa form of the verb to be (*noq/mangyanoq*) equivalent to the Kham form rather than to the dialect of Khumbu's closest Tibetan neighbours (who use the Lhasa dialect's *ree/maaree* for the positive and negative forms of the intransitive 'to be') (Zhang, personal communication,



1985). A Kham homeland means a journey of some 1300 miles from a part of Tibet more humid and forested than most of the Tibetan plateau—and more like the lower valleys of Khumbu.

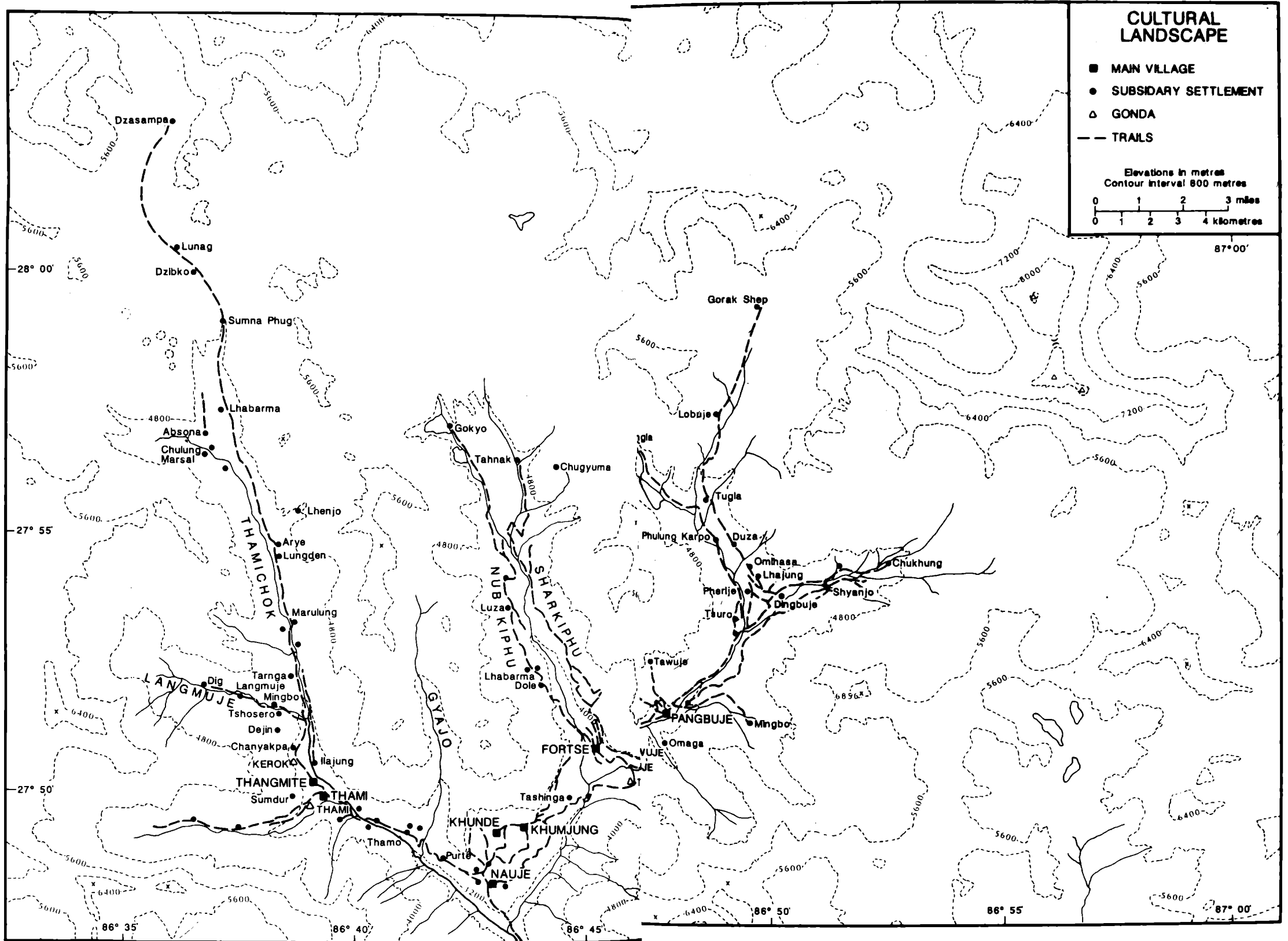
The role of glacier fluctuations in the original settlement of Khumbu makes interesting speculation. Oppitz' date, 1533, falls within the estimated 500-year BP glacial maximum indicated by Williams (1983). According to the Tengbuje Rimpoche's collected accounts, subsequent melting of glaciers which were high when the Sherpas arrived has made travel easier. But according to some other informants, wasting glaciers have made the Nangpa La more treacherous; a large glacier is better for trans-Himalayan travel. Subsequent glacial advances, postulated by Meyewski (1980) and others as occurring from 1860 to 1869, 1900 to 1909, and 1933 to 1939, would certainly have had an effect on Sherpa livelihood as well.

Each of Khumbu's six primary villages claims that it was the site of the first Sherpa settlement. What seems certain is that Nauje, the lowest settlement with the most marginal agricultural prospects, was probably the last settled, perhaps begun as a satellite of the nearest villages, Khunde and Khumjung, in the nineteenth century (Rimpoche and Klatzel, 1986).

Following the initial settlement by the first Sherpas to arrive, other waves of immigration have helped to populate Khumbu. Immigrants from Tibet have continued to settle here over the centuries, and various ethnic and caste groups from lowland Nepal have moved up into Khumbu, especially in recent years, but the Sherpa have always outnumbered later arrivals.

### *Settlement Patterns*

Almost all Khumbu's 3000 residents maintain a principal home in one of the area's six main village communities: Fortse, Pangbuje, Khumjung, Khunde, Nauje, and Thami-chok. Typically, permanent villages occupy the few areas of reasonably level terrain found between 3400 and 3900



2.1 Cultural Landscape of Khumbu

metres, within ready reach of forest and grazing lands. Such areas include abandoned fluvial terraces (Pangbuje, most of Thamichok, and Fortse), and structural depressions (Khunde and Khumjung). In most villages, houses are separated from one another by intervening fields. Nauje is unusual in that it is situated in an amphitheatre of uncertain origin (a massive slump?), with very little level land—houses are built side by side on the slopes of the amphitheatre, facing its centre. Each village is unique in layout, amount and access to necessary resources, and composition of population (Figure 2.1).

Fortse's approximately 60 houses sit high above the confluence of the Imja Khola and Dudh Kosi on an ancient sloping river terrace. Fortse's situation keeps the village out of the mainstream of Khumbu affairs and other Sherpas deride the provincials from this village, which lies on the 'wrong' side of the region's most sacred peak, Khumbu Yul Lha. 'You're dressed like a Fortse girl today' is the devastating comment a Nauje woman hears when she wears an *angi*, the traditional woman's garment, that shows the tops of her shoes. Fortse's small population does seem to have a high proportion of hereditary abnormalities and cretinism, which helps to perpetuate the negative perceptions. Fortse has been labelled one of Sagarmatha National Park's 'unacculturated' villages (Pawson *et al.*, 1984a), where traditions are more closely adhered to than in villages subject to stronger tourist influence. Fortse's adherence to tradition has left it with the best-preserved birch-rhododendron forest of any Khumbu village. In a large tract of village-protected forest between Fortse and the Dudh Kosi there are many massive old birch trees hung with old man's beard (*Usnea sp.*) and harbouring a population of musk deer (Kattel, personal communication, 1986).

Pangbuje is Fortse's nearest neighbour, and is spread in two distinct settlements, upper and lower, along the Imja Khola above the Dudh Kosi confluence. Also one of the 'unacculturated' villages—despite its position across the most heavily used trekking route to Everest—Pangbuje also has a more traditionally employed population (Pawson *et al.*, 1984). Pangbuje, too, has its protected forest, a sacred grove

of large *Juniperus recurva* intermixed with *Abies spectabilis* said to have grown from hairs plucked from his head and scattered by Lama Sanga Dorje, the founder of Buddhism in Khumbu.

Khumjung's 140 houses make it the largest settlement. With the smaller village Khunde (about 60 houses), it occupies the bed of an old lake on the southernmost toes of the sacred Khumbila (Khumbu Yul Lha), 1000 metres above the right-angle junction of the Bhote Kosi and Dudh Kosi. In both Khunde and Khumjung houses are grouped on the rockier, steeper north side of the depression that holds them, leaving most of the flatter areas for fields. Khumjung is the site of a school established by Sir Edmund Hillary; a small hospital also sponsored by Hillary's organization is in Khunde. A substantial proportion of the villages' population is involved in tourist enterprises, particularly with the high prestige trekking companies. Khumjung's population includes a considerable number of more recent immigrants to Khumbu, particularly *gyawa khamba*—people whose ancestors came from Tibet within the last few generations. Khunde, in contrast, is a stronghold of the original Sherpa clans. The villages are linked by ritual as well as geography, and jointly celebrate most major ceremonials. The slopes behind the villages, now supporting a low scrub of intermixed cotoneaster, azalea, and juniper with patches of fir-juniper forest, are often cited as an example of massive, recent deforestation (Lucas *et al.*, 1974; Mishra, 1973; and others), yet there is little evidence to support this (Brower, 1983b; Byers, 1986). Water is the scarce resource for these villages, which rely on the strongly seasonal flows of distant spring systems. It is not uncommon for May to bring a cessation of Khumjung's convenient water supply, forcing villagers to line up at the tap provided by the Khunde Hospital water system.

Water is no problem for Nauje villagers, who are reliably supplied by a large spring in the centre of the village, although a less-than-predicted flow did create considerable difficulties for a small hydroelectric facility established here (Shaeffer and L. N. Sherpa, personal communication, 1984).

The village is built around a flat-floored amphitheatre cut in the loess-veneered slope below the twin villages Khunde and Khumjung. Originally a settlement of traders, today Nauje's residents are almost all engaged in one or another aspect of the tourist business; their village's location and their business acumen are as suited to tourist entrepreneurship as to trade. Agricultural land is scarce, but potatoes are grown in fields below and on terraces above the village, and vegetables find a place in small walled plots next to houses. Nauje's population is more diverse than that of any other village. Lowland Nepalis working for the government, the bank, and the national park live here, and other ethnic groups such as Magars and Tamungs have been drawn by business opportunities. On Saturdays Nauje is the site of a weekly market that brings traders from as far as nine day's walk away. They may carry grain and manufactured goods from Kathmandu or a lowland village, or they may be Khumbu residents with Tibetan salt and dried sheep to sell to the relatively affluent Sherpas, who come to the *hat bazar* by the hundreds for both essential supplies and indulgences.

Small suburbs of Nauje and a few of the other villages are usually tied to the central village for ritual and economic purposes, although some minutes' walk away. Nauje's suburbs include Zarok ('rocky area'), a few houses insinuated among massive boulders above Nauje to the north, and Chorkhang, once a collection of fields up-slope from the village, now a fast-growing commercial district of hotels and trekking company camp sites.

Thamichok is the name given to a collection of fairly small, dispersed settlements in the valley of the Bhote Kosi. The principal permanent villages of Thamichok include Thami, Thangmite, Ilajung, Orsho, and Chanyakpa, as well as several smaller villages lying between these and Nauje. These lower elevation settlements are considered *gunsa* ('winter place'; 'winter ground') although most have year-round residents. Thamichok has a somewhat special status brought about largely because of its geography. Located in the Bhote Kosi valley, it is spared most of the Everest-seeking tourist traffic that has transformed the rest of Khumbu; indeed,

foreigners are barred from proceeding up the Bhote Kosi beyond Thami—the route to the Nangpa La and Chinese Tibet. This was the route of Tibetan refugees fleeing the Chinese take-over in Tibet after 1959. According to local reports, many hundreds came, with many thousands of animals; the landscape still bears the scars of their brief tenure in the Bhote Kosi valley. Thamichok has the lowest proportion of residents whose dominant activities are tourist-related, and the highest number of livestock owners and cattle, particularly yak. It is this valley which sustained the most severe damage in the *Jokhulhlaupt* of August 1985 and continues to suffer from the after-effects of lost crops and property.

In addition to a permanent village home, many Khumbu Sherpas own other dwellings as well, scattered up and down the valleys in any of more than 50 subsidiary settlements. The settlements may be called *yorsa* ('summer place') or *gunsa* depending on their season of use, and most of the high valley settlements have been described in published writings as *yorsa*, after Haimendorf, yet this is a misleading designation since most such settlements are used intermittently throughout the year. Sherpas themselves speak more often of *phu*, meaning highland settlement, or of *chusa*—cattle place. These subsidiary dwellings were used traditionally by stock-keepers and farmers with fields and grazing lands distant from the home village. The houses are modest structures, often a single room with dirt or sod floor. Single-storey dwellings are called *saam*, while one with an added half storey is called *phetam* (the standard two storey structure is a *tenkhang*). People without such a dwelling and with a need to spend time on high pastures may make use of tents, sometimes pitched above rock side-walls, and cave shelters. Although there may be a mix of people from different home villages in the subsidiary settlements, there is a strong tendency for residents of a single village to own houses and fields in the same general area as their neighbours. Thus the settlements high in the Bhote Kosi valley are used mostly by residents of Thamichok, those on the west side of the upper Dudh Kosi ('Nubkiphu') by Khumjung villagers, while

those on the east side ('Sharkiphu') are almost exclusively Fortse's. Khunde people's *phu* are mostly on the east side of the Imja Khola and in the Khumbu Khola's drainage, while Pangbuje villagers are the dominant owners in the upper Imja Khola.

Besides the subsidiary settlements just mentioned, there are two other special-use settlements in Khumbu. In a class by itself is Dingbuje, a settlement at 4400 metres where individuals from all the villages except Thamichok own or rent a house, fields, or both. It is the main residence for only two families. Dingbuje is the only place in Khumbu where barley is grown under irrigation, as discussed in Chapter One.

Barley was once also grown at Tarnga, which is situated at 4000 metres upstream from the permanent villages in the Bhote Kosi Valley. The sites of Tarnga and Dingbuje are strikingly similar. Both settlements are located on broad river terraces, backed by sparsely vegetated slopes, with widely spaced small houses sitting amid a patchwork of fields. Both places provided the wherewithal for irrigation of barley: a divertible stream with low gradient and sufficient cultivable area. Barley continues to be grown at Dingbuje, but Tarnga has become the potato capital of Khumbu. Light sandy soils create perfect conditions for tubers (this part of the Bhote Kosi was the site of a large lake backed up behind a glacier or rockfall-created dam (Vuichard, personal communication, 1985)), and fine lacustrine deposits are widespread. Tarnga's potatoes are universally acknowledged to be the best, and Nauje hotel-keepers particularly have been quick to acquire holdings here in order to supply their trekker guests.

In addition to these secular settlements, there are several important Buddhist temples, *gondas*, in Khumbu. Each village has its *gonda*, and there are monasteries of regional importance at Tengbuje, Thami, Kerok, Dewuje, Thamo, and Laudo, each with a resident population of monks or nuns. Tengbuje monastery is the best known, celebrated in hundreds of photographs by climbers who have rested at the spectacularly situated *gonda*.<sup>4</sup> The reincarnate abbot of

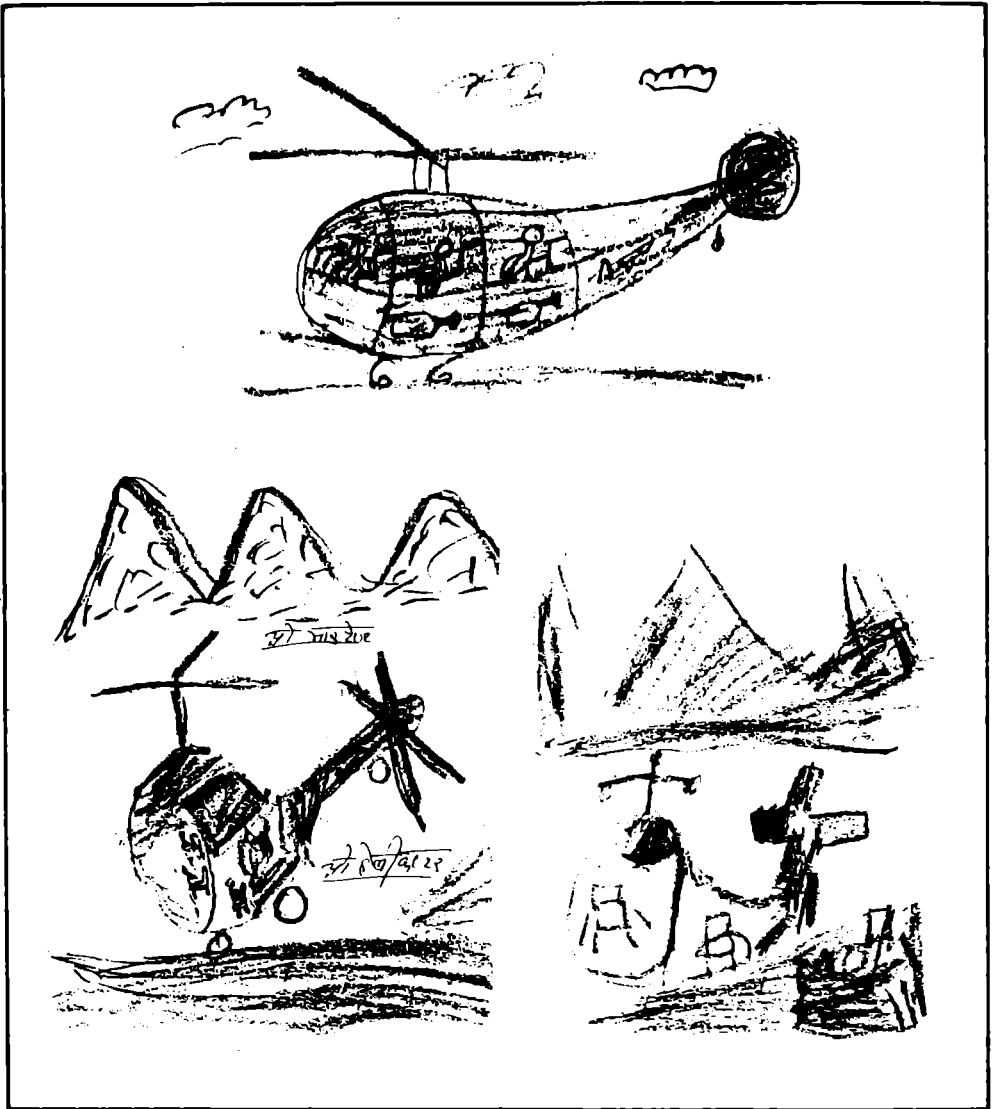
Tengbuje has also contributed to the monastery's high profile by his active involvement in national politics and international development projects. The monastery at Thami is also superintended by a reincarnate abbot, a young man from the Rolwaling Valley west of Khumbu. This *gonda* is central to the spiritual lives of many Thamichok Sherpa. The *gonda* at Kerok is a few kilometres up-valley from Thami, and in one of the ceremonial cycle's important events about half of Thamichok villagers participate in the Kerok-sponsored Tshogen while the rest go to Thami for Dumje, a division in religious observance based on clan allegiance. Kerok's abbot, in contrast to the celibate *rimpoches* of Thami and Tengbuje, is a family man; although he is considered to be an incarnation (of Fortse Lama), and is known as *Lama Tulu*, meaning reincarnate, his position is hereditary. Nunneries are situated at Dewuje and Thamo. Where the two primary monasteries have enjoyed an expansion in members and financing in the last decade, women's religious institutions have apparently declined; both nunneries are extremely modest structures with relatively few residents.

These are the traditional Sherpa settlements within Sagarmatha National Park, but in recent years the world outside has also established its own installations. These include the national park headquarters at Mendelphu overlooking Nauje, a government livestock development farm centred at Shyangbuje between Khunde-Khumjung and Nauje, schools at Khumjung, Nauje, Thami, and Fortse, an army post also at Mendelphu, and a hydroelectric power station with staff housing built at Thamo—and largely destroyed by the 1985 *tshoserup*.

All are linked by a network of trails which are Khumbu's only terrestrial link to the rest of Nepal. Motorable roads reach no closer than a five days' walk from Nauje. Access by air is possible except in summer on scheduled daily flights to Lukla, in Pharak, a long day's walk from Nauje. Charter flights by single engine Pilatus Porter aircraft fly occasionally to the airstrip built to serve a now largely defunct luxury hotel above Shyangbuje, and helicopter charters bring rescue operations, expedition members, army replacements, former



US presidents, and well-to-do Sherpas often enough to enable children, who have never seen a wheeled vehicle, to draw perfect helicopters (Figure 2.2).



2.2 Helicopters drawn by Nauje children

Today's houses, usually of two storeys, are built of unmortared stone and rough-dressed lumber, plastered with a mixture of mud and dung, and roofed with slates, shakes, bamboo matting, or more recently, corrugated metal. This represents an evolution from earlier forms:

Since sherpas first came to Khumbu, our houses have gradually changed from being bamboo huts, to half stone, half split wooden logs, then one

storey stone houses and later two storeys. . . The design of the *lhakang* [god room; household temple] was brought from Tibet. Usually the houses had simple windows of a hole in wooden frame that could be closed by a small door. The wooden latticed windows became popular in Khumbu after a Tibetan carpenter re-built Tengbuje gumpa after the earthquake [1936] with this design of window. [Rimpoche and Klatzel, 1986, p. 19.]

Floors and sometimes roofs are insulated with dried plant material, typically *Cassiope fastigiata* which reduces loss of heat and provides a haven for the fleas that infest houses in some areas of Khumbu in staggering numbers (during May, the peak flea month, some Thamichok householders sleep outside to escape these pests). Doors and windows are built most often into the outward-facing house wall only. Traditional house design called for both low doors which an adult could enter only by stooping and small windows. This design was intended to prevent access to rigid, malevolent ghosts who are too stiff to bend and enter.<sup>5</sup>

In today's house, the upper storey is the family living space, usually a large room with open hearth for cooking, a bedstead in one corner, benches along one wall for sitting and sleeping, and shelves along the facing wall where clothing, bedding, and equipment are stored, and the family's wealth of copper vessels and other precious items is displayed. In one Thangmite family's house three carved wooden shelves along the back wall contained: eight smallish brass and copper *dekchis* (straight-sided cooking vessels); two enormous copper cauldrons, *saa*, used to hold the household water supply; one slightly smaller *saa*; a very large and elaborate teapot from Tibet; four twenty-five litre aluminum *dekchis*; six or seven smaller aluminum pots; two multi-tiered *momo* steamers; two big ladles; two gas lanterns; two large tea kettles; a plastic bucket; a five-gallon plastic jerrycan; an enamel basin; assorted baskets, one full of recently boiled potatoes; several wooden bottles, one ornamented with brass, for the ceremonial serving of *chaang*. The adjoining shelves held aluminum and wooden trunks filled with the family's best clothes, extra yak- and sheep-wool blankets, sleeping bags in their stuff sacks, a stack of covered foam

mattresses (the beds for the junior members of the family who sleep on the floor), a few old and worn Tibetan rugs, and a pile of trade goods recently brought from Tibet: yak bells, *tsampa* and salt in yak-hair bags, *tsilu*—skin-covered lumps of hardened sheep fat—and Chinese tennis shoes. Large plastic drums were stacked beneath the shelves and emblazoned with the names of various expeditions: ('Everest, 1982', 'Lhotse South Face'. Lined up with the expedition plastic was a traditional wooden barrel, locally made and ancient. These held more trade goods, more trekking paraphernalia, dried potatoes, and fermenting *chaang*.

In more affluent houses there may be an additional room upstairs, usually outfitted as the family temple, *lhakhang*. The temple room may be frescoed with religious themes as elaborately as any *gonda's*, with an altar housing bronze images, perhaps *thankas* (fabric paintings on Buddhist themes), and in a few *lhakhangs*, one or perhaps both of the most important ritual texts, Kangyur and Tengyur, wrapped in silk and stored in compartmentalized wall cases. A simpler household shrine could be no more than a poster from Kathmandu illustrating a sacred place or deity, with a prayer scarf draped over it and an offering of water in a row of bowls lined up in front.

The upstairs living space is reached via a steep ladder in the back corner of the bottom floor. For the uninitiated, a climb up a dark Sherpa staircase is a major challenge. But once accustomed to the inevitable position and pitch of the access ladder, one can climb easily into any house in Khumbu. Often the ground floor is divided into two unconnected rooms, one a store-room for hay and agricultural implements, the other a combination entry—stable—toilet. (The standard Sherpa toilet, *chakhang*, is a detached structure built over a pit that is kept generously filled with litter, producing compost crucial in agriculture. It is a remarkably pleasant set-up in marked contrast to the practices in most of the rest of Nepal. Such a practical system for handling human waste and its composted product is an option for Buddhist Sherpas denied those bound either by Hinduism's proscriptions on handling

human waste or by the exaggerated fastidiousness of the West.) The entry side's dirt floor is kept covered with forest litter to absorb manure from young, weak, or lactating animals kept there, and to serve as a convenient toilet.

### *Land Use*

Areas occupied and used by people represent a tiny fraction of the fundamentally forbidding mountain landscape of Sagarmatha National Park, yet the area has maintained a sizeable population for hundreds of years. Although high altitude and the steep gradients impose constraints on Sherpa use of the Khumbu environment, these same factors make for opportunities as well. A series of micro-environments is created by variations in altitude, aspect, and landscape history. Different locations undergo the sequence of seasonal changes at different times and at varying intensities: spring arrives first at lower elevations, and comes progressively later to higher places. Different conditions prevail in any given season or year in the several separate valley systems. By taking advantage of sequential changes, Sherpas can schedule their planting, harvesting, and other subsistence activities through an extended seasonal period in a number of different locations, and thus both increase the productivity of a relatively small labour pool and reduce the risk of total crop failure or other environmental disaster.

*Land Tenure* It is advantageous for the people of Khumbu not to put all their eggs in one basket, but such a dispersal of activities requires control of a number of widely scattered tracts of land of different types. This accounts for the widespread ownership of houses in subsidiary settlements. It is also a reason behind the variety of Sherpa land tenure arrangements. In addition to private ownership of houses and walled fields, there are community controlled lands as well. These include the forest and grazing lands that lie outside the perimeter of the village proper but within village boundaries, as well as grazing and hay-gathering areas up the main valleys and beyond the highest temporary settlements.

*Wild-land Resources*

Sherpas have always relied on wild-land resources as well as on cultivated fields and grazed pasture. Forests supply fir, pine, and juniper for house beams, floorboards, roof shakes, and framing lumber; birch makes tools and kitchen implements; suitably shaped rhododendron becomes pack saddles. Bamboo-like grass from forests at lower elevation is gathered and bound in bunches to make brooms. Mushrooms, berries and other fruits, condiments, tea substitutes, medicines, aromatic leaves for incense, and a host of other wild products are collected for use. Stock-keepers without hayfields or the resources to buy winter fodder are heavily dependent on grass cut from village lands and commons. All animals depend for most of the year on wildland grazing. Everyone relies on fuel-wood from the forest. Another crucial forest resource is the leaf litter that is raked into mammoth carrying baskets for composting in latrines and lower-storey stables. This *saluk*, gathered throughout the dry season but especially in the months before monsoon, is vital to Khumbu agriculture. Branches of juniper are an essential element of many Sherpa rituals: they are burned at the start of most ceremonies to create a conspicuous, aromatic plume of smoke intended to attract the benevolent attention of local gods. Juniper is also the preferred fuel for funeral pyres.

*Society*

Sagarmatha National Park Sherpa are a numerically small part of a larger population of about 20,000 dispersed along the south slope of the Himalaya from Sikkim to Helambu that calls itself Sherpa, speaks variations of one language, and has in common a set of shared cultural traits. The Sherpa of Khumbu are Tibetan Buddhists living as nuclear to extended families in villages. In common with other Tibetan culture groups, the Sherpa occasionally engage in plural marriage. The more common traditional arrangement involved a single woman marrying two brothers, although in recent years the number of marriages involving a single man with more than one wife, one often maintained in Kathmandu while the

other stays in Khumbu, has become more common (Haimendorf, 1985). It is a remarkably egalitarian society, where women and men are essentially coequal, and even young children have standing. Both women and men are property owners; daughters inherit an equal share in their parents' estate. Children are given a great deal of responsibility at an early age, and are free to engage in their own business deals, play activities, and relations with others—including, for adolescents, sexual relations. Although most tasks may be allocated according to gender (women do most field-work, men most construction, for instance) there are no tasks which are exclusively male or female. Men cook, clean, weed, and care for children (most often in the absence of women to do such jobs); women run businesses, trade in India and Tibet, tend livestock in remote areas, hold office in local government. In practical terms, however, there are considerable differences in the daily lives of men and women; roles are defined—if not circumscribed—by gender.

The population of Sagarmatha National Park, although predominantly Sherpa (81 per cent of a total population of 2524, according to Pawson *et al.*'s (1984a) calculations),<sup>6</sup> is made up of people from other groups as well. Culturally closest to the Sherpa are the other Tibetan people who have moved south into the area in a succession of waves of immigration. Most assimilated are the *gyawa khamba*, whose ancestors came from Tibet within the last several generations, but who are superficially indistinguishable from Sherpa belonging to the clans of the original settlers from Kham.<sup>7</sup>

These Khumbu residents live as Sherpa, take the 'Sherpa' surname, intermarry with old-clan Sherpas, and are fully part of the social, economic, and religious life of Khumbu. More recent Tibetan immigrants, known as *Pheuba*, also fit easily into Sherpa life, although they retain a proud identity as Tibetans, speak Tibetan rather than Sherpa, and participate less fully in some social relations than the *gyawa khamba*. Most of these people are refugees who fled to Nepal via the Nangpa La following the Chinese occupation of Tibet in 1959.

Many generations earlier—perhaps as long ago as the first Sherpa—other culturally distinct people settled among the Sherpa in Khumbu. They came from the hills to the south and brought their religion, language, skills, and the attitude conferred by Pahari Hindus to people of their calling: *kami*, blacksmiths, untouchables from the low end of the Pahari Hindus' caste hierarchy. There are *kamis* in several villages, where they live apart from the others, never sharing in village ritual nor much of Sherpa social life, yet often warmly regarded and respected for the services they perform.

There are also Tibetan-culture residents of Khumbu who share something of the status of the *kamis* in the eyes of their neighbours: *khamendo*, decendants of 'polluted' Tibetan caste groups, and *yembas*, decendants of slaves (in Nepal, slavery was abolished only in 1926). The representatives of these groups are considered unclean and no higher ranked Sherpa will eat or drink from a utensil used by such people. Sexual contact with *khamendo* irrevocably converts one to that status (Haimendorf, 1964), and many Sherpa *khamendo* lost their original standing in that way.

In recent years, other non-Sherpas have come to live in Khumbu. Schoolteachers are mostly from other ethnic groups; some such as the headmaster of the school in Khumjung may marry into the Sherpa community and participate in its rituals and social life. Various government offices (Army, Livestock Development Project, Northern Boundary Commission, and Department of National Parks and Wildlife Conservation) located here are staffed mostly with transient Nepali lowlanders (making up almost 11 per cent of the 1982 population according to Pawson *et al.*, 1984a); these *rongbas*—lowlanders—bring their own cultural traditions and are involved only in the more colourful and public of Sherpa events.

### *Economy*

The traditional Sherpa economy was a three-way dependency on agriculture, animal husbandry, and trade. Today, the picture is somewhat more complicated. This is mostly a

result of tourism, which affects almost every household in Khumbu either as a result of direct involvement in the business of tourists (as guides, porters, hotel- and shopkeepers, or owners pack-stock) or indirectly as a consequence of the restructuring of the economy initiated by tourism. But in many respects the basic patterns are substantially unchanged.

Although the Sherpa are occasionally described as a formerly nomadic people who turned to agriculture with the introduction of the potato in the mid-nineteenth century (Bjonness, 1980a), there is no evidence to support this. Far likelier is an early turn to agriculture comparable to that practiced in the Sherpas' inferred homeland in eastern Tibet.

*Agriculture* What the earliest cultigens may have been is a matter for conjecture by Sherpas and researchers alike. The Tibetan staple, barley, was grown more widely, certainly at Tarnga, Tshosero, and perhaps elsewhere as well. Buckwheat was probably more important. The *Ariseama* called *thoh*, an Aracoid that is sometimes encouraged as a weed in potato fields, was in all likelihood cultivated for its edible tuber, which is now processed into a fat, gluey noodle and added to stews. Whatever the historical pattern, it was disrupted in the mid-nineteenth century by the introduction of the potato, which revolutionized Sherpa agriculture and society (Haimendorf, 1964).<sup>8</sup>

Potatoes, domesticated in the Andes, are adapted to mountain conditions. In Khumbu, potatoes are significantly more productive than any grain. In the Himalaya they are out of reach of most of the pests and diseases that evolved with them and are thus an especially reliable, productive crop. Potatoes came to Khumbu probably from the west—or so Sir Joseph Hooker thought.

[Potatoes] have only very recently been introduced amongst the Tibetans, from the English garden at the Nepalese capital, I believe, and their culture has not spread in these regions farther east than Kinchinjunga, but they will very soon penetrate into Tibet, from Darjeeling, or eastward from Nepal [Hooker, 1854, p. 167].

Alternatively, it is suggested that the potato made its way



westward from the botanical gardens at Darjeeling, but Hooker's evidence is more compelling.

Today three principle varieties of potato (*rigi*) are grown in Khumbu: *maru* (red), *ceru* (yellow), and 'bikas' ('development' in Nepali). Other varieties have come and gone, mostly as a result of introduction—by Khumbu-based travellers who have come upon new varieties—of improved types rather than through any selective breeding on the part of Sherpas. A few of the older varieties, such as the small oval *cyuma*, are still grown by a family or two in Khumbu (and *rigi cyuma* is still widely grown in Pharak and Solu). Of today's potatoes, Sherpas consider *maru* to be the tastiest and most nourishing for animals, but it is increasingly displaced by the higher yielding *rigi ceru*. The development potato, *rigi bikas*, which has appeared only in the last couple of years, is a large potato usually with a good flavour and yield, but requires an extra month to mature—seven rather than six months in the case of the others from planting to harvest. Given Khumbu's short growing season, its bigger yields are too great a gamble for most farmers, and only a few fields have been planted with this latest introduction.

Potatoes are planted in the walled fields of Khumbu in early spring, after the compost of forest litter and stable and toilet manure has been dug in. The timing of first planting is scheduled according to guidelines set out in what is in effect a Sherpa almanac. Each village begins its planting when sunrise (or moonrise, or sunset, depending on the village) intersects the appointed place on an intervening ridge.<sup>9</sup>

The potato crop is weeded once or twice (the weeding, *yurma*, contributing an assortment of edible greens including purslane), then left undisturbed. Following the harvest four to six months later (an earlier harvest if stocks are exhausted), the potatoes are sorted and stored in deep pits dug into the fields and insulated with dry plants and earth, from which they are removed as the need arises.

Potatoes are prepared in bewildering variety and form the staple of Sherpa diet. They are fed to livestock. Sliced and dried, they are a valuable trade commodity, carried across the pass into Tibet where potatoes are much less easy to grow.

Sherpa potatoes are sun dried. The biggest *rigi ceru* are first parboiled, then sliced and spread on mats in the sun during the sunniest parts of autumn and spring. The freeze-and-thaw dehydration process that produces the *chuno* of the Andes wouldn't work in the wetter, windier winters of the Himalaya (Murra, 1979).

Barley parched and ground into *tsampa* provides an essential ritual item as well as an important foodstuff for Khumbu Sherpas, but very little of the sizeable demand is met by local production. Still, the barley fields of Dingbuje are important to their owners; the black, gritty *tsampa* from Dingbuje is the variety produced in Tibet and is preferred to the pale lowland type that finds its way up to the Nauje market. The short-stemmed, bearded Tibetan variety of black barley is said by western researchers to be more nutritious. Barley is rotated with potatoes at Dingbuje. It is planted early, in the second lunar moth (*dawa nyiwa*), long before the rains begin; for this reason irrigation is required, and a complex water management system carefully maintained ensures that all fields receive the necessary allotment. Water is led onto the fields from feeder ditches and allowed to pool here and there on the basically flat plot for a couple of hours. Then workers armed with a broad-headed wooden hoe splash the pooled water in shining arcs over the entire field. Fields are splash-irrigated three or four times before the rainy season, and Dingbuje landowners trade off the responsibility of water marshall. Harvest brings considerable hubbub to Dingbuje, which is ritually abandoned for most of the summer season and only reoccupied when harvest time arrives. Work gangs pull up the plants by their roots, and stack and dry them over several days. The threshing takes place on platforms of pounded earth, flailed usually by hand by pairs of workers who raise-and-whack, raise-and-whack their implements on the piled stems in an alternating rhythm that continues late into the night. There are a number of water mills (*chu tak*) on streams throughout Khumbu; it is here that the barley is transformed to *tsampa* (and that market-purchased grains, including corn, wheat, and rice, are also turned into flour).

Along with potatoes, buckwheat, and barley, hardy vegetables in the cabbage family are also cultivated. These include a white turnip, *loh*, that is interplanted with potatoes, and a leafy green that is planted after the potato harvest and cured in garlic, spices, chillies, and brine for winter use. A few Sherpas cultivate medicinal plants as well, which are given or sold to lamas and other medical practitioners.

The brief growing season, averaging six months in good years, and relatively poor agricultural sites mean that agriculture alone would be insufficient to maintain the people of Khumbu. The location forces other economic activities on the Sherpa people, but it also provides a special benefit: the opportunity for trade.

*Trade* Lying on the southern approach to one of a relatively few Himalayan passes—the Nangpa La, 5716 metres—Khumbu is strategically placed for trans-Himalayan trade. Commodities from the lowlands, such as dyes, grains, metals, paper, and other manufactured items, have long been sought by people in the high, cold, dry lands north of the pass. Tibet in turn has been the source for salt, wood, dried meat, and precious religious objects that are necessary to a good life in the lands south of the Himalaya. The Sherpas of Khumbu have traditionally dominated the local trade across their stretch of the mountains, both acting profitably as middlemen in the lowland-Tibet exchange, and also trading their own locally produced items such as dried potatoes, which are taken to Tibet, or Sherpa-made textiles, which are traded south.

Khumbu Sherpas are part of a brotherhood of trans-Himalayan traders whose home is along the Himalayan crest, mostly people of Tibetan-stock like the Sherpa who share language, dress, and custom. Traders such as Hooker encountered are little different from some one meets today on the routes across the mountains:

These motley groups of Tibetans are singularly picturesque, from the variety in their parti-coloured dresses, and their odd appearance. First comes a middle-aged man or woman, driving a little silky black yak, grunting under his load of 260 lb. of salt, besides pots, pans, and kettles,

stools, churn, and bamboo vessels, keeping up a constant rattle, and perhaps buried amongst all, a rosy-cheeked and lipped baby, sucking a lump of cheese curd. The main body follow in due order, and you are soon entangled amidst sheep and goats, each with its two little bags of salt: beside these, stalks the huge, grave, bull-headed mastiff, loaded like the rest, his glorious bushy tail thrown over his back in a majestic sweep, and a thick collar of scarlet wool . . . the children bring up the rear, laughing and chatting together; they, too, have their loads, even to the youngest that can walk alone. [Hooker, 1854, p. 142.]

Today the scale of trade varies, from the individual entrepreneur with a single load to a professional who is part of a far-flung trading network. A trader may be a Thami man who makes the trip over the pass once or twice a year when other work permits (in late autumn or late spring), carrying on his back a load of dry potatoes to trade for salt and barley at Dingri, the closest trade depot on the Tibet side. Or the trader may be one of Nauje's specialists, who exchanges high value items from Lhasa for goods from Calcutta, stopping in Kathmandu and Sikkim to buy and sell as part of a trading journey that takes a year or more. Contraband is sometimes traded across the Nangpa La. Almost every Khumbu trader tries to stockpile water-buffalo hides bought from the Nauje market for transport to Tibet, where they bring a high return. But in an effort to protect its own nascent leather industry, Nepal forbids exports of hides. The primary role of the police post at Thangmite in the Bhote Kosi valley is to intercept these traders, who wait for dense fogs and dark to move their loads up-valley, or take long and treacherous detours up other valleys to bypass the check-post. A few of Khumbu's specialists have engaged in the trade of far more valuable illicit items: watches for Tibetan buyers, Tibetan artifacts smuggled to the Nepal side of the border.

Sherpa trade has changed character through its history as desired commodities change, as the permeability of political boundaries tightens and loosens, and as the other economic options available to Sherpas vary accordingly. When Tibet came fully under China's control in 1959, traffic across the border was stifled at most crossing points. Trade over the Nangpa La diminished but did not cease, although the

conditions of exchange became considerably less favourable from a Sherpa perspective, and traditional trading networks based on friendship and long-standing business relations were substantially replaced by strictly controlled government trade depots on the Chinese side. Perhaps the most significant for Khumbu Sherpas was the imposition of severe constraints on the export from Tibet of *nak* (female yak) for it upset what had been a mainstay of both the trading and cattle economy of Khumbu: the exchange of livestock.

The place of livestock in the Sherpas' trading economy is considered in later chapters, along with further discussion of the third cornerstone of the Sherpa's tripartite economy and primary focus of this analysis: animal husbandry.

## NOTES

1. The newest and most startling evidence for early occupation comes from the preliminary results of soil samples collected in the course of the Mountain Hazard Mapping Project's 1984 field season. This evidence from an Imja Khola sample site includes pollen identified as *Cerealia* with associated datable charcoal (Byers, 1987b). Although the *Cerealia* pollen are a few grains only (Markgraf, 1987), and both their identification and origin remain somewhat in question (grass pollen differs from cultivated grain primarily in size and wind deposition could account for the presence of cereal pollen in Kumbu soil), this evidence does raise the possibility that human presence in Khumbu may have extended perhaps 2000 years into the past. (Byers, 1987b.)

This provocative finding flies in the face of conventional thinking about the history of Himalayan settlement, and seems improbable to one habituated to such thinking, while raising an intriguing array of questions. Why would anyone have been cultivating grain, presumably barley, in so high and inhospitable a site, where today its cultivation is limited to a single location because of the crop's demanding requirements? Who would these people have been, Tibeto-Burman tribals or Tibetan herders, Sherpa ancestors or unrelated groups? How can the evidence for wetter, warmer conditions over 800 years ago, another element of the interpretation of this evidence, be reconciled with the neo-glacial advances documented for Khumbu? Is the increased frequency of fire and consequent conversion of forest to shrub-grassland documented in this soil evidence a human artifact or a result of post-glacial drying? Byers' report certainly argues for a harder look at the history of settlement and land use in the high Himalaya, and

reinforces my own argument, developed in Chapter Six, that people have had a significant and relatively long-term role in shaping the Khumbu landscape, particularly through the use of fire.

2. These are rock ovals representing corrals or perhaps shelter walls that are submerged in soil and look much older than contemporary structures, although in a region where periglacial soil creep is an active slope process, it may be that no great period of years is required for such untended structures to melt into alpine tundra.

3. Another explanation for the Bhote Kosi ruins, which lie just upstream from the seasonal settlement Arye, gives them a more recent origin: they were built by Tibetans from Kaprock who lived here for a few years in a present-day grandfather's grandfather's time, a period when Khumbu residents paid a tribute of butter to Tibet. They returned home to Tibet when reversals in war made Khumbu Nepalese territory. (P. N. Sherpa, personal communication, 1985.)

4. In January 1989, Tengbuje *gonda* was gutted by fire, a disaster of well-meant development. According to reports, an electric heater, powered by a recently installed hydroelectric facility serving the monastery, was left on when Tengbuje's contingent of monks was called to Nauje for a puja (D.B. Bista, personal communication, 1989; Sassoon, 1989). One rationale for providing electricity to the *gonda* was to arrest damage to *thankas* and frescoes from the traditional light source: smoking butter lamps. In hindsight, better butter smudging than electrical conflagration. As for any saving of trees that electricity might have offered: the cost in large timbers to rebuild the monastery will offset the benefits of tens of years of low-wattage cookers and heaters.

5. Today, ghosts are apparently less feared; more and more Khumbu houses have full-sized doors and large windows usually glazed with expensive, high prestige glass instead of the greased paper and shutters that used to seal windows.

6. Pawson's census figures are disputed by some critics, some who question his methodology (K. and E. Buswell, K.T. Sherpa, L.N. Sherpa, personal communication, 1984). Pawson himself acknowledges the difficulties of collecting reliable census data in a dispersed and reluctant population, and offers his numbers as the best available (Pawson, personal communication, 1985).

7. 'Although the word "Khamba" originally means "those from Kham", Khamba is a relatively empty category in local terminology.' (Oppitz, 1973, p. 235.)

8. Haimendorf's assertion of the radical transformation following the potato's introduction is being challenged. Haimendorf and others postulate that the greater productivity of potatoes produced surpluses that allowed the maintenance of an unproductive class of clerics, permitted a concomitant increase in support for various Buddhist institutions, and led to

expanding population. But it may be that Haimendorf misinterpreted some of the information on which he based his reconstruction. (Fisher, personal communication, 1985.)

9. There is a different indicator that determines the planting of *tow*—buckwheat—in Thamichok at least. Early in spring the European cuckoo, *cubi* to the Sherpas, moves up into the Bhote Kosi valley, signalling its arrival with its improbable call. The *cubi* stays around a few weeks, and then leaves; it is the leave-taking that provides their cue to the barley planters.

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## *Khumbu and the World*

**K**HUMBU, although remote from the capital and power centre of Kathmandu, is nevertheless very much a part of Nepal, its history caught up in the nation's, its prospects tied to the future of the country as a whole.

Nepal's population, like its landscape, is highly diverse, made up of groups with origins north, south, east, and west, as well as indigenous peoples like the Terai-dwelling Tharus. Until the beginnings of unification in the seventeenth and eighteenth centuries, the more heavily populated middle hills were a mix of petty hill states and autonomous tribal groups. A succession of dynasties—Kiratis, before the fourth or fifth centuries, followed by the Licchavis, succeeded in the medieval period by the Malla kings—controlled the resource-rich Kathmandu valley and the strategic trade routes to Tibet. The Licchavi period probably coincided with the arrival of a number of ethnic groups, including the Limbus, Magars, and Gurungs, who came from the north and occupied eastern Nepal and the west-central hills (D.R. Regmi, 1969; Berreman, 1963; Rose and Scholz, 1980).

The Licchavis were the first to establish a persistent pattern of rule in which Hindu kings claiming high caste controlled indigenous tribal groups and other non-Hindu populations (Rose and Scholz, 1980). These minor Hindu-dominated principalities developed in the aftermath of the flight of various Hindu groups into the Nepal hills consequent to the arrival of the Mughals. In addition to their role as rulers over non-Hindu subject groups, and the introduction of a cultural tradition that ultimately infiltrated most of Nepal, the Hindu immigrants brought irrigated rice production to lands that



had previously been cultivated by slash-and-burn agriculture (Fisher, 1978; Seddon *et al.*, 1979).

In the seventeenth and eighteenth centuries, these dispersed autonomous petty states and tribal groups was unified by the expansionist efforts of the Gorkhas, the Hindu rulers of a Magar-dominated area of the west-central hills. The House of Gorkha was particularly successful under the leadership of the wily Prithvi Narayan Shah, who recruited experts and armaments from India, seized a strategic trade depot, and expanded the Gorkha empire into the productive lands of the Terai before finally taking over the Kathmandu valley kingdoms. Most of what is presently Nepal was annexed by the end of the eighteenth century (Rose and Scholz, 1980). Central authority was exercised through agents of the Gorkhas, often the pre-conquest rulers, who collected revenues for Kathmandu (which became the seat of the House of Gorkha) while continuing the extraction of resources for their own purposes (English, 1985; Seddon *et al.*, 1979). Timber resources were among those claimed by the government, and government-imposed timber mining from this period on is probably the dominant contributor to the deforestation so conspicuous today around the Kathmandu valley and in the Terai (Bajracharya, 1983; Mahat *et al.*, 1986a) (1).

Khumbu, in common with other areas with a Tibetan culture on the far northern border, was outside the range of substantial effects from these political developments, but not entirely immune. A government order of 1828 kept by Konje Chunbi of Khumjung indicates that the land tax obligation of Khumbu residents was then being collected by the local agents of the central government. These agents, called *talukdar* in Nepali and known to Sherpas as *pembu*, were Sherpas charged with the duty of collecting revenues and delivering them to the treasury at the government seat of Okaldunga (Haimendorf, 1964). The central government exercised control over forest resources as well, again through Sherpa intermediaries. It is likely that the institution of *shing gi nawa*, 'forest guards', considered to be an indigenous Sherpa development (Haimendorf, 1964, and many others

following his lead) is in fact the local expression of a widespread government programme developed in the last century to regulate timber for revenue (Bajracharya, 1983; Griffin, personal communication, 1986).

The nineteenth century brought an end to Nepal's expansionism, the subjugation of the monarchy by the self-proclaimed rule of hereditary prime ministers of the Rana lineage, and a new status for Nepal as a British dependency. There were mutual benefits to this dependency status, which established a British residency in the Kathmandu valley and required that Nepal conduct its business with outside powers through Great Britain.

[The British] were guaranteed a self-manning buffer against possibly hostile powers to the north, a regular supply of soldiers from the hill regions of Nepal (the famous Gurkhas), a small but growing captive market for manufactured goods, and probably even more important, at certain times raw materials and primary products from both Nepal and Tibet. [The rulers of Nepal] were guaranteed a minimum of support and protection, and—more importantly—virtual insulation from outside pressures for change. [Seddon *et al.*, 1979, p. 31.]

For almost a century this isolation protected the Ranas' dominion over an essentially feudal political system begun at the time of the Licchavi dynasty and perpetuated by a succession of rulers. But it wasn't to last forever. Nepal's abrupt entry into the twentieth began with the withdrawal of the British raj—and with it the Ranas' buffer—and was completed by the India-backed revolution of 1950–1. This upset the rule of the Ranas, resulting in the restoration of the monarchy and a continuation of the first tentative efforts at opening Nepal to the rest of the world begun in the late 1940s (Rose, 1971).

#### MOUNT EVEREST AND THE OPENING OF KHUMBU

For most of the rural population of Nepal, the Westerners who began to filter into the country after 1950 were the first white people ever seen. The British resident had been confined to the Kathmandu Valley, and only a special few like Sir Joseph Hooker, who visited the far eastern part of the country, had access to the hinterlands.

But Westerners were old hat to a number of Khumbu Sherpas who had participated for years in Himalayan climbing expeditions launched from the Tibet side. These were staffed often with Sherpas hired in Darjeeling. A tradition of out-migration is an old one for the northern border peoples. Young men and sometimes women would leave for a season or several to work in far away places (Bishop and Bishop, 1978). Darjeeling has long had a substantial Sherpa population, some long-term residents, others transients, drawn initially by work in the tea plantations, as porters or as rickshaw coolies. A British doctor, Kellas, was perhaps the first to hire Darjeeling Sherpas to accompany his expedition into the mountains. Soon others followed suit, and by the 1920s Sherpas would travel from Khumbu to Darjeeling for mountaineering assignments and ultimately return home (Tenzing Norgay Sherpa, 1955)—if they weren't among expedition casualties. Sherpas have always suffered a disproportionate share of mountaineering disasters (M. N. Sherpa, personal communication, 1982). When climbers could at last approach the highest peak from its southern side after 1950, the mountaineering reputation of the area's residents had been firmly established in expeditions throughout the Indian and Tibetan Himalaya. It is not, therefore, surprising that a Khumbu man, Tenzing Norgay 'Sherpa' (although Tenzing spent much of his youth in Thamichok, he was born in Tibet), was first with Edmund Hillary on the summit of Sagarmatha in 1953. This event shaped the future of both men,<sup>2</sup> and has also had a profound effect on Khumbu; no single person since the Buddhist patron Guru Rimpoche has had the impact of Sir Edmund Hillary, who was an important promoter of Sagarmatha National Park and has initiated any number of projects that have transformed the traditional life of Sherpas.

Interest in Everest and the neighbouring Khumbu peaks did not end with the first ascent, and many other visitors besides Edmund Hillary have been moved by a visit to Khumbu to act in what they perceive to be the interests of Sherpas and the region. The Everest area has had a higher international—as well as topographic—profile than the rest

of Nepal, and the fast pace and negative repercussions of change in the last three decades have had a wider audience here than similar disruptions of environment and traditional culture in less known parts of the developing world. It has been a somewhat specialized audience. Khumbu's early visitors were largely mountaineers, mountain-oriented; a group with a long history of interest in conservation, quick to take note of threats to beautiful mountain environments. The Sherpa themselves are a people with a wide appeal, and have caught world interest; many aficionados watch with regret as the modern world reshapes the traditional world of the Sherpa. A third factor that has contributed to the high level of awareness of happenings in Khumbu is the novelty of it all. Nepal was an unknown land until 1950. In a century almost without its blank spots on the map, Nepal has been a place for exploration and discovery, where twentieth-century Hookers and von Humboldts can pretend to be one of the first: virgin ground where anyone can be an 'expert'.

Khumbu in the last thirty years has had its share of such experts, most of whom have commented on the state of the environment and have attributed to recent human users the responsibility for a perceived deterioration in the natural landscape. Reports of this kind, based most often on short visits and spare information, were extremely important to the drive to establish Sagarmatha National Park, and continue to inform park management. The validity of such accounts is investigated later in this chapter; their role in the creation of Sagarmatha National Park forms part of the following discussion.

### *The Rise of Tourism*

Mountaineers were the first Khumbu tourists, but their widely publicized impressions of the Everest area and its residents soon drew others to Khumbu in a steadily increasing stream. Twenty tourists were reported to have visited Khumbu in 1964; by the tourist season (autumn to spring) of 1972-3, 3200 people came (Mishra, 1973) (or 2254, according to figures from the Central Immigration Office,

cited by Bjonness, 1980a) and more than 7000 in 1985 (L. N. Sherpa, personal communication, 1987). These numbers refer to actual tourists and do not include the additional complement of accompanying support staff—estimated at from 1.7 (Bjonness, 1980a) to three (L.N. Sherpa, 1985) for each foreign tourist.

Khumbu's tourist visitors are surprisingly diverse. They range in age from under a year to close to eighty years, and come from nearly every country. The United States has provided the highest proportion of visitors in every year of record, with Japan a close second. Both western and eastern Europe supply a quarter to a third of trekking tourists, the Antipodes a surprisingly high five to ten per cent (Mishra, 1973; Pawson *et al.*, 1984b). Indian tourists are by far the most numerous of Nepal's foreign visitors, but represent a small percentage of Sagarmatha National Park trekkers. Indian climbers, on the other hand, have been a major component of expedition tourism in some years. A number of countries, including Korea, Iran, and the USSR, launch climbing expeditions but send few other tourists. About a third of trekkers are women (Bjonness, 1980b).

Khumbu trekking is strongly seasonal. Monsoon rains wash out trails and bridges, bring out leeches, obscure the mountains, and preclude air travel in the Himalaya: summer tourists are hardy and few. The weather from October into early December is often relatively mild and cloudless, providing perfect conditions for visitors interested in seeing the world's great mountains. This is the peak season for trekkers. Winter can be snowy and quite cold, and although it is possible to walk to Everest Base Camp on a sunny, windless day in January, it is equally possible to be trapped by deep snows at Tengbuje; visits drop off in winter, although evidently less so in recent years than at the time of previous studies. Increasing numbers of visitors largely reflect an increase in 'off-season' travel. March to early May is the secondary trekking season. The weather is warming up, rhododendrons come into bloom, and in most years the unsettled pre-monsoon weather holds off till May. But it is the dry season in the plains; dust and smoke can rise from the

lowlands and shroud the big peaks in a smoggy pall.

In the early days of Himalayan mountaineering, spring was the climbing season. The 1953 Hunt expedition made the top of Sagarmatha in late May. This is still a busy time on the peaks, but the greater predictability of early autumn weather has made the post-monsoon period the peak time for mountaineering. Expeditions arrive, often before the monsoon has blown over in late August, and have the whole of autumn to organize their assault on a big mountain like Everest. Given the fierce competition for first ascents and His Majesty's Government peak permits, probably any month is acceptable for sufficiently motivated climbers.

Before the mid-1960s the only access to Khumbu was by trail, usually from the direction of Kathmandu on a path made ever shorter by an expanding road system. The 1963 American Everest Expedition marched fifteen days from a trail-head at Banepa not far from Kathmandu. Walkers in the late 1980s could take Chinese- and Swiss-built roads to within five brisk hiking days of Nauje (most trekkers take seven to ten days for the walk, which traverses three major north-south trending river systems and the high intervening ridges). But today, most visitors don't approach Khumbu by road; instead, they fly one of two or three daily-scheduled flights to the STOL (short take-off and landing) airstrip at Lukla, elevation 2800 metres, and walk to Nauje in two leisurely days. The airstrip was built by Sir Edmund Hillary's Himalayan Schoolhouse Expedition in 1964 on a sloping terrace above the Dudh Kosi. Now served by 18-seat Twin Otter aircraft, Lukla is the entry and/or exit point for most tourists. Seventy-five per cent of peak-season visitors surveyed in 1978 opted to fly one or both legs of their trip to Everest (Bjonness, 1980a).<sup>3</sup>

A second airstrip was built in Khumbu in 1972, this one at Shyangbuje between Nauje and Khunde-Khumjung. Intended to provide access to a luxury hotel, the Everest View, the Shyangbuje strip can only accommodate single-engine Pilatus Porter planes. The hotel is all but defunct today because of a combination of factors including a scarcity of the planes, a reduction in their permissible payload, and market-

ing problems for a hotel at 3800 metres where altitude sickness is a major threat to the unacclimatized guest. The airstrip's use is limited to an occasional chartered Pilatus Porter or helicopter flight.

A monumental study was commissioned by the World Bank to investigate the potential for increasing tourism: *Khumbu Region Tourism Study* (His Majesty's Government of Nepal, 1977).<sup>4</sup> The study established that Khumbu could not support the sort of multi-million dollar tourism development that the World Bank would have been interested in financing, but it did identify a categorization of Khumbu tourists.

'Luxury class' tourists were the clientele of the Everest View Hotel, willing to pay a hundred and twenty-five dollars a day (in 1983) to stay in an elegant facility with running water—carried up from Khumjung's on-again off-again spring—a large open fireplace, and fantastic picture-window framed views. They ate fresh vegetables grown on a farm in Pharak run by the same Japanese consortium that operated the hotel and enjoyed Khumbu's only flush toilets (outside the doctor's quarters of the New Zealand-built Khunde Hospital). The demand for such opulence was never very great. According to the *Khumbu Region Tourism Study*, these tourists represented only 2.5 per cent of visitor days in 1977. By 1984, the hotel's restaurant served an occasional pot of coffee or plate of 'yak steak' and chips, and might house a visitor once in a while for a negotiable rate (about \$10 a night), but was not the place it had been.

'Standard Class' tourists arrange their visit to Khumbu through an agency in Kathmandu. They represented 25 per cent of the visitors in the World Bank's study, but 70 per cent of trekkers entering Sagarmatha National Park in one 1978 survey (Bjonness, 1980a).<sup>5</sup> Such 'trekking' agencies have sprung up with the growing popularity of a walking trip through back-country Nepal. The trekking agency phenomenon in Nepal originated with Colonel James Roberts, expatriate Britisher who catered and arranged portage for many Himalayan climbing expeditions before he recognized the potential for another sort of tourist travel in Nepal and established Mountain Travel. Organized treks provide kitchen

staff, food, equipment, porters, and guides for groups of foreign tourists who may choose from a number of alternative trekking routes in addition to the trip to Khumbu. It is safari-style travel, where one's needs are anticipated and efficiently met. Hot washing water and a cup of tea wake the trekker in his tent, and the day proceeds with similar attentions from the staff for the duration of the hike through the Himalaya. Guides shoulder tired clients' day packs, lend a helping hand—and sometimes back—when the going gets rough, and generally make themselves useful. Sherpas, having developed a reputation through expedition work for service without servility, have been the first choice for staff in most trekking agencies, although in recent years other ethnic groups drawn by the pay and prestige have become an increasingly substantial part of the trekking work-force. Prices for this sort of catered travel range from \$30 to \$100 per person per day (spring 1986)—rates which represent substantial profits over the extraordinarily low food and labour costs in Nepal, where per capita income ranges around \$100 per year, and porters can be hired for less than \$2 a day to carry 40-kilo loads.

The knowledge that travel in Nepal doesn't have to be so expensive motivates a fair percentage of 'economy class' travellers who hire their own guides or porters and arrange their own itineraries. The *Khumbu Region Tourism Study* makes a distinction between these visitors and tourists of the 'budget class', who most often carry the bulk of their food and equipment and avoid the expense of a porter or guide. These independent Khumbu visitors often make use of small 'Sherpa hotels'. These were originally no more than houses with a 'hotel' sign attached, but increasingly buildings are constructed expressly for the purpose of accommodating tourists. Travellers willing to bunk on a bench by a smoky hearth in a room shared by a Sherpa family and other passers-by, who will eat rice and potato curry, or fried noodles, or gluey Indian oats, can easily find a place to stay all over Sagarmatha National Park—and pay from three to fifteen dollars per day depending on the trekker's appetite and the location and calibre of the establishment.



Mount Everest is the centre-piece of the national park; not surprisingly Everest is the goal for most Khumbu trekkers. The main route continues to be from Lukla to Nauje, thence to Tengbuje, Perije, Lobuje, and either Kala Patar—a ridge of Pumori that provides spectacular views of Everest and adjacent peaks and glaciers from an elevation of 5545 metres—or Everest Base Camp. A fair number are turned back by health or other problems from these goals (Bjonness, 1980a). Tengbuje monastery has long provided a secondary terminus for other tourists. The rewards are considerable, and the elevation (3867 metres) is more manageable than higher up the valley for trekkers without the time to acclimatize. As word about crowding on the Everest route has spread, and with it a growing awareness of other trekking destinations in Khumbu, tourist itineraries have expanded to include the other accessible valley systems of Sagarmatha National Park. The Khumjung yak herders' settlement of Gokyo (4750 metres) has become a popular destination. Gokyo sits by a lake at the base of a baby peak (5483 metres) that offers its own array of spectacular views. A view of Lhotse and Makalu is a lure that attracts trekkers to the Imja Khola's headwaters at Chukhung; Island Peak (6100 metres), a 'trekkers' peak' requiring only easy technical climbing, lures ambitious tourists farther up that valley. An innovation in commercial treks that draws on this spirit of adventure is an itinerary that includes the traverse of one or more of the high passes that provide access to the upper reaches of Khumbu's valley systems. Trekkers may reach Sagarmatha National Park via the Teshi Labsta from the Rolwaling Valley to the west (except when HMG closes this border area to tourists), or over the Amphu Labsta from the Hungu Valley east of Khumbu. Once in the park they may travel from Chukhung to Lobuje across a pass behind the minor peak Pokalde, or cross from the Dudh Kosi valley directly into the Khumbu Khola's drainage via Chugyuma Pass. But most travellers stick to the standard routes; as in national parks in the United States and elsewhere, the way to evade other tourists is to avoid the main trails.

*The Origins of Sagarmaths National Park*

One object in the establishment of Sagarmatha National Park was to draw tourists to the Everest area as part of a His Majesty's Government strategy of developing tourism in Nepal into a source of foreign exchange. Another somewhat opposed object was to provide institutional regulation of tourists to moderate some of tourism's negative effects.

The park owes its beginnings to the concerted effort of foreign conservationists and members of His Majesty's Government. The tactics employed to push the park's establishment involved a campaign to dramatize environmental problems within Sagarmatha National Park's proposed boundaries. Reports based perhaps more on conservationist zeal than on an objective appraisal of conditions in Khumbu portrayed the situation in the park as desperate, requiring immediate international attention to avert irreversible damage to the Everest-area environment. As Mishra wrote:

The early visitors to the Khumbu valley found majestic mountains rising from well-forested valleys rich in wildlife and abounding in colourful plant communities. However, much of this has been lost as a result of continuous encroachments by human beings and animals. This has been due to un-controlled grazing combined with excessive felling which has further led to . . . degradation of land quality. [Mishra, 1973, p. 1.]<sup>6</sup>

In an early effort to draw international attention to the issue of a national park for the Everest area, FAO Wildlife Conservation Officer J.H. Blower paid a two-week visit to Khumbu. His memorandum to the His Majesty's Government of Nepal's Secretary of Forests reported observations made during his visit and concluded with a proposal for a national park.

It might be argued that the main attraction of the Khumbu area is Everest itself and the other great Himalayan peaks, which being immovable and indestructible require no special conservation measures to protect them. However, this is a misleading argument since the attraction of Khumbu lies not only in the great peaks themselves, but in the unspoilt wildness and natural beauty of the forested valleys through which they are approached. But these wilderness values are fragile and could easily be lost within a few years through continued deforestation, over-grazing and resulting soil

erosion, uncontrolled commercial development and other causes. [Blower, 1972, p. 7]

A year later in the spring of 1973 a committee, chaired by the conservation-minded Prince Gyanendra, brother of the king, was established. The chairman's first act was to initiate a field investigation to explore the possibility of a national park in Khumbu (L.N. Sherpa, 1979). The investigation was undertaken by Department of National Parks and Wildlife Conservation (DNPWC) ecologist Hermanta Mishra, quoted above. Mishra's brief visit was unexpectedly shortened by illness, but resulted in a report echoing Blower's recommendations and specifying proposals for the implementation and administration of a national park (Mishra, 1973). His Royal Highness Prince Gyanendra addressed the World Congress of the World Wildlife Fund, also in 1973, indicating implicit support for the national park idea:

Since it was first discovered in 1852, Mount Everest has been attributed special status as highest mountain in the world. We sincerely believe that this region and its surrounding in the grandeur of the Khumbu Valley are of major significance not only to us but to the whole world as an ecological, cultural, and geographical treasure and to be a significant contribution to a better world heritage. [H.R.H. Prince Gyanendra quoted in L.N. Sherpa, 1979, p. 32.]

A decision by His Majesty's Government to establish a national park of Khumbu followed soon after; Sagarmatha National Park needed only a plan of implementation and official authorization.

New Zealanders had been active in Khumbu, beginning with Sir Edmund Hillary's post-Everest aid efforts on behalf of Sherpas; New Zealanders were also involved in efforts to promote the national park idea, and participated in the establishment of the park. New Zealand-sponsored surveys resulted both in some of the best and some of the flimsiest reports on conditions in Khumbu. In 1970, R. Naylor undertook an examination of forests and forestry practices. A limited knowledge of Sherpa culture impairs his analysis somewhat, but in a relatively short period he managed to amass considerable detailed information about selected areas of Khumbu forest. A later study by a three-man team headed

by P.H.C. Lucas was commissioned by the New Zealand government to make recommendations to Nepal on the Sagarmatha National Park proposal. The Lucas report cites three examples of 'overgrazing-initiated' erosion scars (rock-slides at Khunde, Thangmite, and near Dole) (Lucas *et al.*, 1974), none of which can be accounted for by the superficial disturbance of livestock. Each one, including the torrent behind Khunde (Plate 2), is clearly a response to structural conditions far beyond the effect of the most agile yak. These reporters, in common with many others writing about conditions in Khumbu both before the park and after its establishment, apparently permitted both a desire to promote the park and preconceived assumptions about human impacts to obscure the evidence of their own eyes. But the strong case they were thus able to make for the necessity of the protective status of 'national park' proved effective, and persuaded Nepal to cooperate with New Zealand in the organization and establishment of Sagarmatha National Park.

For all its hyperbole and liberties with geomorphic truth, the Lucas report displayed a commendable sensitivity to the need to involve local people in any plans for a national park.

. . . we regard it as essential for community support that the people of the region be closely involved at both the policy and operating levels through participation in decision-making and staffing. It is because understanding of the country and its people will be vital to successful park administration that the [New Zealand] Mission is convinced that the park should be staffed with suitably trained Sherpas as soon as possible. [Lucas *et al.*, 1974, p. 15.]

An early action by the cooperative New Zealand–Nepal project that undertook the development of the national park was the recruitment of several young Sherpas who went to New Zealand for training in park and recreation management. Wardens from New Zealand served in the park's first formative years until replaced by Nepalis (including the New Zealand-trained Sherpas), and the New Zealand style of national park infrastructure and administration became the model for Sagarmatha National Park once it was gazetted in July 1976.

Several studies were commissioned by the first of the New Zealand wardens, including a fuel-wood survey, undertaken by a young Khumjung man, Nima Wangchu Sherpa, who had trained in New Zealand (and who served as Assistant Warden of the park from 1986 to 1988), and studies of tourism and animal husbandry by the Norwegian geographer Inger Marie Bjonness previously cited. These studies and other work provided the basis for the *Sagarmatha National Park Management Plan* which spells out the outsiders' perception of appropriate objectives for the park, and initiated the first regulations imposed through the national park administration.<sup>7</sup>

The measures these planners initiated to address resource problems have sometimes aggravated environmental damage, especially when problems have been wrongly identified. Well-meant programmes to help both people and land have served to accelerate the disruption of historic man-land relations and have further undermined traditional resource management systems, already weakened by the host of social and economic changes that have followed Nepal's mid-century entrance into the modern world (Haimendorf, 1964, 1975; Bjonness, 1980b).

The first focus of regulation was forests. The national park's initial attempt at controlling forest resources offers evidence of this counter-productive effect of externally imposed resource regulation.

Park statutes define permissible areas for each village's woodcutting and limit the number of trees harvested for structural timber. This has reduced the pressure on forests within the park, but not without cost. Restrictions on Sherpa wood use provoked environmental problems even before they were initiated. Hearing rumours of impending park limits on forest use, locals set out to stockpile fuel and construction timber before regulations could be imposed. Ten years later, the lower storeys of Khumbu houses are still stuffed with hoarded lumber, and stacks of fuel-wood stand decaying in many front yards. Unprotected forests beyond the park boundaries suffer increased exploitation. The restriction of accustomed practices generates resentment

against the park and its administrators. A further negative effect has been the erosion of diverse traditional forest management systems, some of them long-standing and effective. Older Sherpa ways of protecting natural resources have given ground before the newly instituted national park authority, as they were forced to yield to earlier government-imposed restrictions. New rules often have authority without effectiveness, and Khumbu's forests bear evidence of the diminished success of recent controls on the use of resources.

In the last few years, creative park administrators have attempted to incorporate an element of traditional Sherpa management into forest protection. The enforcement of park regulations is partly in the hands of park-appointed and funded *shing qi nawa* ('forest guardians') named and modelled after forest protection agents who were important in some villages before the park came into being (L.N. Sherpa, 1985). The system is still evolving, but shows promise. It represents an attempt to tap both local resource expertise and the acceptance and respect which people are likely to have for institutions of their own design.

The national park administration, aided by various international groups including the New Zealand-dominated Himalayan Trust, has been involved in other productive enterprises: reforestation projects involving the establishment of nurseries and plantations; alternative energy schemes to reduce the need for fuel-wood; conservation education projects. The role of the park and its advisors has by no means been exclusively negative.

New Zealand has had a role to play in Khumbu beyond its involvement with the park *per se*, particularly in ongoing aid projects which have developed from Sir Edmund Hillary's initial efforts on behalf of Sherpas. These include a number of projects administered and funded today by the Himalayan Trust, a joint programme of New Zealand and Canada. A New Zealand work party comes to Nepal every year to build or maintain trails, bridges, and schools. Funds and staffing for the Khunde Hospital and the wherewithal for pilot reforestation efforts, including nurseries and plantation

fencing, are also supplied by the Himalayan Trust, which has been involved in monastery restoration projects as well.

These and other Himalayan Trust projects dominate the long-term aid scene in Sagarmatha National Park, although other groups have also been active in projects for Khumbu and Sherpas. These include UNESCO, which funded a tiny hydroelectric installation for Nauje; Cultural Survival, involved in a cooperative effort to build a Cultural Centre at Tengbuje Monastery; the American Himalayan Foundation, which provides scholarships for selected Khumbu students (a facility also provided by the Himalayan Trust to a wider range of students than the sirdars' sons who benefit from the American Himalayan Foundation subsidies); and the Peace Corps, which has sent volunteers to work on village water systems, to salvage the faltering Nauje hydroelectric facility and to build composting toilets at Tengbuje.

Such projects, particularly the long-term programmes sponsored by New Zealand and subsequently the Himalayan Trust, have had a significant effect on Sherpa lives.

But in the ten years since the park's establishment, the initial influence of New Zealand's participation in the planning of Sagarmatha National Park itself has faded somewhat in the face of Nepalese reality. At present, the park plans call for a staff of 114 people, all lowland Nepalese. (The original Cooperative Agreement between New Zealand and Nepal called for a locally recruited Sherpa staff.) This figure includes a senior warden, a warden, five rangers, an accountant, seven clerical workers, four senior game scouts, twenty game scouts, and sixty-five members of the protection unit—a service performed in Nepal's national parks by the army. The park has never operated with a full complement of staff. In the spring of 1986, there was neither warden, nor rangers, nor accountant, and most of these duties fell to the beleaguered senior warden (L. N. Sherpa, personal communication, 1986).<sup>8</sup>

Most of the park staff is made up of *rongba* (lowlanders) Nepalis whose homes and families are in the more temperate parts of the country. Sagarmatha National Park is an alien environment for them. Those with the roles of rangers are

not eager to travel in Khumbu's inhospitable mountains; their effectiveness is thus somewhat diminished. There are a number of constraints on the optimum performance of such alienated staff (L.N. Sherpa, 1985).

The army provides the uniformed and armed police force that is the park's 'protection'—in the case of Sagarmatha National Park, protection of the landscape from the people who draw their sustenance from it. In the Royal Chitwan National Park, rich with wildlife, the army protection unit is authorized to shoot poachers—to kill. In Sagarmatha, the army's responsibilities are less heavy: their primary duty is to enforce park regulations against indiscriminate felling of trees. But Sagarmatha National Park villagers are no happier with the army than those who live near Royal Chitwan (its resident population, like that of Rara National Park in northern Nepal, was removed from within park boundaries (Milton and Binney, 1980; L.N. Sherpa, 1987) ). They accuse the army guard units of favouritism in the enforcement of the rules, and of flagrant violation of the very regulations they are there to enforce.

Newly-imposed regulations plus the perception of irregularities of enforcement create public-relations problems for the park.

There is poor local support for the establishment of national parks and reserves here in Nepal. The establishment of protected areas to control resource use in a country densely populated by people heavily dependent on natural resources is not easy. Conservation often means restricting people's use of local resources, such as timber and grazing land, while they are struggling to fulfill their basic needs [L.N. Sherpa, 1985, p. 8.]

A further conflict arises over the size of the park staff. Resident year-round in Khumbu, the hundred-plus park employees exacerbate demands on scarce resources, particularly fuel-wood; this creates further disharmony between residents and the national park.

These are issues that the park's chief administrator quickly becomes aware of, but difficult problems to mitigate. Yet, as the park's longest serving Warden asserts, 'unless the local people understand and support the park concept, and recognize the relationship between park protection and their



own long-range interests, the destruction of forest, wildlife, and aesthetic values will continue' (L.N. Sherpa, 1985, p. 9).

### *Returns from Tourism*

The combination of the growth of tourism, establishment of Sagarmatha National Park, and an array of development projects all initiated in the last three decades has had enormous effect on Khumbu. Other factors of change operate as well, of course, as the central government expands its operations into peripheral areas like Sagarmatha National Park, as Sherpas venture farther into the twentieth-century world beyond Khumbu, and as geopolitical disruptions intrude even into the remote Sherpa world. But it is the repercussions of the recent growth in tourism in Sagarmatha National Park that appear to be most significant for the man-environment relations that are the theme of this study.

Tourism has brought extraordinary opportunity to the Sherpa people. The rise in tourist visits coincided with a radical restructuring of a traditional cornerstone of the Khumbu economy, trans-Himalayan trade (Haimendorf, 1975). Tourists provided an alternative activity and income when the Chinese occupation of Tibet forced the traders of Khumbu to cut back substantially on their accustomed dealings across the border. Where some of Nepal's other northern border peoples suffered calamitous cultural disintegration in the aftermath of the disruption in their trans-Himalayan trade, particularly in western Nepal where the trade in salt for grain was the Bhotia's economic mainstay, the Sherpas had a ready alternative.

With their experience in mountaineering employment outside Nepal, Khumbu Sherpas were primed to take advantage of the opportunity of working for the expeditions that began to pass through their front yards in 1950. The growth of a new trekking industry has provided yet more jobs for Sherpas, and the diversification of trekking styles has only expanded the money-making opportunities for Sherpa entrepreneurs.

*Trekking Booty* The returns from trekking or expedition employment are far more than simple wages. Foreign expeditions are required by law to outfit their Nepali staff with suitable mountaineering gear; satisfied trekkers frequently pass on their equipment to the people who've served them. Anyone whose tourism work involves contact with *mikaroo* ('white eyes', as Westerners are called in the common Sherpa pejorative) is likely to be supplied with down jackets and sleeping bags, boots or running shoes, synthetic pile sweaters, climbing hardware, and pressure cookers. These are items with a ready resale market, and countless stores in Kathmandu and Nauje are stocked with trek or expedition largesse.

*Patronage* A Sherpa who endears himself particularly to one or another of his clients may find himself with a patron for life. This patronage may be simply a generous gift of money or equipment, but it frequently extends to far more lavish gifts: scholarships so that children may go to school in Kathmandu, Darjeeling, or Europe or America; substantial loans or outright gifts of funds to underwrite particular projects, such as the construction of a hotel or a new metal roof; trips to the United States or Europe for medical care or simply for fun; a mate—advantageous marriages or less formal liaisons between Sherpas and trek or expedition clients are not rare.

It is difficult to spend time in Nepal without being struck by the inequity between affluent visitor and impoverished resident, and when one's visit permits the opportunity to establish what feels to the foreigner to be a warm and enduring bond, the urge to share one's relative riches becomes overpowering. Experienced Sherpas know this and capitalize on the knowledge; there is often an expectation of some such return in the generous provision of friendly service that is the tourist-employed Sherpa's *modus operandi*. Sherpa social interactions are rooted in reciprocity (Ortner, 1978), and for their smiles, service, and the hospitality of their homeland, they expect—and usually receive—a return

in cash, clothes, or the opportunity for a first-born son to go to boarding school (Adams, 1988).

These opportunities are there for any staff member, although particularly likely to fall the way of those with the most contact with sahibs: in expeditions, the 'climbing sherpas'<sup>9</sup> and sirdar; in trekking, the 'sherpas' who set up tents and tend to trekkers on the trail, the cook, and again the sirdar. Especially fortunate is the trek or expedition sirdar, whose position as trip coordinator provides many avenues to increased wealth.

His opportunities begin before the trip. Any expedition requires porters and other staff, and it is the sirdar's responsibility to recruit and pay them. Most Sherpa sirdars hire family first, then friends, keeping tourism's returns within a tight circle. It often happens that the amount budgeted for staff wages is not the amount paid out; it is expected that the sirdar will keep his recruiter's fee. For treks elsewhere in Nepal, the sirdar's extra business opportunities are largely limited to these, but for trips within Khumbu, there are further options. Khumbu sirdars can set up camp on their own or family fields, pocketing the budgeted tenting charge for themselves. They may entertain clients in their own homes, providing wives and daughters with captive consumers to buy the caps and sweaters that Sherpa women knit in their leisure time. And, perhaps most significantly for this discussion, sirdars are in a position to use their own pack-stock for trips within Khumbu. Porter loads carried by yak or *zopkio* bring twice the daily rate of a human porter, since cattle can carry the equivalent of two porter loads—twenty to thirty kilos and more each. The sirdar who uses his own animals compounds the return on his labour and his family's, and can make a sizable amount of money on a large or long trek or expedition.

*Hotels* By these routes tourism provides Khumbu Sherpas with capital. Tourism also provides an array of lucrative business ventures for the family that wants to reinvest this capital. The earliest visitors to Khumbu usually stayed in private homes in a tradition of hospitality developed long

before Westerners set foot in the Himalayas. As more and more tourists came, sometimes inappropriately exploiting the hospitality offered freely by the Sherpa, residents began to charge for potato pancakes and *shyakpa* ('Sherpa stew', a potato-dominated dish often flavoured with Tibetan sheep fat and fortified with noodle flour dumplings). In Nauje, a requisite stop for all Khumbu visitors, one house with a history of catering to the food and housing needs of visiting Tengbuje monks, became Khumbu's first 'Sherpa Hotel', providing simple meals and a place to sleep for a nominal fee. Nauje's Sherpa Hotel has been joined by dozens and dozens of others in the villages and subsidiary settlements along the main trekking routes. Nauje alone has about 18 hotels that cater to tourists, as well as a number of tea-shops that accommodate the lowland traders who come to the weekly market. The tourist hotels range in elegance from the two smoky rooms of the original Sherpa Hotel to the two newest structures on the Nauje skyline, three-storey hotels with glassed-in roof-top restaurants, private rooms, and relatively expensive and elaborate menus (Plate 3).

The fancier hotels are the Nauje hotel-keeper's dream today. In the last three years, two essentially new structures of this kind have been built (the first by Khumbu's most conspicuous success in tourist enterprises, the second by Nauje's *pradhan pancha*, or mayor), and at least four other older buildings have been modified to accommodate the windowed top floor eating place. On the trail from Lukla several such hotels have been built, and the renovation of a hotel in Tengbuje has left it with the newly requisite upper storey dining room. Tourists paid in one way or another for all this construction, and tourists are drawn to these more lavish facilities. They are the first to fill in the busy season, and the ones likeliest to be chosen by off-season visitors. It seems that trekkers who have experienced the more modest tea-house accommodations that characterize the trail to Khumbu are ready for the fleshpots of Nauje; only those with serious budget constraints or a desire for a less Westernized experience patronize the older style Sherpa hotels when an alternative is available.

Proprietors of less opulent facilities are scrambling to maintain a share of the business, but for many such operations a very small share is all that is necessary to turn a profit. The costs of feeding and housing trekkers in an essentially unmodified Sherpa house are little more than the cost of keeping one's family, and the profits can be substantial even at the modest prices charged. All along Nepal's principal trekking routes, residences have been converted into lodges with the simple addition of a sign and perhaps a menu. Hotels like these have been established in Nauje, Tengbuje, Pangbuje, Pherije, and Lobuje for several years; the demand for accommodation at these hot spots on the Everest route has proved a bonanza for Sherpas with property in these settlements, or the wherewithal to acquire it. Recently, hotels have also appeared at Dingbuje, Chukhung, Khunde, Khumjung, Dole, Gokyo, and a few other sites in Sagarmatha National Park, as the independent trekker's itinerary expands to include more of the park and the market for a place to stay expands.

*Shops* Tourists bring another demand to Sagarmatha National Park, one that is being met by small-scale entrepreneurs as well as by participants in the trekking and expedition business with capital to reinvest. Particularly in Nauje, but in other locations as well, shops are becoming a part of the Khumbu business scene. Nauje contains dozens of small stores, usually occupying the front room of a hotel or house, stocked with an unbelievable selection of goods primarily for tourist consumption. Canned fruit from India, Swiss chocolate, beef jerky, freeze-dried packaged meals, drink mixes, baking powder, jam, peanut butter, canned cheese and wheels of 'yak' cheese, batteries, flashlights, camera parts, Chinese and Indian medicines, noodles, bouillon cubes, pâté, Chinese tennis shoes, *sushi* wrappers, sardines, canned Korean squid . . . an amazing array of comestibles and imported odds and ends is displayed alongside 'genuine, made-in-Tibet' knick-knacks and Sherpa handicrafts. The contents of these shop shelves changes in the aftermath of various expeditions. After the Canadian Everest

expedition of 1982 there was excellent fruit-cake in Nauje's shops for weeks. The Czechoslovakians left sausage and cheese, the Russians caviar and mysterious canned meats, the Catalan expedition quince paste, the French and Swiss chocolate and pâté, the Koreans canned fish and pickled garlic, the Japanese *tofu* powder and *sushi* ingredients, the Indians dried *idli-sambar* mix. After a Dutch expedition, the stores were flooded with cases of Mars bars. Store-keepers bring goods from Kathmandu and stock up on staples at the weekly market, but many of the high-profit items are expedition left-overs. The acquisition of these left-overs is itself an example of Sherpa business acumen. Once they were simply given away to expedition staff, often to the sirdar for distribution at his discretion. But lately, in an effort to recoup some of the high costs of footing a big expedition, left-over equipment and food is sold (Alan Burgess, personal communication, 1984). Sometimes one or another of Khumbu's particularly effective traders manages to secure the entire lot. But often a number of hopeful buyers will travel to the base camp and try to bid for left-over supplies, which then appear on the shelves of small shops or on hotel menus.

The lavishly supplied shops, like the fancier hotels, represent for the most part the investment of Sherpas who have become rich from trekking. Most of Nauje's more modest shops, in contrast, are operated by Tibetans, often recent immigrants who rent a room in a Sherpa building and sell mummified sheep, wool, *jtoma* (the root of a *Potentilla* used in ritual and traditional cuisine), and other Tibetan imports as well as the stock Indian fruit and Nepali noodles.

*Servants* Tourism provides the income for a further addition to a number of Khumbu households, particularly in Nauje where servants are increasingly a concomitant of new wealth. Once, newly-arrived Tibetans provided a useful pool of mostly agricultural labour (Haimendorf, 1964). Today, household servants are most often from the lowlands to the south; either young Sherpas from poor families in Solu, or young people from other ethnic groups—Tamang or Rai. For room, board, clothing, and a monthly pittance, some

Khumbu Sherpas have year-round assistants who cut wood, do house-work, watch livestock, and work in the fields. Some of these labourers are lured by a promise of an opportunity to work in trekking—an opportunity denied most villagers off the main tourist routes without appropriate contacts. Servants are almost a necessity for the larger hotels; even when all available family members are pressed into service, there are always tasks, particularly the grubby or difficult ones such as wood-cutting, for the hired help.

*Livestock* Of all the investment opportunities that tourist rupees provide, probably none has the environmental significance—and relevance to this study—as the purchase of livestock. Not only sirdars take advantage of the double pay-off of a pack animal loaded with expedition or trekking gear. In every village of Khumbu there are owners of livestock whose primary interest in cattle keeping is to have yak or preferably *zopkios* available for portering. Again it is in Nauje, the hub of Sagarmatha National Park tourist enterprises, that investment in pack-stock is big business; every household with a few thousand rupees to spare thinks first of buying *zopkio*. A hotel or shop requires property on the trail or in Nauje's 'hotel district'. But pack animals can go to where the load is, and almost every family in Nauje either owns pack animals or plans to acquire them.

*Investing Outside Khumbu* Tourism provides investment opportunities for Sherpas outside Khumbu. A number of the hotels at Lukla are owned by people from Khumbu. Sherpa enterprises are also developing in Kathmandu, where shops, hotels, and businesses are all built out of profits from tourism. Sherpas own and operate a number of Kathmandu-based trekking agencies and engage in the operation of a number of others. Sherpas have acquired a new awareness of the world and its workings.

The arrival of tourism has brought a cornucopia of opportunities for Khumbu Sherpas. These opportunities come at a cost.

*Costs of Tourism*

Perhaps the fundamental negative impact comes from inequities in the opportunity to profit from tourism's bounty. Not everyone in Khumbu is in a position to engage in these enterprises: some gain at other's expense. Success in finding trekking assignments or employment in expedition tourism is largely a matter of whom you know. Particular clans and villages enjoy a disproportionate share of the higher pay and prestige jobs with the more active companies. Although it often happens that these are the traditionally prominent clans, it is also true that tourism's opportunities have enabled formerly disadvantaged households to benefit substantially.<sup>10</sup>

*Inequities in the Distribution of Benefits* Almost every Khumbu household is involved in one or another capacity in tourism, but for many this may only amount to a few weeks of portering work for a household's daughters (particularly prevalent in Thamichok) or livestock. In the post-tourism *status quo*, the best jobs go to able young men with the best connections.

Hotels are a rewarding investment on the trails heavily used by tourists, particularly if appropriately spaced at a day's march from the previous stop. Nauje, Tengbuje, Pherije, and Lobuje all qualify on both counts; Pangbuje, although square on the trail, is too close to Tengbuje where almost all visitors opt to stop, and has only two hotels. Property owners on the Everest trail definitely enjoy opportunities denied their Khumbu neighbours in Khunde, Khumjung, Fortse, and Thamichok. There is more to hotel-making than appropriate property ownership, and it appears that residents of the 'acculturated' villages are more likely to capitalize on such opportunities, but it is clear that for Fortse and Thamichok, opportunities for big returns from tourist hotels just aren't there.

*Labour* Tourism's demands for labour have also had negative impacts in Khumbu. The first evidence of this came in the early 1970s, when the allure of expedition and trekking work



drew young Sherpas out of the Hillary schools and away from the monastic life (Haimendorf, 1975). This was a particular concern of the Tengbuje Rimpoche in 1976, when he feared the ultimate dissolution of Buddhist institutions in Khumbu (Tengbuje Rimpoche, personal communication, 1976). As it happens, probably in part because of the Rimpoche's vigorous efforts, Khumbu's monasteries are stronger than ever. A subsidy is paid by the Himalayan Trust to the families of students in the upper grades to induce them to stay in school. But other elements of the traditional Sherpa way of life are affected by the diversion of labour to tourism.

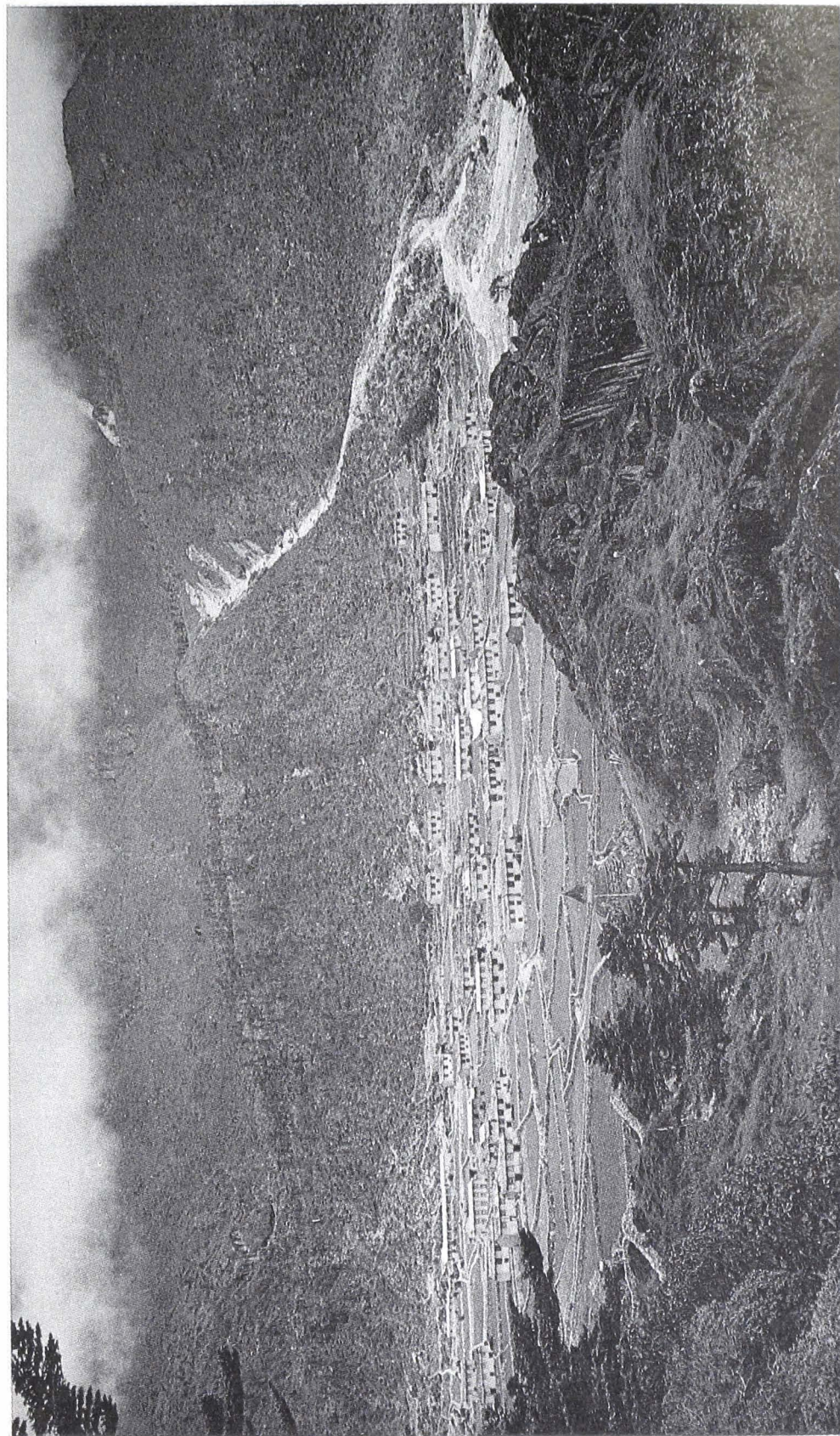
The labour shortage is most keenly felt at the end of monsoon, when the harvest coincides with the beginning of the expedition season. In the seventh and eighth month of the lunar calendar, the potato and barley harvest coincides with the hay-cutting season, followed immediately by the buckwheat harvest. The big expeditions also arrive at the end of summer, and often require substantial numbers of porters, pack-stock, and other staff members. Expedition work pays well, and to compete agriculturalists must offer an inflated wage that few can easily meet. Labour scarcity is a chronic problem for livestock owners, who formerly relied on their children to tend animals grazing on remote pastures. School and tourist work have diverted that pool, and animal husbandry practices have been modified as a consequence.

*Inflation* Sherpas who are making good money from tourism can afford any price for commodities they need. Lowland traders have been drawn to the Nauje *hat bazar* for years because of the relative affluence of Sherpas; greater affluence means greater opportunities for them to profit on the differential between their cost and the price Sherpas can pay, and market costs rise in consequence. Particular items like eggs, fruit, and meat, bought in large part to feed trekking groups and hotel guests, are sold at inflated prices to tourist providers who can simply pass on the costs to their customers. But prices of staples have also risen. What of the Khumbu people whose residence or standing keeps them on the periphery of tourism's opportunities? The people of



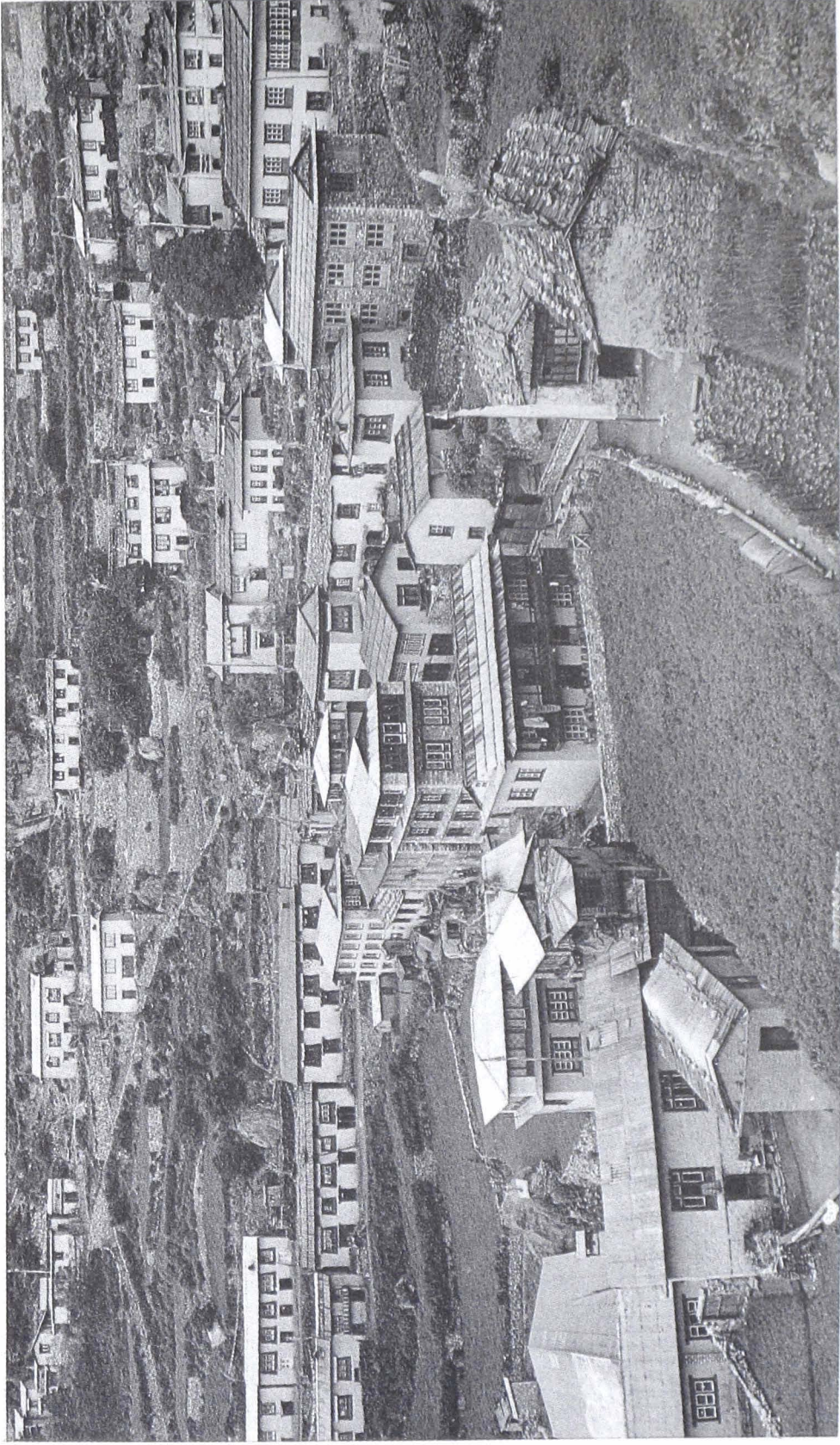
1. Purba Chetin, age two.





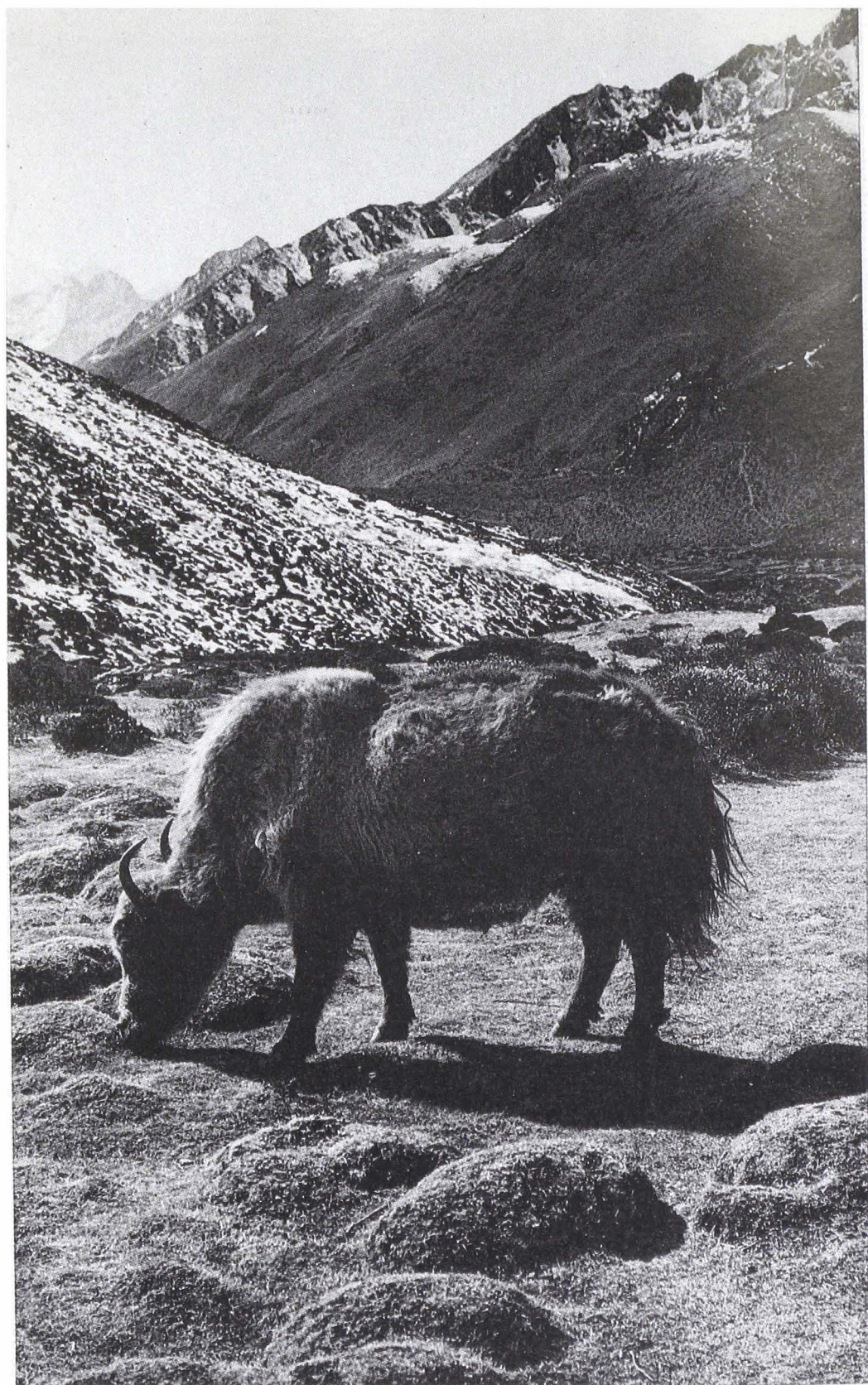
2. Khunde. The Torrent (debris flow) at right. The Khunde 'Tokpa' was attributed to the effect of over-grazing by Lucas *et al.* (1974).





3. Nauje. Major tourist hotels are concentrated in the centre of town.





4. *Nak* grazing on subalpine meadow (4,400 m). Periglacial turf hummocks, in the foreground.





5. *Dzum* grazing on montane vegetation at 3,800 m.





6. *Tsitsa* fields and houses of Dusa (4,500 m) in subalpine vegetation zone.





7. Steep slopes with terracettes above the Dudh Kosi.





8. Eroded trail network at Shyangbujje.

Thamichok and Fortse, as well as the few households in Nauje who get little from tourists, all complain that life has become much more difficult: 'If tourists come [to the currently off-limits upper reaches of the Bhote Kosi Valley], it wouldn't be so good.' That is the judgment of one Thamichok man, who is especially concerned about inflation. In Lhahuje, high in the Bhote Kosi valley, potatoes sold for two or three rupees per *pathi* when the cost in Thame was five rupees. But in Pherije, a seasonal settlement with the same relationship to main villages as Lhahuje and where potato-growing conditions are if anything better, potatoes were selling for ten rupees a *pathi*: Pherije is an important tourist stop on the road to Everest. Hay in Thami could be had for 100 to 150 rupees per *mun* (an abnormally high price reflecting poor hay yields of 1985); in Pherije, the cheapest hay sold for Rs 200 per *mun*. Awareness of this sort of effect on the cost of necessities dampens the enthusiasm of many Khumbu Sherpas for tourists.

Tourism is something of a mixed bag for the people of Khumbu. Some of the costs incurred by those outside the magic circle of tourism's opportunities have been mentioned, but even those who profit most may pay for their good fortune.

Thirty years have brought the Sherpas of Khumbu from a relatively insular existence into the mainstream. Sherpas have travelled all over the world, and a lot of the world has turned up in Khumbu: Nauje is an astonishingly cosmopolitan place. There has been a remarkable adherence to some traditional Sherpa values and ways, but this exposure has had its costs too, in the introduction of some of the more sordid elements of contemporary times, and in the disruption of other traditional systems.

*Drug-running* Sherpa traders have dealt in contraband for much of their history as trans-Himalayan traders. Outwitting the government check-post police is an honourable if onerous element of this trade. But in the last few years Sherpas have become involved in an illegal international trade entailing higher cost than confiscation of illegal hides or

Tibetan artefacts. The world-wide mobility of Sherpas makes them convenient couriers for drugs, and men recruited by trekking and expedition contacts have been caught and imprisoned for drug trafficking.

Interestingly, one of the investments made with drug-running profits has been in religious institutions. Recent lavish gifts to the monasteries at Tengbuje and Thami are said to be merit-buying offerings from someone involved in this business.

Legitimate business profits are also widely turned to religious ends, from restoration of sacred structures to the construction of *mani* (prayer) walls and *chortens* (funerary monuments) and the sponsorship of rituals. Khumbu's religious institutions seem to be strengthened by tourist profits and perhaps by the interest many tourists have in the traditions of Tibetan Buddhism. But secular institutions have not fared so well. It is the decline in such institutions, the traditional systems that regulate livestock movements, and other disruptions of traditional animal husbandry practices that the most serious threats to the Sagarmatha National Park environment lie.

## NOTES

1. Fuel for iron-smelting rather than lumber revenues was the dominant incentive for massive forest removal before the twentieth century in the hills surrounding the Kathmandu Valley (Bajracharya, personal communication, 1986). Iron was an important Nepali trade commodity for a considerable period, and ore mined and smelted near Thase in the hills south-west of Khumbu was transported to Tibet across the Nangpa La.

2. 'It is hard for Westerners to realize the position that Tenzing now holds in the eyes of the East. Probably the most comparable phenomenon, in our own experience, is Charles Lindbergh; but even Lindbergh, in his heyday of hosannahs and ticker-tape, did not receive adulation to the point of actual worship. For millions in the world today Tenzing is a manifestation of godhead: an avatar of Lord Siva, a reincarnation of the Buddha . . .' (Ullman's Introduction in T. N. Sherpa, 1955, *Tiger of the Snows*, p. xi.)

3. The Lukla run is RNAC's most lucrative domestic flight; if conditions were different, RNAC revenues and the number of Khumbu visitors would be far higher. But critical weather patterns prevent flights to



Lukla except in the early morning, and often preclude landing at all on the very dramatically sited and potentially deadly airstrip. Morning clouds in Kathmandu can delay take-off until Lukla is closed by mists, and the monsoon brings a stop to all flights as well as to most tourist traffic. It is not unusual that Lukla flights fail to land for many successive days—two weeks and more in memorable instances. When this happens during autumn's peak trekking periods, stranded passengers numbering several hundred may pile up in the many small hotels that have sprung up to capitalize on just such a situation. Threats, fights, and assaults on the RNAC office at Lukla are common when the planes don't come for several days; riot police were once landed with the first plane after such a flightless interval to control the rabidly impatient trekkers.

4. In addition to this study, several others have been made of tourists in Khumbu, although little has been published. Polly Cooper's Master's Thesis was an investigation of the Everest View Hotel (Cooper, 1975). Inger-Marie Bjonness analysed visitor characteristics and use patterns over a six-week period in autumn 1978 (Bjonness, 1980b); her data, although representing a limited period, are the most reliable yet available. A study by Pawson *et al.* (1984, b) uses basic data from Bjonness' study and the *Khumbu Region Tourism Study* in an analysis of tourism's impacts. His Majesty's Government's Central Immigration Office maintains records of tourist numbers, destinations, and nationalities, based on required visitor permit information, and the national park entrance station attempts to keep track of visitor numbers and countries of origin. Other published writings are based largely on these figures.

5. The *Khumbu Region Tourism Study's* numbers are rough aggregated estimates, whereas Bjonness' survey provides precise short-term figures that include everyone entering the park in the peak visitor period of 15 October to 4 November 1978.

6. Mishra is writing about visitors after 1950, implying significant environmental deterioration in a bare twenty-year period. This is an assertion widely made by Khumbu commentators, but one that is unsupported by comparison of photographic evidence or other objective analysis (Byers, 1986).

7. These regulations reflect initial assumptions about the rate of and responsibility for deforestation in Khumbu: that deforestation is a problem of the post-tourism era and that livestock grazing causes large-scale environmental deterioration. These assumptions are flawed by a failure to recognize both the antiquity of human modification of the Khumbu environment and the resilience of a sub-tropical monsoon mountain landscape—factors discussed further in chapter Six.

8. Fees collected at the entrance station (200 rupees, or just under \$10 at spring 1990 currency values) are returned to the state. Operating funds for the park come from the general fund.

9. 'Sherpa' is appropriately an ethnic designation, but its misinterpretation has been widespread and is now even institutionalized. In common Western parlance, 'sherpa' seems to simply mean porter. In the trekking business, sherpa has application to a position with particular responsibilities. Someone who works in trekking will explain his job as 'cook boy', 'porter', or 'sherpa', and be speaking of a specific occupation.

10. Khumbu's most conspicuously successful hotelier, trekking sirdar, and trekking company owner is a *gyawa khamba*—second generation Tibetan immigrant to Khumbu—who began his career as an expedition porter, then rose through the ranks to his current position of prominence. For a Nauje man, living in a relatively new village with a large population of recent arrivals and without an entrenched traditional élite, such a rise might have been easier than in an older village. But it is also likely that anyone with the enterprise and intelligence of Passang Kami would have succeeded anywhere in Khumbu, given the opportunities tourism has provided.

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## *Sherpa Animal Husbandry*

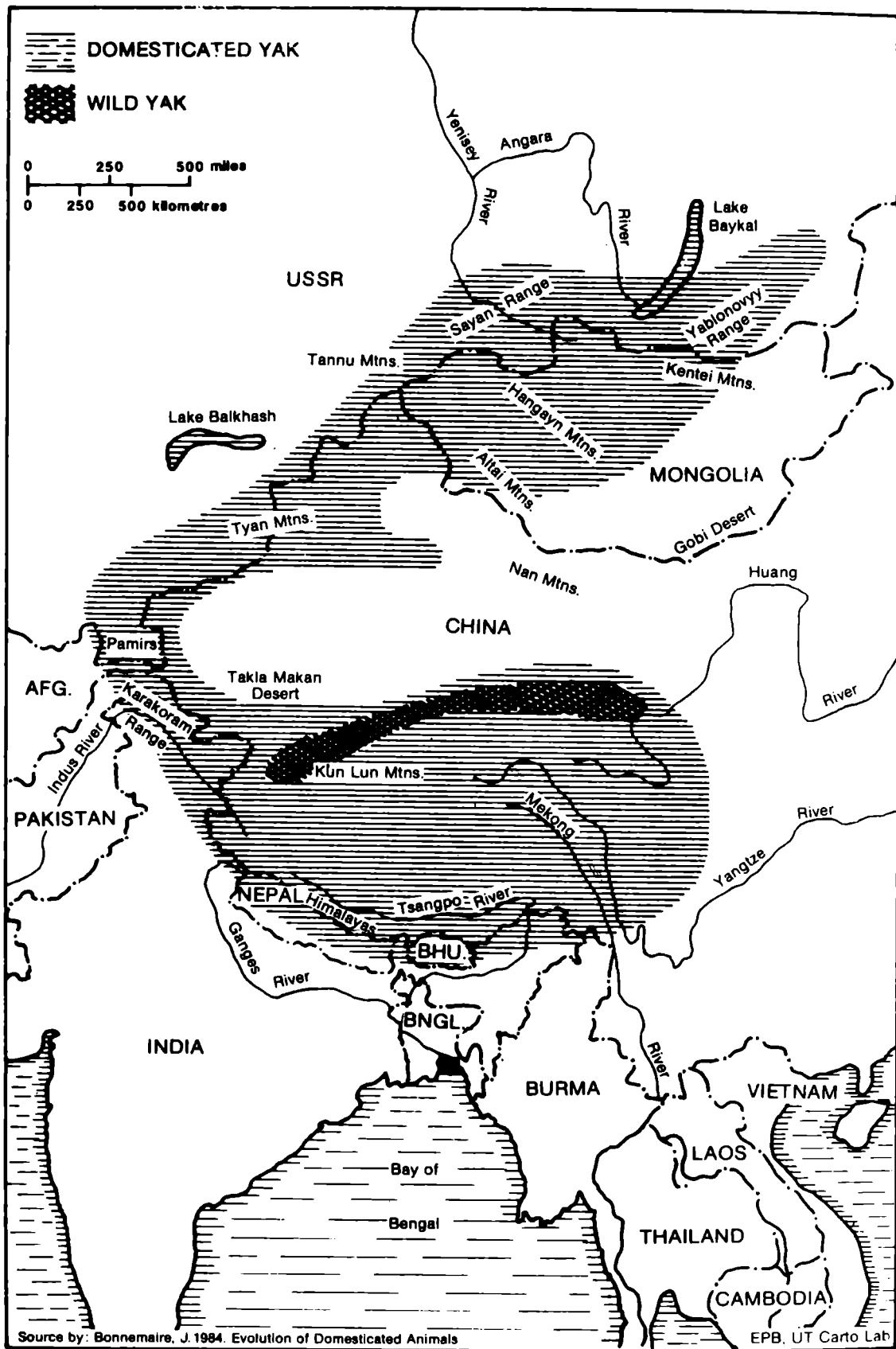
LIVESTOCK are central to the Sherpa way of life in Khumbu. Not all Sherpas own cattle, and only a few families are even dominantly dependent on livestock, yet agriculture, trade, and nearly every other facet of both traditional and transitional Sherpa life are intimately tied up with cattle and cattle keeping.

### *Types of Livestock*

'Cattle' in this high mountain context is a term that encompasses an array of different animals, including the yak (*Bos grunniens*), two species of 'cow' more familiar to us (*Bos taurus* and *B. indicus*), and an assortment of hybrids mingling these three lineages.

The domestic yak is a long-haired bovine native to the cold highlands of central Asia. It is found in a vast but lightly-populated area from the Pamirs to the west, Lake Baikal to the north, east to the headwaters of the Yangtse and Huang Ho, and south to the southern slopes of the Himalaya (Figure 4.1).

At the northernmost extent of their range, in the Sayan Mountains of Siberia, yak meet up with reindeer and camel (Bonnemaire, 1984). In the south, yak genes meet and mix with hump-backed zebu and mithan (*Bos frontalis*); these hybrids share farmsteads in south and south-east Asia with water buffalo, a bovine of a different genus (*Bubalus sp.*). China is home to most of the world's yak, which are found in Qinghai (4.6 million in 1979), Sichuan, Xinjiang, Kansu, and Yunnan, as well as in Tibet. Mongolia, with 500,000, comes second in numbers, followed by the USSR and Nepal.<sup>1</sup> Yak



4.1 Distribution of Wild and domesticated yak

are also found in India, Afghanistan, and Bhutan (Bonnemaire, 1976b; 1984) as well as in zoos all over the world from Rotterdam to Kansas City (Popenoe *et al.*, 1983).

The yak appears to have been an early domesticate, subject to human stewardship and genetic manipulations since the Neolithic age. Wild yak calves may have been raised with domestic cattle (Epstein cited in Bonnemaire, 1976a), or their domestication may have been effected for ritual purposes through salt provisioning (Palmieri, 1976).<sup>2</sup>

The wild progenitor of the domestic yak, which once ranged widely throughout the highlands of Central Asia, suffered the same history of decimation that the American bison experienced. The silk route bisected the wild yak's traditional range as the railroad divided the bison's territory; rifles replaced arrows, and the wild yak's distribution and numbers were reduced to an optimistic estimate of 3000 to 8000 (Bannikov, 1964, cited in Bonnemaire, 1976a), isolated in the most remote of central Asian mountains.

The wild yak's uniform coloration, massive size, and marked sexual dimorphism appear to have been targets of early breeders. The wild bull's weight, for instance—as much as 1000 kilos—is more than twice the biggest domestic yak's. But the progenitors' unique assemblage of adaptations to altitude and cold persist in the domestic version.

A true bovine, with the same basic morphology and number of chromosomes—sixty—as a dairyman's Guernsey, yak are nevertheless very different from such cousins. The domestic yak's body is compact, its legs relatively short, and its fore-quarters well developed (yak, like bison, have fourteen or fifteen pairs of ribs, not the domestic cattle's thirteen). In males particularly there is a prominent hump created by elongated neural spines. The head is large, somewhat dish-shaped in profile, and ornamented with distinctive curved horns (Bonnemaire, 1976a, 1984). A clear advantage in the cold lands is the yak's coat of hair: a woolly undercoat of fine, short fibres, and a coarser outer covering of wiry hairs, very long on flanks and tail. The yak's tail functions rather like a Sherpani's apron, forming a warm woolly covering over vulnerable parts of the body. Yak



adaptation to cold and altitude extend far beyond hair-style. Its skin is thick, with few sweat glands, reducing transpiration losses. The thoracic cavity, like the thorax of high mountain human populations, is unusually large to accommodate the larger lungs that are concomitant of respiration in rare atmosphere. The red blood cells of yak are half the size of other bovines and three to four times as numerous, adaptation presumably also tied to greater oxygenation.<sup>3</sup> The scarce and poor quality feed available to yak in much of their native range through most of the year has fostered other specialized adaptation. The upper lip is thinner and more mobile, and, according to Sherpas, the tongue is also specially designed to facilitate the cropping of very short material. Yak are more efficient than other cattle at metabolizing low-quality feed, although not the fodder-to-flesh conversion machines of water buffalo or goats. Presumably to make travel over rough terrain easier, the yak's feet are short, the stance solid, and the hooves unusually large and hard (Bonnemaire, 1976a, 1984). A yak in motion is nothing like a cow. There is a fluidity, more like a running bear or badger; a somehow distinctive gait that makes a pure yak easy to distinguish from a cow or hybrid at a considerable distance. A further distinguishing character of yak is their vocalization. The species name, *grunniens*, means grunting; the yak's characteristic noise is a low, resonating grunt, used by mothers to summon calves, and by males in aggressive or courtship displays.

Maturation rates and adult sizes of domestic yak are very variable. Nepalese yak appear to be on the small and light end of the spectrum: measured males weighed between 230 and 360 kilos, females 180 to 320 kilos (Russian yak are reported with live weights of 500 kilos for adult males, 300 kilos for females). Full size is reached in six to eight years. Optimally fed, yak reach sexual maturity at fourteen to eighteen months. But maturity is delayed further under traditional management systems: female yak reach sexual maturity at somewhere between sixteen and forty months, males at about two years.<sup>4</sup> Gestation averages 258 days—considerably shorter than other cattle, creating some complications

in the production of hybrids. In common with other cattle, the female yak's cycle lasts twenty-one days, with a winter suppression, but oestrus itself is usually very short and subtle—also a factor in man-regulated reproductive success, since the breeder must be both experienced and alert to recognize the fertile period, and ready with the appropriate male (a Sherpa contention supported in Bonnemaire, 1976a). Under traditional management, most female yaks calve every other year at best. A twenty-year-old yak is an old animal, and few survive beyond this age, in large measure because of tooth wear that prevents adequate food intake.

In the Sherpa's part of north-eastern Nepal, yak are found from a minimum elevation of about 3000 metres to a maximum of more than 6000 metres. The lower limit for yak is determined by their physiology. Their heavy wool and other specialized thermo-regulatory mechanisms keep them alive in the extreme conditions of high altitude, but are a liability in warm weather and heavy rain. A further low-elevation constraint on yak is their absence of immunity to lowland cattle diseases. Yak venturing below about 3000 metres run the risk of contracting a variety of water- and vector-borne afflictions as well as suffering from their unsuitability to the warmer climate of lower elevations. Yak have a few other limitations as well. The milk, although extremely rich, is much less abundant than cow's milk. Males, even when castrated, as almost all are by the age of four, are somewhat intractable and unpredictable.

These limitations of adaptation, productivity, and temperament were probably part of the incentive for the development of yak-cattle cross-breeds. Yak mated with cattle produce a sturdy, productive hybrid in demand for milk production and muscle power on both sides of the Himalaya. The hybrid combines many of the virtues of both parents and lacks some of the liabilities; a classic instance of heterosis, the cross is bigger and usually stronger than either parent. The cow genes provide for increased milk production (intermediate in richness between each parent's) and greater tractability, and confer some immunity to lowland cattle

diseases. The yak parent imparts some of its resistance to high altitude and low temperature.

The production of cross-breeds is by no means a Sherpa exclusive; yak and cattle of various sorts are crossed in many areas on the periphery of domestic yak distribution. Hybrids bridge the altitudinal gap between yak and cow territory, and permit the fullest use of the altitude gradients of south and central Asia's many highland environments.

Hybrid nomenclature is a rich study in itself. 'Yakow' is a term coined in a publication of the National Research Council (Popenoe *et al.*, 1983) but is otherwise unused despite its descriptive precision. The Nepali generic is *chaunri*, but in Sherpa there is no so simple blanket term. Generally speaking, male hybrids are *zopkio*, females *dzum* (Figure 4.1). But a *zopkio* whose mother was a cow is *urang*; if his mother was a female yak, he is called *dimzo*.<sup>5</sup> *Zopkio*, in common with all bovine male hybrids, are sterile, though with a lively interest in sex and invariably castrated. *Dzum*, however, are fertile and there are terms in Sherpa to apply to each of the various backcross progeny of successive generations of hybrids. 'Yak' is a term with Tibetan roots and is applied to *Bos grunniens* in Sherpa as well, but only to males. The female animals in Sherpa, and henceforth in this study, are *nak* (Table 4.1).

Sherpas keep both zebu-type cattle, *Bos indicus*, and the humpless *B. taurus* of temperate latitudes. But the tropical *zebu* does poorly at elevations much above 2600 metres; Lukla is the upper limit for such tender creatures and there

TABLE 4.1 HYBRID NOMENCLATURE

Female	Parents		=	Progeny	
	♀	Male		Female	or Male
nak		yak		nak	yak
nak		lang		dzum/dimzo	dimzo
pamu		yak		dzum/urangma	urang
pamu		lang		pamu	lang
dzum		yak		kokoyak	kokoyak

are none in Khumbu. Zebu genes are undoubtedly part of the Khumbu cattle *mélange*, where every conceivable admixture of bovine genes seems to occur, but it is the hardier variety in the form of dwarf Tibetan cattle (*Bos taurus*, known as *kirkhong* in Sherpa), that is kept by Khumbu Sherpas.

Cattle are by far the most important Khumbu livestock in terms of numbers, social and economic contribution, and environmental effects. But other animals are kept by Khumbu Sherpa.

Sheep and goats, components of the traditional Tibetan herd, have also been among Sherpa livestock. Sheep in small flocks of from one or two to about thirty are found in every village, most of them in Thamichok. Relatively few Sherpas keep sheep.<sup>6</sup> The total sheep population is anyone's guess, probably less than 500 animals: most sheep-owners keep only one or two. Khumbu, according to many reports, is not good sheep-keeping country. Despite the high value and high demand for wool, mutton, and sheep fat, conditions are such that few users of such products consider it worthwhile to produce their own. The aridity and wider open spaces of Tibet appear to be better sheep country than the steep valleys and wet summers of Khumbu, where cattle dominate the available range. In addition to unsuitable weather and pre-empted forage, disease may be a factor in the relative insignificance of sheep. A further factor may be the recent history of range use. The Tibetans who fled the Chinese occupation after 1959 came over the Nangpa La with livestock, including many sheep. According to some Sherpas, these thousands of Tibetan sheep seriously depleted the forage available: they 'ate the grass to the ground'. Refugees sought to sell their sheep, and at one point 100 sheep could be had for 100 rupees. Malnutrition and disease claimed large numbers of the immigrant animals, as well as Sherpa stock forced to compete with them. Dead animals were everywhere. Nauje villagers say that one couldn't leave the house without a mask to stifle the stench of rotting carcasses. It was heaven for the carrion-eating lamergeyers and Himalayan griffons, but hard on Khumbu's range resources and resident stockmen. Today's sheep-owners are mostly poorer families

without the capital and necessary property to support cattle. Fecund sheep, when they survive the somewhat inhospitable environment of Khumbu, provide manure and wool for their owners, and mutton either for the Hindu Nepalis stationed in Nauje or for trekking groups with big budgets.<sup>7</sup>

The same products plus milk were the incentive for Khumbu goat-owners. Again these were most often the poorer families, *kamis* and recent Tibetan immigrants without the wherewithal for higher status cattle, but able to maintain their goats on common property grazing grounds (and, according to indignant villagers, or roofing bamboo, drying grains and vegetables, and other village scavenging). Goats were peripheral to the economic core of Khumbu livestock production, which is centred on cattle, and most goat-owners were on the periphery of Sherpa society.

But goats, with a supremely efficient digestive system and a clever and adventurous temperament, are widely held in the developed world to be agents of environmental degradation. This was the perception of western advisers involved in Sagarmatha National Park policy-making. No attempt was made to identify their actual impact, because goats were 'known' to be browsers and hence bad for the plantations that park planners were trying to establish in reforestation demonstrations near several villages.<sup>8</sup> 'I think there is poison in goat saliva', said the national park's first New Zealand-trained Sherpa warden (M. N. Sherpa, personal communication, 1983). The national park persuaded Khumbu's two Panchayats to outlaw goats within the park, and about 500 animals were bought up by the Himalayan Trust and removed to Pharak, where most of them died from poisoning and disease. The goat-owners, with small voice in the workings of government, were forced to give up what had been a crucial source of manure and milk for many households. Apparently most reinvested in sheep (a good manure source but not milked by Sherpas, unlike Tibetans), which are managed like goats and have about the same resource impact in this setting; others made the leap to *zopkio* ownership, and invested in the animal with the greatest appetite for silver fir forage and perhaps the most significant

element in livestock-induced inhibition of forest regeneration in Sagarmatha National Park.

Horses are essential to the wide-ranging nomadism of many Tibetan herdsman, but in the steep valleys of Khumbu they have no role in livestock management. Nevertheless, there appears to be a latent cultural attraction to horses, and a few horses have always been part of the Khumbu livestock population.

About four generations ago there was a trader in Thangmite, Tundup Tengba. On a trading trip to Tibet he suffered severe frost-bite and lost both legs in consequence. Undeterred, Tundup Tengba continued to trade. He bought a yak in Tibet to carry him home, and acquired a horse on his return to Khumbu which he used as his mount in ongoing trading ventures.

A few others used to keep a horse or two, and another Thangmite man once had five or six. Five years ago there were probably fewer than ten horses in the whole of Khumbu. Traditionally horses had some limited usefulness as transport, but little other function, and they are very expensive to keep: four or five *nak* live nicely on the daily ration of hay it takes to keep a horse at bare subsistence (and a horse will happily consume three times the quantity) (L.N. Sherpa, personal communication, 1986). But the horse population is growing startlingly quickly, for horses provide an as yet barely tapped route to tourist rupees. It seems that this enterprise began when a grateful trekker, sick or injured and lent a horse to ride, rewarded the owner so lavishly that the commercial possibilities of horse rentals to tourists suddenly became attractive. Nauje people, as usual, are particularly able to take advantage of this opportunity. In 1982, Nauje had two horse-owners; by 1986, there were twelve.

Dogs are kept as disposers of offal and sometimes as pets. As a rule they are not held in high regard, being considered filthy and polluting animals without much claim on human affection or kindness.<sup>9</sup> There are a few large dogs of Tibetan mastiff type, used to guard livestock, and an occasional Lhasa Apso may be a pampered part of the household, but

most of Khumbu's dogs are small, nondescript, and belong to no-one. Dogs unattached to particular households quickly learn the standard position of the container of kitchen refuse collected for cattle, and sneak stealthily up the entry stairs to snatch whatever in the accumulated *bangtsa* might suit their indiscriminating palates. Periodic poisoning sponsored by the park administration or by the local panchayat has replaced the raids of forest leopards as a control over the canine population, despite the risk of inadvertant poisoning of other predators and carrion eaters.

Cats are scarce in Khumbu as in most of Nepal, but not because they aren't valued. Cats, in contrast to dogs, are considered to have clean mouths, and people will eat butter licked by cats but will throw out anything they suspect a dog may have touched. Even a tightly-shuttered Sherpa house does not seem to be a cat proof, and cats enter to work the rafters and dark corners at night in search of rats.

Chickens were once considered to be offensive to the country god, Khumbila, and thus not kept by Sherpas here (Bjonness, 1980a). But in the last ten years chickens have appeared in several villages. They are sufficiently accepted for lamas and *lhawas* (shaman) to prescribe the donation of a chicken to placate disgruntled ghosts and gods in cases of illness. All chickens are brought from the lowlands, for it appears that they cannot be successfully hatched and raised under Khumbu conditions. No Khumbu laying hen would last a week in a setting where an egg-a-day performance was the norm, but ten or twelve eggs at two to three rupees apiece easily pay for the investment—and there's still the bird to sell when the autumn trekking season comes round and the hen ceases her pathetic turn-out. Amazing to one accustomed to the strained relations among domestic animals of a western household is the peaceful coexistence of cats, chickens, and dogs, all foraging or basking on the same stretch of Nauje street.

### *Products and Profits*

The returns from animal husbandry are manifold. In addition



to those already mentioned, there is a host of products and profits to be gained from livestock, particularly cattle.

In common with most of the developing world and in contrast to the West, meat is a secondary—even tertiary—livestock product. Sherpas are enjoined by their religion from killing, and while they happily consume the flesh from animals killed by predators or in accidents (no matter how long after death the carcass is discovered, it seems), they will seldom slaughter anything themselves. Occasional encouragement of accidents on narrow trails is not unknown, and unwanted hybrid calves are sometimes helped to kill themselves,<sup>10</sup> but in principle Sherpas will not slaughter their animals. When the Tibet–Nepal border was more open, and the presence of Kathmandu less felt in Khumbu, autumn would bring the butchering services of itinerant *yawa*–low-caste Tibetans who made a living doing other Buddhists' dirty work such as cleaning out *chakhang* and slaughtering livestock. The usual technique involves cutting a hole in the designated animal's chest, then reaching in and pulling out the heart. These roving meat men would butcher excess animals: yak, *nak*, and *dzum* past their productive lives. But the slaughter of female mammals is forbidden in the Hindu monarchy of Nepal. Yak are borderline cows in the government's eyes: technically legal meat, but not approved of. Hybrids, on the other hand, are clearly half cow, and therefore emphatically illegal in the stew-pot. The strong government presence in recent years in Khumbu coupled with post-Chinese restrictions on border crossings for Tibetans have served to reduce the butchering of Khumbu cattle. Many herds today consist of high numbers of unproductive animals which in earlier times would not have been allowed to survive, competing for feed and herder attention with productive animals.

Another sort of protein harvest is practised by Sherpas, in common with other pastoralists. Animals are bled for a variety of purposes, and the blood so collected is mixed with salt, cooked, and eaten as something of a delicacy. *Nak* are sometimes bled to weaken them sufficiently to cooperate with the mating efforts of cattle bulls (*nak* often also have to

be immobilized with ropes to effect this cross-breeding, for some have a strong aversion to bulls). Animals scheduled to travel to higher or lower altitudes may be bled, 'to prepare their blood' for the change in altitude. Both strong and sick animals may be bled, according to different principles of Tibetan veterinary medicine. Some insist that only males should be bled, others assert that bleeding of *nak* is most important—'so they won't be so bouncy in pregnancy'—and almost everyone seems agreed that bleeding is a skill possessed by only a few trained Tibetans in Khumbu. A special curved blade is plunged into the neck of the subject, which is securely tied, held by the horns by an assistant, and has a sort of tourniquet tied about its throat. The gush of arterial blood is caught in a basin and immediately mixed with salt and prepared for eating.

Milk is not an abundant product of Khumbu *nak*, *dzum*, and cows, but what is produced is very important.

Lactation in *nak* lasts a median of 256 days (with a range from 126 to 1066 days) (Bonnemaire, 1976b). The duration of lactation depends in large measure on when calving takes place, since almost all animals dry up in the winter months of December and January. A *nak* that calves in February—unseasonably early in Khumbu—will have a longer lactation than one whose calf arrives in late summer. Another important factor in the duration and amount of lactation is feed. More feed creates more milk, and some *nak* may be induced to continue producing milk through the winter by special feeding. This applies to *dzum* and cows as well, and Sherpas with milking animals will try to keep one or two of these *yerma* producing all the year round to supply even a tiny bit of milk for morning tea. Total milk production per lactation averages 607.9 kilos for the Russian *nak* under traditional management for which the best data are available (Dennisov cited in Bonnemaire, 1976b), and is likely to be considerably less for Khumbu *nak*. What *nak*'s milk lacks in quantity, it makes up for in fat content of about 6.8 per cent. This compares with a production of 740.5 litres of 4.4 per cent butter-fat milk for cows raised in the same environment (Kirghize): a total annual butter-fat production of 32.3 kilos

for cows and 41.3 kilos for *nak* (Bonnemaire, 1976b).

Although very little fluid milk is consumed except what is added to the morning's sweet tea (and occasionally to salt tea), a variety of important milk products is produced, and butter is first among them for all yak-keepers of Tibetan culture. Butter is essential to Tibetan ritual: it fuels votive lamps, is the base for sacred sculptures, and is offered to religious personages and deities. It is also a staple of Sherpa diet, served with potatoes, added to vegetable stews in the absence of meat or animal fat, and the *sine qua non* of butter tea (a robust concoction of vigorously boiled green tea, Tibetan salt, and butter mixed together in a special tea churn and served with, between, before, and in lieu of meals—an inevitable element of all social gatherings). Although a few Khumbu households may occasionally have a sufficient surplus of butter or other milk product to use as payment for hired help, there is almost never enough to sell outright; virtually every Sagarmatha National Park household must buy its butter, at least occasionally, from the vendors who come from Solu, where conditions are far more favourable for dairying to the Saturday market at Nauje.

Female animals are milked morning and evening. In summer, *nak* and *dzum* are sent out before dawn to graze for several hours before they are returned to the *yorsa* for milking. With their calves staked nearby after a few seconds' frantic nursing, the cows are milked, most often by a woman of the household, into a wooden bucket or equivalent container. If a milking animal's calf has died, as a high percentage of even wanted calves do, the let-down reflex is sometimes stimulated by a dummy calf: the dead baby's skin stuffed with straw into a rough approximation of the calf. Sometimes the unstuffed skin is used, and some animals need no such inducement to be milked by a favourite handler. Salt or a ration of *bangtsa* (the kitchen garbage collection) or some other treat is offered at milking time.

In winter, when there is so little milk that making butter is not worthwhile, all available milk is used to make milk tea. In summer, particularly in the later months when milk production peaks, there may be other uses for it depending

on the number of milking animals. The morning's milk is heated, allowed to cool a bit, then poured into a container still holding the cultured residue of yesterday's milking. This container is wrapped in down jackets, sleeping bags, or other trekking booty (or the traditional woollen *churook*—high-pile woven bedding) to culture until evening. Then the resulting curd, *sho*, is poured into a butter churn and worked into butter, *mar*. The buttermilk, *tarra*, is in turn heated and the solids, *serkam*, skimmed off and dried, either on a sunny roof-top or on a rack above the fire. The product of this process is *churpi*, rock-hard, smoky tasting, and a useful preserved protein for snacks on the trail and pacifying small children. *Churpi* is also pulverized into a near-tasteless cheese grit that is sometimes mixed with *tsampa*. Some milk may be added to the summer's stock of a soft, well-rotted cheese, *somar*, which accumulates in a special skin container, quietly ripening until it is wanted as a topping for potato pancakes or other unleavened stove-top bread. Not all the cultured yogurt is made into butter: some may be eaten fresh, and *tsampa* with fresh *nak*'s milk curd is one of summer's treats at the *yersa*.

The woolly hair that protects yak from Himalayan winters is a dividend to Sherpa stock-keepers. The soft inner coat that the animals shed in spring, *pu*, is plucked and saved for spinning. The long guard hairs on the legs, flanks, and tails of both male and female animals, *tshirpa*, is sheared and also spun. The two types of wool are sufficiently different to be usually spun by different techniques and used for different purposes. Men spin *tshirpa* with a hand-carried drop spindle into a coarse twine that is twisted into ropes, *thakpa*, or woven into handsome, durable *charra*<sup>11</sup> mats that are spread with drying grain or pitched as tents. Both men and women spin the *pu* by hand into fine yarn that is then woven into fabric for clothing. *Charras* are in demand as presents for newly-weds and command high prices. Old ones, frayed by the generation of use that is the expected life-span, are patched and made into *puzzie* or sturdy bags in which trade commodities are packed for the trip across the Nangpa La.

Yak tails are a highly valued component of Hindu and

Buddhist ritual, an item of interest to tourists, as well as a useful housekeeping tool for Sherpas themselves (they make excellent dusters). For many years Tibet's dominant export to the West was yak tails—used for Santa Claus beards!

There are some households in Khumbu whose sole objective in animal husbandry is production of manure. Probably for many—if not most—households, the most valuable cattle commodity is dung. Anyone growing potatoes, buckwheat, barley, or hay needs it for fertilizer. Most households burn dried dung at least occasionally; for some it is the dominant fuel. Manure mixed with mud is the plaster for houses, inside and out, and applied over a framework of rocks forms the kitchen stove as well. Sometimes the animals themselves deliver manure to its desired resting place, as when stock graze on stubble, or are corralled in fenced hayfields, or are stabled on a thick accumulation of leaves in the lower storeys of houses. In all seasons cattle are confined during the night, in part as protection against predators, but also because of the concentration of dung that results. On rising, cattle begin the day with a prodigious round of elimination. This makes the task of dung collection relatively painless. Summer dung is too liquid to collect and burn, but it can be piled in the corrals in which cattle have spent the night, which will be the next season's hayfields. The more manure, the better the hay crop; cattle-owners are careful to see that their animals spend sufficient time at each *phu* where hay or other crops are to be grown.

The dung produced during the day while animals graze is important as well, and must be collected; in the dry seasons gangs of schoolchildren go dung-hunting after school over the slopes where cattle have been grazing. Dung for both fuel and fertilizer is sometimes transported for considerable distances. The need for manure at the barley-growing settlement of Dingbuje is so great that people will carry basket-loads of dung from *phu* several kilometres away in order to spread it over their fields. Dried dung in Nauje sold for five rupees a basket in 1985, although the traffic in yak pies was not very great. Some people report a preference for

yak dung over that of other cattle as fuel, and it would be interesting to know whether there are differences in the thermal properties of various types.

Manure is the pre-eminent product for most Khumbu livestock owners, essential to agricultural productivity, a vital fuel and an important building material. But it is clearly the breeding and sale of hybrids that is the most lucrative part of the Khumbu cattle business.

The typical breeder maintains a number of *nak*, a few yak, and one bull, usually of the dwarf Tibetan type (*Bos taurus*). The resulting *dimzo* are sold or traded either personally by the breeder, or through an intermediary contractor who buys up the year's crop of calves to sell either in Tibet or at lower elevations in the Nepal hills. *Dzum* are sought by the cattle-keeping Sherpas of Solu, where lower elevations mean warmer temperatures, more rain, and better conditions for grass which in turn creates better dairying country than Khumbu and a demand for *dzum* greater than locally produced *urang dzum* can supply. Tibetans have traditionally been unwilling to breed their own crosses, but value them highly; there is a good market for *zopkio* across the pass to the north. In recent years, another demand for *zopkio* has come from within Khumbu, as more and more Sherpas both discover the money-making potential of *zopkio* as pack-stock on the trekking route to various tourist destinations within Khumbu, and acquire the surplus capital that permits them to pay the fast-inflating prices of cross-breeds. Although both *dimzo* and *urang* are of value and some *dimzo* may even bring premium prices, *urang* are more useful in tourist work: they share their cow mothers' tolerance of lower elevations.

In addition to these and other miscellaneous uses for cattle products, Sherpas value their livestock for yet another purpose: as ritual objects. Stock-keepers have the option of designating any of their livestock a *tshetar*, or dedicated animal. These *tshetar* are fed and cared for as before, but they are never killed, seldom used to carry loads, and are considered to be somewhat sacred. A woman's *tshetar* will be a female, a man's male. The one remaining goat in Khumbu in 1985 belonged to a man of Thamichok, who had dedicated

him to a particular god and refused to part with him in the Himalayan Trust buy-out in 1983.

### *Cattle-keepers of Khumbu*

The diversity of animal types and uses suggests a diversity of ownerships, and indeed the place of livestock in Khumbu ranges from peripheral to central in the economy of any given household. No generalizations can adequately characterize this variety in animal husbandry at the household level. But there are broad patterns in ownership and use linked to Khumbu's various villages.

The *chungma* (cattle of all kinds) populations of the six main villages of Sagarmatha National Park are significantly different. There are villages in which the herds are dominated by *nak*, reflecting in part the persistence of a traditional pattern of livestock management and reinforcing other evidence of cultural conservatism. There are other villages where male cross-breeds form a large part of the total animal population, indicating a readiness to capitalize on the growing value of *zopkio* in today's tourist economy. It is possible to identify two villages on either extreme of a continuum from traditional/conservative to innovative/disrupted in animal husbandry practices: Fortse and Nauje. But the four other villages represent somewhat complicating enigmas in which animal ownership patterns are not amenable to simple explanations. Tables 4.2-4.4 illustrates patterns and trends in stock ownership.

Khumbu's livestock population is concentrated in Thami-chok. The 158 households in the scattered permanent villages of this area own 37 per cent of Khumbu's total cattle population, including 46 per cent of the *nak*, and is the area where the largest herds are found. The permanent villages of the Bhote Kosi Valley enjoy claim to the most convenient and productive region of Khumbu in which to raise livestock. Their valley is the road to Tibet, which has conferred further advantages. *Nak* imported from north of the Himalaya—the source of many of Khumbu's breeding *nak* both before the Chinese occupation of Tibet and again in

TABLE 4.2 KHUMBU CATTLE POPULATION BY VILLAGE,  
1957

<i>Location</i>	<i>Nak</i>	<i>Yak</i>	<i>Dzum</i>	<i>Zopkio</i>	<i>Pamu</i>	<i>Lhang</i>
Nauje	40	0	57	238*	48	1
Khunde	316	21	2	35	16	17
Khumjung	333	14	15	24	56	13
Thami	647	2	27	79	72	27
Pangbuje	271	21	7	11	37	12
Fortse	454	16	0	0	17	8

\* The larger number reflects young animals in transit, not resident in Nauje. Data from Haimendorf, 1975.

TABLE 4.3 KHUMBU CATTLE POPULATION BY VILLAGE, 1978

<i>Location</i>	<i>Nak</i>	<i>Yak</i>	<i>Dzum</i>	<i>Zopkio</i>	<i>Pamu</i>	<i>Lhang</i>
Nauje	31	51	49	80	80	8
Khunde	109	40	56	61	37	5
Khumjung	121	62	98	60	80	8
Thami	496	134	103	134	126	31
Pangbuje	175	75	24	25	39	7
Fortse	260	95	12	7	31	3

Data from Bjonness, 1980a

TABLE 4.4 KHUMBU CATTLE POPULATION BY VILLAGE,  
1984

<i>Location</i>	<i>Nak</i>	<i>Yak</i>	<i>Dzum</i>	<i>Zopkio</i>	<i>Pamu</i>	<i>Lhang</i>
Nauje	30	44	18	138	53	3
Khunde	85	62	80	56	42	5
Khumjung	88	62	60	82	74	7
Thami	525	109	41	178	103	35
Pangbuje	132	69	32	21	57	7
Fortse	261	67	27	7	16	5



the last year or two—must first pass under the appraising gaze of Thamichok stock-men, who have first pick and often buy up all available *nak*. Before the tightening of the border that followed the Chinese occupation, Thamichok stock-men were accustomed to winter their animals on the far side of the Nangpa La, expanding the usable range and answering the universal stock-man's need for crucial winter feed. And in the villages of Thamichok are members of the oldest Khumbu *rhu*: clans with the longest tenure here, and thus with the most extensive claims on seasonal settlement space and grazing resources.

Throughout Khumbu it is these Sherpas from old families who are the *nakpa*. *Gyawa khamba* and more recent Tibetan immigrants may own cows or cross-breeds, but almost never *nak*. In Khumjung, for instance, where thirty-seven of 107 householders are *gyawa khamba*, only Sherpas are owners of *nak*. Khumjung's *nakpa* illustrate another characteristic of *nak* ownership: the relatively large number of *nak* owned by a single household. Khumjung's eighty-eight *nak* belong to only five owners, whose herds number from fourteen to twenty-six. All over Khumbu, *nak* are maintained in larger groups than any other type of cattle; they are valuable only in relatively large aggregations, for the returns from an individual animal are insubstantial. Milk yields are small, calves come every other year at best, and it is only by keeping a sizable herd that keeping *nak* is economically worthwhile.

*Nak* dominate the cattle populations of three villages: Fortse, where 68 per cent of a total 383 *chungma* are *nak*; Thamichok, where 53 per cent of 991 animals are *nak*; Pangbuje, where the *nak* population represents 42 per cent of all livestock. These are the 'unacculturated' villages, considered to be least caught up in the social and economic perturbations of the last decades.

If *nak* are the indicator of enduring tradition and cultural conservatism, than *zopkio* should be the sign of change. Fortse becomes the archetype traditional village, Nauje the contemporary settlement.

Fortse has a livestock population overwhelmingly of *nak*,

with enough yak to ensure progeny, provide domestic pack-stock, and to plough Fortse's buckwheat fields, a job performed for the whole village by two trained yak. A tiny percentage of Fortse livestock are cross-breeds. There is, further, a strong stability evident in the livestock population here, at least in the last ten years, which is in striking contrast to the trends in all other villages. There was one more *nak* in Fortse in 1985 than in 1978. There are fifteen fewer cows, but fifteen more *dzum*, and most significant of all, *zopkio* numbers have remained constant. Only yak show a significant decline (and also a somewhat implausible one, suggesting an error in the 1978 census figures given the startling jump shown in the number of yak from 1957 to 1978). Other reports have all noted the isolation and resistance to change exhibited in Fortse [Haimendorf, 1975; Pawson *et al.*, 1985, and others], and it appears that animal husbandry here, too, conforms to that characterization.

In all respects the characteristics and trends in Nauje's livestock population are at odds with Fortse's. Nauje has the fewest *nak* of any village, both as a percentage of total village livestock and in absolute numbers. Almost half the animals here are *zopkios*—a far higher percentage than in any other Sagarmatha National Park village. There has been at least a 70 per cent increase in resident *zopkio* numbers since 1978, and probably a far more substantial increase since the livestock census of 1957.<sup>12</sup> Perhaps the most significant pattern evident in Nauje is the distribution of animals among owners. The thirty *nak* belong to just two owners, one of whom keeps his animals in Thamichok all the year round (the other, Sonam Girme, runs his *nak* and yak for most of the year with other people's herds high in the Imja Khola drainage). This is the expected pattern in *nak* ownership, characteristic of the many years of Khumbu history in which *nak* were by far the most abundant animal, and belonged to a relatively few big owners. Almost half of Nauje's 102 counted households own *zopkio*. Nauje *zopkio* owners reflect a new development in cattle ownership evident throughout Khumbu: many first-time cattle owners with one to several *zopkio*.<sup>13</sup> Even one male cross-breed can bring in substantial

income, as a number of Sherpas have discovered, particularly Nauje people.

A look at the numbers for 1957 shows that throughout Khumbu there has been a marked reduction in *nak* and concomitant increase in *zopkio*. In all villages but Nauje there has also been substantial growth in the number of female cross-breeds, and most have more cows today than thirty years ago, but overall the numbers of female cattle have dropped substantially because of the massive reduction in *nak*. Yak as well as *zopkio* are significantly more numerous today than in the 1950s, although there has been something of a reduction in yak numbers since 1978 in all villages except Khunde, which has more today, and Khumjung where the yak population has been constant.

The characteristics of the livestock population of Nauje and Fortse are quite clear and easily interpreted, in contrast to the other four village aggregations. Khunde and Khumjung, although a long stone's throw from one another and with essentially similar levels of involvement in tourism, show striking differences in their population of *chungma*. Khunde, about half Khumjung's size, has as many yak, *nak*, and *dzum*, substantially fewer *zopkio* and cows. There are almost twice as many animals in the average Khunde household. Khumjung is first in relative frequency of cows, second only to Nauje in the relative importance of *zopkio*. The villages have in common a disproportionate share of Khumbu *dzum*—almost 60 per cent.

Pangbuje has its own unique and somewhat enigmatic ownership pattern for livestock: a high proportion of yak and *nak*, a recent increase in cows and *dzum*, and a decline in numbers of *zopkio*. For Pangbuje villagers a day's walk from Nauje, opportunities to transport loads are largely limited to trips from Nauje to higher points. The possibility of picking up or delivering loads at Lukla is effectively denied villagers from such a distance, who must be content with recruitment from Nauje for portering jobs. Yak are only at a disadvantage in low-elevation jobs; they are slightly more useful for some high country portering than *zopkio*. Perhaps this explains Pangbuje's high proportion of yak.

There are interesting patterns in Thamichok's livestock population. Besides the presence of Sagarmatha National Park's greatest number of animals and the high proportion of *nak*, the Thamichok villages own the smallest percentage of yak and *dzum*, and relatively few cows. Somewhat surprisingly, there are more *zopkio* in Thamichok than anywhere else. A higher proportion of these are domestically produced *dimzo*, rather than the Solu-raised *urang* that make up most of Khumbu's *zopkio*. Although the 1985 census figures include some young animals to be sold, most are in permanent ownership, posing an interesting question about the place of male cross-breeds here, in one of the 'unacculturated' villages.

Ownership patterns thus appear to reflect—and effect—the economic and social transformations of the last decades, entailing changes which have had a different impact on each village, including livestock population dynamics. The direction and intensity of such change has been shaped by geography and history, and by other factors as well, including, perhaps, something elusive and unidentifiable that might best be described as village gestalt: whatever the factors are that propel Nauje villagers into new ventures and hold Fortse people to the ways of their grandfathers.

## NOTES

1. As Bonnemaire points out, the actual figures for the yak populations, elusive at best, are often presented as total numbers of cattle, making any report of population a matter of conjecture. To underscore this uncertainty: Bonnemaire infers a yak population for Nepal greater than India's cited 18,000, yet Nepali specialist D.D. Joshi calculates Nepal's yak population as being less than 9000. (Bonnemaire, 1984; D.D. Joshi, 1982.)

2. Palmieri's thesis assumes that yak were first domesticated on the southern slopes of the Himalaya, where natural salt deposits are scarce, rather than on the Tibetan plateau where salt is abundant.

3. Oddly, yak's blood, in contrast to the blood of humans adapted to high altitude, carries no more haemoglobin than the blood of lowland cattle (D.D. Joshi, 1982).

4. Yak are not alone in this management-linked delay in maturation; it holds for other mountain cattle as well. Yak are actually quicker to mature

under traditional management than are Nepali 'hilly cattle'—for instance: 1095 days to first oestrus for female yak, 1277 for cows (D.D. Joshi, 1982).

5. There is more than linguistic significance to the direction of the cross. The mother's characteristics dominate in the F1 progeny so that *urang* are more cow-like, *dimzo* more like their *nak* mothers in many important respects. *Dimzo* are considered both by Sherpas and some scholars (Joshi, 1982) to be hardier than *urang*. They handle high altitude with less stress, and can learn how to 'suck up' the short *pangtisa* (high alpine meadow dominated by short-stemmed *Kobresia* species) as yak do—something *urang* never master.

6. Four of 110 households in Nauje keep sheep; five of fifty-six in Khunde; five of one hundred and seven Khumjung households; eight of seventy-eight in Pangbuje and Tengbuje; nineteen of one hundred and fifty-eight censused households in Thamichok.

7. According to one informant, and contrary to Haimendorf's account (1964), Sherpa sheep have been used occasionally as pack animals, carrying loads of salt and other goods both over to Tibet and into the southern lowlands.

8. Plantations were intended in part as public relations and for purposes of conservation education, and locations near villages (Khunde, Khumjung, and Nauje) were chosen for high visibility. But village proximity guarantees problems with incursions of livestock, since stock of all varieties are concentrated around the villages at various times of the year. Demand is greatest for range forage adjacent to villages, and hungry animals, particularly cross-breeds and sheep, are forever breaching the stone, barbed wire, or newly-installed electric fencing that encloses the plantations to browse on semi-protected grasses and succulent seedlings of fir.

9. Colour is a factor in the status of dogs and consequent treatment. Light coats are more highly valued than dark; a golden-haired dog, invariably named 'Lishi' in Sherpa, has a much better time of it than any 'Nakri'—black dog. The lot of 'Pondus' with black and white coats lies somewhere in between. A number of trekking-route dogs have learned that westerners have an entirely different perception from the Sherpas'; there are many Khumbu dogs who make a good living by staying close to trekking groups, following the kitchen tent, biscuits donated by trekkers, and kind words and caresses from Nauje to Kala Patar. One short-legged Ponda based at Lukla regularly makes the Everest trek, trading one trekker group for another whenever the prospects seem brighter.

10. Calf suicide is accomplished by a variety of techniques designed around the principle that a young animal starved for a few days will gorge itself at the first opportunity, producing fatal digestive disturbances. An animal of low value is thus eliminated from competition for milk and later feed and care, and veal becomes available—provided the owner is sufficiently discreet—for the pot. There is evidence that this is a widespread practice in Joshi's data on cattle mortality in highland Nepal:

eighty per cent for F2 calves of *dzum* mothers as against forty per cent for both *nak* calves and those of dwarf Tibetan cattle ('*kirkho*' cattle in Joshi's nomenclature) (Joshi, 1982).

11. *Charra* made from *tshirpa*, *tsijar*, are the most durable and currently the most expensive to buy in Khumbu. *Tshirpa* is prepared for weaving by first boiling the tight-spun hair, which is then stretched while still hot and wet to eliminate kinks. Other *charras* are made from different wool: *coljar* woven of the soft, short-fibered *pu*; *paljar* made from sheep's wool—*pal*. Women of Thamichok are *charra*-weaving specialists, and are hired by other households, particularly in Nauje, to set up their backstrap looms (*tse*) in the yard in exchange for a daily wage, meals, *chaang* and tea breaks. Ready-made *charras* sell to visiting tourists for prices ranging from forty dollars to more than a hundred. *Charras* and the fabric made from felted *pu* are the only true yak-hair textiles to be found in Nepal, notwithstanding the claims for yak-wool caps and sweaters made by scores of shops in Kathmandu's tourist districts.

12. All *zopkio* in the 1984 census are resident animals, while in 1957 certainly, and 1978 probably, the census figures reflect animals for trading in transit. Hundreds of young *zopkio* are herded through Nauje, and grazed for some weeks in the vicinity, by stockbrokers taking their charges to new owners in Tibet.

13. This important trend was first identified by Inger-Marie Bjonness, who compared her census data with Haimendorf's and noted the marked decline in *nak* and increase in hybrids in more, smaller ownerships.

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## *Pastoral Land Use and Livestock Management*

THE complex and variable patterns of animal husbandry in Khumbu are derived from the Sherpas' ingenious orchestration of land resources, livestock, and labour, coordinated to meet the different objectives and opportunities of access to resources of different owners.

Patterns of access to resources and movements of livestock are a response both to the opportunities and constraints of Himalayan ecosystems discussed in chapter one and to culturally determined regulatory mechanisms.

### RANGE-LAND RESOURCES

The resource base which supports Sherpa animal husbandry includes virtually all areas within Khumbu capable of supporting vegetation, and some peripheral areas as well. Forest, shrub-land, tundra, and riparian zones all provide grazing or fodder for livestock. Altitude, aspect, history, and to a lesser extent other edaphic factors control the distribution of vegetation types here as in any landscape. The great variety in these controls and their respective influences makes for considerable complexity in the patterning of vegetation.

'Grassland' and 'pasture' have been applied to lands supporting livestock in Sagarmatha National Park (Bjonness, 1980a; Byers, 1984, 1986, 1987), but the realities of the landscape require an extremely loose application of any such terms. Although Khumbu nurtures a rich graminoid flora which includes a high diversity of grasses, sedges, and rushes, no vegetation type is dominated by grass-like plants,

which are invariably found in mixed associations with herbaceous plants, shrubs, trees, or cryptogams.

Sagarmatha National Park range-lands, then, are not grasslands. They are the mountain-tuned assemblages of vegetation that clothe any suitable substrate to 6000 metres and beyond. The accessibility of vegetation to livestock is perhaps the sole criterion in delineating the 'range-land' category, since components of every type of vegetation are incorporated in the diet of animals. Gradient of slopes and distance from water, two factors that determine the accessibility of forage for Western range livestock, operate differently in the Himalaya with herds dominated by yak genes and agile sheep and goats. The grazing yaks' daily pattern of dispersal on most slopes is a progressive ascent towards higher ground. Afternoon finds yak and *nak* napping on crests of ridges, where summer breezes keep flies at bay, and where winter snows are thinnest and quickest to melt. A system of management that confines most livestock near human habitation each night (only adult yak and *zopkio* not needed for portering are permitted to range freely, and only in the summer), means that accessible vegetation—range-land—is largely determined by livestock's daily movements around permanent or subsidiary settlements and temporary camps.

In effect this means that range-land subject to regular use is any ground supporting vegetation within yak's reach from a settlement or encampment. Areas of dense forest are sparsely used by livestock; it is only in the relatively open woodland areas, most often quite near settlements, that significant grazing and browsing occur. The more extensive and diverse under-storey of browsable birch-and fir-dominated forest is preferred to the more limited undergrowth and unpalatable foliage found where pine, rhododendron, and juniper dominate. Open slopes are those most heavily exploited: the scrub types of the submontane, montane, and subalpine zones, and the tundra-dominated cover of highest alpine areas. Excluded from the broad category of range-land resources are areas out of the reach of livestock across rivers or up subsidiary drainages without settlements or camps.



Examples would be the south-east side of the Imja Khola above the confluence of the Bhote Kosi and the Bhote Kosi's north-west side from this confluence towards the permanent Thamichok settlement of Pare. Although neither area is entirely free from occasional visits by livestock, and the Bhote Kosi's remote slope has become increasingly important to some Nauje stockmen in particular, these areas of relatively undisturbed forest provide little range forage for Khumbu cattle.

#### FODDER RESOURCES

In all seasons Sherpa livestock depend on these range-land resources, which comprise most and sometimes all the nutrition for every animal except the occasional ill or incapacitated high-value one which receives special treatment. Yet supplementary feeding of crop residues, kitchen waste, hay, and other fodder is also essential to the survival of Khumbu herds. This supplemental feeding is offered night and morning during the hard months to valuable and vulnerable animals. Throughout the year stockmen offer a token feeding to cows at milking time and to working pack animals. They try to maintain a two-months' supply of cured hay to boost their animals through winter and the lean spring months before the monsoon. Undersized potatoes, turnips, and field weeds and residues supply part of this supplementary feeding. Hay cut from walled hayfields (called *tsitsa*) or *ritsa*, which is grass collected from communally controlled wild-lands, accounts for the rest.<sup>2</sup>

Privately owned hayfields are essential to livestock operations for any owner of more than a very few head. *Tsitsa* near villages, at subsidiary settlements, and scattered in a few other places supply a small but crucial component of animal nutrition and are highly valued. These fields are small, walled with rock (occasionally mortared with turf, as at Pherije), and do double duty as cold-season corrals for animals being kept at the higher settlements and camps. Confining livestock to these corrals at night in the post-harvest season not only confers protection from predators and keeps stock

handy but also ensures a supply of manure to enrich the hay crop. The manure that accumulates is piled in mounds around the fields, to be broken up and scattered just before the rains begin. More manure makes more hay, according to Sherpa informants and confirming observations of the density of scattered dung, *che*, and subsequent hay yields. Timing of distribution as well as quantity is crucial: scattered too early, the 'strength' of the *che* is lost; too late and the fertilizer hasn't time to work into the young plants. This manuring is the only attention may *tsitsa* receive except for the end-of-summer harvest, when the grass and attendant weeds are hand cut by squatting workers armed with sickles, who scatter this hay on the harvested field to dry, bringing it under cover at night and when rain threatens. In some areas, particularly around the villages at lower elevation, *Anemone rivularis* and perhaps other weedy anemones dominate the early summer growth within the *tsitsa*, and weeding parties may make a pass or two across the field, pulling out these flowers and tossing them over the wall. (The anemones seem to thrive under this treatment, and return in showy vigour each year.) *Tsitsa* grasses include *Elymus nutans* and several robust *Poas*, but weedy forbs in considerable diversity dominate almost every field. Despite the high ratio of forbs to grass, the resulting hay compares favourably with that produced on meadows in the Swiss Alps, according to a visiting cowherd's assessment based on appearance and scent (Bernard, personal communication, 1982). The nutritive value of hay grown in hayfields, in more objective analysis, is considerably higher than tested samples of hay cut from untended slopes (Zinke, personal communication, 1985).

Almost every stock-owner will harvest some *ritsa*, sending children or hired labourers into the hills with sickles and baskets. A good haycutter (*tsangapmi*) can harvest forty kilos of grass a day. Almost anyone can manage a twenty to thirty kilo harvest. But it is nasty work, and in addition to a relatively good daily wage (20 to 25 rupees in 1984, in contrast to the wages for live-in household help, which averaged less than five rupees per day), *tsangapmi* expect to be provided with *really* good food and plenty of *chaang*. But for

some operators—those without *tsitsa*—this *ritsa* supplies most if not all the supplementary hay available. Nauje stock-owners in particular depend on *ritsa*. These latecomers to the livestock business lack the family landholdings that equip long-established owners with hayfields, but often have hired household labour available to send out after wild grass.

In favourable years, hay is sufficiently abundant to allow those in need—who have money to pay—to acquire the necessary stores from Khumbu neighbours. In the last few years, however, the demands on local wild hay sources have exceeded supply. In both 1984 and 1985 the combination of hard winters, dry summers, the loss of hayfields to the Langmuje *tshoserup*, and expanding populations of livestock in new ownerships has created a shortage. One response has been to import *ritsa* and hayfield hay from the more productive low elevations of Pharak, either purchased or cut by stockmen's family members or household servants. The high cost and inconvenience of importing hay makes this a feasible option only for the wealthiest Nauje stock-keepers and for the government-sponsored Livestock Development Farm at Shyangbuje.

#### ACCESS TO RESOURCES

Traditionally and to diminished extent still, access to rangeland and fodder resources has been controlled by the community of users. Usufruct based largely on village of residence determines where particular owners pasture their animals; regionally varying systems of ritual, coupled with weather and range conditions, influence the timing of resource use.

Lands within Khumbu can be classified as protected, private, village, and public. Protected lands include particular areas of forest, such as those in the vicinity of *gondas*, to which access for exploitation has traditionally been denied or restricted for spiritual and secular purposes. Today, walled national park nurseries and plantations have joined this category of areas removed from free egress.

Structures and walled crop and hayfields are the only land in private hands. Records of ownership are maintained by the

local Panchayat; tax records still extant reflect a long history—150 years—of private landownership (Haimendorf, 1964), which may well be an even older Khumbu phenomenon. Village control extends over communally used lands beyond the boundaries of private village holdings; in the relatively closely spaced main settlement zone, one village's land claim extends to meet that of the adjacent village. These areas adjacent to villages are the range-lands that support the most intensive use by livestock. In principal, areas beyond on the high slopes and in the upper valleys outside the walls of subsidiary settlements are anyone's to use. In practice, as a result of patterns of ownership in the subsidiary settlements, these range-lands are used by particular groups of stock-keepers.

There is a strong correlation between village of residence, ownership of property in subsidiary settlements, and use of a particular range, as discussed in chapter Two. For most of the owners of livestock in each village, grazing grounds are as follows: Thamichok's *phu* and grazing lands lie in the Bhote Kosi valley and its tributaries, where traditionally only one outside household (from Nauje's suburb, Zarok) also grazes its livestock. Khunde and Khumjung, although neighbouring villages, take their animals to widely separated grazing grounds: Khunde into the Imja Khola and Khumbu Khola drainages, Khumjung up the west side of the upper Dudh Kosi (Nubkiphu). The people of Fortse predictably use the higher grazing lands most accessible to their village: the east slope of the upper Dudh Kosi (Sharkiphu). Pangbuje's grazing grounds, like Khunde's, are on both sides of the Imja Khola and up the valley of the Khumbu glacier. Nauje's traditional summer grazing area was the Kyajo valley just west of Khumbila, a small area of somewhat difficult access where the village's few *dzum* could summer in company with animals from Thamichok and Khunde.

This organization of space reflects both geography and clan settlement history. Anomalies in the relation of village of residence to subsidiary property ownership usually is explainable by inter-village marriage. This accounts for the single Zarok household's use of Thamichok *phu* and range-land

for instance. A further explanation for some departures from the general pattern is in the new uses to which these auxiliary landholdings are being put on the important tourist routes. The hotel business, not animal husbandry, was the incentive for property acquisition at Lobuje by people with no traditional claims to this former *chusa*. Some Nauje *zopkio* owners have acquired hayfields and houses along the road to Everest Base Camp, permitting them to provide their own feed for pack-stock and saving the uncertainty and cost of finding fodder during the busy—and lean in forage—tourist seasons.<sup>3</sup>

Within the broad regional associations of particular villages with traditional range-lands are yet other use patterns. The highest, farthest *chusa* are most often the holdings of *nak* owners. It is yak and *nak* that can make the fullest use of such sites with their penchant for climbing slopes and capacity to withstand winter conditions. *Dzum* owners are more likely to use range-lands and *phu* closer to hand. The highest settlements of Thamichok are staging areas for trips into Tibet, more likely to be undertaken by yak owners; once winter grazing for some Thamichok yak and *nak* was to be found across the Nangpa La on the snow-free alpine range-lands in the Himalayan rain-shadow. In summer yak can be permitted to wander freely from day to day, seeking their own pasture, and will work their way high up the valleys, far from even the remotest subsidiary settlement. A further complication of the village range-land pattern comes from the presence of HMG Livestock Development Farm—the ‘yak farm’ in common parlance. The farm, established in 1973, is located at Shyangbuje on hayfields which were commandeered (according to some villagers) or amiably purchased (in the yak farm staff’s view) from villagers in Khumjung and Khunde. The farm’s herd, dominated by breeding *nak*, consists of about seventy animals. The yak farm mimics the seasonal movements of Sherpa livestock operations, relying on range-lands accessible from *phu* located mostly in the valleys of the lower Imja and Khumbu Kholas which are leased from their owners (Figure 5.2). Purchased hay is essential to the farm’s survival, for its own

Shyangbuje hayfields produce too little for winter. Hay suppliers and *phu* lessors vary from year to year, so that the yak farm herd's movements also vary annually.

Access to range-land is thus primarily contingent on distributions of private and communal property. Other factors, however, also serve to regulate access of livestock to such resources.

### *Ritual Regulation of Livestock Movements and Resource Use*

Ceremonial exclusion of livestock from particular areas for specified times is a crucial component of the Sherpa resource management system. This practice serves both to protect village crops from depredation by livestock and, most importantly from a resource management perspective, to create a *de facto* deferred grazing system which distributes livestock impact through space and time.

Following the early summer celebration of Dumje or Tshojen, a day is designated by the village *nawa*,<sup>4</sup> after which animals are forbidden to remain within village boundaries. In most villages the growth stage of potato or buckwheat plants determines the date which establishes the *di*: a line designating a season of protection for fields and range-land around the villages. In earlier times the designation of the *di* would signal a mass exodus from most villages as families closed their main-village houses and moved whole households to a succession of *phu*. The day is still marked by an festive caravan of people and pack-stock leaving the villages for high valley grazing. Dawdlers are fined for each day their livestock remain on the restricted side of the *di*, although exceptions may be made in hardship cases, as in 1985 when a *dzum* with a broken leg was allowed to overstay in Khunde. Following the expulsion of livestock, other restrictions are imposed on entry into village fields and on other activities considered to jeopardize the crops and village welfare (Haimendorf, 1964).<sup>5</sup>

Somewhat later in the summer secondary *di* are established in the Imja Kholā and Bhote Kosi drainages which push livestock still farther up the valleys, simultaneously remov-

ing the threat of hayfield intrusion and extending protection over mid-elevation range-land.

This system can mitigate significantly the impact of grazing on range resources, as it does in the case of on stock-owners in Pangbuje, where the *nawa* retain power and effectiveness and the *di* is scrupulously observed. Here, the initial *di* excludes livestock from the north-west side of the Imja Khola as far as the bridge at Tsuru near the confluence of Khumbu and Imja Kholas. Some weeks later, at a time determined by *nawa* selected from the summer cultivator population at Dingbuje, a second *di* is designated, based on the maturity of the barley crop. Livestock must be herded beyond Bibre on the Imja Khola's north bank, not to return down valley until the barley is sufficiently mature and the *di* is lifted.<sup>6</sup> The Dingbuje *di* extends up the Khumbu Khola drainage too and displaces livestock from the hayfields and riparian range around Pherije and the Pokalde-terrace *phu*, including Omlhasa, Lhajung, and Duza (Figure 5.3). Pangbuje villagers shareholdings here with Khunde people, and the effect is to direct livestock whose owners honour the *di* to the highest grazing areas: towards Dzonglha, Lobuje, Chukhung, and the south-east side of the Imja Khola.

This implementation of the *di* and equivalent use of restrictions in the other valley systems has encouraged a seasonal scheduling of livestock impact around strategic settlements. Main villages gain protection for the entire growing season for the range-lands that bear the brunt of livestock pressure in autumn, winter, and spring. In Dingbuje, stockmen who own fields have strong incentives to keep their manure-producing livestock in the settlement whenever they can, and yet the relatively dry, unconsolidated morainal slopes above the settlement are perhaps among the areas of Khumbu least resistant to the negative effects of intense livestock use. The *di* guarantees that for a strategic segment of the growing season—defined by the critical maturational stage of the cereal grass, barley—wild grasses and other plants are provided with a respite that may permit seed set and nutrient storage to sustain the flora through periods of livestock use. There is evidence for the

effectiveness of this *di*-deferred grazing in the extremely high diversity of palatable grasses growing near the settlement—the highest diversity of grasses noted anywhere in Khumbu.

Access to range-land resources is denied both to livestock and to people until the *di* is lifted, thus providing a season of protection from haying as well as from grazing on wild grasses. In most areas of Khumbu, the *di*'s limitations on access to resources are removed sequentially, and cutting of hay is permitted to begin shortly before the crop is harvested and livestock is returned to the neighbourhood of settlements. In Dingbuje, the *ritsa* harvest begins with the lifting of the restriction on household fires, just before the barley harvest. Wild hay is thus protected for most of its potential growing season. Allowing the cutting of hay to precede other labour-intensive harvest-time activities promotes efficiency in the use of labour during the year's busiest season.

Whatever the articulated function of the *di* may be, the result clearly is to increase the sustainability of Sherpa animal husbandry through the institution of a deferred grazing system and other protections on wild-land resources.

#### SEASONAL PATTERNS IN LIVESTOCK MOVEMENT

Steered by the broad constraints imposed by land tenure, tradition, ritual regulation, and the dynamics of mountain vegetation, Sherpa livestock move around Khumbu in complex, seasonally changing patterns that also reflect livestock type and owner intent.

The distribution of livestock within Khumbu is quite unlike the predictable, bi-directional seasonal movements associated with the practice of transhumance in the European Alps or the mountains of North America. In the Alps and the Rockies, cattle and sheep move up to high meadows in summer, down to the winter protection of village or low elevation range-land. Khumbu yak, by contrast, in an environment of often light and erratic winter precipitation, are not barred from high elevation grazing in the winter, and may be found in the highest subsidiary settlements in any season. Thus owners principally of *nak* and yak will move



their animals from one grazing area to the next in response to different considerations from those that impel cross-breed owners. Cross-breeds, not as hardy as yak, are less free in their travel. Their movements through the seasons resemble a Swiss cow's in outline—up in summer, down in winter—but within that broad scheme Khumbu *zopkio* and *dzum*, like yak and *nak*, gain and lose altitude in erratic and unpredictable sequences (Figs 5.2, 5.3).

It is in the summer season, when the adaptive differences in livestock types are minimized, that animals of all types may be found together.

### Summer

The animal husbandry year begins in early summer—Dawa Shiwa (Fourth Month) of the Sherpa's lunar calendar, late May to early June according to ours—just as the rains are about to begin. A few calves have already been born, and the rest will drop in the next few weeks. All livestock, whether sheep, goats, yak, cows, or hybrids, are banished from each village as the *di* are established.

Cattle spend the summer months on high pastures, feeding on the grasses and forbs that monsoon rains pull from the slopes and meadows. The stock-owner will move his animals from one place to the next, staying no less than a month at most at each of his *yersa*, moving on when the forage begins to show wear, following the emplacement of high-valley *di*, or, in winter, when local hay stores are depleted. Sherpa cattle may travel up valley, down, and up again during the course of the summer, each owner moving according to his own schedule (with a certain degree of coordination among users of the same *yersa*), leap-frogging his neighbours' herds, making several visits to a favoured spot.

The summer day begins before dawn for livestock and their tenders. Adult cattle have been kept overnight within the walls of their owner's hayfield-corral (except for rugged yak and *zopkio* which are usually permitted to find their own ways around summer range-land, subject only to an occasional taming visit by a herder bringing salt). They are

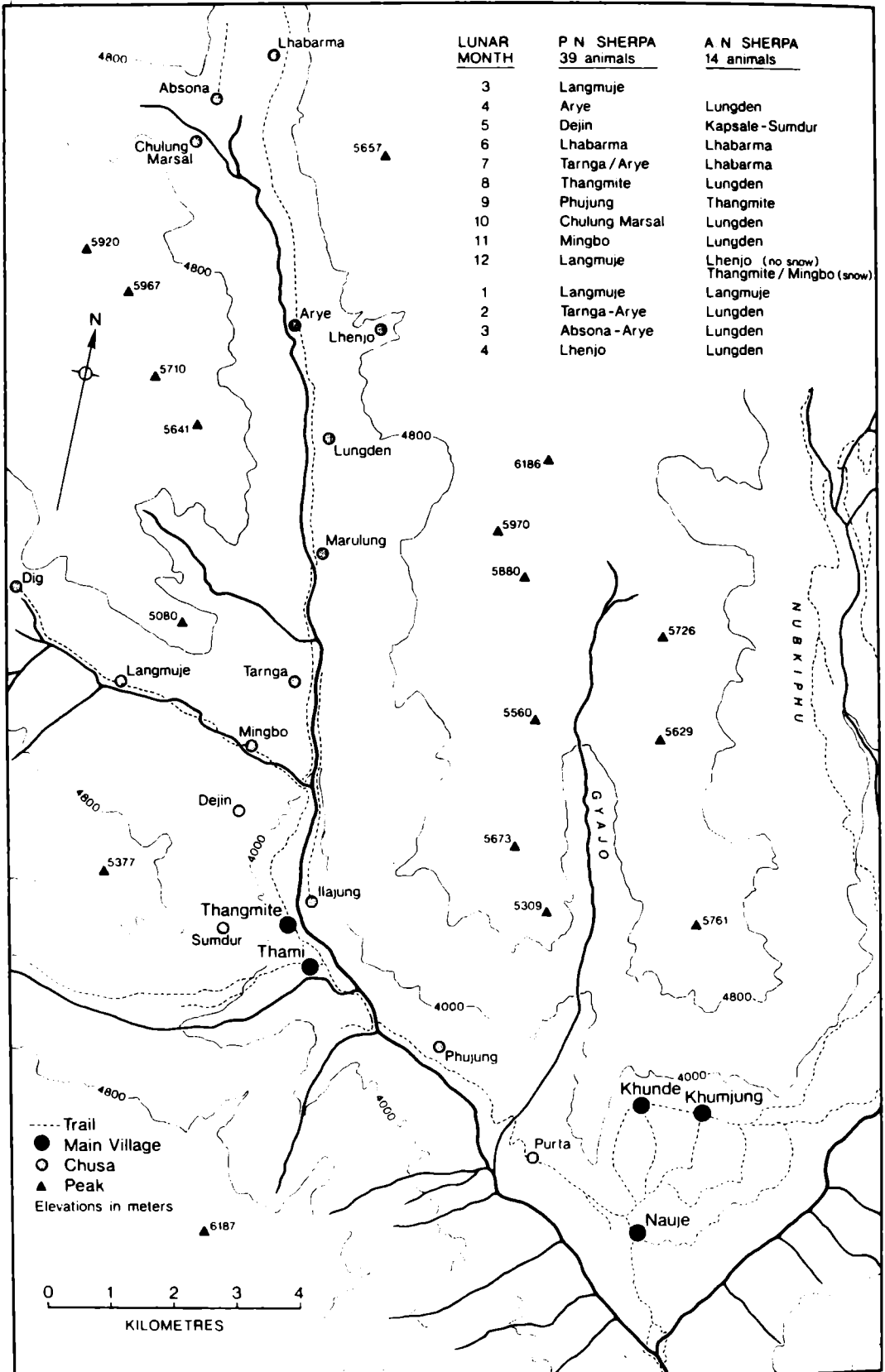
released in early morning and shooed to a grazing area within half an hour's walk, where they will feed for a few hours before the females are rounded up and returned to the *phu* for milking. According to Sherpas, this pre-milking period of early morning grazing boosts milk production. Once milking is over, the animals are once again escorted away from the *yorsa* to graze, to be rounded up and returned in the evening. The necessity for this twice-daily round trip restricts the radius of movement for milk stock, for they can wander only within retrieval distance between early morning and first milking, late morning and evening milking. This in turn concentrates grazing pressure within a closely circumscribed zone and doubles the herding and trampling impact around subsidiary settlements. But it minimizes the demands on labour: animals are never too far from camp, and someone who must spend time at the *phu* to process milk or prepare a potato field may still do double duty as cowhand.

*Labour* Traditional management practice required attendants to monitor the welfare of grazing animals: to direct their wandering and to protect them against predators. Even today in upper Thamichok and in the headwaters of Imja Khola, someone will usually stay with the cattle to watch for predators and other hazards. In other areas, including Nubkiphu where Khumjung villagers are the principal users, the animals are left often unsupervised. The children and young adults who formerly filled the role of traders are occupied elsewhere today. Many children attend school, and are not free to make the summer trip to the *yorsa*. Jobs in Kathmandu and in the tourist industry keep other young people from the job of tending to livestock they would have undertaken in simpler times.

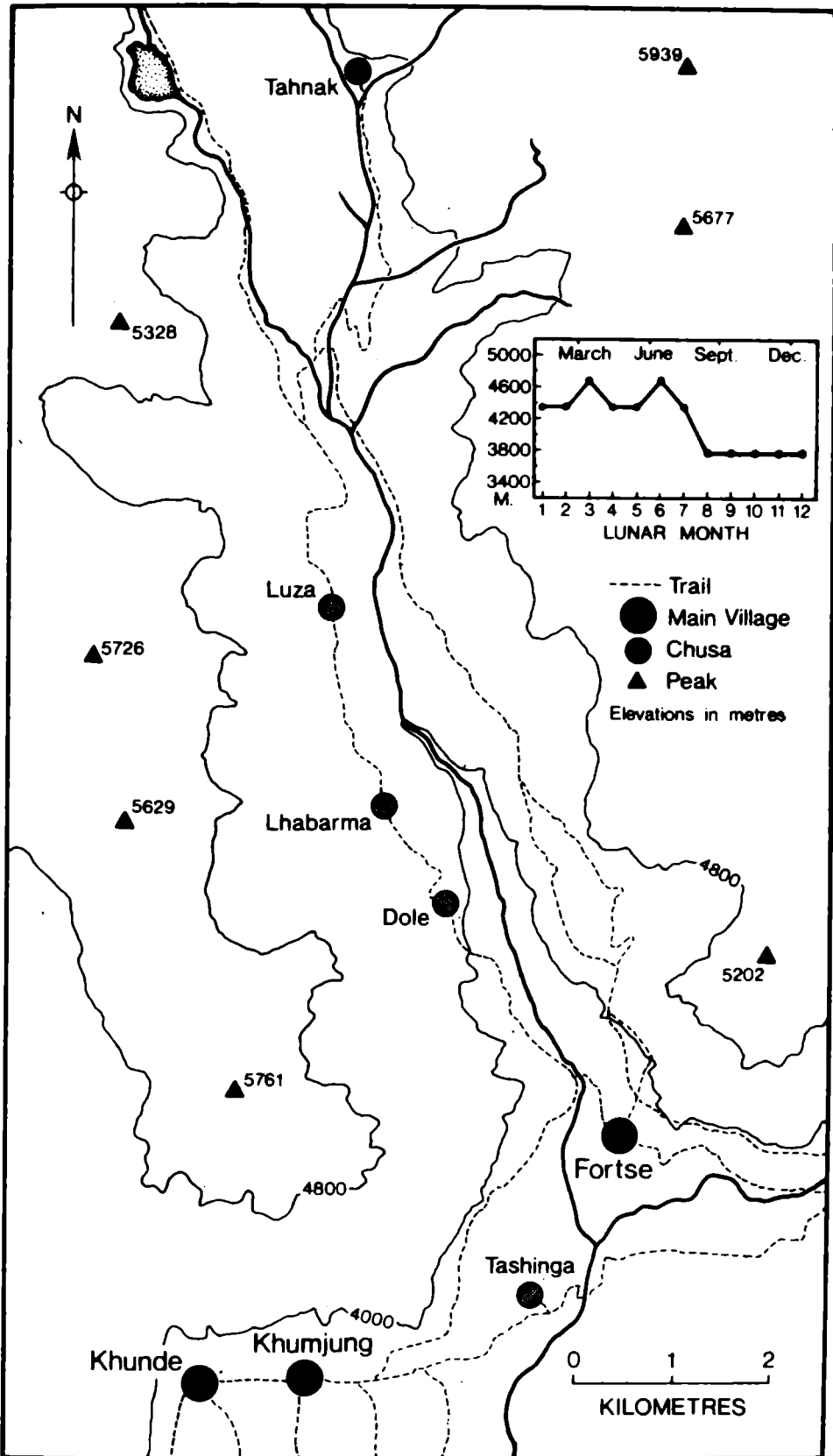
A further reduction in labour available for herding comes indirectly from an otherwise welcome intervention of western medicine. The iodine deficiency problems common to many mountain peoples have seriously afflicted a number of Sherpa households. Two conspicuous consequences of this iodine deficiency are the goitres one sees fairly frequently on older Sherpas, and a significant incidence of cretinism in the

population of individuals of twenty- to twenty-five years and over: victims of the varied complications of their mothers' critical lack of iodine in pregnancy, called *kuwa* (male) and *kuma* (female) by Sherpas. The consequences of this deficiency range from profound mental retardation and physical handicaps to a relatively minor affliction seen commonly in Khumbu—deafness. Mildly affected *kuwa* and *kuma* are fully integrated into the daily life of Khumbu households, and almost everyone is able to carry on spirited and involved conversations in sign language with neighbours and family members whose hearing is impaired (indeed, communication with such people can be among the most satisfying for a visitor ill-at-ease in local languages, for Sherpa sign language is universally intelligible). Deafness and the *kuwa*'s other disabilities can make some sorts of social intercourse more difficult, but are no liability in tending to livestock, and mildly afflicted cretins are effective herders, commonly encountered in charge of the family livestock. But the introduction of iodine, first injected through a programme initiated by Khunde Hospital, has essentially eliminated this disability in Sherpas born after about 1965—and with it a labour pool less likely to be diverted by the changed Khumbu economy.

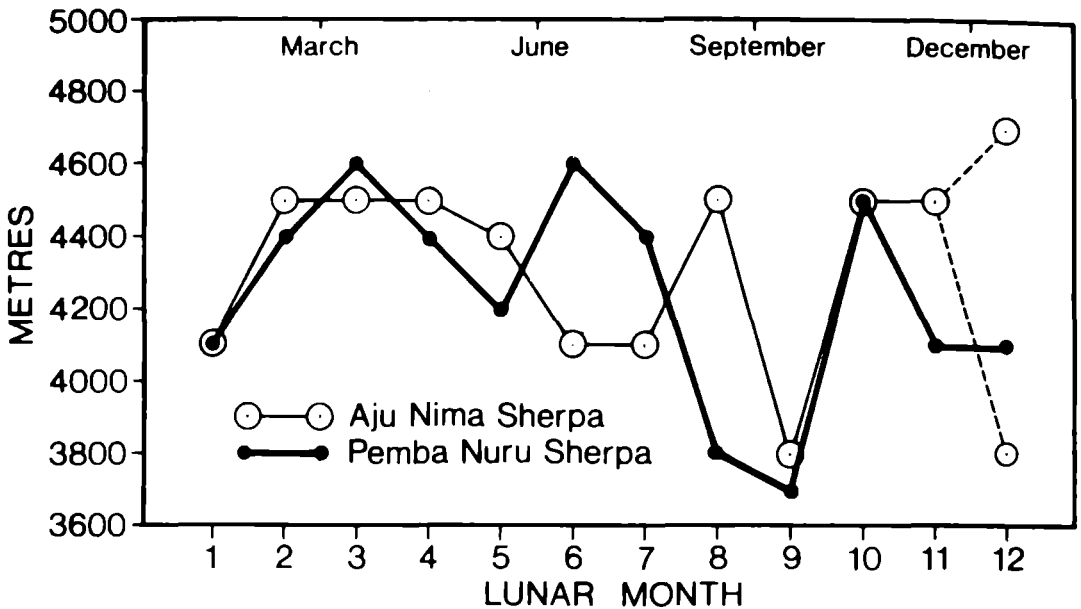
For some stock-owning households, this shortage of family labour has forced a reduction in animal holdings, changes in management practices, or conversion to other economic endeavour. Householders express reservations about employing hired labour in livestock management. 'Servants cannot be trusted with yaks', is a common explanation, even in households where hired help are responsible for many complex tasks. Ethnicity appears to be a factor in willingness to trust hirelings with livestock. Lowland *rongba*, usually Tamung or Rai, are the most commonly recruited household help today. They replace an older Sherpa practice of hiring immigrant Tibetans (Haimendorf, 1964) who performed many of the functions of today's lowland helpers, such as field-work, cooking, child care, and wood-gathering, and who were also entrusted with livestock. High altitude *nak* herding is, after all, a traditional



5.1 Dynamic transhumance: Khumjung dzum



5.2 Dynamic transhumance: Thamichok *nak*



### 5.3 Dynamic transhumance: Thamichok *nak*

occupation of Tibetans and not so common to *rongba*. Among those households that do employ help to tend to livestock, most use Tibetans.

Even within the family there are preferences about who is best equipped to manage livestock. In Thamichok, poor reproductive performance in *nak* in several ownerships has been attributed to the increasing number of young women who are minding the animals. It takes the expert eye of older men—now engaged in more lucrative tourist enterprises—to identify the subtle signs of *nak* estrus, and thus ensure successful mating with the stud of choice. These and other factors have resulted in a labour shortage that is especially acute in villages with greatest involvement in occupations that conflict with traditional animal management. Not surprisingly, losses to predators are higher for such owners, particularly during the summer months when mists hugging the ground permit a close approach by a stealthy predators.

*Predators* Like stock-owners everywhere, Sherpas are plagued with predators. The greatest threat, according to Sherpas, comes from three in particular which are not merely animals, but agents of offended deities: the wolf, snow leopard, and yeti—the abominable snowman, legendary in the remote Himalaya. The evidence for yeti predation still eludes dispassionate science (although it can be fairly

compelling to Sherpas and others), but both snow leopards and wolves have undoubtedly accounted for losses. Snow leopards may have returned to Sagarmatha National Park after an absence of several years: pug marks were seen in Thamichok during the winter of 1988–9 (H. S. Sherpa, personal communication, 1989), the first reliable evidence of their presence in many years. Perhaps twenty years ago Khumjung man killed a *serkan*—snow leopard—and marched the skin through the village. Fellow townspeople rewarded him with gifts of food and money as small children paraded along: evidence that in some situations, stock-owner interests win out over Buddhist beliefs. More recently, two snow leopard cubs were reported to have been captured by a Fortse man, who sold them somewhere in the Terai. Forest leopards are occasionally reported as high as Khunde and Khumjung, but are not considered to present a significant threat to livestock. But canine predators are relatively common. Jackals, feral dogs, and wild dogs of possibly two types are potential predators of young stock. Yak and *nak* in groups can defend themselves fairly effectively from most attacks by a predator, rather in the manner of musk ox: a circle of horned heads is presented to the predator whose attack has been anticipated. But isolated animals are vulnerable. Several *zopkio* have been killed by *khatumbu* (dhole?) over the last several years in the forests below Nauje. During the summer of 1986 *khatumbu* ranged higher into Khumbu than they had been known to travel; they fatally mauled a Pangbuje man's valuable *dzum* and harrassed livestock near Khunde and Khumjung.

The most conspicuous predator, thought to be responsible for numerous attacks on animals as big as full grown *nak* and hill cattle bulls, is the wolf. For about five years, from 1979 until the winter of 1984 when he was joined by several emigrants from Tibet, a single widower wolf was supposed to be responsible for a trail of stock losses and maimings that included every corner of Khumbu. His trademark, evidence of a failed attempt, is found on an amazing number of yak, *nak*, *zopkio*, *dzum*, cows, and bulls—a missing tail. The wolf attack comes from behind, making the streaming tail of a

fleeing *nak* the first available piece to grab;<sup>7</sup> the wild dogs, by contrast, hunt in packs, and encircle and disembowel their standing victims. Yeti kills are distinctive: the *chuti* which prey on livestock (but not the man-killing *miti*) turn their victims' hides inside out ('Like a man takes off his jacket'), wrench off the head and bash it into the rocks ('like a bowl of rice porridge') and break the bones of the legs into chopsticks.

There is a tendency for livestock owners everywhere to exaggerate their casualties to predation, and it seems certain that if the Khumbu wolf has really been responsible for all the damage credited to him, he must indeed be god-propelled. Sherpas admit their own complicity in some predator losses: 'No one was watching that animal and it wandered away—then the wolf found it.' But it is also certain that wolf predation is a serious concern of Sherpas, and a real threat to their livestock. Before the national park's establishment made it illegal, and in spite of their religion's proscriptions against killing, the successful hunter of a *wolf*—or snow leopard—was rewarded by his grateful neighbours. Still scattered around the high grazing areas are wolf traps: a heavy rock is balanced on a slender prop, a bait is placed beneath, and a knife-edged stone is set so that if a wolf takes the bait and unbalances the prop—and waits long enough—the stone will drop on his head and push his neck into the sharp edge beneath. (No-one has ever known it to work, but making traps is entertainment for herders without a lot of other projects, rather like the inverted cairns and aspen-bark graffiti of sheep-herders in the American West.) Wolf-scares resembling cornfield scarecrows are posted around *yersa*, and other wolf repellents are also sometimes tried. One technique requires a rope or string to be tied around the place where stock is bedded (a technique reminiscent of rattlesnake-repellent folklore, except that to keep off rattlesnakes the rope has to be horsehair; anything should work against wolves). In addition to vigilance, folk remedies, traps, and bounty hunting, Sherpas call on other help in coping with predators. There is reportedly a daily ceremony performed in Tengbuje *gonda* designed to placate gods who might other-



wise send a vengeful agent (*kangso puja*). This ritual may have guided the hand of whoever it was who successfully eliminated the small Khumbu wolf population during the summer of 1986. Or perhaps a zealous member of the Yak Farm's vehemently anti-wolf staff, which has suffered its share of wolf-attributed losses, took matters into his own hands. Or it may be that a slackening in the commitment to predator protection with a change in national park administration provided the inducement for some unknown wolf adversary to destroy the park's remaining wolves. In any case, at least until new animals wander over from Tibet, Khumbu cattle-keepers no longer have wolf predation to contend with.

This is an especially welcome development for *nakpa* who pin hopes on successful production of calves, either cross-breeds for sale or *nak* to build up their herds. It is young animals that are most vulnerable to predators, yet in calves is much of the profit and promise of the Khumbu cattle business.

*Cattle Breeding and Trade* Producing *dimzo* calves for sale or trade is an old occupation in Khumbu, extending back at least to several generations and probably far longer.<sup>8</sup>

Summer is the breeding season. Timing is critical, for conception must be scheduled so that calves drop late enough the following spring to provide their mothers with new grass to fortify them for the dual duty of sustaining a calf and contributing to the milking pail. Yet orchestrating conception can be a major problem for the breeder, who must contend with the subtleties of *nak* estrus, a lack of cooperation from some subjects, and a variable gestation depending on the foetal calf's heritage: for pure yak it is about eight months, but about nine for a hybrid foetus. (*Nak* and to a small extent cows are the mothers whose progeny have value; the second generation hybrid *dzum* calf is worthless to most owners.) This means a concerted effort in late summer to arrange the breeding of receptive *nak*, either by a yak or *lhang*.

Almost all yak are castrated by the age of three or four

TABLE 5.1 AGE-CLASS DISTINCTIONS FOR CATTLE

<i>Years</i>	<i>Male</i>	<i>Female</i>
0-1	Pik	Pik
1-2	Dungbu	Dungmu
2-3	Shayba	Naldang
3-4	Tuwu	Khokham
4-5	Niruk	Nijtum

(only *tshetars* would escape the knife), and breeding animals are those old enough to be sexually mature yet still intact. Yak and *nak* are happy to cooperate in such encounters, but the resulting calf has a relatively low value and most breeders prefer to recruit a cattle bull. Many *nak*, with a preference for their own species, resist the attentions of *lhang*; an *lhang* whose experience has been with cows is often reluctant to take on a *nak*. *Nak* resistance must therefore be quelled (by bleeding, tying, and other mechanisms), and a *lhang* with a predilection for *nak* selected, before matings producing *dimzo* can be effected. There are a few bulls in Khumbu with a reputation for success with *nak*, and their services are in great demand. One such *lhang* which seems to have the knack of producing these bulls was purchased for a large, undisclosed sum from Fortse by a major Thamichok *nak* owner. Also in demand are *lhang* with red coats; they are quite rare, but some believe they produce only female calves. Colour is an important consideration to breeders. All possible coat colour combinations of black, white, red, grey, and brown are named, and each animal is identified by its usually distinctive coloration (Table. 5.2).

Sherpas prefer light-coated animals, and all else being equal, value black animals least. Particular animals may endear themselves to their tenders for reasons that have a lot or a little to do with colour of its coat: one young man desperately coveted a pair of black *nak* with white spots on the forehead (*dongmu*), and was quite eloquent about their loveliness; another had a white (*carsang*) *tshetar* yak, twenty

TABLE 5.2 NAMES FOR CATTLE BY COLOUR PATTERN

<i>Colour Pattern</i>	<i>Name</i>	
	<i>Male</i>	<i>Female</i>
all black	Rokbu	Rokmu
black w. white spot on forehead	Dongbu	Dongmu
black w. white eye sockets	Miktha	Mikthum
mixed black and white, black predominant	Saoo	Samu
black w. white mouth, legs, spine	Ngangba	Ngangma
black w. white tail	Ngale	Ngalem
red-brown	Marri	Marmu
yellow-brown	Marsal	Marsal
brown w. white spot on forehead	Tshendo	Tshendum
dark body w. white face	Kawa	Kama
dark body w. white mouth	Khake	Khakim
dark body w. yellow-brown along spine	Seta	Setam
white	Kharsang	Khalim
grey	Chule	Chulim

years old, which was his favourite from among forty animals. This colour preference and good horn morphology in yak are two breeding criteria cited by stockmen as important, but there is no evidence in actual prices paid for stock purchased in the last few years that these are crucial considerations.

In buying livestock a Sherpa purchaser will first take into account the animal's age. The productive lives of Khumbu cattle averages around ten years, from about four to perhaps fifteen. The age of an animal is determined by the sequence of tooth eruptions; as with colour, each age class is named (Table 5.1). The greatest value is placed on animals early in their productive period: between the ages of about three to eight. Other considerations include overall liveliness, condition of teeth and tongue, colour of eyes (a little red is good), and, in *dimzo*, the presence or absence of a distinctive bald spot under the chin. Other considerations, such as mother's milk production or fecundity, father's potency or tractability, do not seem to be taken into account. Only one stock-owner

expressed a special interest in obtaining of calf from a *nak* which might calve every year, instead of the usual two-year interval. In recent years at least, the demand for calves has been such that considerations like coat colour or potential performance have not entered into the purchaser's calculations; he is most interested in obtaining a healthy, lively animal.

This demand comes from north, south, and from within Khumbu. Where the sale of most *dimzo* calves is concerned, Khumbu Sherpas are the breeders, not brokers: specialists are engaged in the purchase of Khumbu-produced calves and subsequent resale either in Solu or in Tibet. A common first journey for both *zopruk* (baby *dzum*) and *zopkio pik* (male cross-breed calves) towards the end of their first year is down to the relatively lush pastures of Pharak and Solu. Brokers will buy up a substantial part of the surviving calf crop and herd the animals to the lowlands for resale. *Zopruk* will stay with their new owners, to augment lowland dairy herds. The young *zopkio* will remain a year or so, profiting from the greater productivity of low elevation Solu range-land; than a stock-broker will return, buy the growing animals back, and take them by trail to Khumbu. The broker, who is likely to be one of Nauje's semi-resident Tibetans, will search out more saleable stock from the villages of Khumbu until he has amassed a sizable herd, of anywhere from dozens to hundreds of young animals. He or she will gradually move them up the valley of the Bhote Kosi towards the Nangpa La until conditions are good for the crossing.

The trans-Himalayan trade in young animals is potentially perilous. Even seasoned yak are lost to accident or harsh weather in crossing the Nangpa La, and anyone on the trail with young stock expects casualties. But there are great potential profits. In Tibet, the demand for cross-breeds is considerable, and the traffic over the mountains in young *zopkio* persisted despite the Chinese-initiated border tightening. One Nauje trader bought up forty *zopkio* and took them by trail to Dingri in 1983. She exchanged them for large quantities of Tibetan wool, which she then shipped back by truck across the mountains to Kathmandu in time to

capitalize on a period of high prices and short supply in the Tibetan rug-making industry. Wool is a commodity valued in Khumbu as well, and other traders exchange livestock for it, or for any of a host of other commodities ranging from Chinese tennis shoes and thermos bottles to *tsampa*, salt, dried sheep, silver ritual objects, pack saddles, aprons, yak bells, hats, and a hundred other items. But for Khumbu cattle-breeders, the most important exchange has been the trade of young cross-breeds for *nak*.

In a traditional trading pattern involving individual breeders as well as brokers, one young *zopkio*—or even an old, tired *dzum*—could be exchanged for a couple of vigorous *nak*. This system provided Khumbu stock-owners with breeding *nak* and a market for both young and older, unproductive animals, and undoubtedly helped to account for the proportions of *nak* and other cattle types evident in Khumbu herds in the 1957 census.

The political events of 1959 brought a stop to this livestock trading pattern, as well as an interruption in other Khumbu-Tibet trade relations, and the cessation of trans-Himalayan winter grazing by some Thamichok households. Consequences of the Chinese presence in Tibet and subsequent border restrictions included increased pressure on Thamichok rangelands from both displaced Sherpa graziers and refugee Tibetan stock-keepers, increased involvement in tourism as an alternative to trade (Haimendorf, 1975), and the establishment of His Majesty's Government of Nepal's Livestock Development Farm at Shyangbuje. The Yak Farm's initial primary purpose was to supply pure-bred *nak* to Sherpa breeders who had lost out on their Tibetan source of supply (D.D. Joshi, personal communication, 1984). After unsuccessful forays into cross-breed improvement and range enhancement,<sup>10</sup> the farm continues to view *nak* production as its primary objective, despite some unanswered questions about the advisability of encouraging an increase in the local livestock population and a recent rejuvenation of trade in Tibetan *nak*.

*Nak* are once more entering Khumbu freely from Tibet, and Sherpas anxious to get into or expand a potentially

profitable breeding business have been quick to buy them up. Within the last five years a number of Thamichok people with no history of *nak* ownership have acquired them in order to attempt to breed *dimzo*. As a rule these new *nak* owners, like those in Nauje and other villages who have recently acquired cross-breeds, lack the subsidiary settlement and hayfield network of the old owners. This has created some tension over range and *ritsa* resources with established *nak* owners, who face growing competition for common-land range and hay, and must rely increasingly on the output of their *tsitsa*. The last few summers have been especially busy ones in Thamichok, as established stockmen attempt to entrench themselves and newcomers struggle to obtain the *phu* and hayfields necessary for *nak* ownership.

*Other Summer Tasks* During summertime at the *yersa*, there are other tasks than milk-making, predator surveillance, and stock-breeding.

Potatoes must be planted and weeded at those *yersa* where residents grow them for winter feeding of animals and herders. The shorter growing season of fields at the highest elevation creates a preference for the older potato variety, *rigi maru* (the newer, high-yield *rigi ceru*, like *rigi bikas*, takes too long: 'The leaves will still be green when it's time to dig potatoes.').

The long hairs from the flanks of yak and *nak* must be sheared. One technique of immobilizing yak for shearing involves tying two together, head to head, by their horns, placating them with salt (poured on the ground between the animals, who lick salt from each other's muzzles) and quickly snipping the long hair from flanks and tail—leaving the hair on the haunches long, 'for looks'. The hair is sorted by colour and hand-carded (short-fibred *pu* can be carded with the same Indian or Chinese carding combs used to the prepare sheep's wool for spinning and knitting into hats and socks for sale to visiting tourists). During summer, no man is without a wad of *tshirpa* or *pu* wrapped around his wrist, which he spins as he walks, talks, or sits watching over his animals.

During sunny parts of the day (relatively infrequent in this monsoon climate) a woman may set up her back-strap loom in the field next to her house and weave the coarse yak hair into light-and-dark banded *charras*. Most weaving waits for winter, and although a substantial proportion of Sherpa textiles are now commercially produced, there are still many households doing the bulk of their own weaving. *Pu*, sometimes mixed with longer-staple sheep's wool, is woven into fabric that is boiled almost to felt, dyed, and made into the traditional woman's *angi*. Wool or acrylic yarns bought from the Saturday market or Nauje's shops is first unspun into individual strands, and then woven into the woman's brightly-banded front apron, *mhutil*. Sheep's wool is woven into high-pile *churook*, the sleeping mats and blankets that are traditional Sherpa bedding—still in demand despite the prevalence of down sleeping bags and other mountaineering booty.

In summer there are all the things to do to sustain the people living at the *yorsa*. There is water to carry, fuel to collect, tea to make, potatoes to boil, ceremonies to prepare, shopping to do—every few weeks someone must take a pack animal or two and go to the weekly market at Nauje for supplies. Some tasks are shared among the temporary residents of a particular subsidiary settlement. Although they may come from different home villages, *yorsa* residents are likely to have spent many summers in each other's company, sharing work and ritual, and bound by strong ties of friendship—or by more formal ties, since it is during summer that young men and women are most together, forming romantic attachments that often lead to marriage.

*Yerchaang* One ritual in particular is associated with summer in the *yorsa*: *Yerchaang* ('summer beer'). A family celebrates *Yerchaang* year after year at the same *phu*, in association with a set of other *yorsa*-goers that remains nearly constant. Although *Yerchaang* has declined in importance in some areas, notably *Thamichok* where most stock-owners either ignore it or celebrate a minimalist version in their home village, elsewhere it remains important as the spiritual and social focal point of summer.

In the Nubkiphu settlement Lhabarma, five families participate together in Yerchaang: three Khumjung householders, two—mother and son—from Khunde. Gathered in Lhabarma in Dawa Thukpa (mid July), the families spend several days in ritual and partying. Sculptures (*peimar*—‘flour-butter’) are made of *tsampa* and butter which represent the gods of *rhu* and region worshipped by each household, animals including yak, sheep, and goats, and other special symbols; offerings of *chaang* and *sho*—yogurt—are made, along with prayers. The men of each household assemble the materials and work the dough into the prescribed shapes, while their wives keep them fortified with *chang* and *arak*. Flowers are added to the major figures of clan-gods, which are mitre-shaped, humble layman’s versions of the elaborate *torma* made by specially trained lamas for particular rituals. Once the prayers are finished the *peimar* are eaten along with the yoghurt and beer offerings. Parties, morning and night, are hosted by each household in turn in the standard Sherpa pattern of convivial reciprocity. The ceremony affirms each household’s commitment to its special deities and invokes protection for the animals, while providing a friendly social occasion that reinforces the tenuous bonds of short, shared tenure in a particular *yersa*.

Yerchaang falls during the slack period in summer. Daily responsibilities are relatively light. Although there are animals to gather and disperse, milk to process, and a number of other tasks, it is Sherpa holiday time, when favourite foods like *sho* are plentiful, the weather is warm, if damp, and seldom-seen friends are together. It is also the calm before a storm of sorts, for the end of the monsoon brings the most intensely busy time.

Late summer—early autumn is the year’s most crowded season. It is harvest time first for grass, then barley, then potatoes and buckwheat; it is also the beginning of the expedition season, when animals and men are in demand for carrying loads. Demand for labour exceeds the available bodies, wages are high, and stock-owning households especially are pressed to finish the season’s work.

The harvest marks the end of the summer pattern of



animal management. For the rest of the year, most yak and *nak* will be handled differently from cross-breeds, and there is greater variation in the practices of stock-owners from different villages. There is further variation introduced into livestock management by the uses to which animals are put. Pack animals, mostly yak and *zopkio*, have a special role to play; their seasonal movements and management will differ from that of other stock.

### *Autumn, Winter, Spring*

By October, most stock-owners and their animals will be back in the neighbourhood of their home villages. Everywhere the *di* are lifted, and stock-owning households return home to village-field harvest and autumn ceremonies. For some cattlemen with herds of yak and *nak* this period home may be very short, a matter of a few weeks. Then they will move off again, to begin the autumn-winter-spring cycle of grazing from area to area. The summer leap-frog pattern of movement prevails in winter as well, but then it is stores of hay and weather conditions rather than ritual regulation and availability of forage that determine herd movements.

Milk production drops off substantially after summer, and the tasks of the *nakpa* become simpler. It is no longer necessary for whole families to follow the peripatetic herds as they move from *phu* to *phu*. Winter herding is a job for a single member of a household. In traditional polyandrous households, one husband is likely to be the one who minds the animals while the other may engage in trade. In other family settings, it may be a young man or unmarried daughter who shoulders responsibilities for winter livestock. It is not uncommon for two families to combine their animals and share the responsibilities for winter management, which can be a lonely and dangerous time. There is very little of summer's rowdy conviviality at a high elevation *phu* in January.

Unless snows are unusually heavy and persistent, *nak* and yak do relatively well on winter grazing with only a token supplementary feeding. They are physiologically equipped to

cope with snow, cold, and forage with low nutritional value. When snowfalls blanket the moraines on which yak need to graze, the winter herder may drive stronger animals up the ridges towards thinner snow cover and accessible browse. The path forced by these animals can be followed by smaller and weaker ones. Often there is no need for such strenuous efforts, for winter snows are infrequent in most years; livestock can graze freely on the short turf of cured sedges and grasses at high elevations even in the middle of winter. But a long period of plant dormancy beginning with the end of monsoon means a progressive diminution of available range forage, and an increasing need for stockpiled feed. For Khumbu Sherpas as for most of the temperate world's stock-keepers, winter-to-spring is the crux season. The stress of the cold weather and poor nutrition take their toll on Sherpa herds.

By the warmer, drier weather of spring, which brings relief from most snow and cold but does not produce a flush of new growth until quite late, fodder reserves are usually exhausted and surviving animals are at their weakest and most vulnerable. A year of generous summer rains that produce good crops of hay and rich range vegetation, followed by a mild winter, may not be much of a problem. But dry summers, hard winters, and the decreasing effectiveness of traditional controls on range resource use can combine to create serious livestock morbidity and mortality.<sup>10</sup>

According to Sherpas, when yak and other cattle are thin, as in spring before the grass begins to grow again, they are very susceptible to accidents, disease, and predation. Hungry animals will hunt out whatever forage remains. Precariously situated tufts of grass that are no temptation to a comfortably full animal draw the hungry one. In the rocky, rugged environment of Sagarmatha National Park, any grasses bypassed by agile and enterprising livestock the first time around are likely to be *very* precariously placed, and the animal driven to get to them has frequently tried to reach its last meal. Weakness undoubtedly also contributes to the increased rate of accidents in spring. Diarrhoea is a springtime

scourge of undernourished animals, which also show increased burdens of intestinal parasites.<sup>11</sup> Illness and injury to animals are treated by an assortment of home remedies and by the medical practitioners who also serve the human population. Lamas and *lhawas* may perform special rituals to determine the source of a particular animal's affliction—usually an aggravated deity or ghost—and prescribe accordingly.

### *Cross-breed Management*

Except during the summer, stockowners with herds of cross-breeds are comparative stay-at-homes. Their animals are less sturdy than pure yak, and must remain at lower elevations. Hybrid cattle-owners do not have so critical a need for hayfields and subsidiary houses; hybrids spend a greater proportion of the year within a few hours' graze of their main village. The typical *dzum*-owning household keeps livestock as a concomitant to other economic activities, particularly tourism; large *nak* herds, on the other hand, are often the primary source of subsistence for owners who are likely to be less heavily involved in trekking and expeditions. *Nak* owners in consequence manage livestock in more traditional ways for more traditional uses. Cross-breed management is a less traditional, more variable matter, and it is in today's transitional patterns of cross-breed management that the greatest potential for environmental disruption lies.

*Pack-stock* The big incentive for maintaining cross-breeds has come in recent years from the high value on the labour of pack-stock. Although there was speculation that the increased numbers of *dzum* evident in the 1978 census reflected the increasing tourist market for dairy products (Bjonness, 1980a), *dzum* milk does not appear to provide any such return. (Powdered milk, usually aid either from Australia or from the USA, and often adulterated with white flour, finds its way to the Nauje market and thence into the tea-shops and camp kitchens that supply trekkers' milk tea, hot chocolate, and Bournvita). Overall, *dzum* numbers have declined since

1979, while numbers of *zopkio* have increased. The versatility of load-carrying *zopkio* has unquestionably led to the growth in cross-breed ownership.

Although the initial cost of a young *zopkio*—3500 to 4000 rupees (approx. \$120 to \$135 1990 dollars)—may be steep, they are cheap to keep. Housing is no problem: every traditional Sherpa house comes equipped with a barn—the unoccupied ground floor. The animals can feed themselves on common range-land, and require very little in the way of supplementary feed. Nauje households with a few *zopkio* manage very well without *tsitsa*, augmenting their animals' diet during the lean season with kitchen refuse (*bangtsa*, the variable concoction which often includes odds and ends of potatoes and other vegetables, plate scrapings, salt, and bits of unidentifiable flotsam much relished by livestock), *ritsa*, and field weeds.

One dietary item judged a necessity by cross-breed owners is *dhanur* (*Scopolia tangetica*), a plant in the potato family which has narcotic properties. 'For *chungma* [cattle], it is like *chaang*—feed a *zopkio* *dhanur* and it makes him warm.' *Dhanur* is poisonous to people, but when dried and fed to livestock, it helps *zopkio* especially to cope with the rigours of high altitude winter portering. Some stockmen advocate feeding *dhanur* to all types of livestock; others restrict its use to hybrids; yet others to male animals only. It is grown here and there, in and around the main villages in patches supplied occasionally with manure, but otherwise uncultivated. *Scopolia* is a perennial, and readily re-sprouts following the harvest of mature leaves which is timed by a *di* in the Thamichok area.

When they are engaged in transporting loads, *zopkio* require extra fodder, especially in winter when there is neither time nor much forage for grazing. But this feed can be carried from the home store (added to the pack animal's burden), picked up at a cache along the way, or purchased or bartered *en route* out of the animal's portering profits. Pack saddles, either imported from Tibet or locally made from rhododendron and birch, may be had fairly cheaply. There need be no other costs. The returns can be substantial. At a daily

rate of Rs 30 to 40 each for the *zopkio*'s two loads, the initial investment is recouped in just nine or ten round trips to Lukla or a couple of trips to Lobuje or Everest Base Camp (distances between popular tourist destinations are calculated at a standard rate, regardless of how many days may actually be involved: thus Nauje-to-Lukla was considered a two-day trip for porters and pack-stock, although for most Sherpas it was only a four to six hour walk before the route was altered by the 1985 *jokulhlaupt*).

As the numbers of animals and owners grows, the competition for jobs increases. It is tourist portering that provides by far the largest number of jobs; these are limited. Expedition portering is often arranged well in advance, and stock-owners can count on a job when a brother or son is expedition sirdar. But for many owners most of the time, portering jobs are a catch-as-catch-can proposition. During the seasons when opportunities are likely to present themselves—from late summer to December, then again from March into May—pack animals must be handy. This means keeping them close at hand in the main village—no problem for Nauje villagers, who are in position for the optimal exploitation of impromptu arrangements. But this necessity reduces the opportunities for involvement in animal portering open to other Sherpas with more traditional life-styles living in less strategically placed villages. Except for the few families with adequate labour available who can both manage the main herd and attend to the transit of pack-stock, it effectively excludes *nak* owners from major involvement in this lucrative pastime. But for many cross-breed owners in Khunde, Khumjung, and Nauje, animal portering fits nicely into the annual system of livestock management.

Stock-owners at home in these villages are occupied, as a rule, with a wide variety of tasks including tourism, agriculture, and assorted home industries. Careful attention to their *dzum*, *zopkio*, or cows is neither feasible nor necessary. Once any lactating animal has been fed and milked, cattle are essentially on their own. Sometimes the animals are escorted from the village by the young children

or women of the household. Other householders may do no more than open the door of their downstairs barn and permit the livestock to wander out and find their own ways to the day's grazing.

Livestock of different types distribute themselves distinctively on the grazing lands near villages. Cows appear to be the frailest and least ambitious. They may confine themselves to the forage to be found on the paths of the village itself: old bamboo matting, weeds growing out of walls, plastic and rags, people's carelessly guarded stores of hay (Khumbu cattle are as catholic in their diet as any goat). Yak and *nak*, as already discussed, prefer to move up-slope; by mid-morning any yak kept at night in the village will be grazing high on a ridge above town. Cross-breeds, as might be expected, choose an intermediate path. Neither alpinists like yak nor as content with village streets as cows, they will wander beyond the fields adjacent to the village—though seldom as far away as *nak* and yak.

Another significant difference between yak and cross-breeds is in their dietary preferences. Yak are very much grass specialists, and while tender forbs may make up a sizeable proportion of their summer menu, they are not likely to make use of woody browse except when very hard-pressed. *Zopkio* and *dzum*, on the other hand, particularly the cow-mothered *urang*, are ready browsers. Shrubs, including *Piptanthus nepalensis*, roses and even barberries of Khumbu's several species are freely browsed upon by cross-breeds, who actively seek out both birch and the spicy new foliage of silver fir. Yak browsing is much more limited: an occasional bite of cotoneaster or new birch, but very little else; they are predominantly grazers.<sup>12</sup>

The autumn–winter–spring concentration of cross-breeds around permanent settlements, given these factors of distribution and feeding behaviour, affects the patterning of vegetation around the villages. These patterns and other influences of Sherpa occupation on the Khumbu landscape are the subject of the next chapter.

## NOTES

1. The contemporary distribution of juniper is more than a response to natural factors, for in addition to natural pressures it reflects human exploitation to the point of eradication in some parts of the tree's potential range.

2. Sherpas in lower elevation communities, in common with most Himalayan hill dwellers, cut forest fodder for their livestock, and in Pharak and Solu Sherpa stockmen have pollarded oaks and other preferred fodder trees into the bizarre lopped shapes so characteristic of Nepal's middle hills. But Khumbu lacks accessible oaks, and stockmen here offer no alternative tree-supplied fodder. Birch is highly palatable to hill cattle, hybrids, and yak to a lesser extent, but no birch is cut to feed the animals of Sagarmatha National Park.

3. Others address the same problem through cooperative arrangements with kin or friends who have suitably placed property and fodder resources. A Nauje stock-keeper may supply a relative's yak with hay on a trip to the Saturday Market in return for a reciprocal provisioning at the relative's Pangbuje home or Phulung Karpo *phu*.

4. These officials appointed by the village with responsibility for orchestrating various village functions (also *naua*) are described in detail by Haimendorf (1964; 1975; 1984), who was most familiar with Khumjung. There is considerable variety in the responsibilities and terms of appointment of *nawa* throughout Khumbu, and recent developments such as the collapse of village-level regulatory institutions in some areas and the national park's institution of salaried *shing gi nawa* to address forest-use problems make for a complex and changing situation.

5. Pangbuje's *di* prohibits felling of trees and any dyeing of textiles within the village, among other restrictions.

6. For Dingbuje, restrictions are also imposed on human use of the settlement: no fires within the village and no entry into the fields are the most significant in a long list of proscriptions. With fire forbidden, the settlement empties, to remain a ghost town until the *di* is removed and a flurry of harvest activities begins.

7. Some people joke that cattle tails are wolf *tukpa*—noodles—and the number of tail-less animals does suggest a preference for this appendage beyond a measure of a missed kill. There is also a possibility that some tail-less yak and *nak* have made a donation not to predation, but to commerce: yak tails have considerable commercial value, and it may be that tail harvesting has attracted resident Khumbu entrepreneurs.

8. Konje Chunbi asserted on one occasion that Sherpa ancestors had been breeding *dimzo* for 2000 years at least.

9. His Majesty's Government of Nepal Livestock Development Farm has undertaken several such projects. An attempt to develop a more

productive *dzum*, by inseminating *nak* with Brown Swiss semen, was not a complete success. The resulting two offspring are strikingly large and handsome animals, and the Brown Swiss *dzum* is a terrific milker. But both this *dzum* and the resulting *zopkio* have a difficult time getting around the rugged terrain of Khumbu. Sherpas complain that the *dzum*, who stays all round the year at Shyangbuje, is a voracious grazer, often invades their fields, and spends most of her time on village grazing lands. The breeding programme was discontinued not for these reasons, however, but because of a more fundamental problem: the large hybrid foetuses killed their mothers in the process of birth. Range improvement efforts, although a minor part of the Farm programme, have not been successful. Exotic grasses (including the annual rye *Lolium multiflorum*) were drilled into hayfields near Orsho: the ridges are still evident, but the grass never took root. The national park forbids the introduction of non-native species, and the most recent pasture experiments have involved trials with the principal *tsitsa* grass, *Elymus nutans* (Sarad Neupane, personal communication 1985).

10. 1986 saw extremely heavy casualties in Khumbu herds, particularly those of Thamichok where cattle mortality for some owners reached 50 per cent. The combination of poor summer conditions for grass, a somewhat difficult winter, the loss of hayfields destroyed in the 1985 *jokulhlaupt*, and wholesale disregard for the lower Thamichok *di* by local villagers and Nauje stock-owners and *ritsa* harvesters combined to produce widespread cattle hunger and consequent disease. *Nak* and yak, as well as very young or old animals, were apparently particularly affected.

11. Intestinal parasites found in fecal samples examined in May 1986, included organisms of the genera *Coccidia*, *Ascaris*, and either *Ostertagla* or *Heamonchus* in concentrations little different from the typical burden of an Iowa farm steer (Dr Douglas Shulke, D.V.M., personal communication, 1986).

12. These characterizations of diet are based on extensive observation and information from cattle-owners, and have yet to be confirmed from the more objective microhistological analysis of faeces collected in 1985 and 1986.



## *Livestock, People, and Environment*

THE overwhelming power and wildness of the mountains in Sagarmatha National Park obscure the fact that this is a human landscape. The peaks themselves may have remained out of reach of most human meddling, but the rest of the park environment, like any other long-term home to man, is an artefact of his use.

### *Historic Human Impact and the Natural Landscape*

The precise extent of human manipulation and alteration of the Khumbu landscape is impossible to determine. Even a rough approximation of the degree of transformation in vegetation since people came to live here is a matter requiring extensive investigation of evidence both in the landscape itself and in the records and recollections of residents—an investigation that has barely begun.

A complex interplay of factors has been shaping the environment of Sagarmatha National Park in the half millenium that Sherpas have made their home here. Glaciers have advanced and waned, climate and weather patterns have varied, natural cataclysms—earthquake, *tshoserup*, flood, avalanche, rock-fall—have continued to re-engineer this mobile mountain environment. People from probably several cultural traditions have moved about here, making homes, fields, trails; bringing cultigens and accompanying pests; tending livestock.

Human manipulation of Khumbu has been both direct and indirect, inadvertent and intentional, and is most apparent

where it has been most intense: in the vicinity of permanent villages and subsidiary settlements. Sherpas have had a variety of landscaping tools at their disposal, and a number of purposes to fulfil, in shaping the Sagarmatha National Park environment into a homeland. Houses, fields, cooking fires all bring about a transformation in the natural landscape, as land is cleared, timber felled, fuel cut and collected. A more extensive alteration comes about with the man-guided application of fire and grazing animals.

*Effects of Historic Land Use Practices* Villages, walled fields, and trail systems are the most conspicuous evidence of long-term human presence. In addition to areas presently occupied and used, there are abandoned houses and fields scattered about Khumbu. Some houses, particularly in *yorsa* or *gunsa*, may lie unused for years and even generations, depending on changing family fortunes and needs. There are a few entire settlements that have been forsaken, as for instance Lhare between Pare and Thami.<sup>1</sup> Such old settlement sites and fields are often identifiable because of unobscured terracing or vegetation associated with settlements.

It is widely assumed that people account for the absence of forest on the slopes around Khumbu villages, where altitude, aspect, and soil and moisture conditions could support trees. Woodcutting for house construction and fuel is the process by which the original forests are usually thought to have disappeared, to be replaced by the shrub communities one finds today. It has been popular to assume that contemporary pressures led to this deforestation. It is usually considered to be a recent phenomenon, brought on by accelerated forest exploitation.<sup>2</sup> Factors often cited to account for the rapid increase in woodcutting that is often inferred include the nationalization of forests by His Majesty's Government and subsequent erosion of traditional wood use controls, and the demands for fuel-wood and crevasse-bridging timber by expeditions and tourist groups (Haimendorf, 1964, 1975; Naylor, 1970; Lucas *et al.*, 1974; Speechly, 1976; Bjonness, 1979, 1980a,b; and many others). But it is becoming

increasingly clear that any recent escalation of demands on forest products has had negligible effect on the forests of Khumbu except, perhaps, in the juniper shrub land at the highest altitude. Photographs taken in the 1950s and early 1960s (by Erwin Schneider, Austrian cartographer) appear to show substantially the same extent of forest one finds today. It may be that forest composition and density have altered (L. N. Sherpa, personal communication, 1987), but a careful comparison of these older photos with recent re-takes shows no significant change in forest cover (Byers, 1987a). Other lines of evidence, including soil profiles and dendrochronology, support such an interpretation (Byers, 1986). The conversion of pristine forest to altered forest types began long ago. Except at timberline on tourist routes, the extent of forest has remained substantially unchanged for the last few decades.

The assumption must be, then, that the transformation from forest to shrubland near villages results from an older process. The need for housing lumber alone would not account for the disappearance of trees. Sherpas are not so numerous nor their houses so ephemeral that twenty generations of housing for six villages would have required extensive areas of forest. Fuel is used conservatively today, and although people were reportedly somewhat more profligate in earlier times, it still seems improbable that the constricted distribution of trees reflects these requirements only.

Systems for forest protection are a part of the traditional Sherpa heritage (Haimendorf, 1964; but *see* Stevens, 1986, cited in Ives, 1989) augmented by regulations imposed by past rulers in Kathmandu (Brower, 1986). This attention to the maintenance of existing forest argues an early awareness of their vulnerability to overuse, and suggests that if housing and fuel needs cannot plausibly account for the reduction in forest area, some other human factor must be involved.

It may be that fire and the deliberate burning of forest to produce pasture help to account for the widespread absence of forest in Khumbu where conditions would permit it to grow. Although there is slim evidence yet collected to

confirm any such hypothesis, it seems a likely explanation for this enigmatic patterning of Khumbu vegetation. Yak and other cattle prefer feeding on open slopes, which produce more fodder than the closed-canopy pine or juniper forest one would expect to find on these south-facing village sites. Fire is certainly used elsewhere by Sherpas to manipulate range vegetation, and it seems likely that this has been true in Khumbu as well.

Today, given the constraining presence of the national park and its vigorous fire-prevention stance, Khumbu Sherpas deny any deliberate use of fire. Yet, particularly in high alpine areas, fires are common. Carelessness is the usual explanation: herders often light themselves a fire for warmth, amusement, or to roast potatoes. Wood is scarce, but winter-dry shrubs burn nicely; ignite a juniper or azalea, and there's your fire. When it's time to move on, you're likely to leave the fire smouldering, even if you are a conscientious adult. For bored kids on lonely herding duty, lighting a succession of bushes is good fun, and many grown Sherpas admit to having entertained themselves in this way as children. A fire carries well in the fuel provided by vegetation such as the rhododendron-cassiope shrub type. These shrubs have less to offer grazing livestock than almost any other vegetation type. The new growth of grasses, sedges, and succulent forbs that follows a fire is much more useful to graziers.

The calculated use of fire to improve pasture, then, as well as inadvertent burning, seems a plausible factor in the transformation of the Khumbu landscape. The effects of burning, whether deliberate, accidental or natural, on alpine vegetation dynamics has not been studied. One could speculate that the plants with high vulnerability to fire such as juniper lose out, while those with high resistance are favoured. It appears that some rhododendron species, cassiope, ephedra, and other woody alpine plants including *Rhodiola* may re-sprout after fire. Plant adaptations to high altitudes, including vegetative reproduction and low-to-ground morphology, are multipurpose safeguards against both fire and grazing as well as adjustments to the constraints

of altitude. Perhaps, except for a depression in tree-line because of the juniper's special vulnerability, long-term vegetation change in the alpine zone is minimal under a frequent-fire regime. More radical effects would be expected in lower elevation forest types.

Sherpas may have brought about some degree of environmental transformation with another traditional practice: the raking and gathering of *saluk* forest litter for composting in toilets and stables. It seems likely that this widespread practice, undertaken in most forest areas within a day's round trip of the main villages, has had some effect on forest or under-storey composition. The loose material is raked into large baskets and carried away leaving, sometimes, a bare mineral surface. Whether the practice promotes or inhibits the growth of particular species remains to be tested. Certainly it removes nutrients from the forest system. But to casual observation, at least, there appears to be no significant difference between forests of a given type subject to repeated collection of *saluk* and those left alone.

*Impact of Livestock* Livestock have undoubtedly influenced both vegetation and topography. It would be impossible to isolate the particular environmental influences of animals, for they have been one element in an array of agents, natural and cultural, interacting over several hundred years. But the role of grazing animals in some sorts of environmental transformation is fairly clear.

The collective efforts of man and animals probably help to account for characteristic vegetation distribution, as for instance in the wide extent of shrub land already discussed. The high concentration of unpalatable and poisonous plants around high use areas—villages and subsidiary settlements—is probably an effect of animals alone. Thorny *Berberis* is the most conspicuous plant in this category, and is found in high concentration everywhere in the vicinity of villages and *phu*. Other plants favoured by grazing include the rhododendrons, primroses, *Pedicularis* spp., iris, anemone, potentillas, *Sybbaldia*, *Geum*, and other members of the rose family including *Spirea*, most gentians, *Ephedra*, and many

others.<sup>3</sup> All grassy plants except perhaps the most fiercely armoured *Stipas* and some tough sedges are preferentially grazed, and by the end of winter grasses persist only in protected locations: behind walls, in shrub nurseries, and on boulders and rocky outcrops.

These inaccessible harbours are a reservoir of plant diversity.<sup>4</sup> Even brief protection from intense grazing permits the re-establishment of species preferred by livestock. This is evident in the proliferation of species rarely encountered on slopes open to grazing, which sprang up in the plantation above Nauje after just a season's respite from unimpeded animal access. The increased plant cover was conspicuous enough to draw Himalayan tahr into the plantation in 1986. These wild ungulates were willing to risk exposure within plain sight of the village for opportunity to graze in an area free from yaks. Reduced plant diversity, a common consequence of intense grazing pressures in other environments, does not appear to be a response in Himalayan vegetation. In a sampling of 300 sites throughout Khumbu, the highest diversity was recorded on a south-facing slope adjacent to a well-used *phu*—a site subject to heavy use—at about 4800 metres.

It is apparent that these subtropical mountains do not have the same fragility as the higher latitude ranges familiar to most visitor-commentators. There is an astounding resilience in the vegetation, an ability to bounce back quickly from the disturbance of grazing—as from glacial advance or *tshoserup* or avalanche.

Terracettes are extremely conspicuous on shrub-clad montane and submontane slopes of Sagarmatha National Park, and common at higher elevations as well. Treads are usually ten to twenty centimetres wide, lagged with a light veneer of gravel, and supported by contoneaster or rhododendron-covered risers. Slope steepness and intensity of use appear to influence the frequency of these terracettes. The reticulation of intersecting trails seems as fundamental a part of the landscape as the glaciers and peaks, yet they represent a post-Sherpa phenomenon: the hoof-marks of generation upon generation of foraging livestock (Plate 7).

Domestic animals alone are not the engineers for these features. Livestock management calls for much human travel in the wake of grazing animals: an escort accompanies them out in the morning and retrieves them in the evening; dung hunters tail livestock, too. On steep slopes with a dense brush cover, stock trails are convenient people trails even for those not deliberately following yak. Both human and animal agency, then, contribute to this distinctive patterning of slopes.

This highly visible animal effect in Sagarmatha National Park has been assumed to mean a correspondingly high environmental impact; over-grazing is often cited as a source of accelerated erosion (Lucas *et al.*, 1974; Misra, 1973; Speechly, 1976; Bjonness, 1980a, b; and others). But longer-term familiarity with landscape dynamics, geological analysis (Vuichard, 1986), and the only study of geomorphic processes undertaken to date (Byers, 1986) suggests that the livestock contribution to erosion is grossly overstated.

Most of those moved to comment in print on conditions in Sagarmatha National Park have been short-term visitors, often motivated by a desire to raise consciousness or funds around issues of environmental degradation, as has been discussed. Their trekking season visits coincide with the most desolate of Khumbu seasons: they visit the most intensely used areas, and they see the landscape looking its worst. They imagine the fury of monsoon rains as described or experienced in the plains, and assume that the bared slopes they see in December or April, subjected to their vision of summer monsoon, must bring catastrophic erosion. To stay longer in Khumbu, to experience monsoon as mostly mist, to watch what rains actually do to dessicated-looking slopes, to observe the transformation from bare and dry to green and alive, is to lose faith in the casual visitor's assumptions, and to revise one's appraisal of the role of people and livestock in this landscape.

High Himalayan monsoon is mostly gentle rain; rainfall event intensities are low (Byers, 1986). Monsoon and the spring rains that precede it quickly revive the vegetation, dormant in winter, which serves to mitigate the impact of the

rain that later does fall. Terracettes, like terracing, may serve to *enhance* the stability of slopes. The usually sub-parallel stock trails check rather than facilitate the downslope movement of materials under most circumstances. It may be that hoof compaction here, as in the Andes, also serves to reduce erosion. In environments where the needle ice of the cold season perpetually lifts and disaggregates soil particles, making a surface more susceptible to erosion, treading and consequent compaction have a positive effect (Perez, personal communication, 1987). In consequence of these and perhaps other factors, measured erosion rates in Sagarmatha National Park are relatively insignificant for most sites (Byers, 1986).

Except where deeply incised trails could undermine the stability of the surfaces of some steep slopes and create a risk of slope failure, as between Pangbuje and Fortse (Vuichard, personal communication, 1984), it appears that the potential contribution to erosion by both people and livestock is limited. Certainly the added human increment, given the inherent mobility of these mountains, is infinitesimal.

It appears, then, that traditional Sherpa practices, including the actions taken by and for livestock, carried out over many generations, are responsible for the human transformation of today's Khumbu landscape. Although the long presence of Sherpas and their beasts in Khumbu has shaped vegetation and superficial topography, it cannot be considered to be a major factor in large-scale geomorphic processes.

But new forces are involved in reshaping this environment. Contemporary processes are escalating human modification and accelerating the rate of change. These forces come both from outside the Sherpa world and from within Khumbu, where the social and economic changes of the last few decades are reflected in new people-environment interactions.

### *Contemporary Environmental Impact*

Although it seems unlikely that tourist demands for forest products have yet significantly affected most Sagarmatha



National Park forests, tourists and development projects are certainly implicated in environmental transformations of a range of magnitudes.

*Forests, Tourists, Stone* Tourists, both mountaineers and trekkers, *do* require wood for cooking. Despite national park regulations which forbid camp and cooking fires for trekking groups and expeditions, many groups continue to violate these rules, which are a relatively recent innovation and follow many years of unregulated use of fire by tourists. Often the fires of trekking groups burn with impunity, either because the camp kitchen is sufficiently remote to elude scrutiny, or because of special under-the-table arrangements made with park personnel (once quite common, according to local reports, but increasingly rare). Cooks prefer to use wood fuel to the dirty, recalcitrant kerosene stoves that are the primary alternative. Kerosene is not only dirty, but dangerous, and leaves a disagreeable taste. Wood fires are more familiar, manageable, and produce better food, in the typical cook's view. Treks and expeditions may have a kerosene budget that can be turned to meet other expenses if the trek staff gathers its own fuel-wood. Khumbu Sherpas, particularly in a strategically placed village like Pangbuje, have made substantial profits from fuel-wood and timber sales to expeditions and other groups (N. W. Sherpa, 1979). There are, in short, many incentives to violate park rules. Trekking agency offices in Kathmandu may claim that their policy is to use stoves in accordance with national park regulations and good conservation practice, but even the most closely supervised kitchens of the most committed and conscientious group leaders are likely to use wood fires at some times.

There are, as yet, no regulations that address the use of wood fires in Sagarmatha National Park hotels and tea-houses. In the busy season, a Nauje hotel may use as many as three back loads (of thirty to forty kilos each) of fuel a day—enough to supply a private household for several weeks. National park rules direct the fuel-collection activities of each village to specified areas of forest; for Nauje, to forest

across the Dudh Kosi on the lower slopes of Tamserku. It is likely that many Nauje hotel-keepers, with hired staff to send, cut most fuel-wood in the prescribed manner. But in other areas, particularly in the higher elevation *phu*-turned-hotels, it is illicitly cut green juniper that fuels the tourist fires. It is probable that this demand, and a three-decade history of unregulated expedition appetite for fuel, sometimes in massive amounts (as for the 1963 American Everest expedition, with twenty-two members and almost 1000 porters), has radically modified high altitude forest in well-travelled areas. There is confirmation of this in a comparison of juniper forest in two locations, approximately analagous in altitude and aspect: the slope above Tuglha at the nose of the Khumbu glacier and the slope above Absona and Khalemu where the Lunag Glacier terminates and the Bhote Kosi begins. Herders and traders pass the juniper forest of the Bhote Kosi drainage site, hundreds of Tibetan refugees passed by after 1959, but no tourists are allowed here. The Khumbu Khola site is within a harvest-day's march of Everest Base Camp. Juniper on the trail to Everest is significantly sparser, and shows evidence of regular and recent hacking; tea-houses and hotels here are flanked by large piles of green branches. On the off-route site two drainages to the west, juniper cover appears much more complete and extends higher. People in the *chusa* here make most of their fires with dung, dry, dead juniper, and other shrubs, which are available within the distance of an easy stroll from the household hearth. There is fuel enough for people to sometimes light fires just for warmth—almost unheard of elsewhere in Khumbu.

The repression of high altitude juniper forest is the probable result of years of overuse by tourist groups. A newer process threatens a different plant: the cushion-form perennials of the alpine zone. These plants, of several genera including *Stellaria*, *Saxafraga*, and *Arenaria*, are dormant in winter. They are easily dislodged with a kick from the dry winter earth and offer a compact mass of desiccated vegetation that burns almost as well as dung. The exploitation of cushion plants for fuel is apparently a very new

practice, and so far has been reported only for the hotel-*phu* around Gokyo. The commercial collection of morphologically and ecologically similar plants in the Andes is feared to have serious environmental repercussions: the plants are very slow-growing, and are important both to surface stability and as a nursery site for establishment of the new plant (Perez, personal communication, 1987). The continuation or expansion in this practice in Khumbu could be expected to be similarly unfortunate.

The Sagarmatha National Park population has been augmented in recent years by people other than tourists. Lowlanders staffing the bank and other government offices in Nauje have their own needs for fuel. So do the substantial staffs of the national park and Livestock Development Farm, and the police and army units stationed within Sagarmatha National Park. Allegations of illegal woodcutting by members of these groups are commonly heard from Sherpas.

Traditional Sherpa demands on fuel-wood resources have thus been swelled by the advent of tourist visitors and newly enlarged classes of non-Sherpa residents, and new patterns of fuel exploitation have probably affected the distribution of subalpine forest types. The added increment of even legitimate fuel collection surely adds to the potential for forest degradation that must be imminent, if not yet evident.

The environmental influence of tourism and other new developments extend beyond in vegetation changes.

Tourists inspire other environmentally disruptive activities in addition to stepped-up wood collection. The hotel business has made new demands on Khumbu resources, particularly in the use of building materials. The big new hotels that are the hotelier's dream require considerable timber and stone. Although most building lumber comes from Pharak (where ill-regulated, accelerated timber-cutting threatens even the relatively fast-growing forests of these lower elevations), stone is a local product. Quarrying has been essentially unregulated. The inconvenience and expense of long-distance transport of heavy building rock means that the closest sources are most heavily exploited. There is no scarcity of rock in this landscape. But there is some question

about slope stability in places such as those near Nauje that have suffered indiscriminate extraction of substantial amounts of rock. Trail-side boulders are likely objects for the stone mason, and the pit left behind when the rock is removed represents a raw wound in the slope which is extremely vulnerable to further disturbance and likely to be the site initiating erosion.

*Hydroelectric Projects* A more substantial, if ephemeral, environmental transformation followed the development of hydroelectric facilities in Sagarmatha National Park. One such project, the Austria-sponsored Namche Micro Hydel ('hyd'-ro 'el'-ectric) Project located at Thamo, has involved major excavation and alteration of the channel of the Bhoté Kosi. The project's impact began before construction, with the increase in porter traffic to Sagarmatha National Park required by the facility's massive needs for materials. Pressure on fuel-wood for fires of porters was intense all along the route from the roadhead, which advanced during the course of construction until it reached Jiri, a loaded porter's trip of perhaps seven days. Although the project was designed to operate without impoundments as a run-of-the-river generating facility, a portion of the flow was to have been redirected into a stream-side channel cut into a colluvial slope on the right bank. Inadequate stream-flow data produced an under-built facility which suffered several expensive and delaying wash-outs even before the 1985 *tshoserup*, which almost completely wasted the many months and millions of dollars of preliminary work.

There remain both the remnant of the diversion channel, now many feet above the river's changed course, and plans to proceed with alternative hydroelectric generating schemes. New project designs, in common with the defunct Thamo project, call for overhead power transmission cables. This will add a new element to the Sagarmatha National Park landscape, one that strikes many as not only inappropriate in the setting of a national park, but also ill-advised, given the vagaries of Khumbu weather and the vulnerability of over-ground power lines.

A smaller scale hydel project for Nauje itself relied on minimal intervention in the stream that supplies electricity-generating energy and on underground lines. Except for a penstock in stream and small power station, this UNESCO/HMG-sponsored facility's environmental impacts have been indirect and perhaps positive. The plant is a prototype, a small-scale facility intended to meet local energy needs: a fuel-wood alternative that was to save many trees that would otherwise have fuelled Sherpa fires. Over-optimistic projections, inadequate advance planning, and insufficient stream-flow data have marred the plant's operations and threatened for a time to finish it off. A plant promoted as providing electric stoves to all of Nauje's hotels has fallen far short (just four of twenty hotels enjoy the day-time use of one-burner hotplates). Electric lights provided to almost every house in Nauje were extremely erratic in the first year of operation; this failure capping widespread residual resentment following the facility's installation period created considerable ill-will within the village population. Subsequent modifications of the generating plant and introduction of low-wattage bulbs have reduced the problems with the lighting part of the system, and most Nauje people are finally happy with the *bijuli* (Nepali: electricity) project. Inequities in the allocation of bulbs and outlets, such as the dazzling illumination provided the hotels of prominent citizens contrasted with the single forty-watt bulb barely brightening more modest people's homes, are accepted with good grace by most Sherpas.

Questions raised when electric lighting for Khumbu was mere speculation have yet to be answered. If people have an easy light source, will they stay up later and burn more fuel? What is to prevent the use of electricity for other uses incompatible with the national park? Personal familiarity with pre- and post-electricity Nauje confirms that people do indeed stay up later. Nauje villagers keep their lights burning until the power is turned off, at 10.00 p.m. In consequence, perhaps, they rise later in the morning. Life in unelectrified villages operates on a schedule that Ben Franklin would approve, but people in Nauje, according to other villagers,

are now lazy. The question of whether more wood is burned in consequence remains unresolved. For most households, fuel-wood is a precious, hard-to-come-by resource; if a light keeps you up later with school-work or spinning, you may dress more warmly but you are unlikely to maintain a fire for warmth or late-night snacks. Hotels are a different story, for electrified trekkers do seem to stay up later and continue their demands on the kitchen fires (hotel stove electricity is supplied by a separate grid and operates only during the day). It is clear that enterprising Sherpas will not readily accept the intended limits of household lighting. Nightly videos at one hotel drew crowds of young people in the spring of 1985, and several households have experimented with radios and space heaters brought from Kathmandu. Such unanticipated load demands led to some of the early problems with insufficient generating capacity, and will in all likelihood continue to plague the system (Shaeffer, personal communication, 1984).

#### *Further Consequences of Development*

The variety of development-induced environmental impact is indeed wide. The unintended ramifications of well-intentioned projects extend beyond hydroelectric power development.

One could argue that among the most significant man-related agents of erosion operating today in Khumbu is the commuting schoolchild. The role of children in removing vegetation, cutting trails, and otherwise disturbing the stability of steep slopes exceeds any other agent in some areas, notably between Nauje and Shyangbuje—the path taken twice daily by Nauje children going to school in Khumjung. About a hundred children from seven to eighteen make the trip six days a week except during winter vacation and other holidays. They travel in groups, often by age cohort, and while they may move pretty sedately up the 400 metres to Khumjung, they come down in a rowdy hurry. Established paths offer very little in the way of challenge to Sherpa schoolchildren, especially the ten-to-fourteen-year-olds, who lead each other pell-mell downhill

with no regard for obstacle or incline. They knock rocks, pull up plants, kick up dirt, and raise a lot of dust as they head for home at the end of the day. No yak moves with such abandon. The paths they take cross an area subject to many other pressures, including the market-goers of Khunde and Khumjung, fair numbers of tourists, Nauje grazing stock, and the yak farm's substantial herd. Not surprisingly, it is an area of deeply incised trails and evidence of much material in motion (Plate 8).

It is unlikely that Sir Edmund Hillary anticipated increased erosion as a consequence of establishing the school at Khumjung, but it is often this sort of unlooked-for by-product that represents the most serious threat to the integrity of the Khumbu landscape.

*Implications of Changing Traditional Practices* New ways of dealing with the land have followed the new opportunities available to Khumbu Sherpas. This is evident in the patterns of forest and other resource-exploitation that are part of the Sherpas' entrepreneurial response to Sagarmatha National Park tourism. Of more environmental moment, perhaps, are the implications of new livestock-related land use practices.

Changes in Sherpa animal husbandry are many and far-reaching. There has been a decline in the old pattern of large *nak* herds owned by few, specialist owners with extensive supporting property. Many newcomers have taken up livestock ownership. Some, like the new *nak* owners in Thamichok, are interested in breeding calves for sale; others, in those villages with good access to the opportunities provided by tourists, have acquired *zopkio* or yak to use as pack-stock. These stock-owners once met their minimal subsistence needs for manure and milk with a cow or *dzum*. But the chance to profit on the labour of pack animals makes good business sense in the increasingly monetarized economy of Khumbu. This is especially true given the minimal maintenance costs of keeping a few *zopkio*.

If new owners lack the land and access to resources that supported the traditional livestock economy of Khumbu, that is no obstacle; common-land grazing is available to

anyone willing to turn a deaf ear to the objections of neighbours. Traditional controls on the use of these lands depend for effectiveness on the cooperation of the community of users. There are no teeth to the restrictions of the *di*. A *nawa* may impose a fine, traditionally *chaang* or a small fee, but no-one can make the violator pay up; and when a village full of stock-owners disregards the old controls, what can be done?

'Nauje people let their animals stay all summer and graze on our lands', complained Khunde and Khumjung villagers during Yerchaang in 1984, 'Why should we leave our grass for them—maybe we should stay ourselves.' By the summer of 1985, stock-owners from formerly well-regulated villages were ignoring the proscriptions of the *di*, moving their animals up-valley when they felt like it, bringing them down when it suited them. In Thamichok, the *nawa* gave up in disgust and people have quit planting buckwheat: the cattle are returned too soon, before buckwheat harvest, and help themselves to the crop.

One conscientious Khunde stockman, the current *nawa* and hereditary stock-keeper, had a wandering *zopkio* that turned up in a field in Pharak, where it had eaten its way through a good part of the crop. His owner retrieved him, very shamefaced, and willingly paid a substantial fine. The effectiveness of traditional controls depends on such a response. In contrast, a Nauje family heavily involved in tourism and fairly new to *zopkio* ownership responded with indifference to objections to their animal's violations of others' grazing. One of their *zopkio* was found murdered.

Contemporary animal husbandry practices are compromising a traditional management system which permitted a sustainable coexistence of Sherpa livestock and landscape. There are clearly social costs to this erosion of the traditional system. What of effects on the environment?

*Environmental Implications of Changing Livestock Management.* The extent of major environmental damage legitimately attributable to the effects of historic animal use appears to be minimal. The potential for significant damage, given a



continuation or escalation of present patterns and trends, is perhaps another matter—although it is important to bear in mind that natural forces in this active mountain landscape are responsible for environmental disturbance many orders of magnitude beyond that which yak and Sherpa might contrive at their most industrious.

New management patterns mean that highland pastures, except along heavily travelled tourist routes, are used more lightly today than in years past. This effect was first pointed out by I. M. Bjonness (1979; 1980a), who also noted the increased concentration of cross-breeds around villages. This concentration results from a number of interacting factors: the relative fragility of cross-breeds which keeps them from high winter grazing; the reduced availability of labour tending stock, which prevents owners from sending their animals out; the need to keep pack-stock handy for work; a disregard for the traditional mechanisms that insured better seasonal distribution of livestock. The environmental consequence is the constriction and intensification of grazing and trampling. These pressures may be assumed to lead to increasing proportions of vegetation resistant to grazing, reduced vegetation cover, and perhaps, to increasing compaction, terracette formation, and trail incision near villages.

Animals permitted to graze too low too early jeopardize not only field crops like Thami buckwheat, but also wild-land range resources. Cattle allowed into village grazing grounds in late summer are both eating into their winter account and short-circuiting the mechanisms of maturation, seed set, and nutrient storage of the plants they feed on, reducing future productivity.

Changed patterns of harvesting grass by Sherpa also affect productivity of range vegetation. An early *ritsa* harvest means wild hay grasses are cut before they have finished their annual cycle, presumably undermining their chances for persistence.

To Sherpas, particularly those with long involvement in animal husbandry, the negative implications of changing practices are clear. The increasing competition for mid-elevation grass and grazing that is created by these new

patterns, coupled with growing awareness among Sherpas that departures from tried tradition come at a cost, have provoked responses within Khumbu which may represent the best chance for sustainable animal management in the National park setting.

Perhaps the best example of such a response comes from Thamichok. The summer of 1986 was a bad one for stock-owners here. There were unprecedented heavy stock losses during spring and early summer, when animals of all kinds, but especially yak and *nak*, succumbed to health problems manifested by weakness, lethargy, and acute diarrhoea. Most afflicted animals were seriously undernourished, even thinner and sorer-looking than usual for Sherpa livestock in spring. A number of factors contributed to the shortage of range forage and fodder that brought about these nutritional problems. The year 1986 was preceded by a poor season for hay throughout Khumbu. The flood of 1985 not only destroyed a number of hayfields, it also seriously disrupted the economic base of a number of stock-owning households. The weakening of the Thamichok *di* system, already apparent a year or two earlier, reached a nadir in 1986: there were no appointed *nawa*, Thamichok animal management was strictly *laissez-faire*, and Nauje people made free use of Thamichok lands for both range grazing and premature harvesting of hay. Stock-owners with newly acquired Tibetan *nak* were struggling to feed their animals in direct competition with established owners. The consequence: too many animals depending too heavily on inadequate resources, and an inevitable collapse of the population.

Several prominent Thamichok householders called a meeting to discuss the situation, which resulted in the creation of a 'di committee' directed to designate new *nawa*, re-establish the effective operation of the *di*, and to procure cooperation from Nauje stock-keepers. The meeting involved both secular and religious authorities (including the Thami Rimpoche, *pradhan pancha* of the Nauje-Thamichok panchayat, and the national park warden) but was fundamentally a grass-roots enterprise which promised a positive outcome.

This reassertion of community control seems an important step towards sound resource management in Khumbu. The economic opportunities of the tourist era, while distributed quite widely throughout Khumbu, are opportunities available to the individual entrepreneur. Traditional Sherpa society and economy had a place for the enterprising individual; the spirit of free enterprise operating in trans-Himalayan trade is little different from what required to succeed in the contemporary tourism-dominated economy. But in the last few years individuals have flourished at the expense of community interests, as evidenced in the environmental and social impact of changes in the livestock economy. Thamichok's recent misfortunes brought that message home and led to the reactivation of a system developed long ago to address this incompatibility of private and public interest.

## NOTES

1. This site may be resurrected because of a post-*tshoserup* re-routing of the trail up the Bhote Kosi, which brings the main road right through a once-remote settlement.

2. This demonstrated readiness to make such an inference on the basis of inadequate information has several possible explanations. The incentive to portray an image of serious and escalating environmental problems in the Khumbu area by proponents of a national park has been discussed. Misinterpretation of local sources is a possible contributory factor. As an example: 'Nauje' in Sherpa is interpreted to mean 'dense forest' (*nau* = ?; *je*, or *che* = big). A visitor making inquiries into the former state of forest would be likely to ask a resident of Nauje, as I did, whether the slope above the village used to have more trees. The response would be a resounding yes; why, within the last twenty years, many trees were cut from above the village. Aha! Evidence for rapid, recent deforestation. Perhaps other visitors failed to clarify this information. I ultimately did, and thus learnt that the recent tree felling occurred not on the walls of the village amphitheatre itself, which have been bare of most trees for a generation at least, but above on the slopes of Shyangbuje where massive clearing preceded construction of the airfield.

3. These determination of resistance to grazing are based on extensive investigation over a four-year period of vegetation in all areas subject to grazing pressures of varying degrees. Although the data collected in the

course of these investigations are still being analyzed, the familiarity with the flora gained from this intimate acquaintance supports these general interpretations.

4. Except for the plantations, themselves but imperfectly protected from access to livestock, there are essentially no vegetated areas protected from grazing that are analogues for grazed sites. Thus interpretations of the effects of grazing on particular types must be based on inferences about relative grazing intensity.

## *Summary and Prospects*

**T**HIS account of livestock and landscape in Sagarmatha National Park, Khumbu has explored Sherpa animal husbandry in the broad context of changing society and environment. The natural landscape and its traditional use by Sherpas have been described. The changes Khumbu has experienced in the last few decades have been outlined. The effects on environment and society of the changing relations between people and mountain landscape have been discussed, for it is only through an awareness of the interconnections of people, livestock, and landscape through time and change that the patterns evident today are intelligible and interpretable.

Khumbu is a place that has been subject to human manipulation for a long time. Whether that manipulation began hundreds or thousands of years ago, it has transformed much of the lowland landscape. This transformation has not been a result of unbridled exploitation, but of land use practices that in some instances at least allow for optimum use of resources while mitigating the impact of exploitation. The result is a probably radical conversion of natural vegetation that has enhanced its utility to people with livestock, without creating serious environmental degradation.

Human users have unquestionably altered vegetation, destroyed wildlife and habitat, and in countless other ways reworked a high mountain ecosystem. But mountains are environments in which radical change is endemic, brought about by the instability in many elements of the natural system. The flora of the subtropical, summer-watered eastern Himalaya is more resilient than most observers experienced in

other mountain landscapes have guessed. For these and other reasons, human impact on these mountains stop well short of the severe environmental deterioration that has been postulated for the Himalayas in general and for the Everest area in particular.

Misperceptions by outsiders of the role of people in this landscape, particularly an over-emphasis on damage attributed to recent activities and inadequate understanding of long-term effects, have led to hasty and sometimes inappropriate corrective measures. These have sometimes exacerbated and often failed to address actual environmental problems and their causes.

The Sherpa world has changed in the last three decades with the opening of Nepal's borders and the advent of tourism. There are new pressures on Sherpa society and economy, and on the natural environment of Khumbu. These are pressures that traditional Sherpa systems have sometimes been unable to accommodate. But within traditional mechanisms of social control and resource regulation are likely to be found effective, appropriate, acceptable strategies for coping with actual—rather than inaccurately inferred—environmental problems.

Given the complex, interconnected relations of environment and people through history that shape this environment, given the international objectives for Khumbu as national park and Natural and Cultural Heritage Site, and given the plans and prospects of the Sherpa themselves, what is in store for Sagarmatha National Park and its residents?

National and international agendas prescribe for it one future as a preserve of natural environment and traditional culture with the world's highest peak as its centre-piece. It is unlikely that most Sherpas, given a voice, would propose an identical future. For the most part they are happy to take advantage of the opportunities that public attention to their homeland brings. But many Sherpas are reluctant to pay the price of artificial, externally imposed regulation of their way of life. Although a western observer may perceive no conflict in the long-term interests of Khumbu Sherpa and international park advocates (both, it would seem, being served by a

sustainable use of natural resources and minimal disruption of the high mountain environment), Sherpas don't always see it that way. Instead they may be conscious of an erosion in traditional freedoms, a disruption in the accustomed social order, and arbitrary interference in decision-making properly left to the people themselves. For many the insinuation of the government's authority through the national park is an unwelcome intrusion, to be resisted where possible.

Is there a way of reconciling the international agenda with the disenchanted Sherpa's? How can the real problems of environmental deterioration threatened by present patterns in use by Sherpas and visitors alike be addressed so as to ensure the willing cooperation of visitor and resident? Any prospect for successful national park management requires answers to these questions.

My own provisional answers, to apply to livestock-related planning, centre on the following set of considerations.

Anyone attempting either to make sense of what goes on in Sagarmatha National Park or to decide what should go on must recognize the matrix: the interplay of environment, history, and people that is Khumbu. Livestock management, like any other element of Sherpa society and economy, needs to be viewed in relation to the Sagarmatha National Park environment, to local history, and to every other element of Sherpa society and economy. It is especially important to acknowledge the information in the landscape itself: the antiquity and pervasiveness of human modification; the resilience of a flora that is not, after all, so very like the mountain flora of higher latitudes; the inherent instability of a high mountain environment where nature plays a far more significant role in erosion and other environmental disturbance than man ever could.

Planners must accommodate traditional practices to the maximum extent possible. This can be presumed to be an objective of the 'natural and cultural heritage area' designation for Khumbu. But there is a utility in keeping room for traditional ways of doing things beyond their preservation as museum-pieces to display to the curious. Sherpa strategies for survival are a tested response to the opportunities and

constraints of this particular landscape. They are not, clearly, adaptations free from environmental impact, but they do not represent a dire threat to the stability of the Sagarmatha National Park ecosystem, as has been suggested too often, and they *do* provide a workable, sustainable way of dealing with a difficult environment.

The park in its planning must take care if not to foster traditional systems of resource regulation, at least to avoid sabotaging and circumventing such systems. Park experiments with *shing gi nawa* recruited from individual villages to implement rules on wood use, although perhaps not modelled on a truly Sherpa institution and initially fairly ineffective, may well prove to be a sound approach to one problem in Sagarmatha National Park. Park support for village *di* systems and *nawa* could also be useful and might mitigate the erosion in such traditional mechanisms that the establishment of the park has helped to bring about.

Except for this light-handed, diplomatically proffered reinforcement of existing institutions such as the *nawa*, park administrators might turn their attention from traditional Sherpa practices and take a more active role in regulating external sources of environmental and social disruption. There are a number of possible targets.

His Majesty's Government's Livestock Development Farm is a project hardly compatible with the goals of a national park. The farm's herd adds substantially to the negative effects of Khumbu livestock, competing for grazing and hay supplies, displacing traditional users from their accustomed use areas, and concentrating the impact of grazing and trampling on one of the seriously over-exploited areas of the park: the Nauje-Khunde-Khumjung triangle centred on Shyangbuje. The farm's object—*nak* production—is inappropriate today when Tibetan *nak* enter Khumbu relatively freely, and doubly inappropriate given the questions about the environmental impact of current animal husbandry practices. An even more direct conflict in purpose comes from the farm's long-standing advocacy of wolf eradication, its reluctance to abide by park guarantees for the protection of wildlife, and its eagerness to experiment



with alien—and inappropriate—species of grass. Yak Farm personnel represent an additional demand for fuel and water resources and have shown a disregard for both Sherpa and national park values.

Another target of national park attentions might be organized expeditions and treks. Expeditions have long been criticized for littering, a problem that continues year after year despite government regulations. Various proposals have been made for dealing with this cosmetic problem, including fines or refundable deposits to be returned following an inspection of base camp (M. N. Sherpa, personal communication, 1982), but nothing has yet come of them. Far more serious expedition-related problems involve the timing of all expeditions and consequent competition for labour and disregard for the pre-harvest *di*. When expeditions arrive in late summer, potential portering animals must be available in Nauje if their owners are to have a chance at a job; *zopkio* and yak are brought down early from high pastures, and kept close at hand—often on lands under the *di*'s protection. Animals portering for expeditions, as for trekking parties, are usually left to fend for themselves once the day's work is finished. Except during the winter, they are not offered more than a token feeding and must make a meal of the grazing available within a tired *zopkio*'s walk from camp. Camps are made most often in the same few established spots; grazing and trampling are concentrated in such places. Large expeditions can thus create significant impact. It is perhaps time for His Majesty's Government's Ministry of Tourism and Department of National Parks and Wildlife Conservation to apply the force of law to a pattern already evident in international expeditions: a trend away from the monster assaults of the past and towards more streamlined, 'alpine style' ascents of the big peaks. The savings would extend beyond reduced livestock pressure: less loss of life of Sherpas and other Nepali staff, reduced illicit demand for wood supplies, and reduction in the disruption of local markets by the inflationary buying power of big expeditions, among others.

A more problematic target of possible park intervention is

one less-immediately linked to external forces, and more likely to generate controversy within Khumbu. But it is also a source of increasing environmental problems and occupies a niche which, if not new, has at least been substantially reshaped by the new order in Sagarmatha National Park. This is the *zopkio*. Changed patterns of *zopkio* numbers, ownership, and management appear to be at the root of contemporary environmental problems created by livestock within Khumbu. Restrictions on *zopkio* ownership and use might be one step to take to reduce the possibility of increased environmental damage.

Any attempt at such regulation by the park must include the active, substantial, significant, broad-based participation of the local population. There is no other way of achieving either equity or effectiveness in regulation. The realities of such participation, as of any utopian approach to the complexities and uncertainties of the management of Sagarmatha National Park, present an enormous array of problems. First among them, perhaps, is politics. If the local investiture of power does not provide for the equitable representation of community interests, Sherpa involvement loses its effectiveness. The individual interests of an entrepreneur whose success is expressed in both political influence and ownership of *zopkio* may not be compatible with the community interest—and park interest—in regulated resource use and the long-term sustainability of Sherpa animal husbandry. Yet often in Khumbu, political influence comes packaged with just this kind of success at capitalizing on tourism's opportunities, *zopkio* ownership conspicuous among them.

Whatever the difficulties of achieving broad local involvement in park planning may be, the impediments to the implementation of planning without such involvement are worse. Awareness of a need to inform the Sherpa population of park goals, to include them, at least in some capacity, in the planning process, and to educate Sherpas to an understanding of Western perceptions of the value of natural resources has been around almost as long as plans for the park (Lucas *et al.*, 1974). Past park wardens have held town

meetings and taught conservation education in the schools, not, however, with significant effect. Missing from these efforts has been the acknowledgment of what Sherpas themselves know about Sagarmatha National Park and could teach alien planners. A reciprocal exchange of information and ideas, rather than the programmatic indoctrination that has been attempted in the past, might prove a more effective approach to increasing the compatibility of national park and Sherpa objectives.

Certainly planners need to recognize the limitations of their own understanding of this environment and what goes on in it. There may be a great deal that Western techniques of scientific analysis can explain about Khumbu, but to date at least, such information is essentially absent—this study and others cited here notwithstanding. On the basis of some familiarity with place and people, I have ventured to suggest some avenues for the focus of future park planning, but neither in my work nor in anyone else's is there substantial evidence on which to base any prescriptions for modification of traditional Sherpa practices. Too little is known about this extraordinarily variable mountain landscape and the effects on it of human use.

A readiness to prescribe on the basis of insufficient information shows up in almost all work on Khumbu. Examples from the park's past have been cited throughout this study. It is a continuing problem. For example, the praiseworthy study of slope processes in Khumbu sponsored by the Mountain Hazards Mapping Project and superintended by Alton Byers identified high rates of soil loss from only one high elevation sampling plot: 'Dingboche Pasture'. Byers reports:

. . . grazing and continued harvesting of shrub *Juniperus* sp. for local and tourist fuelwood needs have, in general, created much more severe levels of landscape degradation than those found at lower elevations . . . strict land-use policies for certain regions above 4200 metres will be necessary to prevent further environmental degradation. (Byers, 1986, p. 86).

As far as grazing effects are concerned, on the basis of a single plot monitored for a single season—more substantial data than informs most such pronouncements, to be sure—and

without considering either the implications for Sherpa users or the actual mechanisms by which conditions could be improved, Byers is willing to prescribe 'strict land-use policies'. It is clear, given other findings of this study and others, that juniper cover is affected by recent changes in resource use. But the effects of grazing around Dingbuje are another matter. Byer's sample site, a slope just north-east of the settlement, is of steep, unconsolidated morainal material subject to recurrent rock-fall from the cliffs above; a reduced cover of vegetation evident here may be largely a product of these factors alone (Vuichard, personal communication, 1984). Enigmatic circulation patterns divert moisture-bearing winds at the confluence of the upper Imja Khola and Khumbu Khola, so that Dingbuje is considerably drier than the near settlement, Pherije. (This helps to account for the production of barley at Dingbuje, and its absence in wetter Perije.) According to legend, Dingbuje was the first site of settlement in Khumbu, and has thus been subject to use for a long period. These factors are all likely to contribute to the reduced vegetation cover and appearance of over-use that are evident around Dingbuje. But extensive sampling and repeated observation of this site in the course of my study suggest even here the operation of the resilience that characterizes the Everest landscape. Diversity of grass is extremely high, suggesting that grazing pressures are not severe; juniper regeneration is conspicuous, with the highest frequency of seedling establishment recorded on any of 300 Khumbu sites. The Himalayan junipers are opportunistic species, effective colonizers of bare mineral surfaces such as are found above Dingbuje and on other analagous moraine slopes. But they are slow-growing at these altitudes. People are in residence at Dingbuje throughout the year, except for the duration of the *di*. Dung is at a premium for field fertilizer, and thus the juniper here has been subject to heavy fuel and ritual demands for many generations.

Given this complex history of use, the characteristics of the site itself, and the importance of Dingbuje fields to Sherpas, it seems premature and possibly dangerous to generalize from one short study to regional goals for management.

On the basis of my research, I am willing to assert that there is no place in Sagarmatha National Park where livestock pressures are responsible for serious environmental degradation. It is possible that a continuation of new patterns of livestock management has the potential for more significant environmental damage. It is likely that the most effective mechanisms to address the environmental and social disruptions attendant on these new patterns are the Sherpas' own. Intervention from outside, unless based on a far more comprehensive understanding of livestock and landscape than has been evident to date in Sagarmatha National Park, is unlikely to be accepted or effective.

Future park planning, in contrast to too many of the past prescriptions for park management, needs to be informed by awareness of the intricacy and antiquity of man-landscape relations, and must take into clearer account the needs and goals of park residents. Careful analysis of the workings of the environment must be substituted for the unsupported assumptions that have influenced park policy in the past.

Early park advocates were in a hurry. Their sense of impending crisis pushed them into hasty fixes for the problems they thought they saw. But more recent, longer-term work supports a different scenario: human disturbance of the Sagarmatha National Park environment has not reached crisis proportions. The major human influences here are historic. Contemporary processes should be watched and may portend an escalation of environmental problems, but there need be no sense of urgency so great that it leads to hasty, unsubstantiated, and ineffective policy measures that needlessly disrupt the lives of a people who have been at home in Khumbu for many generations.



# Glossary

- angi* traditional woman's garment  
*arak* distilled spirits  
*bijuli* electricity (Nepali)  
*bikas* development (Nepali)  
*carsang* white yak or *zopkio*  
*ceru* yellow  
*chaang* grain beer  
*chakhang* Sherpa toilet  
*charra* woven mats  
*chaunri* yak and/or yak-cow cross-breeds (Nepali)  
*che* dung  
*chorten* funerary monument  
*chungma* cattle of all kinds  
*churook* high-pile woven bedding  
*churpi* dried cheese  
*chusa* 'cattle place'  
*chuu tak* water mill  
*chuti* yeti that preys on livestock  
*dekchi* cooking vessel  
*dhanur* narcotic plant of the potato family  
*di* limit on access to fields and range  
*dimzo* *zopkio* with *nak* mother  
*dongmu* *nak* or *dzum* with white spot on forehead  
*dzum* female hybrid yak-cow or *nak*-bull  
*gonda* (*gompa*) monastery  
*gunsa* winter settlement  
*gyawa khamba* Sherpas of recent Tibetan origin (resident in Khumbu for two to three generations)  
*hat bazar* weekly market  
*jtoma* root used in ritual and traditional cuisine  
*khamendo* descendants of 'polluted' Tibetan castes  
*khatumbu* wild dog  
*kirkhong* Sherpa for dwarf Tibetan cattle (*Bos taurus*)  
*kuma* female cretin, also used as a pejorative  
*kuwa* male cretin

- lhakhang* household shrine room  
*lhang* bull  
*lhawsa* shaman  
*loh* white turnip  
*mani* prayer  
*mar* butter  
*maru* red  
*mhutil* front apron  
*mikeroo* 'light eyes', Westerners  
*miti* yeti that preys on people  
*momo* filled noodle dumpling  
*mun* unit of weight  
*nak* female yak  
*nakpa* *nak* owner  
*nawa* village official  
*pangtsa* alpine meadow (usually *Kobvesia pygmaea*)  
*pati* measure of volume  
*peimar* mixture of flour and butter  
*pembu* tax collector  
*Phangnyi* festival  
*phetam* one and a half storey dwelling  
*Pheuba* recent immigrants from Tibet  
*phu* cattle-keeper's highland settlement  
*pu* soft yak hair  
*puzzie* woven bags made of yak hair  
*rhu* patrilineal clan (literally 'bone')  
*rigi* potato  
*ritsa* wild-land grass, hay  
*rongba* lowlanders  
*saa* copper cauldrons  
*saam* single-storey dwelling  
*saluk* leaf litter  
*serkam* solids from heated buttermilk  
*serken* snow leopard  
*shing gi nawa* forest guardians  
*sho* yoghurt  
*shyakpa* Sherpa stew  
*somar* soft cheese  
*talukdar* tax collector (Nepali)  
*tenjhug* autumn rain  
*tarra* buttermilk  
*tengyur* Buddhist text  
*tenkhang* two-storey structure  
*thakpa* rope  
*thanka* religious fabric painting  
*tsampa* ground, parched barley



- tsangapmi* hay-cutter  
*tshetar* dedicated domestic animal  
*tshirpa* long guard hairs of yak and *nak*  
*tshoserup* rupture of a glacial lake (*jokulhlaupt*)  
*tsilu* sheep fat  
*tsitsa* hay from walled hayfields  
*urang* *zopkio* with cow for mother  
*yawa* Tibetan butcher caste  
*yemba* descendant of slaves  
*yerchang* summer beer  
*yerjhug* summer rain  
*yerma* cattle lactating for more than one year after calving  
*yersa* summer place  
*yurma* weeding  
*zebu* *Bos indicus*  
*zopkio* male hybrid yak-cow  
*zopkio pik* first-year *zopkio* calf  
*zopruk* first year *dzum* calf



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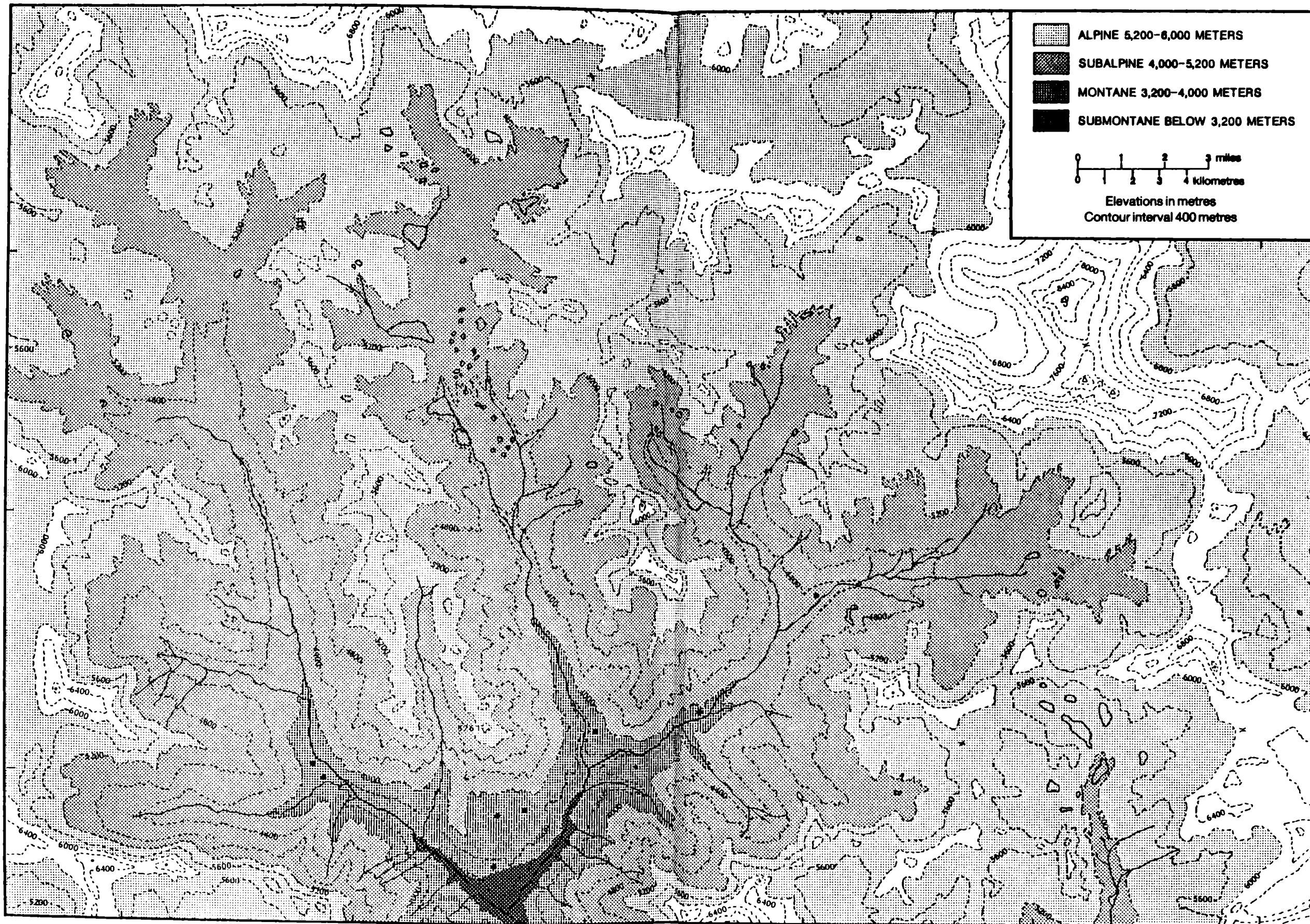
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ALPINE 5,200-6,000 METERS  
SUBALPINE 4,000-5,200 METERS  
MONTANE 3,200-4,000 METERS  
SUBMONTANE BELOW 3,200 METERS

0 1 2 3 miles  
0 1 2 3 4 kilometres

Elevations in metres  
Contour interval 400 metres

Vegetation Zones