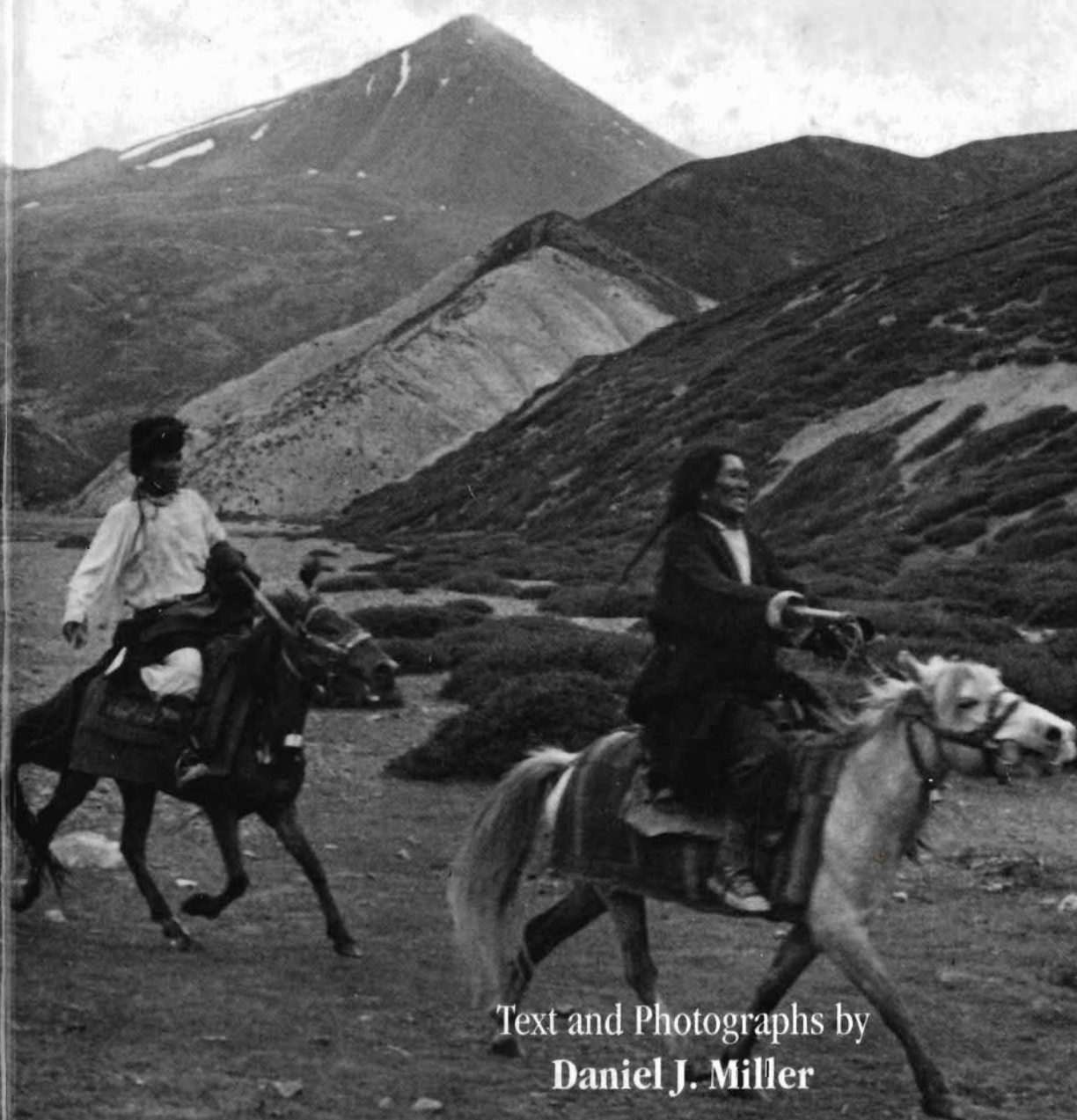


Fields of Grass

Portraits of the Pastoral Landscape and
Nomads of the Tibetan Plateau and Himalayas



Text and Photographs by
Daniel J. Miller

Preface by
George B. Schaller

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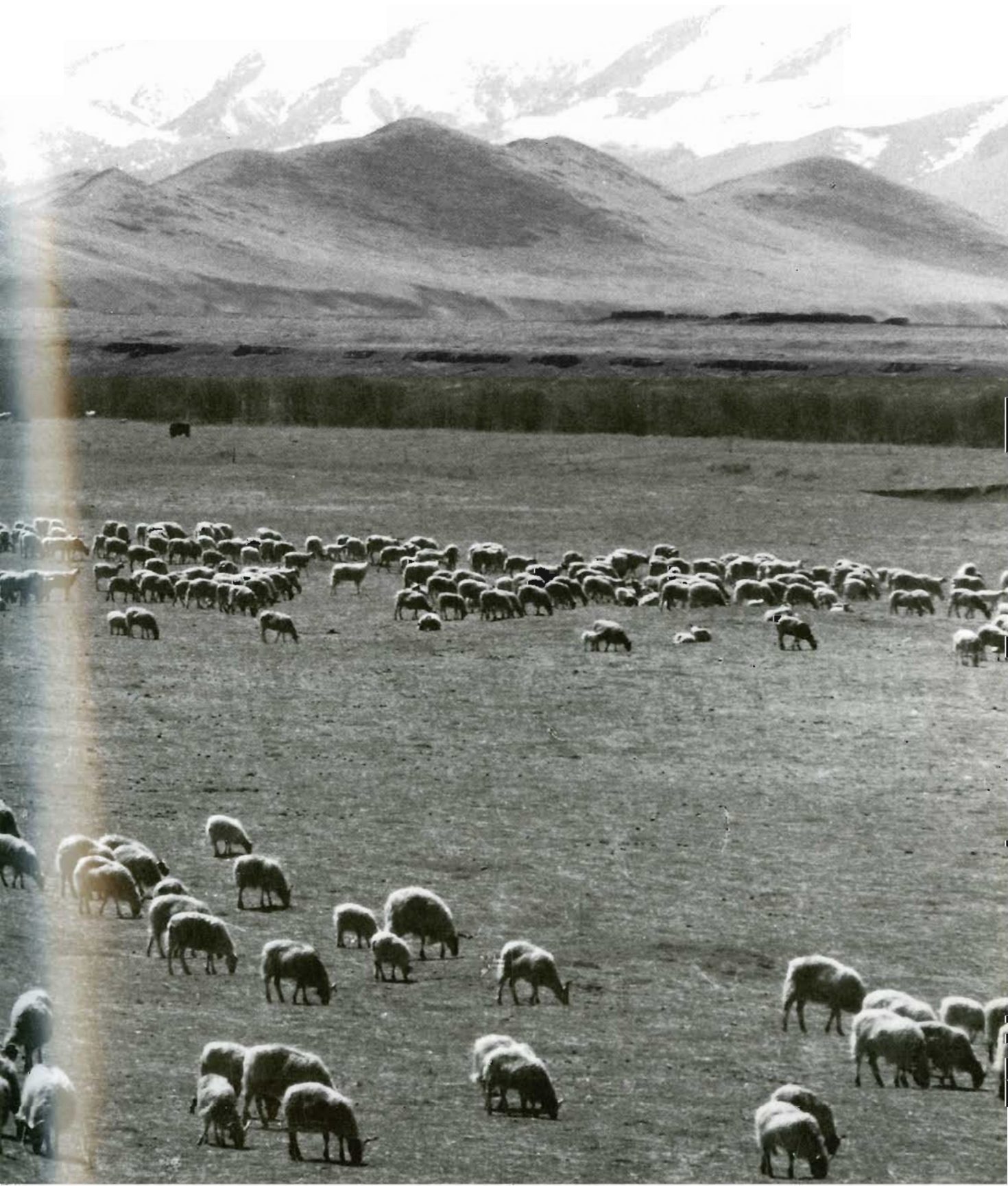


*"..... nothing can bring back the hour
of splendour in the grass, of glory in the flower."*

Wordsworth, W., 1807



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Daniel J. Miller

International Centre for Integrated Mountain Development



For Cynthia and Ashley

Foreword

Of the 4.3 million square kilometres that the continuing mountain range of the Hindu Kush-Himalayas and Qinghai Tibetan Plateau covers, nearly 80 per cent consists of rangelands. Rangelands include grasslands, steppes, deserts, and lush alpine meadows. Varied fauna and flora are among their important characteristics. The harsh conditions in most of these areas allowed only a low population density and enforced a nomadic lifestyle in response to climatic and altitudinal variations.

The remoteness of the high altitude rangelands and the marginal political influence of its inhabitants on national decision-making processes for some time were also reflected in the limited attention ICIMOD was able to devote to this typical mountain ecosystem. With the adoption of the First Regional Collaborative Programme for the Sustainable Development of the Hindu Kush-Himalayas in 1995, rangeland management became a fully fledged programme of the Centre, and Mr. Daniel J. Miller became ICIMOD's first rangeland management specialist. We were fortunate that Mr. Miller brought with him not only extensive knowledge and experience on the rangelands of this region, but also the skills of a highly accomplished photographer.

It is unusual for ICIMOD to publish a document that is based on photo essays; yet for the rangelands it is logical enough. First of all, few scholars and development workers have ventured into these rangelands for long, if ever. The camera's eye tells us a great deal that a topographical map or even satellite images cannot. And, secondly, this unique ecosystem warrants accelerated attention by a broader constituency/audience – one not having a primary interest in the more technical documents that ICIMOD and Mr. Miller have also produced.

Mr. Miller worked hard to produce this special edition as a testimony to the riches of the Tibetan Plateau and the Himalayan rangelands. Each photograph tells a story in itself and, in addition, is the narration of the author. In his own introduction, he has comprehensively noted his initiation, progress, and experiences into work on the rangelands and has given a generous list of acknowledgements.

We are very grateful to Daniel Miller for all the extra work he put into the preparation of this book, even after he left ICIMOD in late 1997. His successor, Ms. Camille Richard and all of us at ICIMOD no longer have a problem in explaining the importance and beauty of this important part of ICIMOD's 'territory'.

I would like to take this opportunity to thank George Schaller on behalf of ICIMOD for contributing a special preface for this edition. It is a fitting indication of the calibre of the work undertaken.

Egbert Pelinck
Director General

Author's Preface

In the fall of 1974, I first went to Nepal and trekked into the Himalayas. For four years I travelled throughout the mountains of northern Nepal, living and working with yak herders. I spoke Nepali and, after a couple of years, Tibetan. I was able to talk to nomads in their own languages about yaks and grasses and the challenges they faced in herding animals for a living in some of the world's highest elevation rangelands. Having grown up on a dairy farm in southern Minnesota in the United States, I found yak herding a fascinating way of life and the pastures the yaks grazed in a remarkable landscape. Compared to Guernsey cows in a field of clover, yaks running down a glacial moraine with their tails waving in the air exhibited a grandeur that matched the mountains in which they were found. I also found Tibetan-speaking herders an engaging group of people and believed that since they had been herding yaks across this landscape for centuries, and were still doing it, there must be many things about their lives worth learning. I started investigating Himalayan rangelands and pastoral production systems. I also began to take photos of the nomads, the animals they herded, and the land in which they lived.

At that time, Tibet was closed to foreigners, but throughout much of northern Nepal, the landscape and the pastoral production systems had close affinities with Tibet. Many of the herders spoke Tibetan and in some areas, such as Dolpo in northwest Nepal, the culture probably exhibited more traits of typical Tibetan culture than it did in neighbouring Tibet at the time. In my journeys, I sometimes travelled with yak caravans going to Tibet to trade, although I had to stop before crossing the border. From mountain passes in Nepal I could see across the ridges to the vast Tibetan plains fading into a blue horizon, and my desire to learn more about those Tibetan grazing lands was whetted. After four years in Nepal I returned to the United States committed to preparing myself for further investigations of Himalayan and Tibetan rangelands, animals, and Tibetan nomads. I went to Montana and worked as a cowboy and pursued graduate studies in range ecology at the University of Montana.

With skills acquired to handle horses and cattle, training in range management, and with an attraction for open spaces and a pastoral way of life, I returned to the Himalayas in 1983 to work on range-livestock development and wildlife conservation programmes. In Nepal and Bhutan, I quickly saw that the traditional pastoral way of life was changing. In some cases, since I was involved in development activities, I was even an instrument of the changes to which herders were trying to adapt. Documenting in photographs the daily lives of the herders I worked with became a way to portray, to others unable to visit the remote pastoral areas, the nomadic way of life and the transformations nomad society was going through. Photographs also provided a valuable record of the landscape and the uses it had been subjected to by people and their livestock.

In 1988, I had the opportunity to actually see Tibetan grazing lands for the first time. I travelled to the Tibetan area known as Amdo, in the present day Qinghai Province of China. These rangelands, in the northeastern part of the Tibetan Plateau, have always been considered some of the best grazing lands in Central Asia. It did not take long for me to develop an appreciation for them too. Since then, I have spent many months of every year working in either the Himalayas or Tibetan Plateau. My journeys have taken me from the cold deserts of the Kunlun Mountains on the northern edge of the Tibetan Plateau to the subtropical savannas of the southern Himalayas, and from the lush Songpan grasslands in northwestern Sichuan Province of China in the east to the dry steppes of western Tibet. I was fortunate to have the opportunity to travel to, and work in, such a vast region. A number of the areas I travelled in are still closed to tourists and require special permits. My aim in these

journeys was to develop a better understanding of the ecology of the rangelands and the dynamics of the pastoral production systems. I was also often trying to design development programmes that would improve livestock productivity and the livelihoods of the people dependent upon livestock while, at the same time, maintaining the productivity of the rangelands and conserving wildlife.

In reviewing the photographs I had taken over the last twenty years, I realised that I had amassed a large collection of images of rangelands, nomads, and the pastoral way of life in the Himalayas and on the Tibetan Plateau. I had opportunities to visit pastoral areas that few people had been able to and acquired considerable information about these unique grazing lands. I thought it would be worthwhile to try to organize my photos into a book in order to portray the Tibetan pastoral landscape and nomadic society to others. Since so little is known about these pastoral areas, I also wanted to share some of the data and insights I had also assembled. The purpose of this book is to present images and information about the rangelands and nomads of the Himalayas and Tibetan Plateau. Improved understanding of the complex dynamics of this pastoral ecosystem should help us to make better decisions in the future about how these grazing lands should be developed and managed.

The photographs presented here span a period of twenty-two years from 1975 to 1997. Some of the very first photographs I ever took are portrayed here. Cameras and photographs are a tool I use to understand the ecology of the rangelands, the same way I use binoculars or spotting scopes to have a better view of the landscape. Many of these photographs provide a valuable record for assessing vegetation changes on the rangelands over time. Some of them already date back far enough to be useful for repeat photography now and others should prove useful in the future.

This publication would not have been possible without the support of the International Centre for Integrated Mountain Development (ICIMOD). I express my sincere appreciation to Egbert Pelinck, Director General of ICIMOD, for encouraging me to take on this work. Greta Rana, Senior Editor, ICIMOD, deserves special thanks for her work on this document. Thanks are owed to Sushil Joshi for the excellent layout and to Asha Kaji Thaku for preparing the maps. I also would like to express my thanks to all the herders throughout the Himalayas and Tibetan Plateau who took me into their tents and homes and shared with me their unique lifestyle. Finally, I must express my sincere love and appreciation to my wife, Ai-Chin Wee, for enabling me to take off for long periods of time to pursue my work in the Himalayas and on the Tibetan Plateau. During my absences, she raised our daughters and maintained a home for the family.

Daniel J. Miller
Beijing

Preface

Most people think of the Himalayan region, if they think of it at all, in terms of a desolate panorama of glacier-covered peaks upon which mountain climbers struggle towards an elusive summit. Often overlooked is the fact that these mountains also harbour a splendid variety of plants and animals, many of them unique to these uplands. I have spent three decades studying wildlife along the sweep of ranges from the Karakoram in Pakistan east to the Himalayas of Nepal and north across the Tibetan Plateau where sombre plains and rumpled hills stretch to the horizon. There I have marvelled at slopes of rhododendrons in red flower, snow leopards gliding among crags, herds of Tibetan antelopes migrating across the steppes at 5000 m, and massive wild yak bulls standing like black totems on ridge tops.

The mountains are also home to several million people. Human existence seems insignificant in relation to the vast terrain – a cluster of huts, a nomad tent – yet its impact upon the landscape is pervasive. Forests have been cut for timber and razed for firewood, stony fields extend upwards to 4,300 m, and pastoralists penetrate the most remote valleys in search of grazing for their livestock. Degradation of habitat has exposed the soil to wind and rain, causing erosion as well as flooding in the lowlands. The hunting of wildlife for subsistence and sale is so intensive that large mammals have almost everywhere been decimated and some species are endangered. The remnants have retreated into the most inhospitable terrain.

I had come to the mountains to study large mammals, everything from markhor and blue sheep to wolf and brown bear. But it soon became clear to me that any knowledge gained through research would also have to benefit the conservation of the species. To understand nature is not enough; any biologist also has the moral obligation to help protect what he or she studies. I realised too that large samples of the mountain ecosystems, each with its unique assemblage of plants and animals, needed to be protected in national parks and reserves. Fortunately all countries in the Himalayan region have now established a network of reserves that, if properly protected and managed, will preserve fragments of their natural heritage.

However, humans are part of the mountains and will continue to be, even within reserves. Almost everywhere they live beyond their means, ecologically speaking. The goal of conservation must be to find a balance between the needs of people and their livestock and the environment with all its biological diversity. The difficult challenge is to integrate conservation with the social, spiritual, and economic values of the local people. The whole land-use pattern must be examined before innovative programmes of forest, rangeland, and wildlife management can be developed; programmes that suit the communities and are continually adapted as circumstances change. The task is immense and daunting, for it means finding viable alternatives for scarce resources and better economic ways of using them. Instead of being able to focus on an intriguing research problem, a biologist becomes a politician, fundraiser, social anthropologist, livestock specialist, and takes on many other roles to promote and implement conservation.

In recent years, I have confronted this problem on a large scale in the Chang Tang, a vast, treeless upland, most of it above 4,500m in elevation in the northwest part of the Tibetan Autonomous Region. It is one of the last great rangelands in the world, one that has not yet been degraded. But each year there is greater emphasis on development – more roads, more livestock production, more fences that impede the movements of the Tibetan wild ass and other wildlife across the open range. Yet nomads, livestock, and wildlife need to live there in the ecological harmony that is the basis of Tibetan Buddhism.

Daniel Miller has accompanied me on two of my dozen journeys to the Chang Tang to evaluate the conditions of the rangelands. His concerns were similar to mine: how can the cultural traditions of the nomads and the magnificent wild herds be preserved for the future? In *Fields of Grass* he has extended this concern to the whole pastoral area of the Himalayan region. With evocative photographs and insightful text he draws attention to a little known and neglected part of the world. The uplands are changing rapidly as global economic forces intrude into even the most isolated hut or tent. A Sanskrit proverb states that “ *a hundred divine epochs would not suffice to describe all the marvels of the Himalaya.*” At the very least we must preserve these marvels for future generations.

George B. Schaller
Wildlife Conservation Society
New York

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Introduction

It was winter in the highlands of Nepal, the time of year when the yak herds are down out of the alpine meadows and being herded around the villages, and as my porters and I walked around a bend in the trail on the way to the Langtang Valley, we ran right into a yak. It was the first yak I had ever seen. It was a big, black bull yak with tremendous horns that curved out, up, and then swept back again. The yak had long tresses of hair hanging from its belly that brushed the ground, making him appear even more burly and imposing. Judging from the number of ropes that a bunch of long-haired, wild-looking men had tied on him, and the fact that he was standing in the middle of the trail shaking his massive, horned head and waving his bushy tail in the air, this was one yak with which you did not want to argue. My lowland porters quickly dropped their loads and scrambled to safety in the rocks above the trail, and I promptly followed their evasive course of action. Laughing and shouting, sanguine of what they were doing, the bunch of audacious yak herders urged the big bull yak past us and on down the trail, yanking on the ropes every once in a while to prevent the yak from running away.

As we collected our loads, I asked my porters who these people were and where were they from? *"They are bhotia(s), Tibetan-speaking yak herders, and they live way up in the mountains, in the pastures with their herds of yaks. They have brought this yak bull down to sell to Tamang farmers to breed hill cows to produce chauri, yak-cattle hybrid crosses."* Thus, on a mountain path in Nepal, 23 years ago, I received my first lessons about yaks and Tibetan nomadic pastoralism.

Nomadic pastoralism has been described as one of the great advances in the evolution of human civilisation. It is an adaptation by human groups to grassland areas of the world where extensive livestock production is more supportive of human culture than cultivated agriculture. When people specialise in animal husbandry that requires periodic movement of their herds, they are known as nomadic pastoralists, or, simply nomads. Nomadic pastoralism originated about 9,000 years ago in the mountainous Zagros region of Southwest Asia (Northeast Iraq and Northwest Iran), with the domestication of goats and sheep. Concomitant with cereal cultivation, which began somewhat earlier in the same general area, animal husbandry quickly dispersed from this centre of origin northwards and eastwards. With the domestication of the horse about 6,000 years ago, in the fertile steppes of south-western Russia, nomadic pastoralism as a way of life really started to expand throughout Central Asia.

Although there is evidence that strongly suggests cultivated agriculture began about 9,000 years ago in the Upper Yellow River basin of northern China independently of influences from Southwest Asia, the development of nomadic pastoralism on the Tibetan Plateau was most certainly shaped by nomads radiating into the Tibetan grasslands from Central Asia to the west and north. These early Central Asian nomads would have brought goats, sheep, horses, and many pastoral technologies with them. The Tibetan black, yak-hair tent, for example, is strikingly similar to the black, goat-hair tents of nomad tribes in Afghanistan, Iran, and Iraq. Nomads, believed to have originated from the Kurgan Culture of southern Russia, expanded into the Indian subcontinent about 3,500 years ago, bringing with them not only the practice of nomadic pastoralism but also the Indo-European languages that they spoke. Groups of these nomads would undoubtedly also have penetrated into the Western Himalayas, where alpine meadows would have provided good grazing for their livestock.

Other Central Asian nomads moved into the north-eastern Tibetan grazing lands. The *Yuezhi*, an Indo-European speaking nomadic tribe, was known to reside in the Qilian Mountains and Gansu Corridor region on the north-eastern edge of the Tibetan Plateau in the second millennium B.C. They must have moved into the region long before, probably following trails into the Tibetan frontier region that later became the famous Silk Route. In the second half of the third century B.C., early Mongol nomadic tribes, known as the *Xiongnu*, coalesced into a powerful steppe empire in the Ordos region, not far from the north-eastern edge of the Tibetan Plateau. The *Xiongnu* would have had influence in the Tibetan grasslands, as they were often allied with various *Qiang* tribes against *Han* Chinese military forces pushing into what is now the Gansu Corridor.

The *Qiang*, nomadic tribes believed to be the ancestors of the modern Tibetans, were known to the Chinese in the Hsia dynasty (2205-1766 BC). They were numerous and widespread throughout the grasslands of the north-eastern Tibetan Plateau, in what are now the eastern Qinghai and western Gansu Provinces. It is believed that the *Qiang* originated from tribes of the Neolithic *Yangshao* culture, based in the Wei Valley of the Upper Yellow River basin, who moved west into the Tibetan highlands in the fourth millennium B.C. and took up a mixed hunting-gathering, herding, and agricultural way of life.

Although sheep, goats, and horses were probably brought into Tibetan grazing lands from the west, the domestication of the yak undoubtedly first took place in the highlands of the Tibetan Plateau, most likely through the skills of some very daring *Qiang* hunters. Chinese scholars claim yak husbandry is about 4,000 years old. Whenever it began, the domestication of the yak was the single most important factor in the evolution of nomadic pastoralism on the Tibetan Plateau. Domesticated yaks enabled mankind to really start exploiting Tibetan grazing lands and to earn a livelihood on the grasslands. Although Tibetan nomads also raise other animals, they place so much value on the yak that the Tibetan term for yak, *nor*, is also translated as 'wealth'. The yak, in many ways, defines nomadic pastoralism throughout most of the Tibetan Plateau and in the Himalayas.

The Tibetan nomadic pastoral area encompasses a huge area. It includes the high-elevation areas of the Himalayas in Bhutan, Nepal, and India (including Ladakh) in the south and stretches north for almost 1,200 km across Tibet to the Kunlun and Qilian Mountains in the Qinghai and Gansu Provinces of China. In the east, it begins in the Songpan grasslands of north-western Sichuan Province and extends west for 2,600 km to the far western part of the Tibetan Autonomous Region of China.

Nomadic pastoralism on the Tibetan Plateau and in the Himalayas is distinct ecologically from pastoralism in the semi-arid pastoral regions of Eurasia and Africa. There, it is normally aridity, or the lack of water, that separates cultivated agricultural areas from nomadic pastoral regions. Nomads in these semi-arid areas are pushed into the marginal grasslands where low and erratic rainfall precludes the growing of crops. The key ecological factor that sets Tibetan nomads apart from pastoral nomads in the rest of Eurasia and Africa is altitude, not lack of water. In Tibet and the Himalayas, at altitudes that generally lie above 3,500 m and in environments so harsh that crop cultivation is impossible, expansive grazing grounds are found. Tibetan pastoralism has flourished because there has been no encroachment into the grasslands by farmers trying to plough up the land and plant crops. Here, across a vast area, nomadic pastoralism has been the primary human activity for thousands of years. Unlike the vast, open steppes of Eurasia, Tibetan grazing lands are divided by rugged mountain ranges, deep river valleys, and large lake basins that give rise to great diversity in topography, climate, vegetation, and pastoral production practices.

Across this vast, high-elevation plateau of Asia and in the neighbouring Himalayas, the nomads share many things in common. First, the landscape is strikingly similar. Whether it is on the alpine steppes near the headwaters of the Yangtze River in

south-western Qinghai Province or 1,000 km away in the marshes near the 'knee', the first great bend, of the Yellow River in north-western Sichuan Province, the landscape is comparable. It is a landscape battered by wind, frequent changes in the weather, severe storms, and remarkable temperature changes even during the course of a day. It is a high-elevation steppe environment inhospitable to most outsiders, especially those from the lowlands unaccustomed to high altitude and cold, wind-swept spaces. Secondly, pastoral production practices are very much alike, although the composition of herds varies over the breadth of the Tibetan Plateau. Almost all nomads have a base, usually the traditional winter area, and make established moves with their livestock from there to distant pastures throughout the year. Yak-hair tents are in common use throughout the region. All nomads also have strong economic links with agricultural communities outside the pastoral world. Thirdly, Tibetan speaking nomads throughout the region raise the same kind of animals: yaks, yak-cattle hybrids, sheep, goats, and horses. Livestock production plays an important role in local and regional economies. Fourthly, the nomads all share a similar language and culture. Across the Tibetan Plateau, nomads can usually communicate with each other in Tibetan, even though their local dialects may differ. Religious and cultural beliefs and practices are also similar throughout the whole region. Fifthly, the different nomadic populations across the region are facing rapid changes in their lives, brought on, for the most part, by the forces of economic development sweeping the region. Finally, nomads throughout the Tibetan Plateau and Himalayas are also addressing many similar challenges as they seek to maintain their pastoral production systems and way of life.

This book focusses on Tibetan-speaking nomads across the Tibetan Plateau and Himalayas by breaking the analysis of nomadic pastoralism into separate, but related, themes as described above: pastoral landscape, pastoral production, livestock, nomads, changes, and future challenges. This approach establishes a framework in which the important characteristics of Tibetan nomadic pastoralism in various pastoral areas can be viewed and compared. By using photographs, it provides portraits of pastoralists and pastoral production practices to help illustrate the common ground that exists in nomadic pastoralism across the Tibetan ranges.

The economic viability and environmental sustainability of nomadic pastoralism in the Tibetan Plateau and the Himalayas are under considerable scrutiny these days. Traditional pastoral production practices are often viewed as archaic by development planners and administrators. The structure of nomads' herds is often termed irrational and uneconomic by livestock specialists, and Tibetan nomads are frequently labelled backward. Nomads are widely perceived to have no system for managing their livestock's use of the grazing lands and it is thought they simply graze them on communal pasture, which leads to large, unproductive herds, overgrazing, and rangeland degradation. Heavy livestock losses experienced during harsh winters in recent years on the Tibetan Plateau are thought by many officials to be a result, for the most part, of the traditional pastoral systems that are still widely practised. Many authorities insist that, for development to be achieved in pastoral areas, nomads need to be settled, rangeland has to be privatised and fenced, livestock numbers need to be limited, and herds need to be restructured. The realities of nomadic pastoralism in the Tibetan Plateau and the Himalayas, as you will see, are much more complex.

Nomadic pastoralism across much of the Tibetan Plateau has good prospects for prospering in the future. Making the case for the economic viability and environmental sustainability of Tibetan pastoral production systems, however, requires pastoral research programmes that start acquiring long-term data on the condition of the rangelands, the changes in livestock numbers and productivity, and the adaptations that nomads have made and will continue to make.

PASTORAL LANDSCAPE





Rangelands and Yaks, Madol, Qinghai, China, 1988

The rangelands of the Tibetan Plateau and adjoining Himalayan region are one of the world's great grazing land ecosystems. Stretching for almost 3,000km from west to east and 1,500km from south to north, and encompassing about three million square kilometres, the region is one of the largest and most important pastoral areas on earth. Most of the area is above 3,000m and the climate is harsh. Annual rainfall varies from about 1,500mm on the southern slopes of the Himalayas to less than 100mm in northwest Tibet. The varied topography, altitudes, and climate give rise to great diversity in rangeland types. Rangelands include the lush, alpine meadows in the Himalayan mountains and eastern Tibetan Plateau, semi-arid shrublands of the dry valleys of Central Tibet, the spacious alpine steppes of Tibet's northern plains, and the cold, dry deserts of the Kunlun mountains. These different rangelands display a diverse assortment of plant communities, wildlife species, and various, distinct nomad cultural groups and nomadic pastoral production systems. The fact that these grazing lands have supported pastoral cultures for thousands of years while sustaining a varied and unique flora and fauna bears witness to the existence of a remarkably diverse and resilient rangeland ecosystem. Some of these rangelands, especially in northwestern Tibet, also represent one of the last notable examples of a grazing land ecosystem relatively undisturbed by man.

River and Yaks, Hongyuan, Sichuan, China, 1996 [chapter photo]





Tianzhu white yak bull, Tianzhu, Gansu, China, 1996

Rangeland and sheep, Phala, Tibet, China, 1997



Rangelands are defined as those areas of the earth which, due to physical limitations, such as low and erratic precipitation, rough topography, or cold temperatures, are unsuited for cultivated agriculture and are a source of forage for wild and domestic animals. This definition encompasses grasslands, steppes, deserts, and alpine meadows, as well as shrublands and forest areas often used by grazing animals. Rangeland refers to not only grass and other plants grazed by animals, but to all the natural resources of the rangelands, which include vegetation, animals, soil, water, and space.

Across most of the pastoral region of the Tibetan Plateau, the land is too cold and arid to support cultivated agriculture and forests. Here, fields of grass, green for only a few months of the year, clothe the rugged mountain ranges, extensive steppes, and broad valleys. Growing seasons are short and cool. Nevertheless, the grasslands nurture a rich wild fauna and a flourishing pastoral economy. The lives of pastoralists and animals, both wild and domestic, are tuned to the growth of the grass and the rhythms of the grazing lands. These fields of grass provide the theatre in which nomads and their animals interact and bring into force a unique pastoral culture - a remarkable nomadic way of life, thousands of years old, about which little is known.

Nomad camp, Zoige, Sichuan, China, 1996





Flock of sheep, Hongyuan, Sichuan, China, 1996

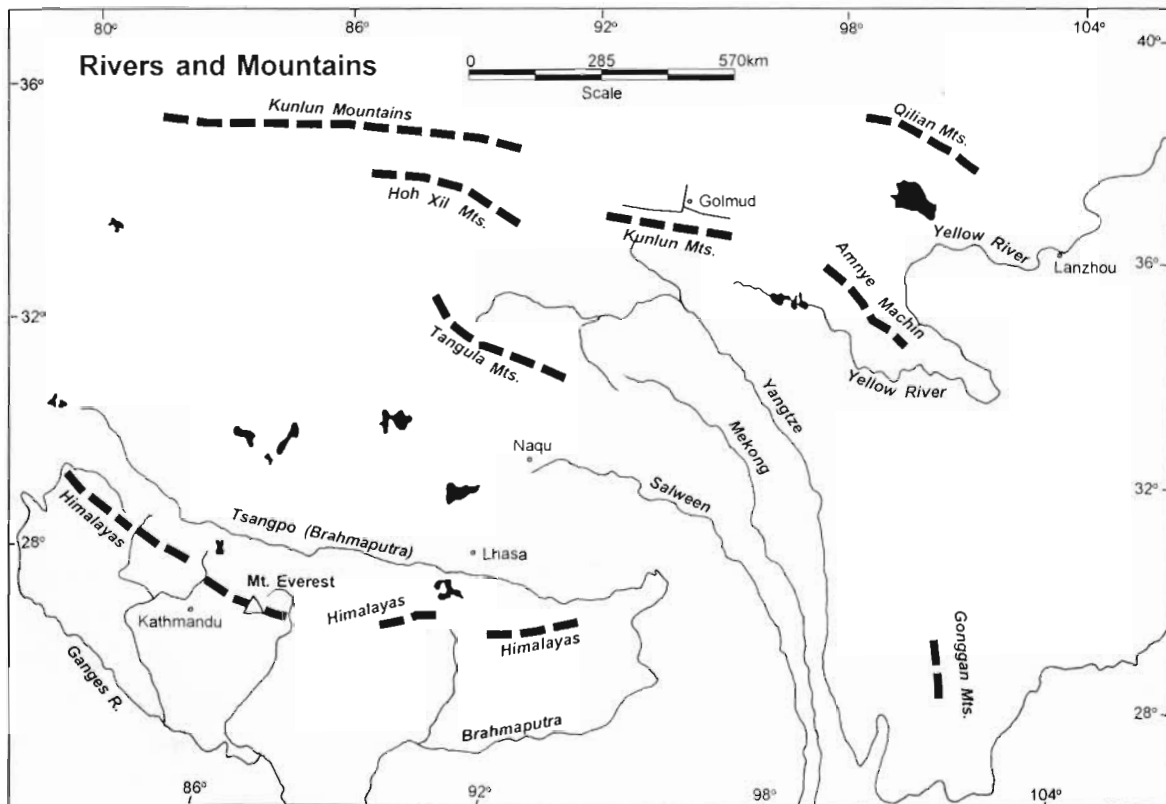



Tibetan sheep, Hongyuan, Sichuan, China, 1996





River and rangeland, Henan Mongol, Qinghai, China, 1997





Tibetan rangelands are at the heart of Asia. These grazing lands form the headwaters' environment where many important rivers have their beginnings. Here, the Yellow, Yangtze, Mekong, Salween, Brahmaputra, Ganges, Indus, and Sutlej rivers originate. The preservation and management of these river source environments have global implications, as the water from their watersheds will be of increasing importance in the future. Upsetting the ecological balance in these high-elevation rangelands will have a profound effect on millions of people living downstream. As such, these grazing lands demand respect and should be considered sacred ground.

Yaks, river, and grazing land, Hongyuan, Sichuan, China, 1996

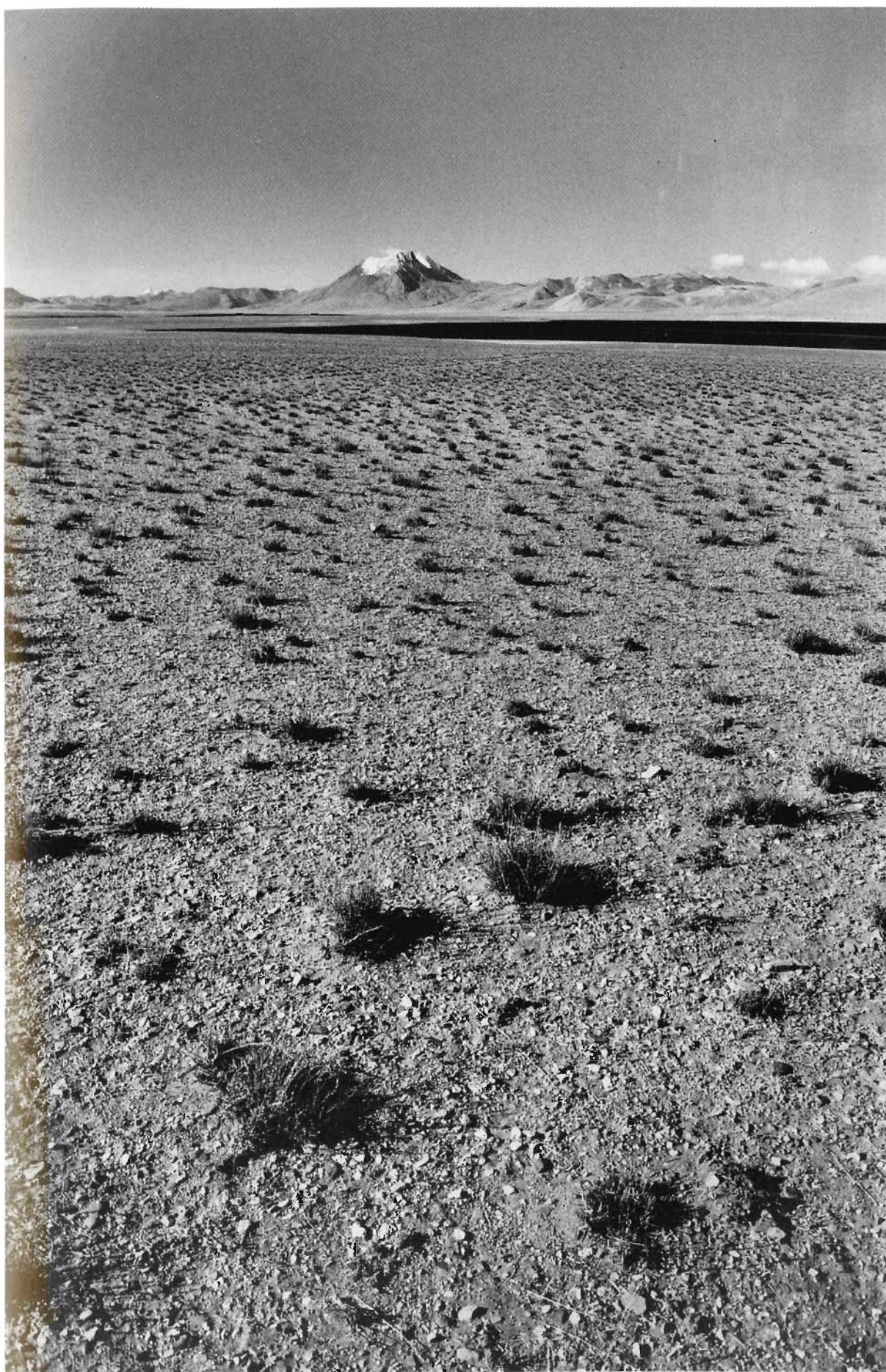




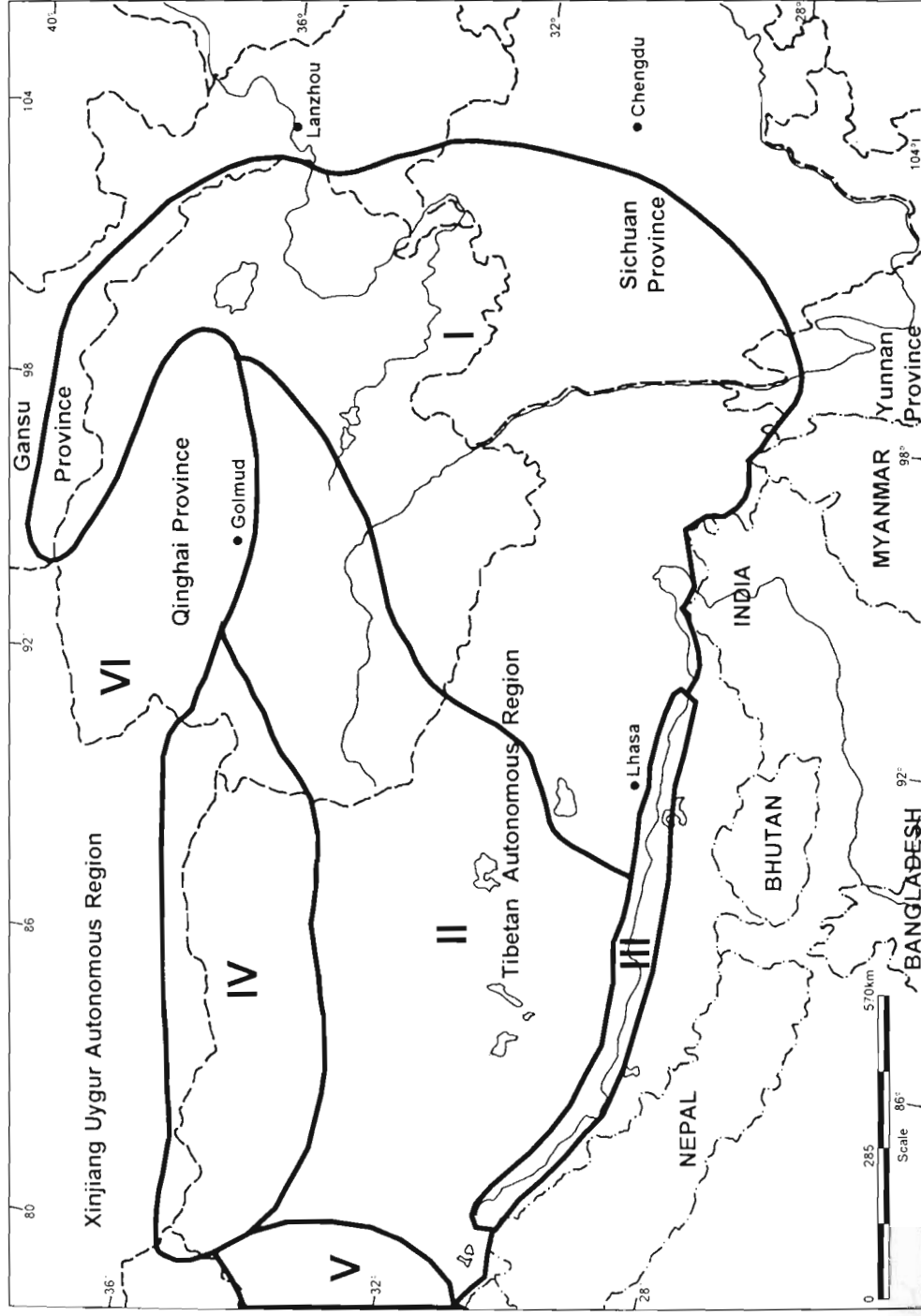
Summer storm, Chang Tang Wildlife Reserve, Tibet, China, 1994

Rangelands of the Tibetan Plateau and the Himalayas are unique, as they are the highest elevation grazing lands in the world. Much of the Tibetan Plateau is above 4,000m; some nomads maintain permanent camps at elevations as high as 5,100m. Temperatures of minus 30°C are often reached in the winter and snowstorms are common even in the summer. As such, these grazing lands are one of the world's most extreme environments and, undoubtedly, the harshest pastoral areas on earth — still used extensively by nomads.

Rangelands, diverse in structure and composition, vary from cold deserts to semi-arid steppe and shrublands to lush alpine meadows. Forest areas in the eastern Tibetan Plateau and Himalayas also provide grazing land for wildlife and livestock. Vegetation differs considerably in plant community structure, depending on altitude, temperature, rainfall, and the uses the land has been subjected to by man and his animals. Each rangeland type has its own unique assemblage of plants and animals. Vegetation variations define movements and foraging behaviour of both wildlife and livestock and influence the manner in which ungulates affect the ecosystem. Although often limited in overall plant species' richness, especially in the cold, arid steppes of northern Tibet, the rangelands are still fertile environments, providing a habitat for numerous species of wild animals, as well as grazing for domestic animals.



Rangeland and mountain range, Tsatsey, Tibet, China, 1997



Vegetation Zones of the Tibetan Plateau

- I Eastern Tibetan High-cold meadow and Scrub
- II Changtang Plateau High-cold Steppe
- III Tsangpo Valley Xeric Shrubland-steppe
- IV Northern Tibetan High-cold Desert
- V Western Tibetan Temperate Desert
- VI Central Asiatic Temperate Desert

Adapted from Chang, 1981



Rangeland, Phala, Tibet, China, 1997

These high elevation rangelands are important for a number of reasons. First, they provide water and are the source for many important rivers. Second, rangelands provide habitats for a wealth of plant and wildlife species, many of which are endangered. Numerous plants are of medicinal value and other species may provide important genetic material for future economic use. Many of the protected areas in the Himalayas and on the Tibetan Plateau are dominated by rangeland vegetation. Conserving the rich biological diversity of these lands is crucial for sustainable development, yet grazing-related issues are often the main management concerns in protected areas. Third, these grazing lands provide forage for livestock. Since cultivated agriculture is not possible on the rangelands, grazing by livestock enables pastoralists to convert otherwise unusable plant biomass into valuable animal products. As economies in the region modernise and begin to demand more livestock products, it is the rangelands that are expected to be the source for this increased demand. Fourth, many mountain rangeland environments are becoming increasingly popular as recreational sites for tourists. Tourism has the potential to not only help improve the livelihoods of pastoralists but also to contribute to the overall economic development in pastoral areas.



Grasslands with flowers, Maiwa, Sichuan, China, 1996





Early summer nomad camp, Longri, Hongyuan, Sichuan, China, 1996



Factors such as geographical extent, watershed protection, biodiversity conservation, livestock production, and economic development suggest that the Himalayan and the Tibetan Plateau rangelands should be a priority area for development; but, unfortunately, they have not been given the attention they deserve. These pastoral areas are home to millions of people who have mostly been ignored by previous development efforts, due not only to remoteness but also as a result of government policies that failed to appreciate the importance and potential of these grazing ecosystems. The lack of concern for pastoral areas and misconceptions regarding rangelands and pastoral production systems have led to a general downward spiral in the productivity of many areas, loss of biodiversity, and increased marginalisation of herders. Reversing these trends should be a priority for range researchers, policy-makers, range-livestock extension personnel, pastoral specialists, and herders.



Houses and forest, near Zamtang, Sichuan, China, 1996

Despite their extent and importance, rangeland ecosystem dynamics in the Himalayas and on the Tibetan Plateau are still poorly understood. Scientific data on ecological processes taking place throughout different rangeland types are limited. Many questions concerning how rangeland vegetation functions and the effect of grazing animals on the ecosystem remain unanswered for the most part. The socioeconomic dimensions of the pastoral production systems are also not well known. This lack of information limits the proper management and sustainable development of the rangelands.

The poor perception of rangeland environments and traditional Tibetan pastoral production systems, along with the limited support for pastoral development and rangeland resource management in the Himalayas and on the Tibetan Plateau, need to be counterbalanced by fresh perspectives and the new information emerging regarding rangeland ecosystem dynamics and pastoral production. These perceptions and innovative development paradigms suggest new possibilities for and fresh approaches to designing improved, and more appropriate, rangeland management and pastoral development programmes in the future.



Like the prairies of North America, the rangelands of the Tibetan Plateau evolved with large grazing animals. Over millennia, wild ungulates grazing on the plains of Tibet helped create a unique symbiosis between plants and grazing animals. The long history of livestock grazing on these rangelands has undoubtedly contributed to the fact that some species of grasses appear to be more resilient to heavy grazing than the native species in the same genera in North America. Many of the grasses and other plants grazed by animals are especially high in crude protein content and provide nutritious forage during the summer. Wild ungulates and livestock are able to graze enough high quality forage during the brief plant growing season to put on sufficient layers of fat reserves, enabling them to survive the winter and spring when good grazing is scarce. Thousands of years of livestock grazing have also probably resulted in considerable changes in vegetation composition that are often hard to detect and difficult to understand.

Forest and rangelands, Maiwa, Sichuan, China, 1996



Rangelands of the Tibetan Plateau and the Himalayas provide habitats for a wide variety of wildlife, especially ungulates, or large-hooved, grazing mammals. On the steppes of northern Tibet, wildlife such as the Tibetan wild ass (*kiang*), wild yak, Tibetan antelope, Tibetan gazelle, brown bear, and wolves are found. The mountains harbour blue sheep and argali along with the snow leopard and the lynx. In the mountain rangelands of eastern Tibet, where forests mix with grasslands, musk deer, red deer, white-lipped deer, roe deer, and takin are found. In the western Himalayas, ungulates such as urial, ibex, and markhor appear along with the ubiquitous blue sheep and occasional argali. In the central Himalayas, Himalayan tahr and musk deer and, on lower elevation grasslands, goral, serow, and barking deer are seen. Some of these species are among the least-known wild animals in the world. For example, Tibetan antelope are one of the earth's principal migratory animals, yet the exact location of their birthing grounds is still unknown.



Tibetan wild ass (*kiang*), Chang Tang Wildlife Reserve, Tibet, China, 1993

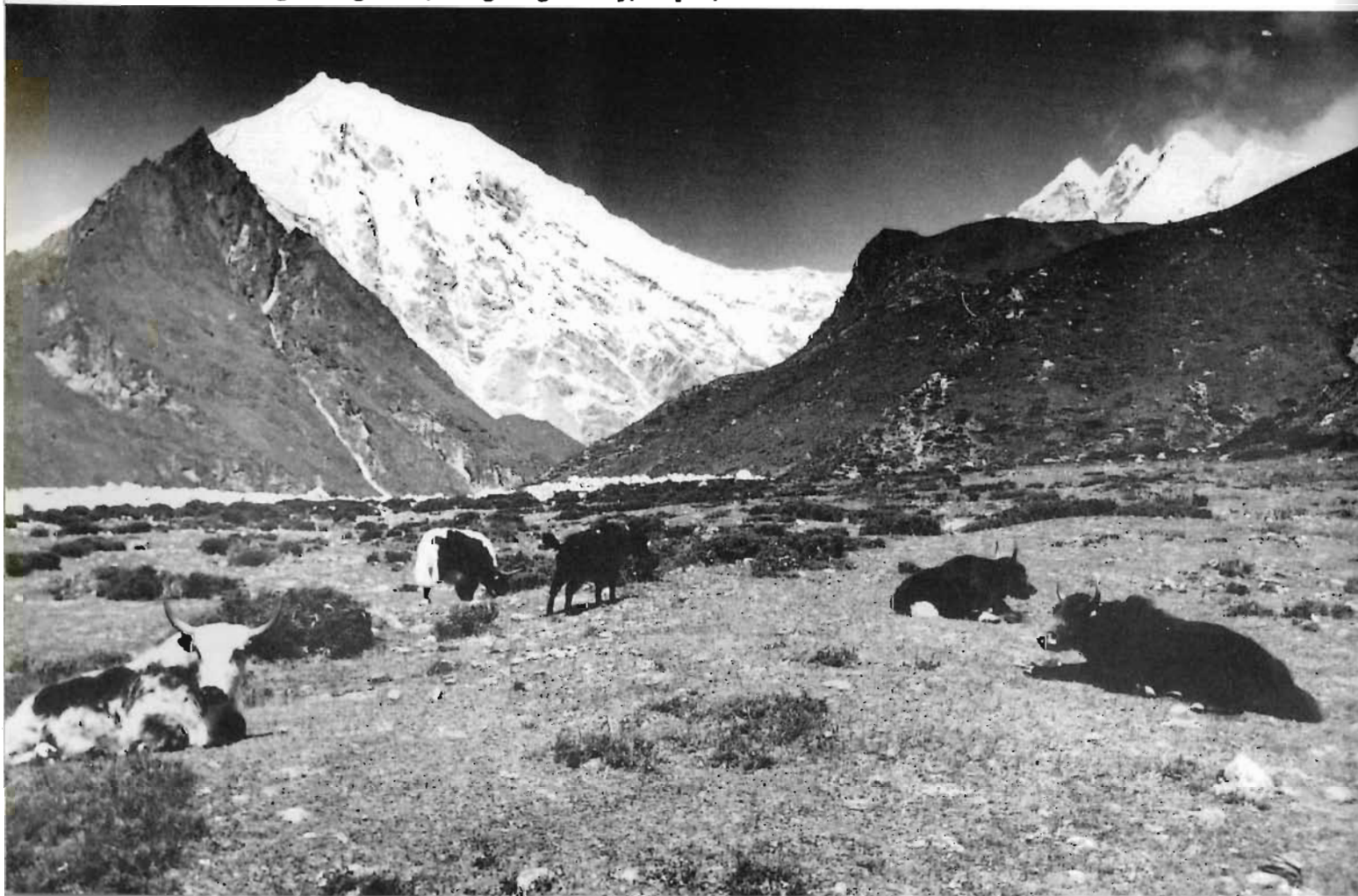
The Chang Tang Wildlife Reserve protects Tibet's remaining, principal wildlife populations and the rangelands they depend upon. It is one of the world's last great wilderness areas. In the Chang Tang Reserve, Tibetan wild ass still roam unfettered across the steppes in large herds. Wild yaks, exterminated throughout most of the Tibetan Plateau, maintain their last refuge in the mountains of the Reserve, and huge herds of Tibetan antelope still follow ancient trails on their annual migration routes. The Chang Tang Reserve provides Tibet's best hope for the survival of its wildlife.



In Nepal, about 12 per cent of the total land area of the country is classified as grassland. These grazing lands include the Tibetan-like steppe vegetation type in the Trans-Himalayan region, north of the main mountain ranges, alpine meadows, and temperate and subtropical grasslands. Over one-half of the grassland area is located in the alpine zone. Large areas classified as forests and shrublands are also used for grazing by livestock. Including these grazing lands, it is estimated that about one-third of Nepal is rangeland.

Northern Nepal has a long history of pastoralism. For example, the Dolpo region has recorded history going back to the 10th century. Pastoral production practices vary widely throughout the rangelands of Nepal, but across most of the northern part of the country, pastoralism is Tibetan in character with yaks and yak-hybrids the important animals in the production system. There are few 'pure' nomads in Nepal who rely solely on livestock for a livelihood. Rather, most inhabitants of the rangelands are 'agro-pastoralists' who combine animal husbandry with the cultivation of crops. Trans-Himalayan trade was also an essential element in the economy of many of the agro-pastoralists in northern Nepal.

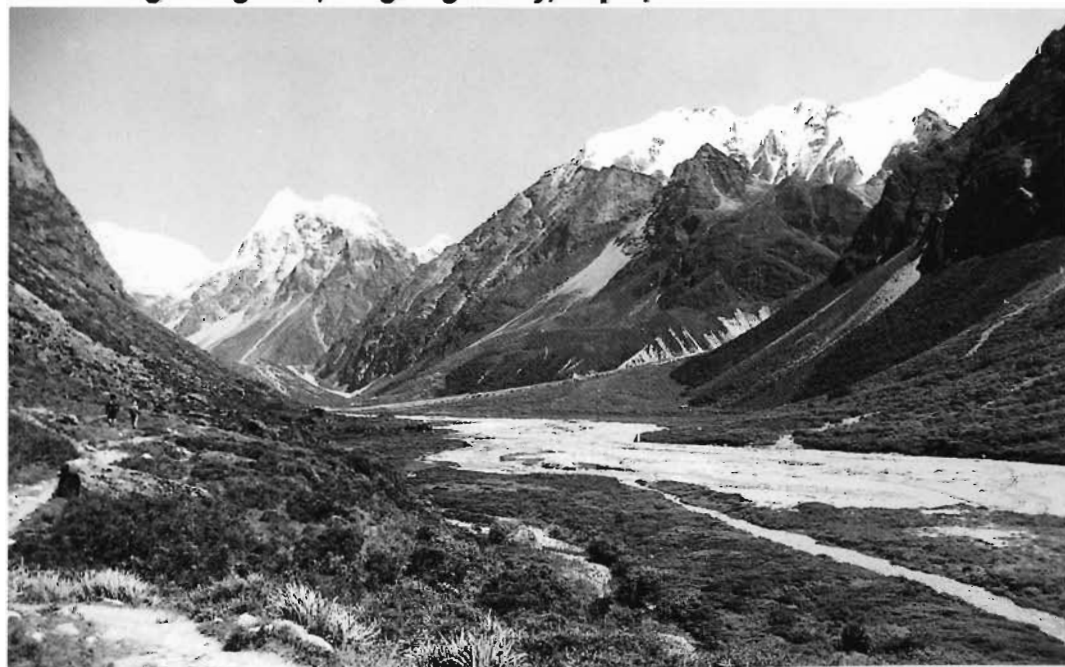
Yaks and grazing land, Langtang Valley, Nepal, 1992





Rangelands, Mustang, Nepal, 1992

Mountain grazing land, Langtang Valley, Nepal, 1992



In the Himalayas of Nepal, rangelands predominate on the valley floors and mountain slopes amidst towering glacier-capped peaks. Here, the pastoral landscape has been greatly influenced by yak herders and their animals. In the Mount Everest region, yak herders have developed some of the highest elevation hay fields in the world. At elevations of 4,500m, native grasses are grown by yak herders and the grass is cut and dried into hay for winter feeding.

Hay fields and rangeland, Pheriche, Khumbu, Nepal, 1992





Hay fields and rangeland, Bibre, Khumbu, Nepal, 1984



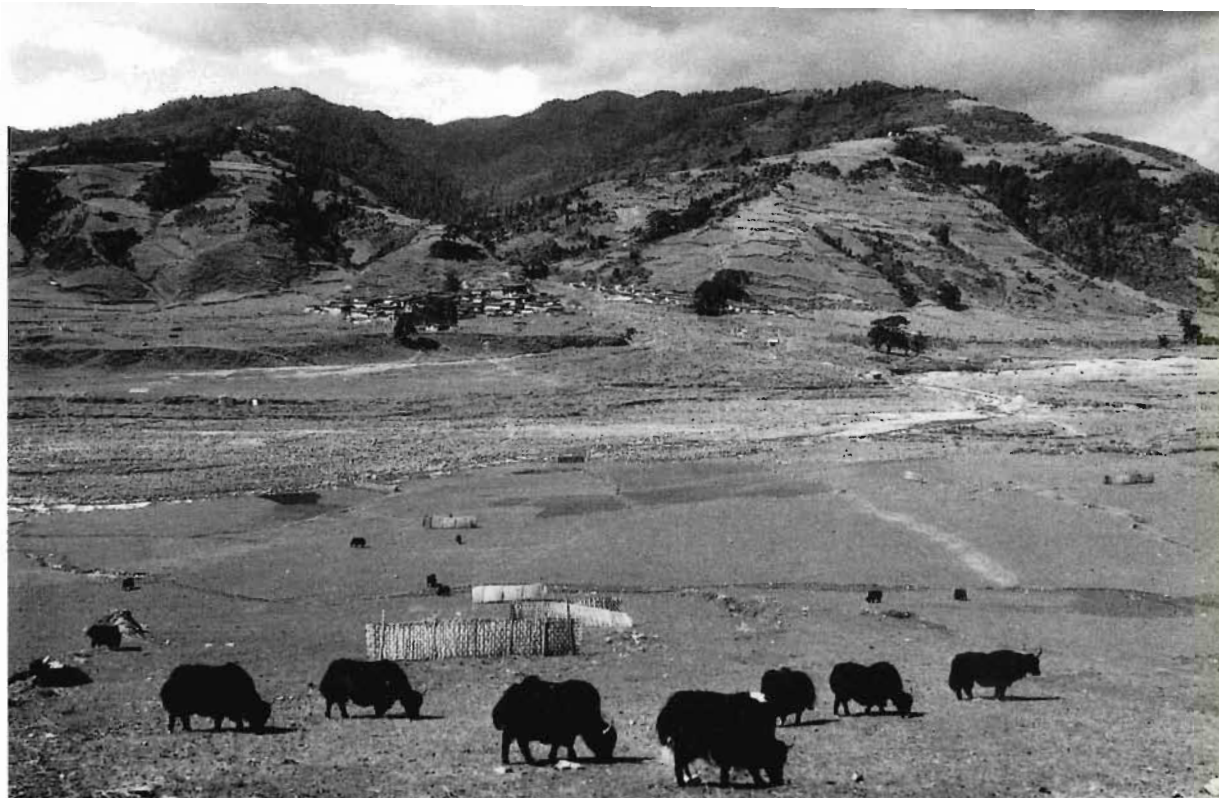
Yaks and hay fields, Bibre, Khumbu, Nepal, 1994



Ruins of old fort and Mt. Chomo'hari, Bhutan, 1987



Tents and rangelands, Soi, Bhutan, 1987



Yaks and grazing land, Sakten, Bhutan, 1985

In Bhutan, rangelands are widespread in the northern part of the country. Here, pastoralists raise herds of yaks and, as in the neighbouring areas of Tibet, herders also use yak-hair tents as a moveable dwelling while camped in the alpine pastures in the summer. Yaks are an important component of Bhutan's high-elevation pastoral system, and there are a number of nomadic groups in the country that are totally dependent upon yaks for their livelihood as they practice no cultivated agriculture. These nomads are located in the northwestern part of Bhutan, in Soi, Lingshi, Laya, and Lunana, and, in eastern Bhutan, in Merak and Sakten.



Early summer snow storm, Phala, Tibet, China, 1997

Tibetan Plateau and Himalayan pastoral areas are complex environments and appear to function as highly dynamic ecosystems. Over much of the Tibetan Plateau, there is considerable variation in forage production from one year to another due to different precipitation patterns. There are even remarkable differences in grass growth in a small geographic area within one year due to local climatic patterns. Severe winter blizzards can bury forage for livestock under snow, often resulting in large livestock losses. These periodic snowstorms add to the complexity and non-equilibrium nature of the pastoral system, making pastoral production a high risk enterprise. Nomads cope with the uncertainties of the environment by adopting a number of flexible production strategies that minimise risk and make optimal use of the resources available to them. One such strategy is to diversify herds and maintain a high degree of mobility. Social arrangements with neighbours and neighbouring groups of nomads have also been established to enable herders to gain access to additional resources or assistance during times of stress. Although not as important now in many areas, hunting and gathering were also strategies engaged in by pastoralists to supplement subsistence livestock production. All of these strategies aimed to minimise risk, stabilise production, diversify food and livestock product sources and income, and maximise returns to household labour.



Dead yak, Phala, Tibet, China, 1997

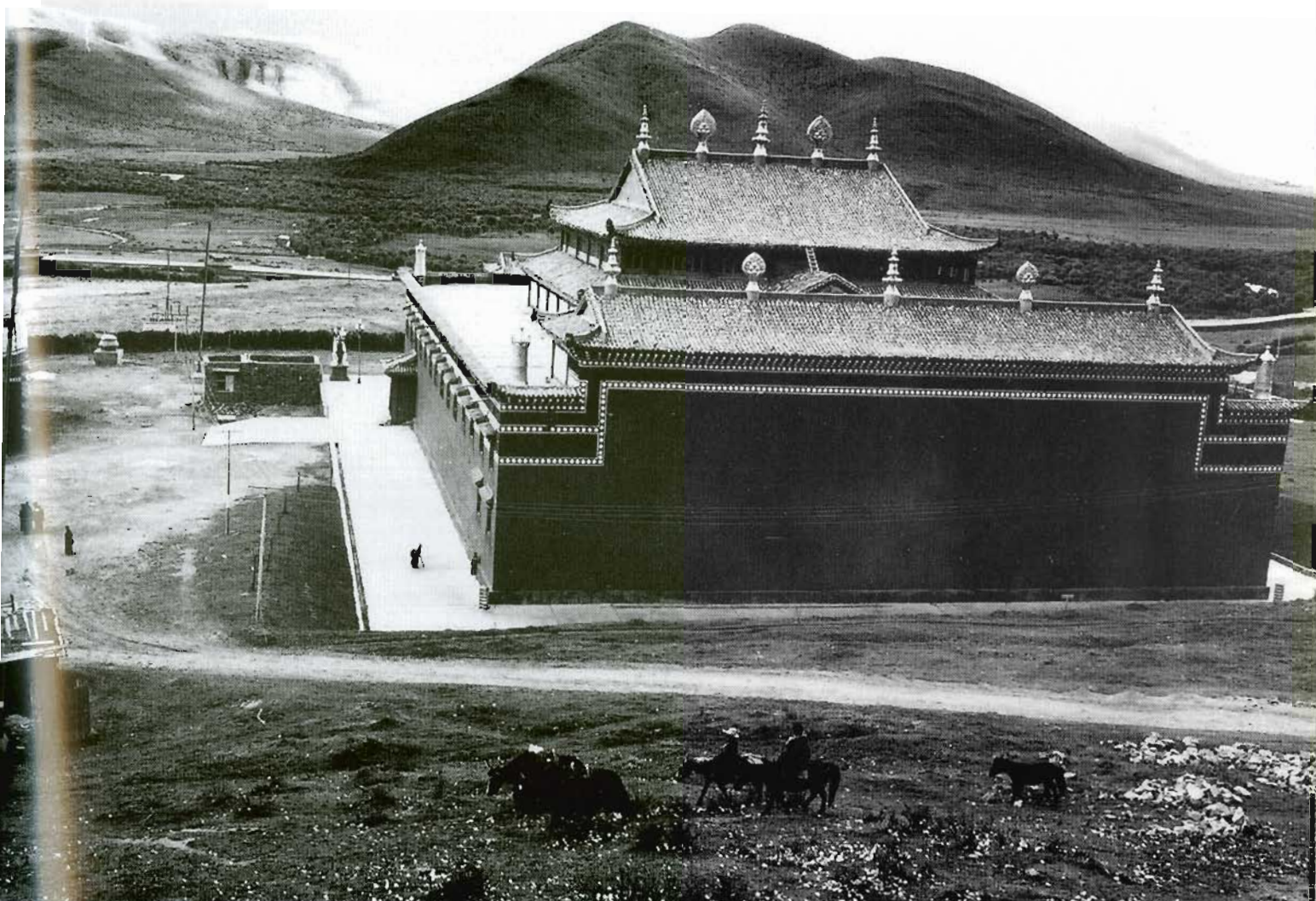


The foundation for the rise of strong nomad tribal federations, kingdoms, and empires on the Tibetan Plateau was the rangelands. The boundless, fertile grazing lands, and the livestock grazed on them, helped create prosperous, pastoralist cultures. Tibet's vast grasslands nurtured a prolific livestock industry. Tibet was rich with animals, wool, and butter. The pastoral landscape was also home to nomads accustomed to taking care of animals. This legacy enabled troops on horseback to be easily organized and for cavalry to travel swiftly and conquer far-flung territories. Without such a pastoral setting, the people residing on the Tibetan Plateau would never have been able to develop into such an extraordinary civilization.

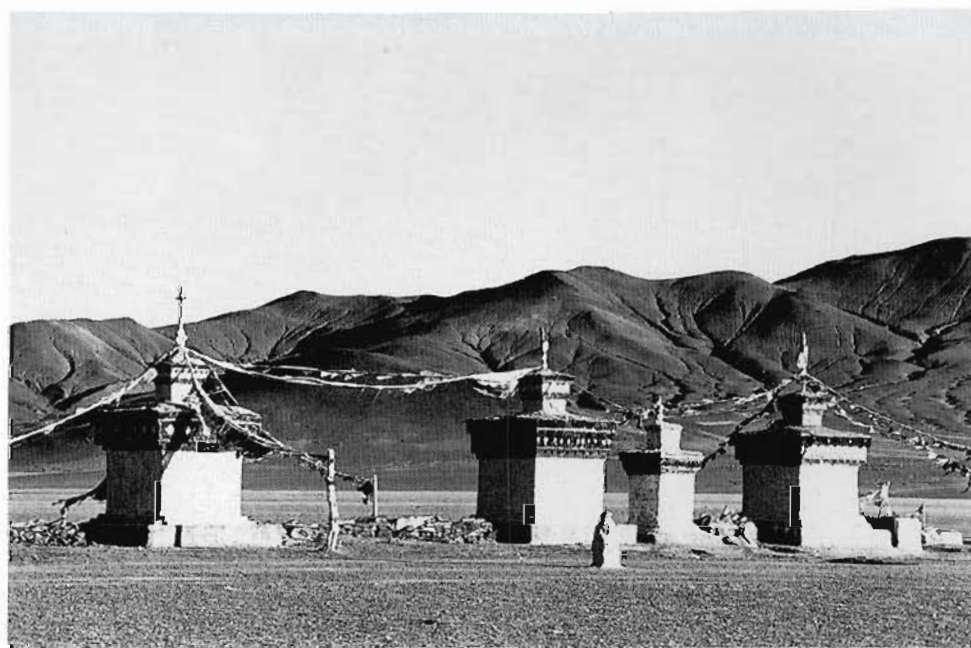


Stupa, Chharang, Mustang, Nepal, 1992

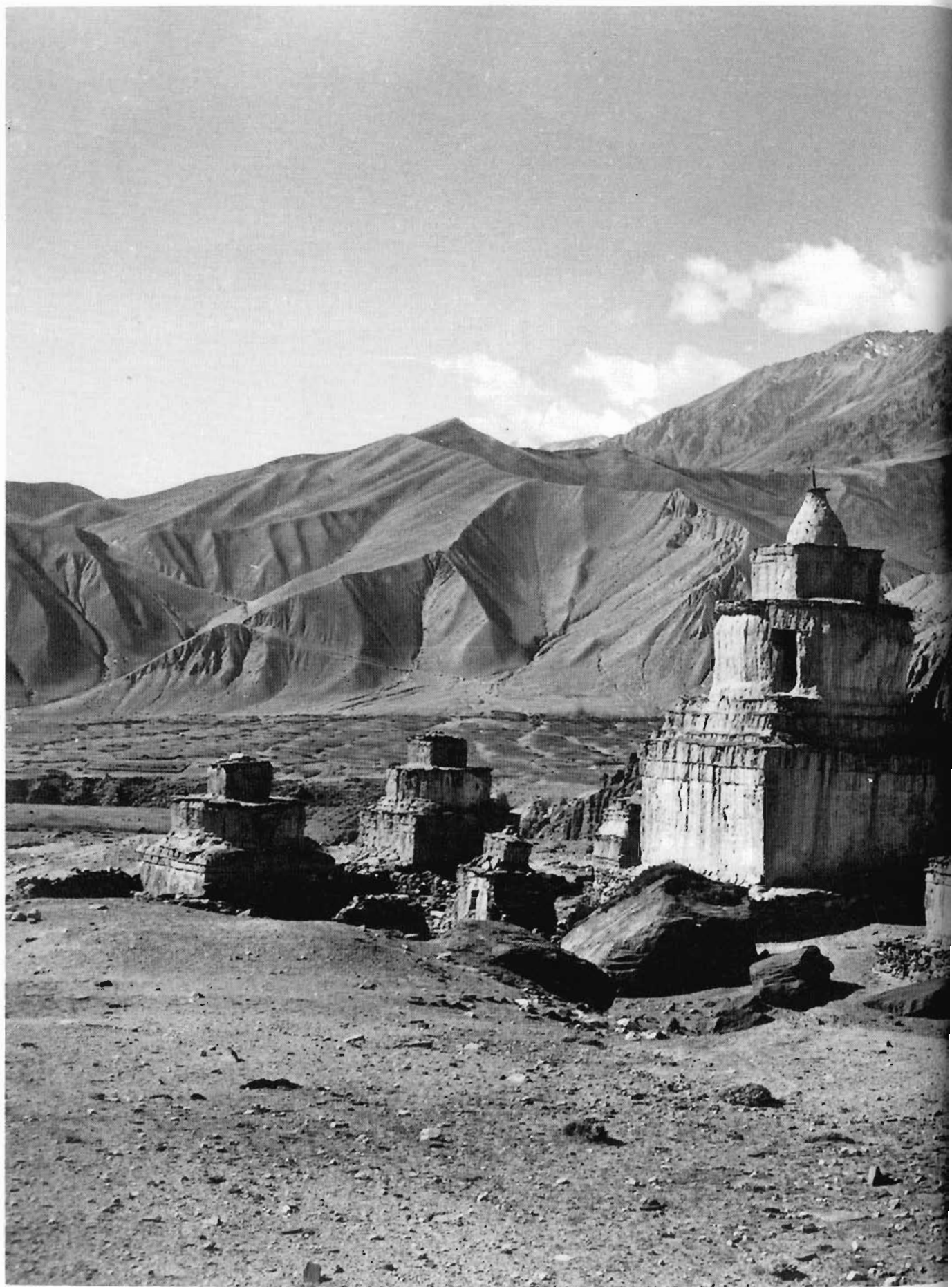




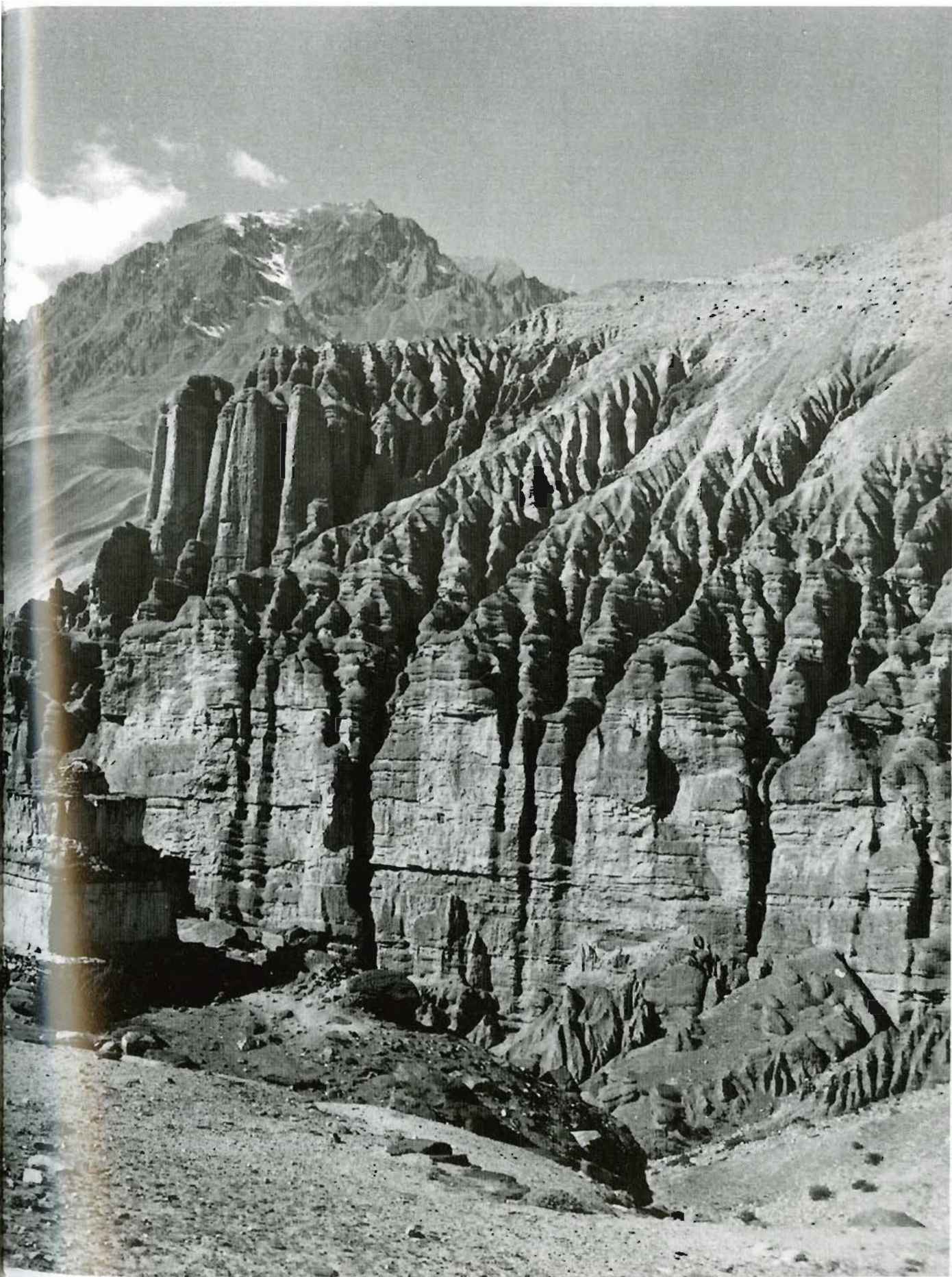
Monastery and rangeland, near Hongyuan, Sichuan, China, 1996



Stupas and Rangeland, Gertze, Tibet, China, 1993

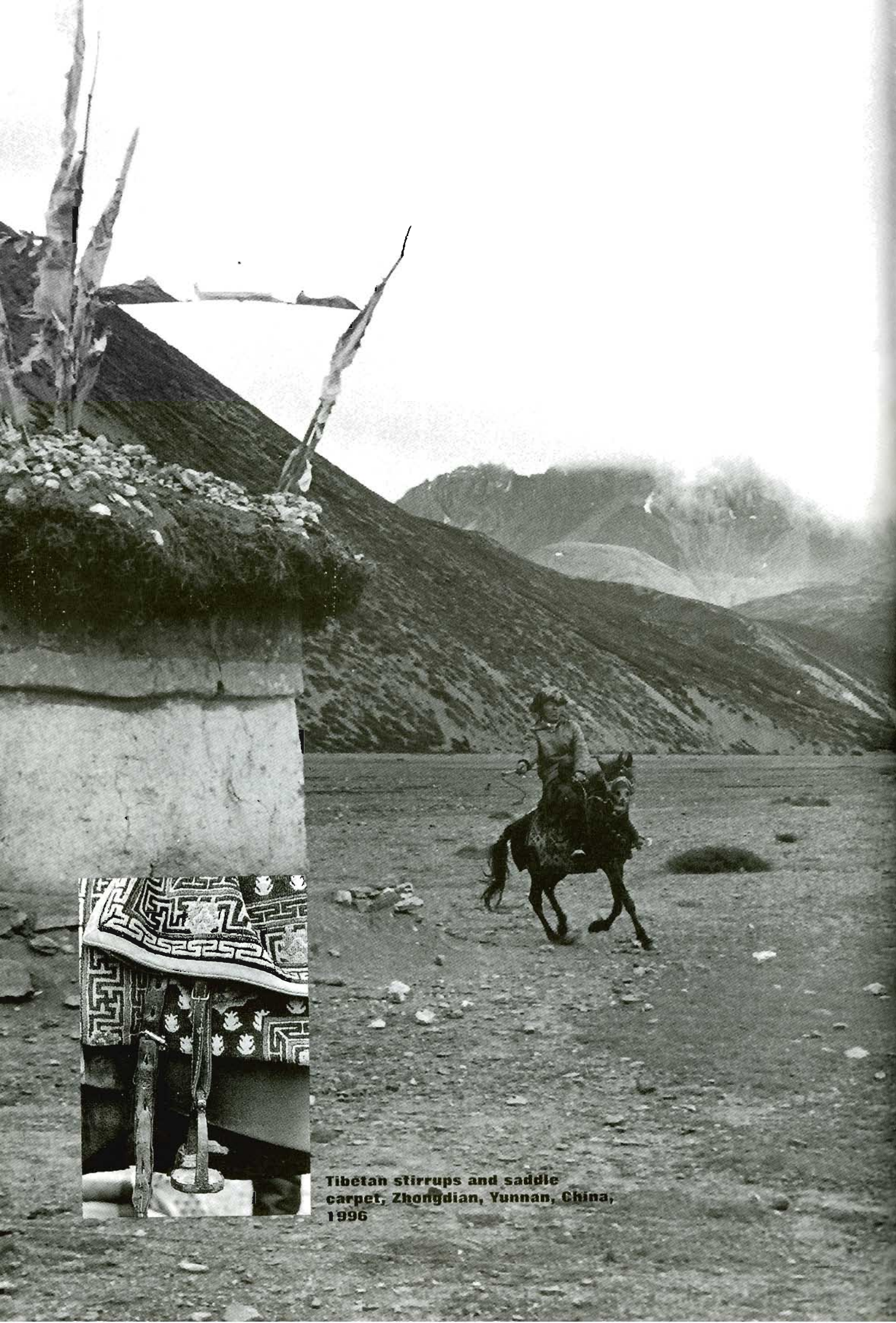


Stupas and rangeland landscape, Near Chharang, Mustang, Nepal, 1992



PASTORAL PRODUCTION



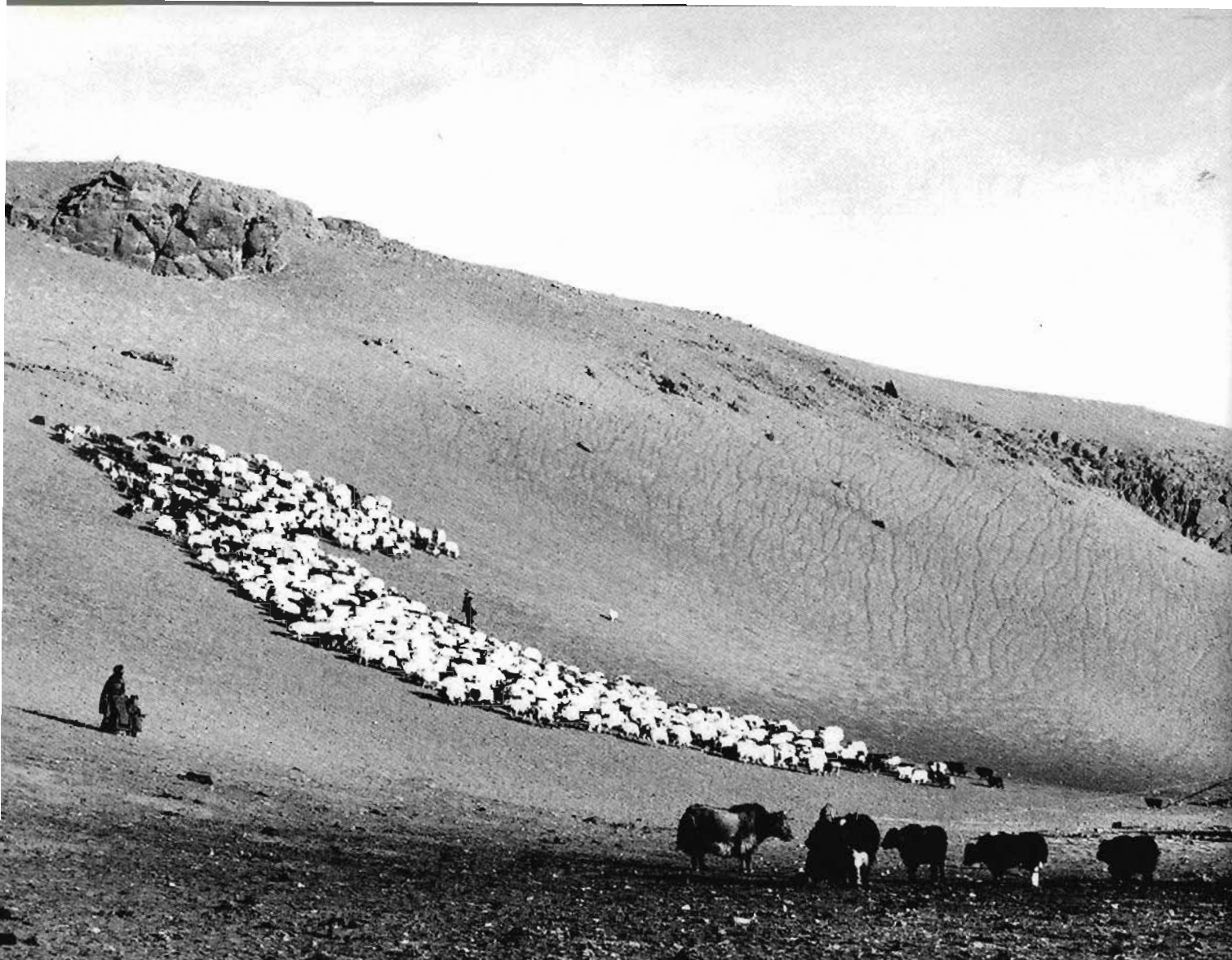


**Tibetan stirrups and saddle
carpet, Zhongdian, Yunnan, China,
1996**

When analysing rangeland ecology and current pastoral production practices on the Tibetan rangelands, it is important to keep in mind the region's long pastoral history. The movements of early hunters, herders, traders, and troops across the grazing lands had an important impact on the later historical development of dynasties and kingdoms throughout the region. They, in turn, affected how pastoral areas were used. Understanding the historical developments that took place in the grasslands is invaluable for comprehending the present ecology of the landscape. It also helps to inculcate a greater appreciation for present day nomads and their long experience with herding livestock across these vast fields of grass.



Horse races, Namdo, Dhotpo, Nepal, 1978



Nomad camp, northeast of Rongma, Chang Tang Wildlife Reserve, Tibet, China, 1993

Nomads have been herding livestock on the grazing lands of the Tibetan Plateau for probably 4,000 years. As early as the Chinese Hsia dynasty (2205-1766 BC), nomadic tribes called the Qiang, who were believed to be the early ancestors of Tibetans, were known for making a fine woven woollen material in their camps in the Kunlun Mountains in the northeastern part of the Tibetan Plateau. Even rugs made from the 'hair of animals' were recorded as one of the articles of tribute received by the Hsia Emperor from these early nomads. During the Chinese Shang dynasty (1766-1027 BC), these nomad tribes inhabiting the eastern Tibetan Plateau grasslands were also renowned for their horses and were known as the 'Qiang of Many Horses'. Throughout the Shang and Zhou (1027-256 BC), the Qiang were a powerful force in the grasslands and often plundered Chinese agricultural settlements. These barbarians from the grasslands kept Chinese military forces on constant alert.

The consolidation of power among the Qiang tribes in the period between the Han (206 BC - 220 AD) and Tang (618-907 AD) dynasties led to the formation of kingdoms of considerable size in the eastern Tibetan grasslands. One of these was the legendary Women's Kingdom located in the mountains south of the headwaters of the Yellow River. During the Sixteen Kingdoms' period (301-439 AD), a number of Tibetan dynasties controlled much of Western China and the Silk Route for long periods of time. During the reign of the Tibetan King, Songsten Gampo (602-650 AD), the Tibetan Empire really emerged as a force to be reckoned with in Central Asia. By the eighth century, Tibetan territory included vast domains and, at one time, controlled most of the Silk Route. In 763, Tibetan troops even captured and briefly held the Chinese Tang dynasty capital at Chang-an (modern day Xian). Tibet's control of Central Asia and monopoly of the principal trade routes lasted well into the ninth century.

Milking sheep, Phala, Tibet, China, 1997 [chapter photo]



Female yak, above Thimphu, Bhutan, 1986



**Nomad lady bundled up while
herding, south of Shuanghu,
Tibet, China, 1993**



Nomad camp and yaks, Sol, Bhutan, 1987

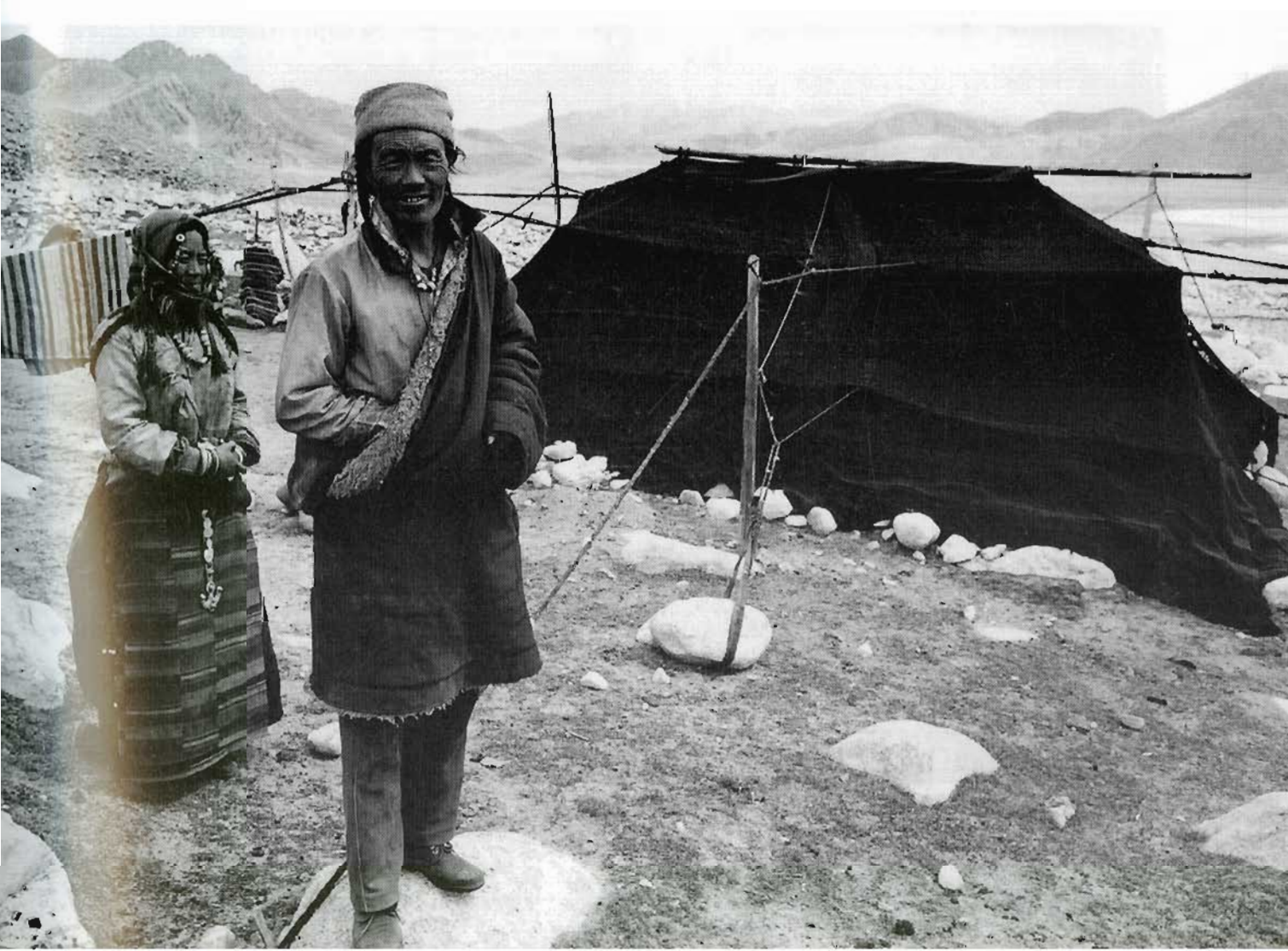
The fact that nomads still populate Tibetan grazing lands today is proof of the rationality and efficacy of many aspects of traditional pastoral production as a means of converting forage from cold, arid rangelands into valuable animal products in an environment where cultivated agriculture is not possible. The survival of pastoral nomads indicates that many of the strategies of animal husbandry and range management developed centuries ago are well-adapted responses to the spectrum of environmental conditions found on the Tibetan steppes. Over thousands of years, nomads accommodated to their environment, learning to live with what it offered instead of changing and moulding the landscape to suit their needs, as farmers are wont to do. The endurance of pastoralism on the Tibetan Plateau also provides examples of nomadic practices that were once common throughout the pastoral world but are now increasingly hard to find. Tibetan pastoralists offer an opportunity to learn more about a way of life that is fast vanishing from the earth.





Pastoral production strategies and practices vary widely across the rangelands, depending on altitude, environmental conditions, and rangeland types and, in recent years, on the influence of pastoral development policies, development interventions, and new markets for livestock and livestock products. Pastoralism in this environment has evolved through long-term persistence in one of the most inhospitable places on earth. As such, nomads have adjusted their production strategies to best suit the local environment and to take comparative advantage of the opportunities that are presented.

The indigenous, or traditional, pastoral production systems that operated across most of the Tibetan Plateau were an evolutionary adaptation by Tibetan nomads. The livestock production practices that developed were rational, aggregate behavioural responses by Tibetan nomads to the resources and risks of the environment. Since they still operate, many aspects of the traditional Tibetan pastoral production system have proved to be successful over the centuries. As such, there is a lot of value in many aspects of traditional pastoral production systems.





Nomad camp near Madoi, Qinghai, China, 1988





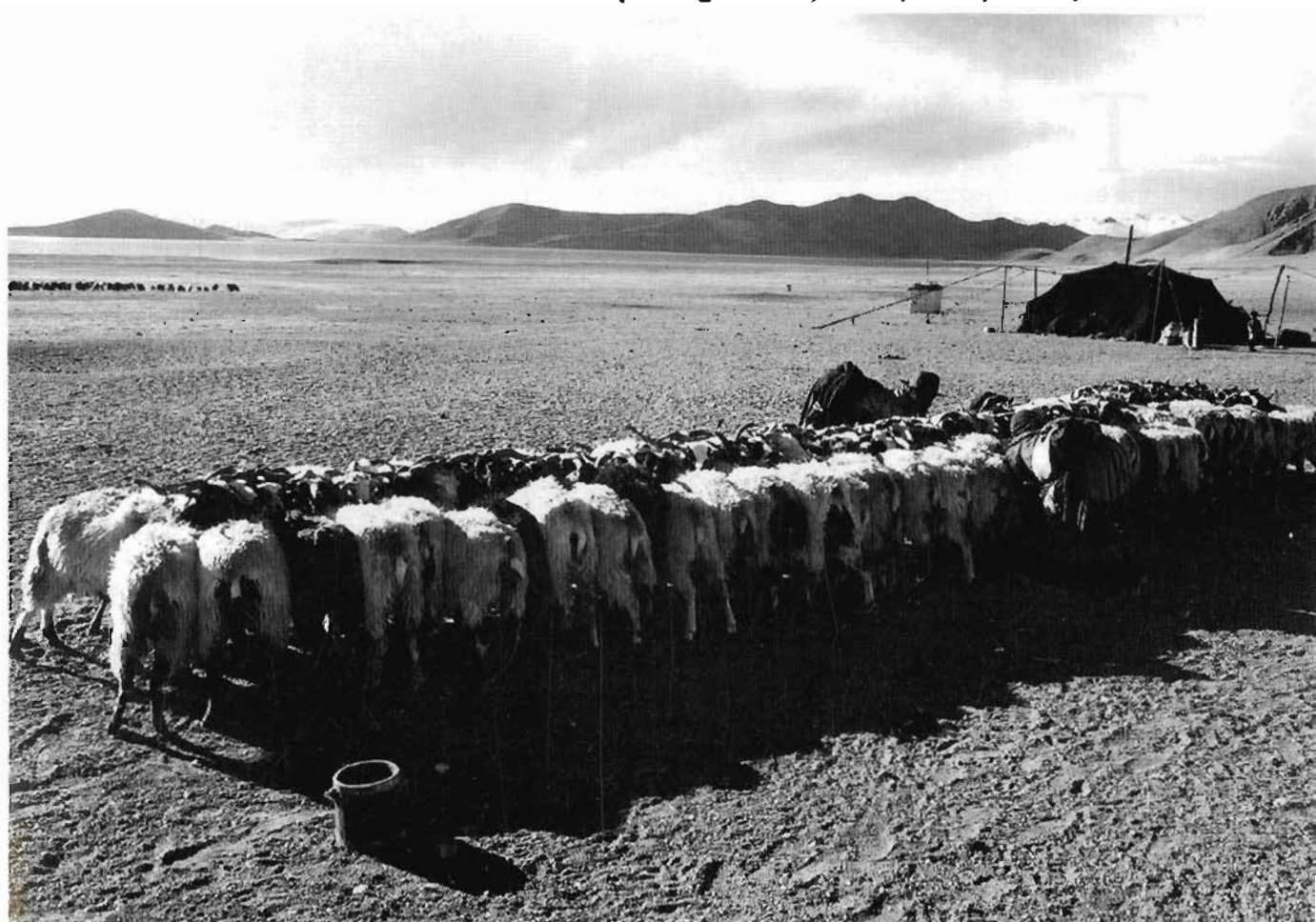
Nomad woman, Phala, Tibet, China, 1997

Yak herd moving, Phala, Tibet, China, 1997



Nomads on the Tibetan Plateau often raise a mix of different animal species. Each species has its own specific characteristics and adaptations to the grazing environment. The multi-species' grazing system – the raising of yaks, sheep, goats, and horses together, commonly practised by Tibetan nomads - maximises the use of rangeland resources. Different species of animals graze on different plants and, when herded together on the same range, make more efficient use of rangeland vegetation than a single species. Maintaining diverse herd compositions is also a strategy employed by herders to minimise the risk of losses. In the harsh environment in which pastoralism is practised, livestock are the only means by which people can subsist. Heavy snowstorms or outbreaks of livestock disease can devastate herds. Maintaining a mix of different species of animals provides some insurance for nomads that not all animals will be lost and herds can be rebuilt again. Different types of animals also have varied uses and provide different products for home consumption or for sale.

Sheep being milked, Phala, Tibet, China, 1997





Milking goats, Chang Tang Wildlife Reserve, Tibet, China, 1993

The composition of livestock species within Tibetan nomads' herds, and the number of animals individual nomad families raise, varies considerably across the rangelands of the Tibetan Plateau. For example, in western Tibet, where it is drier, sheep and goats are more common than yaks; in the east, where rainfall is greater and vegetation is lush, yaks are the most important animals raised. In Naqu Prefecture of the Tibetan Autonomous Region, in the counties of Shuanghu and Nyima, sheep make up 65 per cent of the total livestock numbers; goats comprise 30 per cent, and yaks and horses only four and one per cent, respectively. In Naqu County, sheep make up 56 per cent of the total livestock; goats comprise 15 per cent; yaks 26 per cent; and horses only total about one per cent. In Jiali County of Naqu Prefecture, sheep only make up about 35 per cent of all livestock while yaks make up over 53 per cent of the total livestock. Much further to the east, in Hongyuan County of northwestern Sichuan Province, sheep and goats combined only make up nine per cent of the total livestock, while yaks comprise over 85 per cent of all animals. In Hongyuan, horses are also more important and make up about five per cent of all livestock.

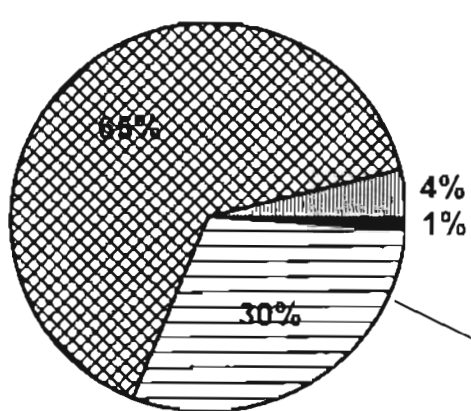
In terms of numbers of animals, typical (not rich, not poor) nomad families in Shuanghu and Nyima Counties maintain, on average, about 250 sheep, 100 goats, 15 yaks, and two to three horses per family. In Naqu County, a typical nomad family of five to six persons would have about 60-80 sheep and goats, 30-35 yaks, and two to three horses. A rich household in Naqu may have perhaps 200 sheep and goats and 100 yaks. In Hongyuan County, a typical family would have 80-100 yaks, five horses, and probably no, or only a few, sheep. For a family in Hongyuan with a total of 100 yaks, only about 30-40 of the yaks would be milch animals, however. In the nomad region of Phala, in the remote northwestern Shigatse Prefecture of Tibet, the richest nomad family in the area had 286 sheep, 250 goats, 77 yaks, and eight horses; a total of 621 animals. With six people in the family, this amounted to 103 animals per person. Their total income from the sale of livestock and livestock products in one year amounted to about US\$ 1,000, with sheep providing about 60 per cent of this and goats about 35 per cent.



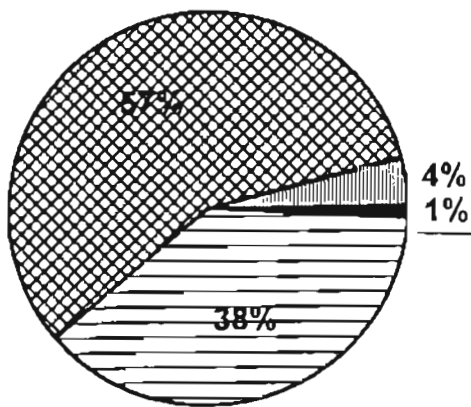
Shearing wool from sheep, Langtang, Nepal, 1977



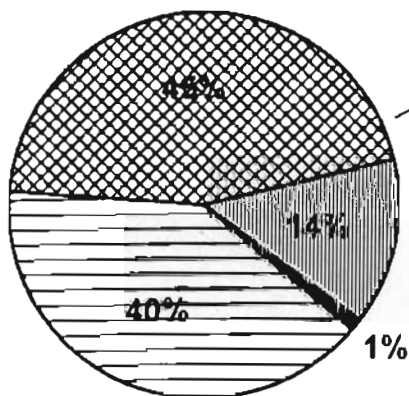
**Yak herder with
butter churn,
Langtang, Nepal,
1977**



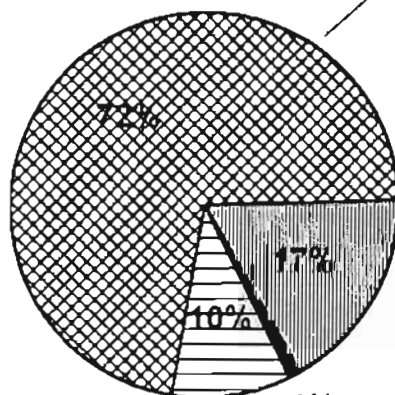
Shuanghu



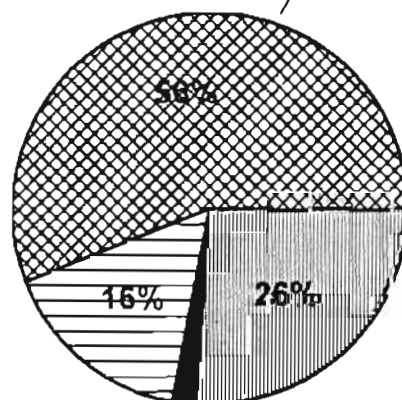
Nyima



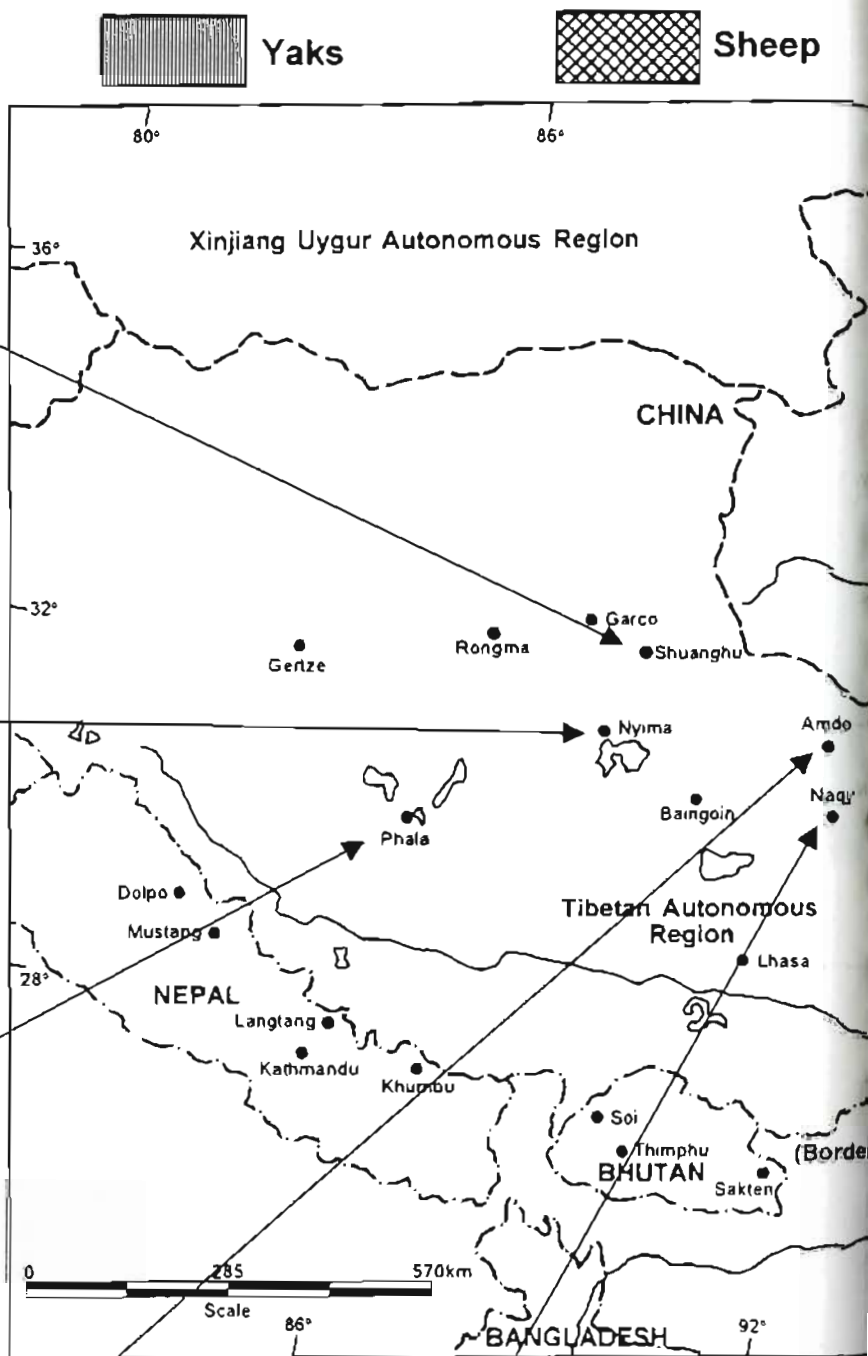
Phala*



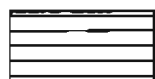
Amdo



Naqu



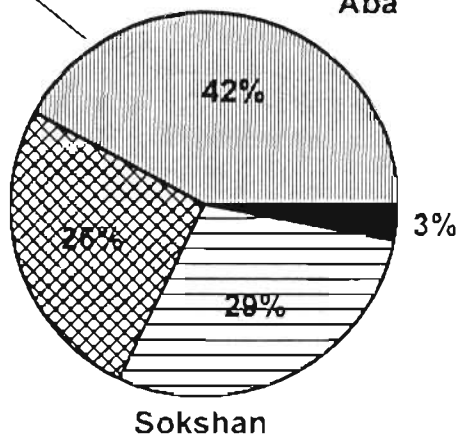
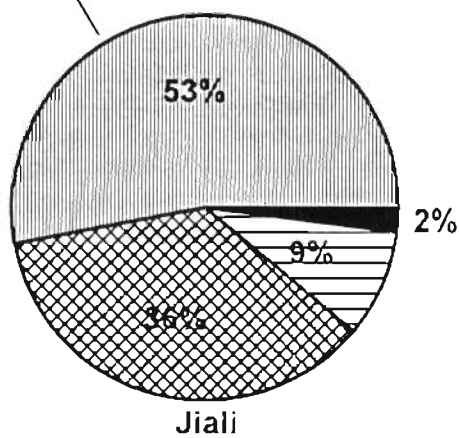
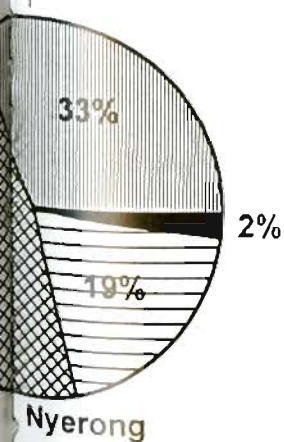
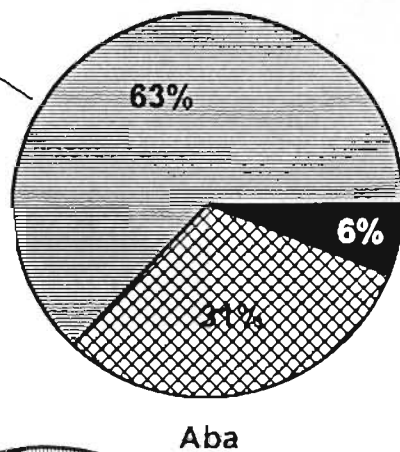
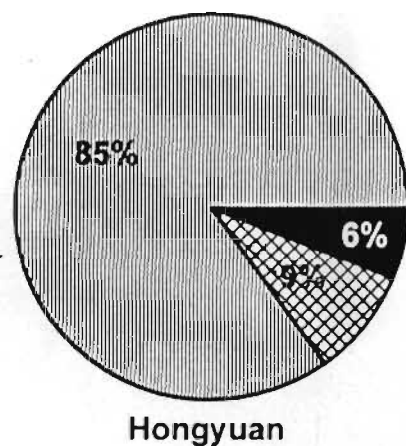
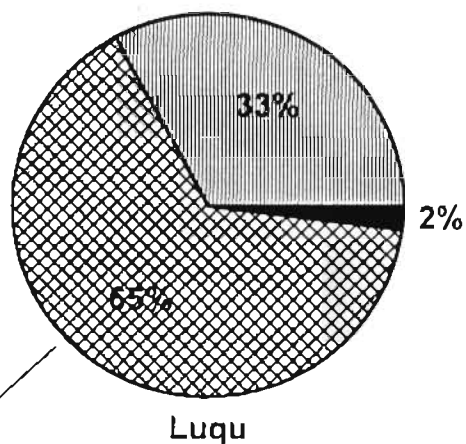
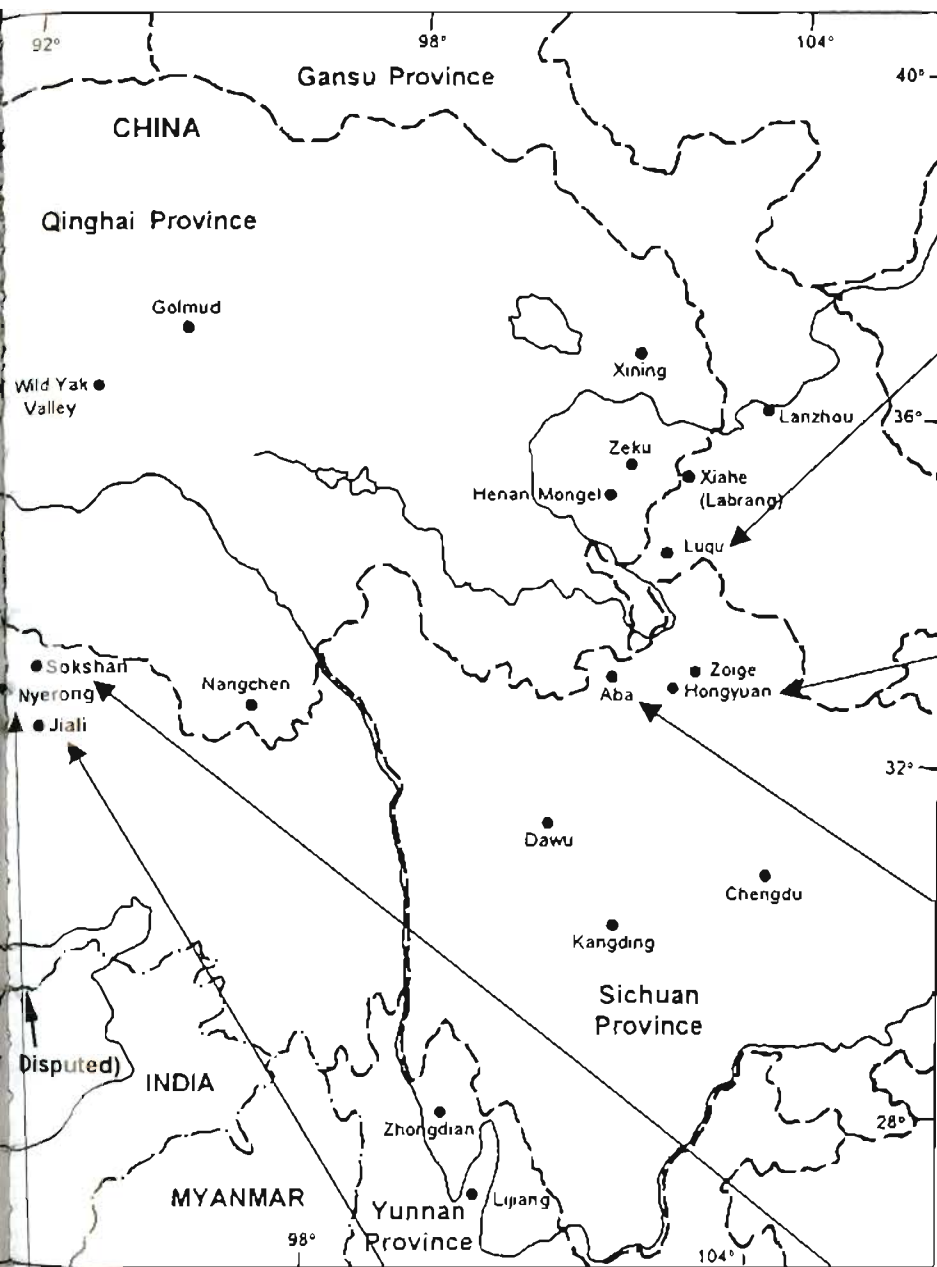
Map and figures of herd compositions

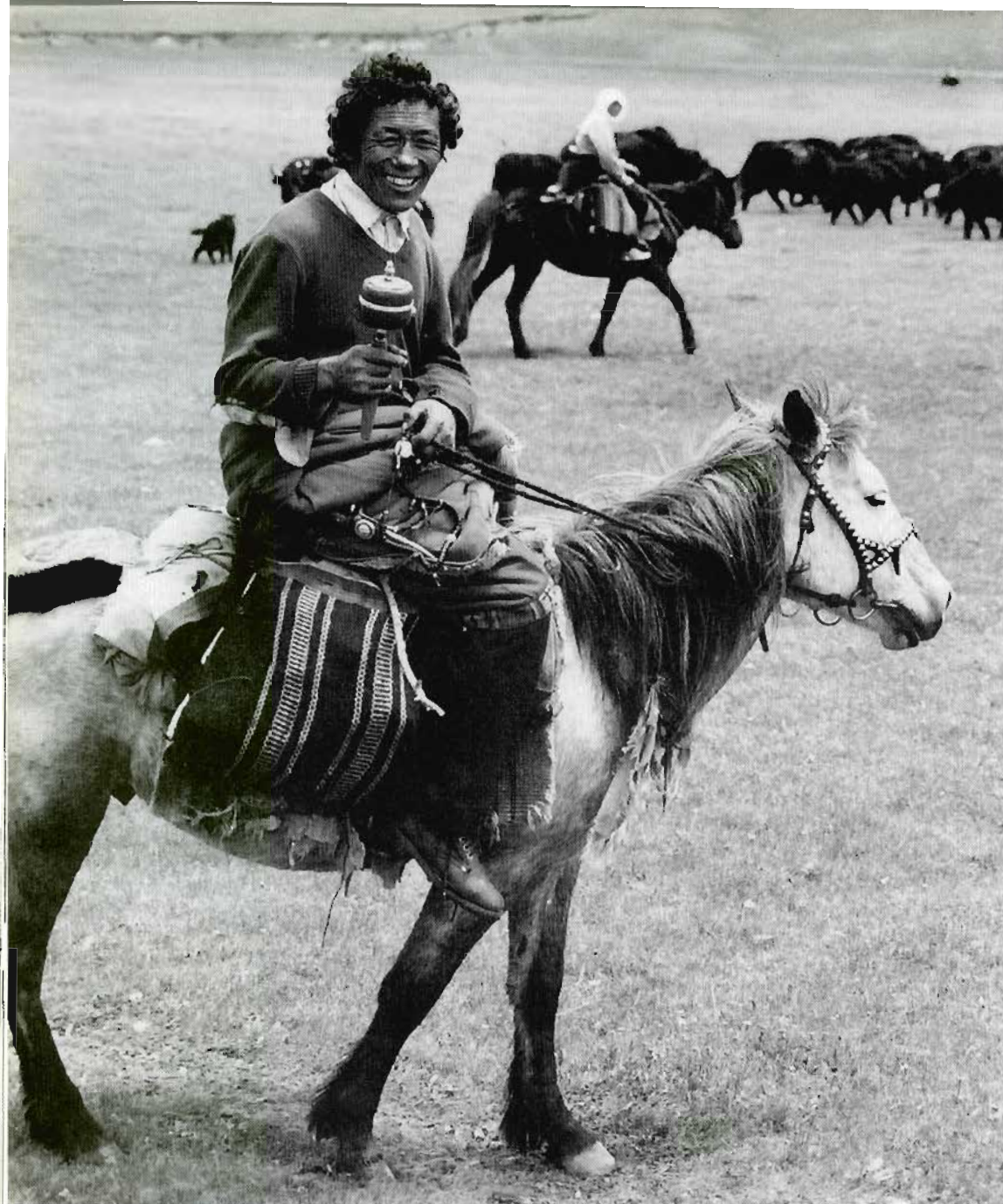


Goats



Horses





Nomad moving to summer camp, Aba, Sichuan, China, 1998



In terms of livestock species' mix and herd structure, the herd design of Tibetan pastoral systems is not haphazard but, instead, shows sophisticated adaptive responses by Tibetan nomads to the environment in which they live and the resources available to them and their animals. The proportions of different livestock species vary regionally across the Tibetan Plateau, generally according to rangeland factors and the suitability of the landscape for different animals. Herd compositions within a geographic area can also vary with the skills, preferences, and availability of labour of the nomads. The rationality for the traditional structure of Tibetan nomads' herds was usually unacknowledged by early livestock and pastoral development specialists working in Tibet who came and advocated 'scientific' animal husbandry. Unfortunately, the utility and productiveness of nomads' herd structures are still often unappreciated.



Yak herd on the move, Malwa, Sichuan, China, 1996

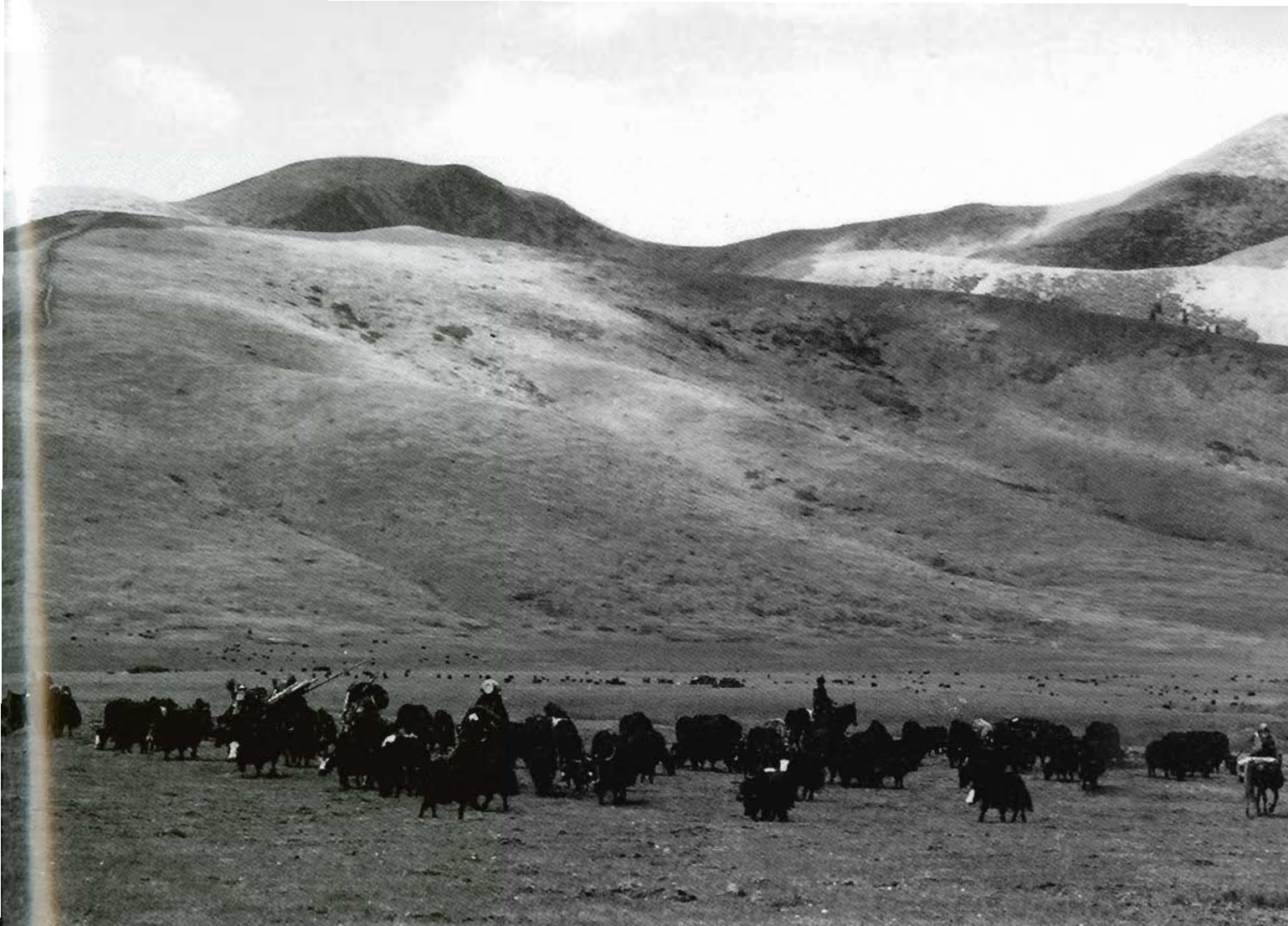
Mobility is an important feature of pastoralism on the Tibetan Plateau. Traditional pastoral management systems were designed around the movement of herds to various pastures during different seasons of the year and the tracking of favourable forage conditions. Livestock are regularly moved between pastures to maintain rangeland condition and animal productivity. Herders do not randomly move across the landscape; rather, their movements are often well prescribed by complex social organizations and are highly regulated. Rotation of livestock between different ranges helps to conserve the grass and takes advantage of topography and climatic factors to make the best use of the rangeland.

Environmental disturbances (severe and prolonged cold weather, snowstorms, drought, etc) that are highly unpredictable often affect Tibetan pastoral areas. The organizational flexibility of the traditional Tibetan nomadic pastoral production systems developed as a response to this unpredictability of the grazing land ecosystem. Nomadic pastoralism on the Tibetan Plateau can be viewed as an excellent strategy to optimize scarce grazing resources in a harsh environment in which forage productivity is low and extremely variable. A strategy of livestock herd movement, or mobility, is an appropriate response to the environmental situation early Tibetan herders were faced with when trying to design livestock and grazing systems to exploit rangeland resources.



Mongol sheep and camels on the move, Wild Yak Valley, Qinghai, China, 1990





Yaks moving to summer pasture, Aba, Sichuan, China, 1996



Adjusting load on yak, Aba, Sichuan, China, 1996



Sheep moving to autumn pastures, Henan Mongol, Qinghai, China, 1997

For Tibetan nomads, environmental tracking and manipulation are key elements of the pastoral system, as they are for most pastoral societies. Certain vegetation types, such as wet, *Kobresia* sedge meadows, that green early are sought out by herders. Other ranges, that are free of snow in the winter due to local topographic and climatic conditions, were identified for winter and early spring grazing. Tibetan nomads only incidentally achieved direct control of the rangeland environment though, since skills, instead of tools, were the most important component of their traditional pastoral technology. Intervention by nomads was significant, however: certain rangelands were reserved from grazing during the growing season for use later in the year; seasonal water sources were exploited; and fire was used to control shrubs and to promote new grass growth. These days, tools (fencing, barns, and wheeled transport) are also being used increasingly by Tibetan nomads to exert more direct control over the pastoral environment.

Tibetan nomads attained indirect environmental tracking and manipulation of the Tibetan rangeland environment with considerable skill, however. The structure of nomads' herds, in terms of the number of breeding females, breeding males, young stock, and pack stock, illustrates Tibetan nomads' skills in adjusting herds to exploit available resources. The different species' composition of animals in livestock herds found among Tibetan pastoralists is also indicative of nomads' expertise in managing rangeland resources available to them.





Moving camp, Henan Mongol, Qinghai, China, 1997



Moving to summer pastures, Zamtang, Sichuan, China, 1996



Nomad camp, Shey Gonpa, Dolpo, Nepal, 1978



Yak herder, Sakten, Bhutan, 1990



Extensive pastoralism has been the basis for livestock production across most of the Tibetan Plateau for millennia. In recent decades, efforts to develop Tibetan pastoralism through introduction of new livestock breeds, veterinary health care, pasture development, and range management have yielded little, or even negative, return on investment. Growth in livestock production in Tibetan pastoral areas has generally occurred from expansion in livestock numbers with traditional practices still being widely practised, instead of from adopting new livestock production technologies giving higher yields per animal. Government development efforts in many pastoral areas of the Tibetan Plateau in China now focus on reforms in rangeland tenure (privatisation and enclosure of rangelands) and investments in fencing, houses for nomads, and barns for livestock. It is thought that such developments will improve rangeland and livestock management and increase livestock productivity. Often, however, the basic characteristics and constraints of nomadic production in Tibetan rangelands are not considered when prescribing these new developments.

The central characteristics of Tibetan pastoralism – low productivity, high variability in forage and livestock production, generally low production density, and high market transaction costs – has meant that conventional markets in land, labour, and capital have not become well developed. Tibetan nomads have, nevertheless, developed arrangements (often quite sophisticated) for meeting their labour requirements, for managing rangeland without exclusive private property rights, and for allocating their livestock as capital in the absence of financial markets. The absence of viable markets and high transaction costs often preclude nomads from selling more animals to the marketplace. Since costs for maintaining animals are low, it is usually profitable to hold animals, although critics of pastoralism often maintain that nomads just keep large numbers of animals as a status symbol.

Over the centuries, Tibetan nomads acquired complex knowledge about the environment in which they lived and upon which their lives depended. The fact that numerous, prosperous pastoral groups remain to this day, despite living in one of the harshest pastoral areas on earth, bears witness to the extraordinary knowledge and animal husbandry skills of the nomads. Nomads have intricate ecological knowledge and understanding of the rangeland environment. Pastoral development specialists need to access this vast body of indigenous knowledge and incorporate such information in range-livestock development programmes. Nomads should be considered as 'experts', even though they may be illiterate. Many old Tibetan herders have probably already forgotten more details about rangelands and yaks than most young range ecologists and animal nutritionists will ever learn.



Young herder and horse, Namdo Valley, Dolpo, Nepal, 1978



Herders and horsemen, Namdo, Dolpo, Nepal, 1978



**Happy nomad man, Dolpo, Nepal,
1978**



Pastoral development policies on the Tibetan Plateau, as elsewhere in much of the pastoral world, often maintain that nomads are 'backward' and that their traditional practices need to be 'improved'. Policies also often dictate that herds need to be restructured to contain an optimum, or economically efficient, composition of livestock species and age classes of animals. Such policies are often prescribed by people with limited understanding of pastoral production systems and with little appreciation of the fact that nomads have been herding animals for thousands of years and, in many instances, already had or possess quite sophisticated systems for managing rangelands and livestock. Nomads have, after all, been raising animals on these grasslands for thousands of years and over time have worked out how best to use grazing land resources. Fortunately, many aspects of traditional Tibetan nomadic practices are being seen increasingly by some researchers as highly efficient strategies for range management and livestock production in the high, cold environment of the Tibetan Plateau.



Nomad camp, Phala, Tibet, China, 1997

The increasing appreciation for the complexity and ecological and economic efficacy of many aspects of Tibetan pastoral production systems is encouraging. It provides hope that the vast wealth of knowledge that nomads possess will be better appreciated and understood and used in designing more appropriate development interventions for pastoral areas. It also provides hope that the nomads will be listened to and involved in the planning and implementation of pastoral development programmes in the future.



**Lady spinning wool, Tarap,
Dolpo, Nepal, 1978**

Since the first nomads ventured on to the Tibetan steppes and began raising sheep and yaks, perhaps 4,000 years ago, their very existence has depended on spinning and weaving skills. Since the beginning of Tibetan civilization, Tibetans have been exposed to various Central Asian weaving centres. In the eighth century AD, the Tibetan Empire controlled the Silk Route oasis-city states, such as Khotan, where carpets were known to be made. Spinning and weaving techniques moved along the Tibetan frontier, linking cultures, spinners, and weavers. Over time, various ethnic influences and trends were absorbed by Tibetans and incorporated into the formation of their own unique aesthetic styles. Old Tibetan carpets exhibit an elegance that is finally beginning to be better appreciated. These ancient spinning and weaving talents continue, in an intact legacy, even now. Nomad men still spin sheep and yak wool and yak hair. Women weave wool into material for tents, blankets, bags, and clothing. Men braid ropes. These items are still used in everyday nomadic life.



Weaving yak hair, Hongyuan, Sichuan, China, 1996

Detail of a yak hair tent, Lugu, Gansu, China, 1996

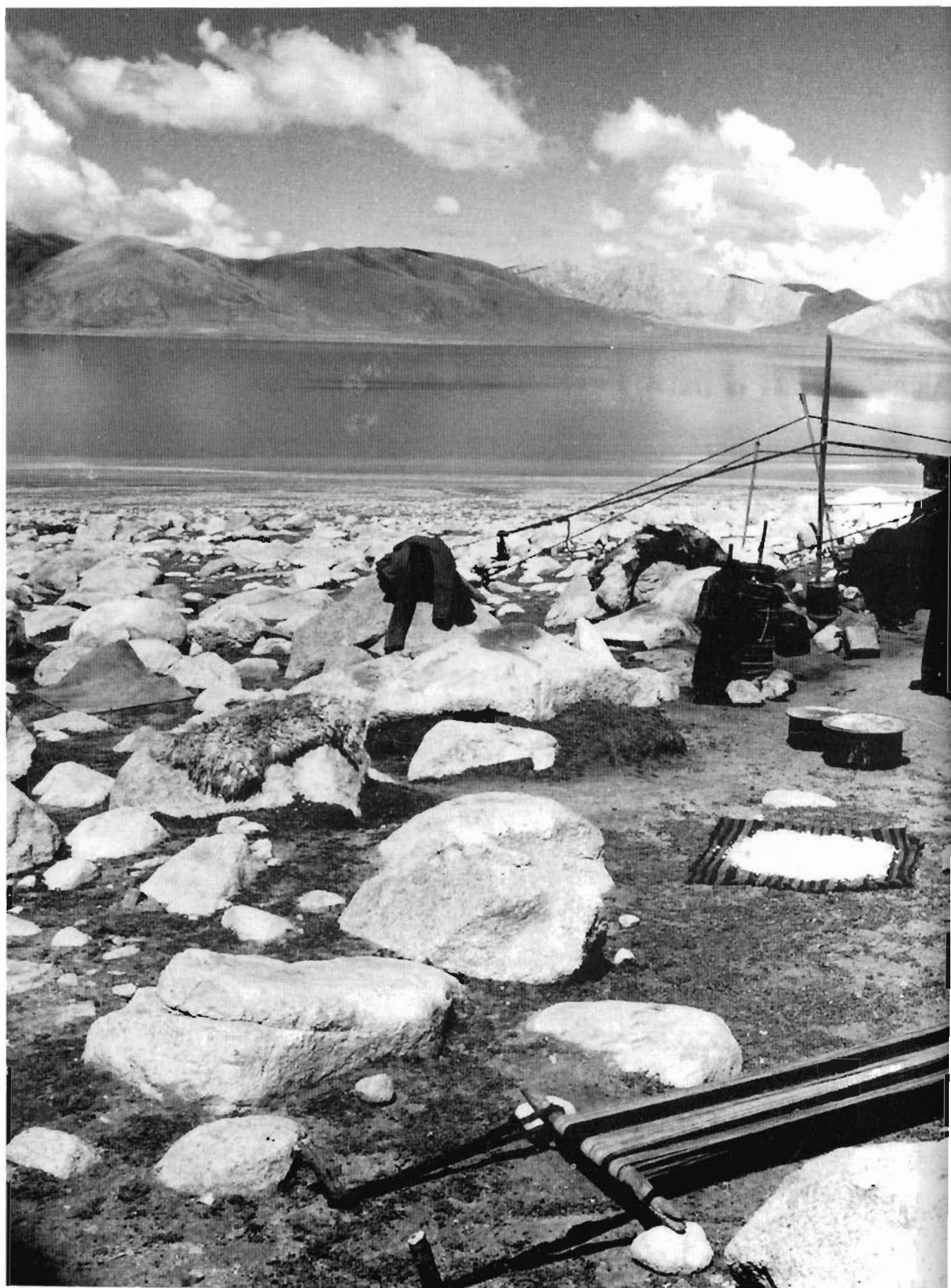






Man spinning wool, Saktien, Bhutan, 1990

**Man spinning wool, Namdo,
Dolpo, Nepal, 1978**

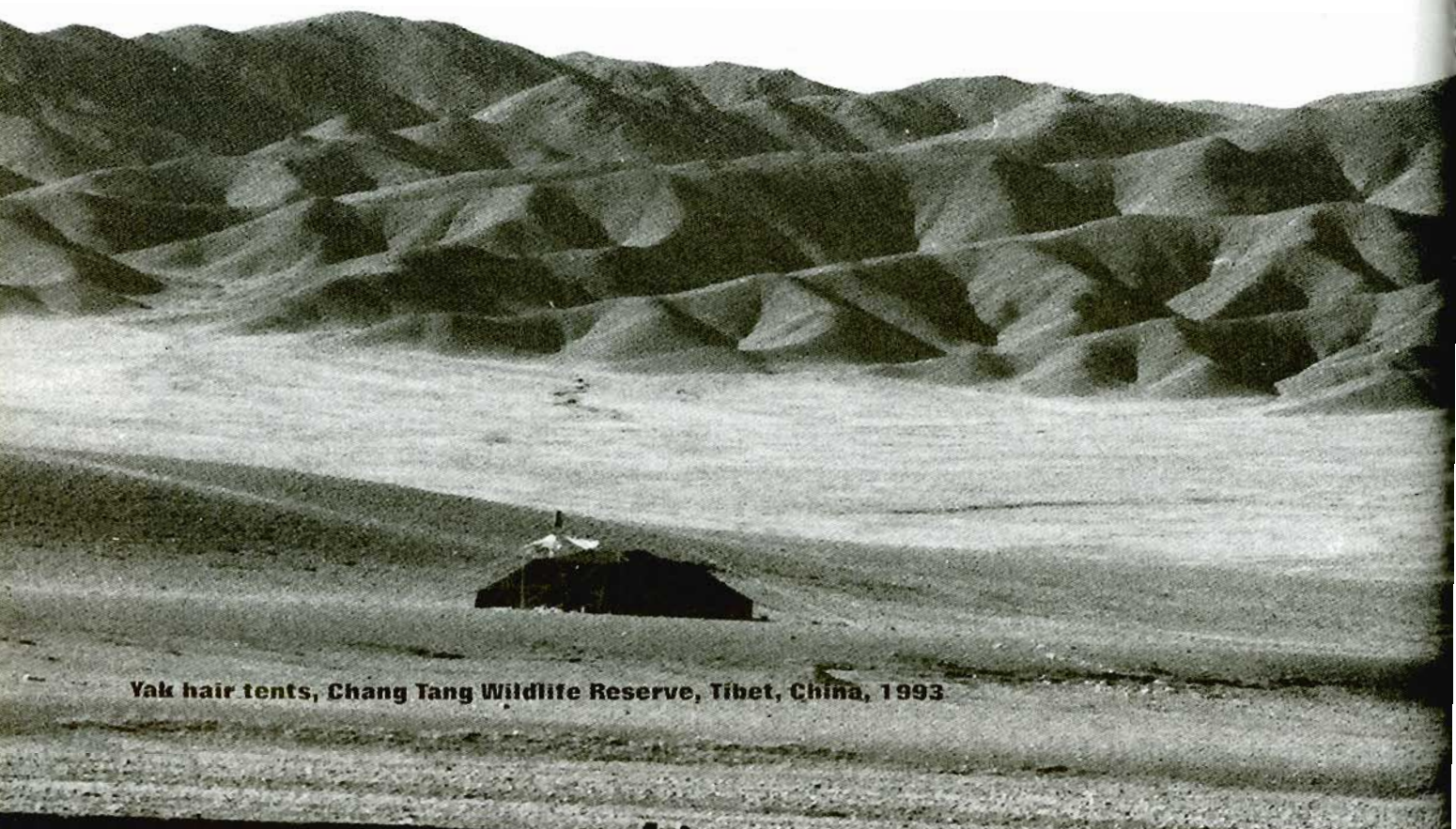




Woman weaving, Phala, Tibet, China, 1997



Inside a yak hair tent, headwaters of Yangtze River, Qinghai, China, 1993



Yak hair tents, Chang Tang Wildlife Reserve, Tibet, China, 1993





Tibetan tent, Zeku, Qinghai, China, 1997



Yak hair tents and grazing land, Shey Gonpa, Dolpo, Nepal, 1978





Tibetan tent and rangeland, Aba, Sichuan, China, 1996



Yak hair tents are a prime example of the Tibetan nomads' skill in adapting to life on the vast, windswept plains of the Tibetan Plateau. Locally made from the long, coarse hair of the yak, Tibetan tents are very much suited to a nomadic lifestyle. They can be easily taken down and packed on yaks when moving camp. They keep out the rain, yet let in light. Sections of the tent that become old and frayed can be easily replaced with new strips of woven yak hair. Tents have been perfected to stand up in the fierce winds that blow across the Tibetan plains in winter. The size and design of Tibetan nomads' tents varies across the Tibetan Plateau but, wherever they are found, Tibetan yak hair tents are an excellent shelter that have suitably served nomads for thousands of years.



Nomad tent, Luqu, Gansu, China, 1996





Inside a Tibetan nomad tent, Luqu, Gansu, China, 1996

Mongol nomadic influences are also found on the Tibetan Plateau, especially in the northeastern rangelands around Qinghai Lake (Koko Nor). Mongol influence dates back to the 13th century when Khubilai Khan dispatched Mongol troops to Tibet and set up an administration system patterned on Mongol rule in conquered territories. In the early 1600s, the Khoshot Mongol chief, Gushri Khan invaded Tibet, which resulted in many Mongols settling in Tibetan areas. Mongol nomads still inhabit grazing lands in the Qaidam Basin and surrounding Kunlun Mountains in Qinghai Province. Many Mongol nomads that settled on the northeastern Tibetan grazing lands (such as in Henan Mongol, Qinghai Province) have become Tibetanised over the centuries, but they continue to use the traditional Mongol felt tent. Many of the Mongol nomads also raise the Bactrian, or two-humped, camel. Camels were a common sight in Lhasa as caravan animals before the advent of roads in the early 1950s.



Camels, horse and nomad, Wild Yak Valley, Qinghai, China, 1990

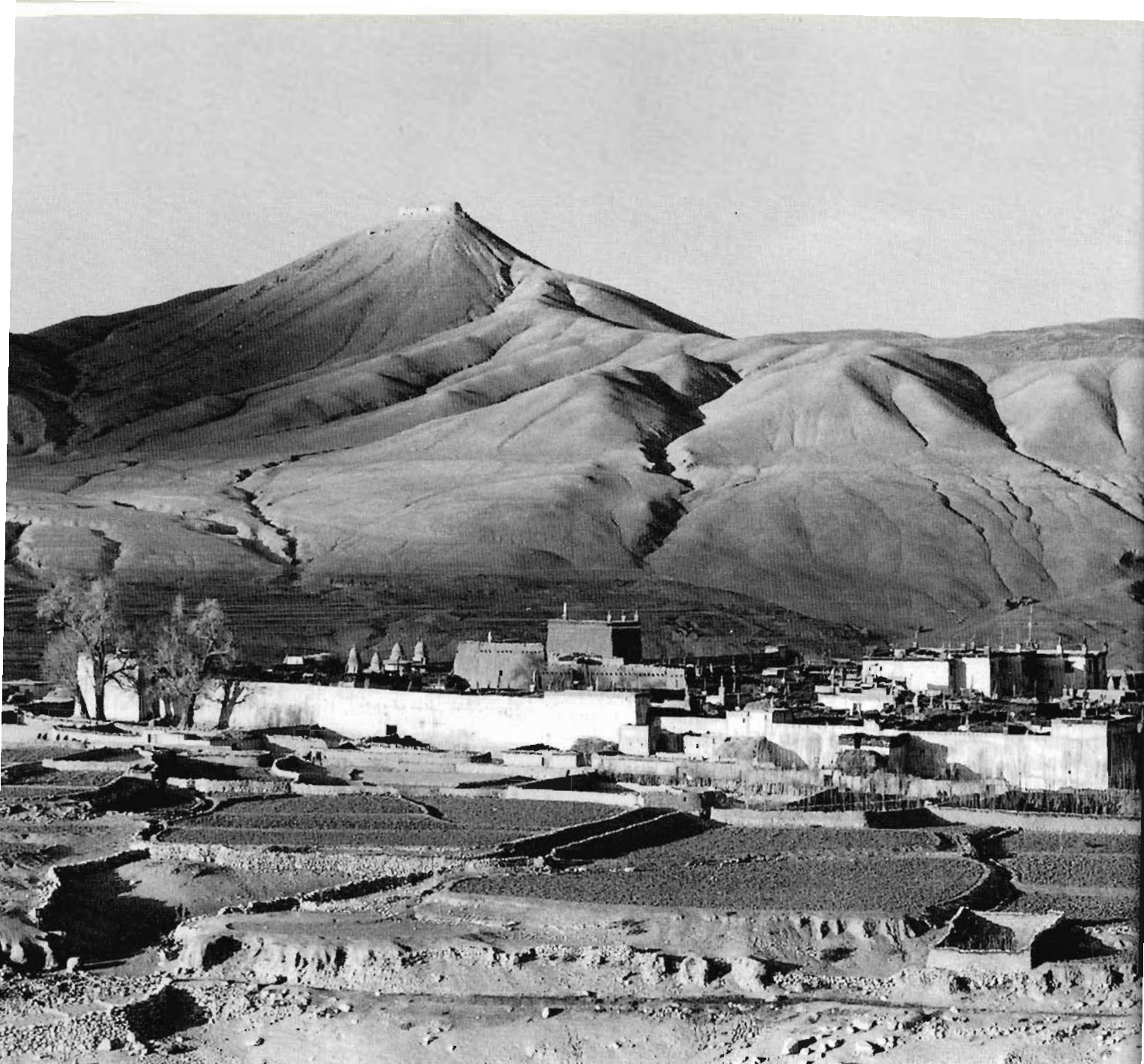




Mongol camp, Wild Yak Valley, Qinghai, China, 1990



Nomad camp, Henan Mongol, Qinghai, China, 1997



The walled city of Lomanthang, Mustang, Nepal, 1992

Trade and links with agricultural communities have always been important features of pastoralism in the Himalayas and on the Tibetan Plateau. Trade represented an essential element in the pastoral economy in most areas and, for some pastoral groups, defined the structure of their herding operations as well. Various factors, such as ethnicity, religion, subsistence patterns, and environment, played key causal roles in the development of trading enterprises within each community. For centuries, this trade linked pastoral regions with grain-producing areas and both the means of transport and the basic characteristics of this trade remained constant over long periods of time. In much of the Himalayas, trade was based on the exchange of grain for salt and wool in Tibet and the subsequent bartering of Tibetan salt for grain. In the eastern Tibetan grasslands, a lively tea-horse trade developed during the Tang dynasty with Tibet supplying horses to the Tang court in exchange for Chinese tea.



Village of Saldang, Dolpo, Nepal, 1978



Nomad trader, Namdo, Dolpo, Nepal, 1978

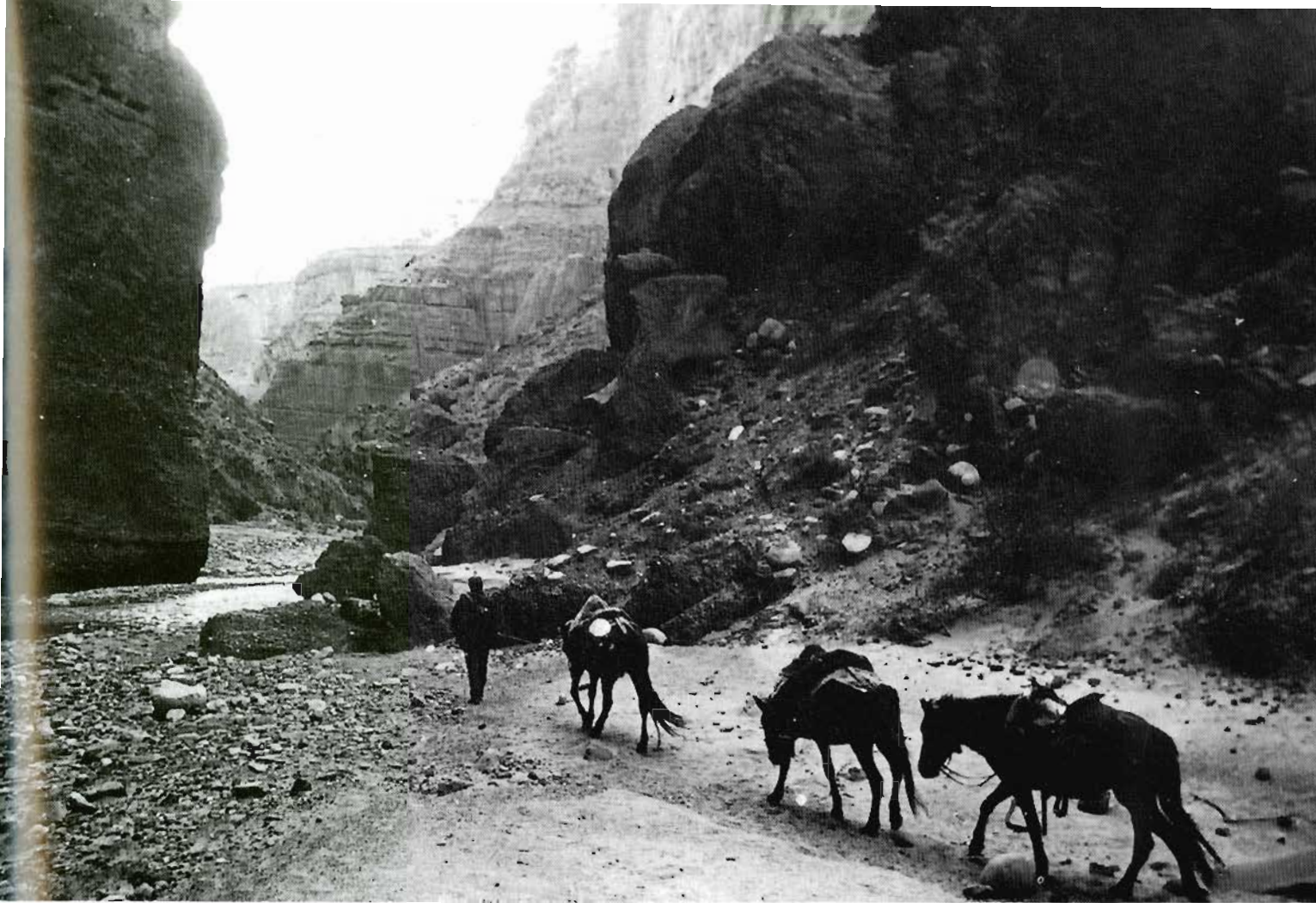


Pack saddles and loads, Chharang, Mustang, Nepal, 1992



Mule carrying Tibetan wool, Birethanti, Nepal, 1984





Horses along Kail Gandaki River, Mustang, Nepal, 1992



It is unclear when trade across Tibet and through the Himalayas began, but it must have been flourishing when the Central Asian city-state of Khotan was founded in 250 B.C. The opening of the Silk Road in the first century B.C. ushered in a period of rapidly expanding trade across Central Asia and across Tibet to India. Pastoralists must have contributed to, and been a part of, much of this trade. Annals from the Han Dynasty (220 BC-202 A.D.) indicate that large trade marts had been operating for centuries in the Koko Nor (Qinghai Lake) region on the northeastern edge of the Tibetan Plateau, with horses highly valued. Luxury saddles were also fashionable among Chinese officials at this time and both Tibet and Mongolia were sources of horses for the Chinese emperors.

For much of the period of Chinese-nomadic interaction, the amount of and frequency with which goods were exchanged were often dictated by the nomads. Contrary to widely held beliefs about Chinese domination over barbarian nomadic tribes, in reality it was often the Chinese who offered tribute to nomadic rulers. Silks and princesses were presented to nomads in exchange for a cessation of hostilities. At one time in the seventh century A.D., the Tibetan Empire was receiving an annual tribute of 50,000 bolts of silk from China. Homage was also made by the Chinese to the nomads in order to establish trade marts on the frontier. Discoveries of fine carpets, textiles, porcelains, and other Chinese and Sogdian adornments in nomad areas indicate the level of sophistication and desire for Chinese goods that these nomadic barbarians had attained. It also sheds light on the degree of trade and cultural contact that existed between nomadic and settled civilizations.

L I V E S T O C K



Yak bull, Langtang, Nepal, 1975 [chapter photo]

Yaks are one of the most important domestic animals found in the pastoral areas of the Himalayan and Tibetan Plateau. Yaks provide milk and milk products, meat, hair and wool, and hides. Yaks are also used as pack and draught animals and for riding. Yak dung is an important source of fuel in an area where firewood is not available. Without the yak it is doubtful if man could live as well as he does in high altitude pastoral areas. The yak makes life possible for man in one of the world's harshest environments.

The wild yak is the progenitor of all yak populations. There is little doubt that the presence of wild yaks, and their later domestication, was the single most important factor in the adaptation of civilization on the Tibetan Plateau. Yaks still play an important role in many pastoral rituals and religious ceremonies. Events such as yak dances signify the vital role that yaks have in pastoral society, not only as a means of daily sustenance, but also for their cultural and spiritual value. Yak herd movements are often integrally linked to religious calendars and monitored by complex social structures.

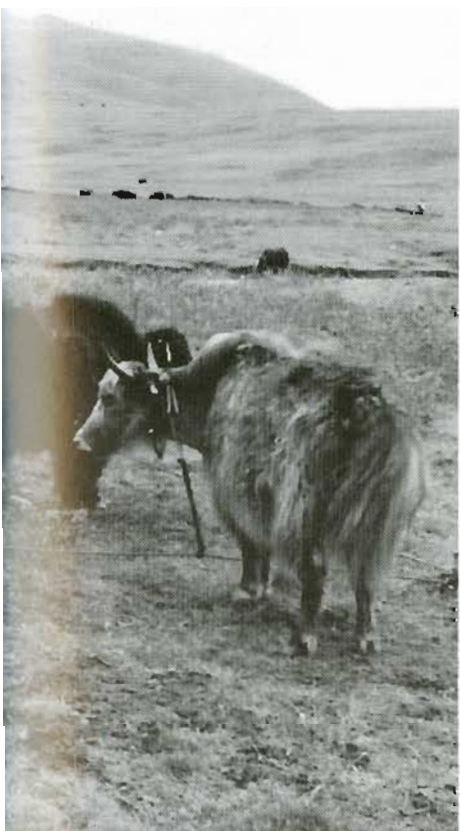
Yaks tied up for milking, Hongyuan, Sichuan, China, 1996





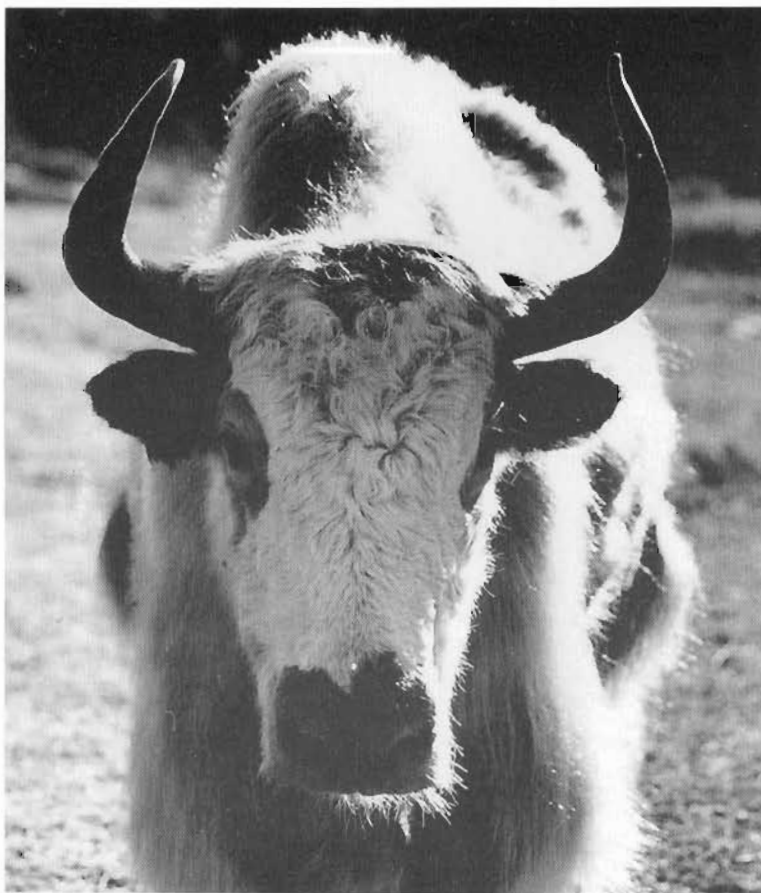
Riding yak, Hongyuan, Sichuan, China, 1996

White yak, Tianzhu, Gansu, China, 1996





Milking yak-cattle hybrid [*dzo-mo*], Philjor, Dolpo, Nepal, 1978

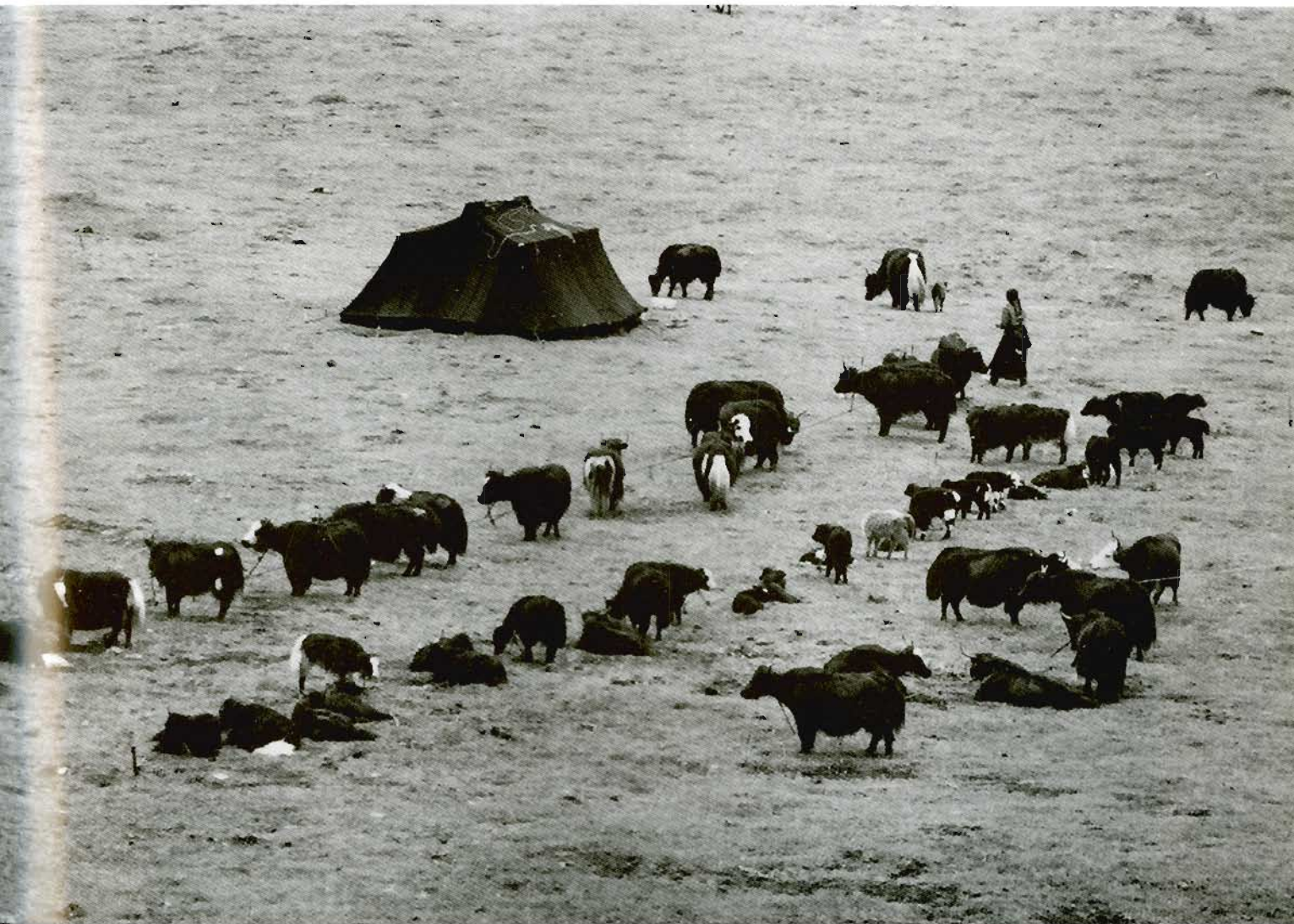


Yak used for packing supplies, Namche Bazaar, Khumbu, Nepal, 1984



Yak production systems vary widely across the Tibetan Plateau. In some areas, herders maintain only yaks and, in other regions, both yaks and yak-cattle hybrids are raised. Complex systems for cross-breeding, with specific nomenclature for the different crosses, are also found in yak-raising areas. The wide range of yak production practices is a testimony to the diverse animal husbandry skills yak herders have acquired and the unique adaptations they have made for survival in a harsh environment. Despite these adaptations and skills, yak production today faces many problems. Improving yak productivity is often constrained by inadequate forage, especially in the winter. This leads to poor nutrition, health-related problems, and reduced fertility. Some of the current yak-breeding practices are thought to lead to inbreeding, which lowers yak performance. Although access to pastoral areas is improving, yak herders are often still marginalised; social services are inadequate and outlets to markets for their livestock products are limited. Yak production systems, and especially their socioeconomic characteristics, are still poorly understood. As a result, many development interventions are often inappropriate. All of these issues combine to create considerable challenges to improving yak productivity.

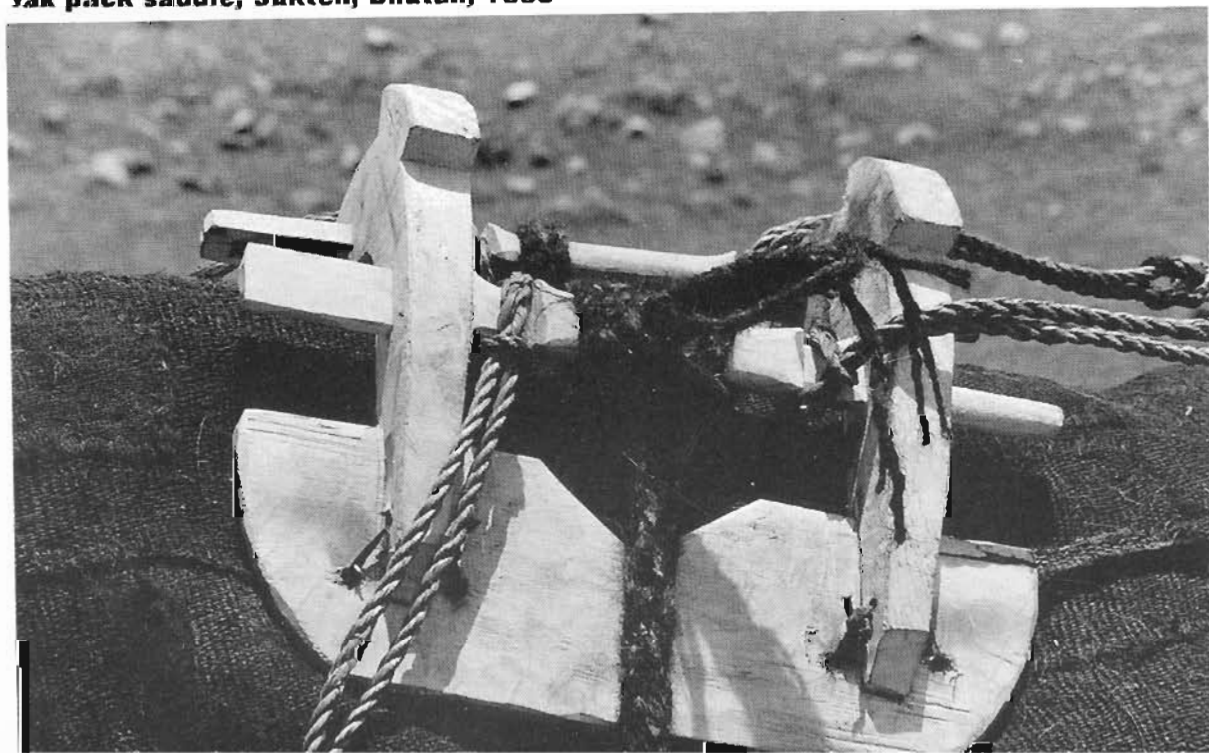
Nomad camp, Longri, Hongyuan, Sichuan, China, 1996





Yaks and yak herders, Mustang, Nepal, 1992

Yak pack saddle, Sakten, Bhutan, 1990





Yak herders have developed local yak types, often recognised as distinct breeds with different characteristics. However, to date, there is little scientific data available about the genetic variations between these breeds. Research needs to be carried out to determine if there are genetic differences among the various yak breeds.

Yaks will continue to be important draught animals in many areas of the Tibetan Plateau and the Himalayas for years to come. Improving animal draught power efficiency will be an important challenge for livestock and development specialists in yak pastoral areas.

Yak hybrid crosses plowing, Zhongdian, Yunnan, China, 1996





Yak hybrid cross used for riding, Hongyuan, Sichuan, China, 1997

Pure-bred yaks and yak crosses are trained to the saddle and used both as pack animals and as mounts. Yaks, once trained, are easily handled, even by women and children. Yak races are held in some parts of Tibet. These events, like their equestrian equivalents, are popular community events wherever and whenever they occur. Yaks and yak-crosses are often ridden in the winter instead of horses since horses tend to be weak at that time of year. Yaks are sure-footed and can travel easily across rough terrain. They can also withstand colder temperatures than horses.



Yak hybrid crosses give more milk than pure-bred yaks and can calve every year. Intricate cross-breeding programmes have been developed by Tibetan yak herders and the various offspring of these crosses and back-crosses have separate terminology. The female hybrids are fertile and can be bred to either yaks or cattle bulls, but male hybrids are sterile.

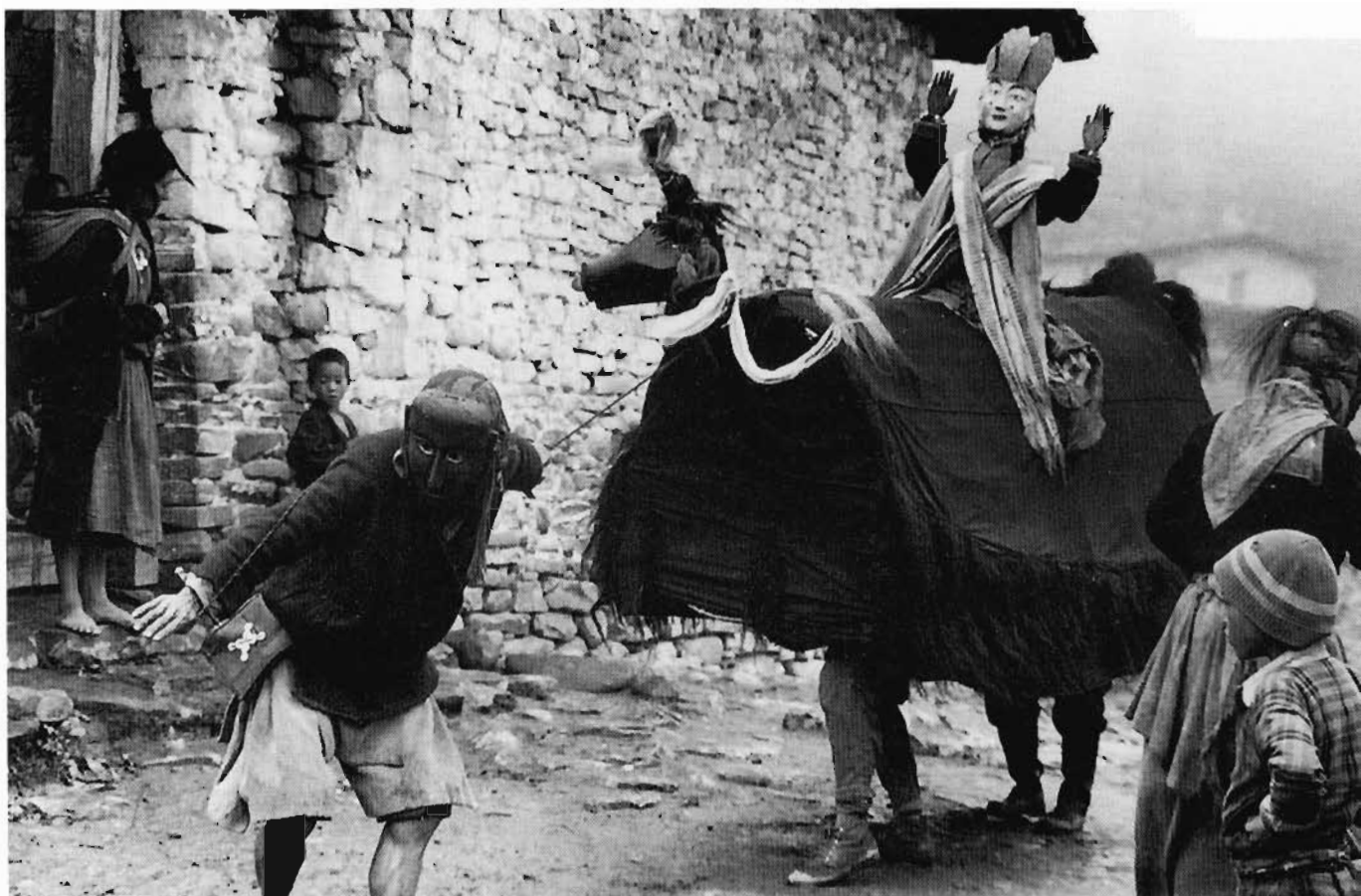


Riding yak, Maiwa, Sichuan, China, 1996





Yak dance, Sakten, Bhutan, 1990



In addition to providing Tibetan nomads with sustenance, yaks also play an important role in many pastoral rituals and religious festivals. For example, yak dances are held by herders throughout yak-raising regions. These events signify the vital role that yaks play in pastoral society; not only as a means of daily sustenance, but also for their cultural and spiritual values. In many pastoral areas, the community will often set a domestic yak free. This 'god yak', as it is called in Tibetan, is an offering to the local gods, a gift back to the environment which sustains the pastoralists.



Yak skulls in a *gomba*, Sakten, Bhutan, 1990

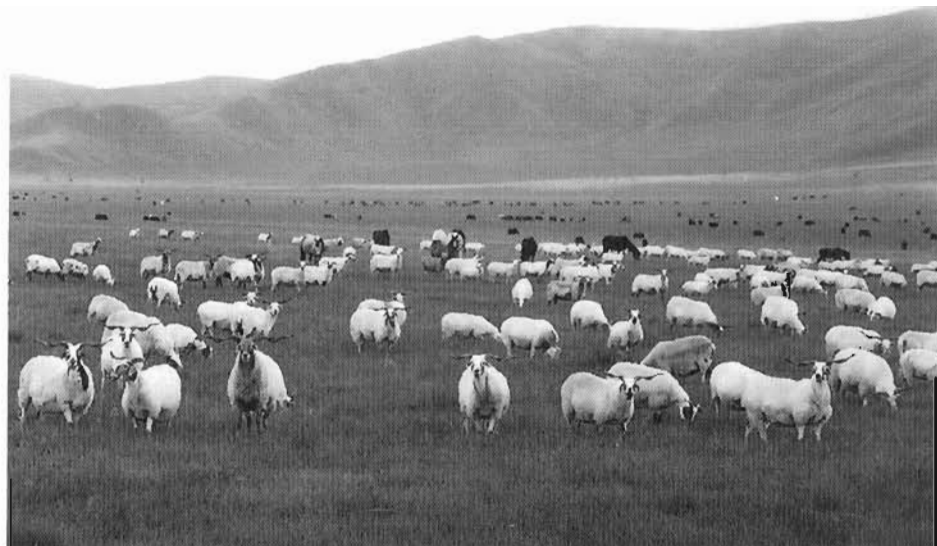


Yak skull and Tibetan Buddhist prayers, Sakten, Bhutan, 1990



Sheep and rangelands, Baingoin, Tibet, China, 1994

Sheep are very important animals on the Tibetan Plateau and Himalayan rangelands. Although yaks characterise Tibetan pastoralism, sheep are often more important economically in many areas. Sheep provide wool, meat, hides, and, in some areas of western Tibet, sheep are also milked. Sheep meat is the preferred meat among nomads and agricultural people throughout Tibet. The wool from Tibetan sheep ranks among the best carpet wools in the world. Tibetan wool is highly prized in the carpet industry for its great elasticity, deep lustre, and outstanding tensile strength. The fibres of Tibetan sheep wool have an exceptionally smooth surface which reflects extra light, making them more lustrous than wool from other breeds of sheep. These factors help give Tibetan carpets their unique characteristics: the subtle, shaded abash; supple resiliency; and a potentially radiant patina.



Fat Tibetan sheep, Zoige, Sichuan, China, 1996



Sheep tied up for milking, Phala, Tibet, China, 1997



Goats being milked, Phala, Tibet, China, 1997

Tibetan goats are raised widely in western Tibet and parts of the western Himalayas. These animals are cashmere producing; some of the finest cashmere in the world comes from western Tibet. Kashmir shawls, made from the cashmere of Tibetan goats, became popular in Europe in the late 1700s. Kashmir had a monopoly on the supply of cashmere at the time. The British were eager to enter this profitable business. Early British interests in the northwest Himalayas and Tibet in the late 1700s and early 1800s were often linked to the trade in shawl wool. The fine cashmere from Tibetan goats enjoys a strong reputation even today, as much of Tibet's cashmere is exported to Europe. Goats are also milked by nomads and actually produce milk for a longer period of time than sheep.





Harvesting cashmere, Phala, Tibet, China, 1997

Goats being milked, Phijor, Dolpo, Nepal, 1978





Horsemen, Nagqu, Tibet, China, 1984

Horse and saddle carpet, Namdo, Dolpo, Nepal, 1978

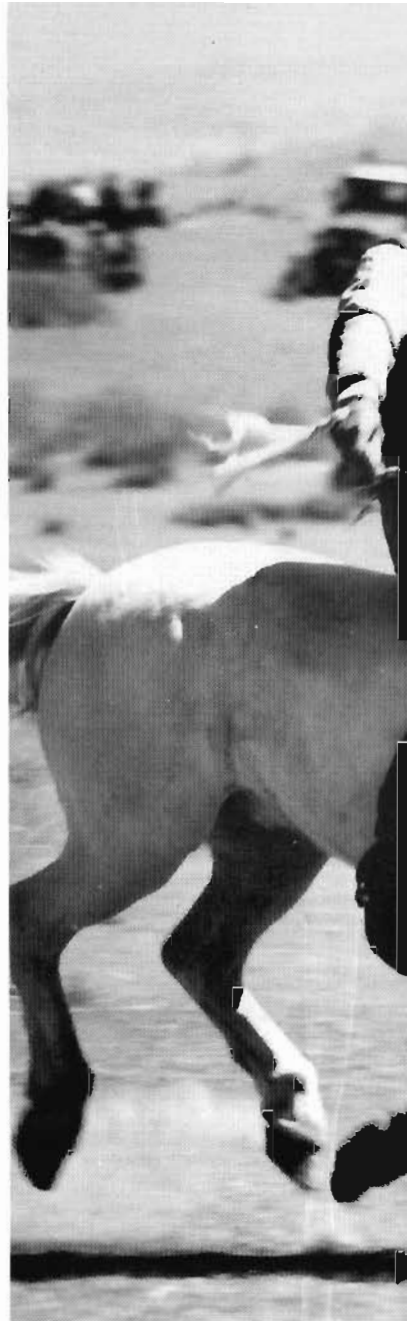




Horses were believed to have been first domesticated on the steppes of southern Russia about 5,000 years ago. Whenever the horse was first domesticated, it probably appeared on the steppes of the northeastern Tibetan Plateau soon afterwards. Horses would have been quite easily brought down to Tibet through what is now Xinjiang and Gansu on trails that later became the Silk Road. The Tibetan Plateau grasslands of present day western Gansu, eastern Qinghai, and northwestern Sichuan Provinces, the area known as Amdo in Tibetan, has long been renowned for producing good horses. Horses bred from around Qinghai Lake were supposed to be able to run 1,000 *li* (500km) in a day. This area is also the home of the legendary *Golok* tribes, excellent horsemen who are descended from ancestral nomads who considered it bad manners to walk even when exchanging greetings between one tent and another. The sport of polo is even thought to have originated in Tibet over 1,000 years ago.



Siling horse, near Qinghai Lake, Qinghai, China, 1997



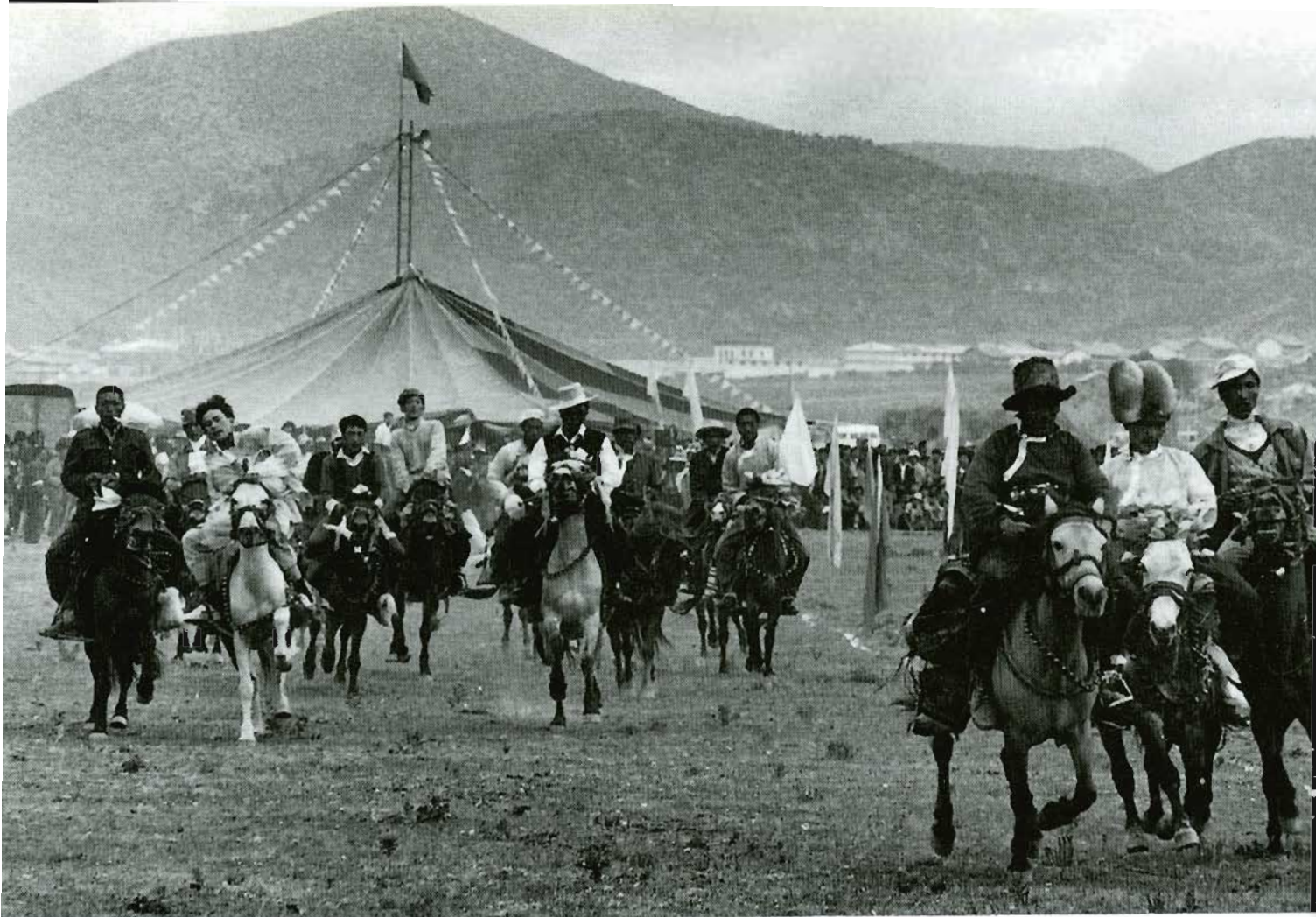
Tibetan saddle, Henan Mongol, Qinghai, China, 1997





Horse race, near Qinghai Lake, Qinghai, China, 1997

Among Tibetan nomads, horses are highly valued, especially in the northeastern region of Amdo and in the eastern area of Kham, where the best horses in Tibet are found. Although horses play only a minor economic role in Tibetan nomadic production, and their numbers are never anywhere near as large as those found in the horse pastoral cultures of Mongolia, horses do help to create special attitudes and values among Tibetan nomads often characteristic of horse-culture modal personalities. Horsemanship is a highly regarded skill among many Tibetan nomads, especially in Amdo and Kham. Throughout Tibet, and the Tibetan regions of northern Nepal, horse races and various contests are held that test both riders' skills and horses' performance.



Horse race, Zhongdian, Yunnan, China, 1996

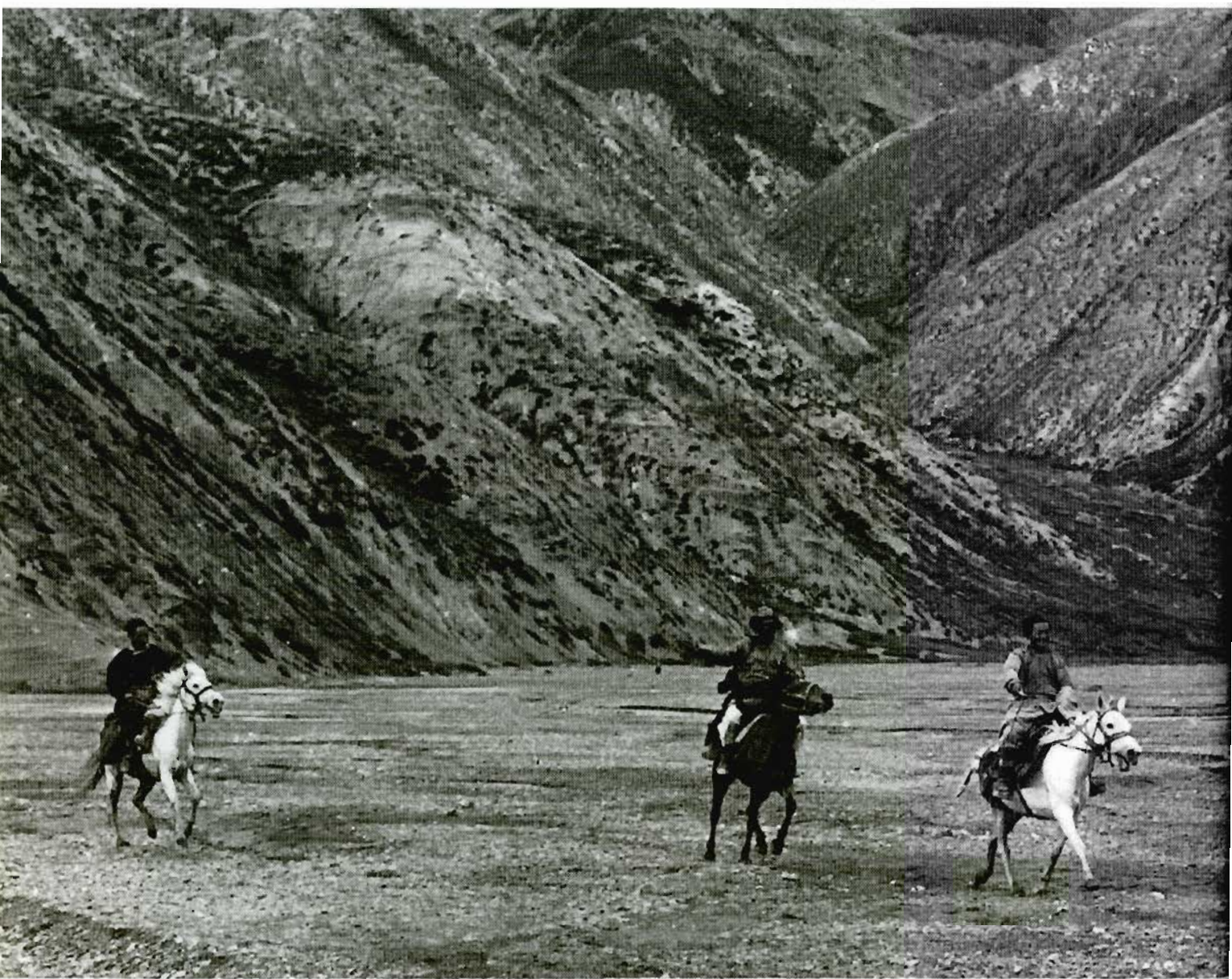
Horse, Hongyuan, Sichuan, China, 1996





Horse and saddle carpets, Zhongdian, Yunnan, China, 1996

Numerous legends attest to the Tibetan's prowess with horses. In one well-known Tibetan tale, the kings of India, Persia, Turkestan, and Tibet sent envoys to the Chinese court, each seeking the emperor's daughter as a bride for their king. These envoys were subjected to a number of tests. In one of the tests set to the envoys, 100 mares were kept in one place. 100 foals in another, and the envoys had to identify the offspring of each mare. When the Tibetan envoy easily succeeded in this, the Chinese emperor supposedly waved the matter aside, saying, "*The test is not a fair one, for Tibet is known as the Land of Horses*".



Horse races, Namdo, Dolpo, Nepal, 1978



N O M A D S

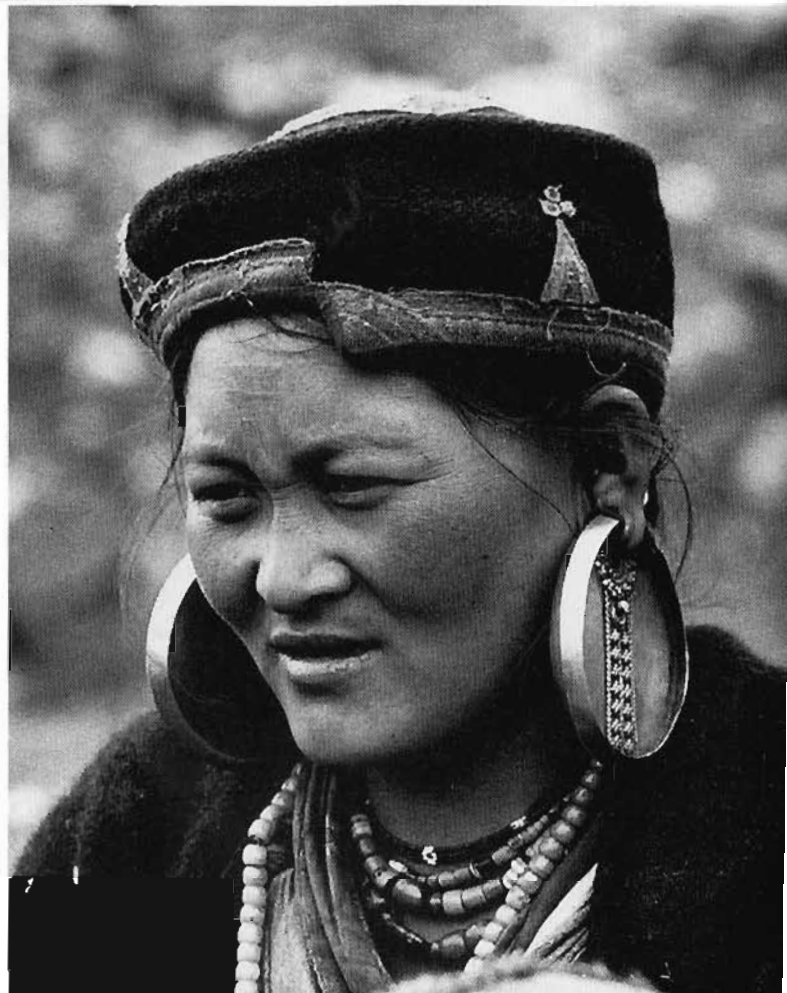




**Nomad woman, Langtang, Nepal,
1976**

Various pastoral cultural groups inhabit the rangeland areas of the Tibetan Plateau and Himalayas, but the Tibetan language, or dialects of it, is a common bond for most of these herders (except for small groups of Kazak and Mongol nomads in Qinghai). Tibetan Buddhism is also a cultural trait that links many of these different nomadic groups together.

**Herder, Zhongdian, Yunnan, China, 1996
[chapter photo]**



**Nomad woman, Langtang, Nepal,
1976**

Another characteristic that binds these disparate groups of nomads together is their hardiness. Constantly exposed to the harsh elements of the Tibetan Plateau, these nomads display an impressive disregard for what we Westerners would regard as poor weather conditions. Whether it is sudden hailstorms in the middle of summer or severe snow storms in the frozen depths of winter, nomads seem to accept these hardships with amazing equanimity.



Nomad man, Zhongdian, Yunnan, China, 1996



Nomad man, Zhongdian, Yunnan, China, 1996

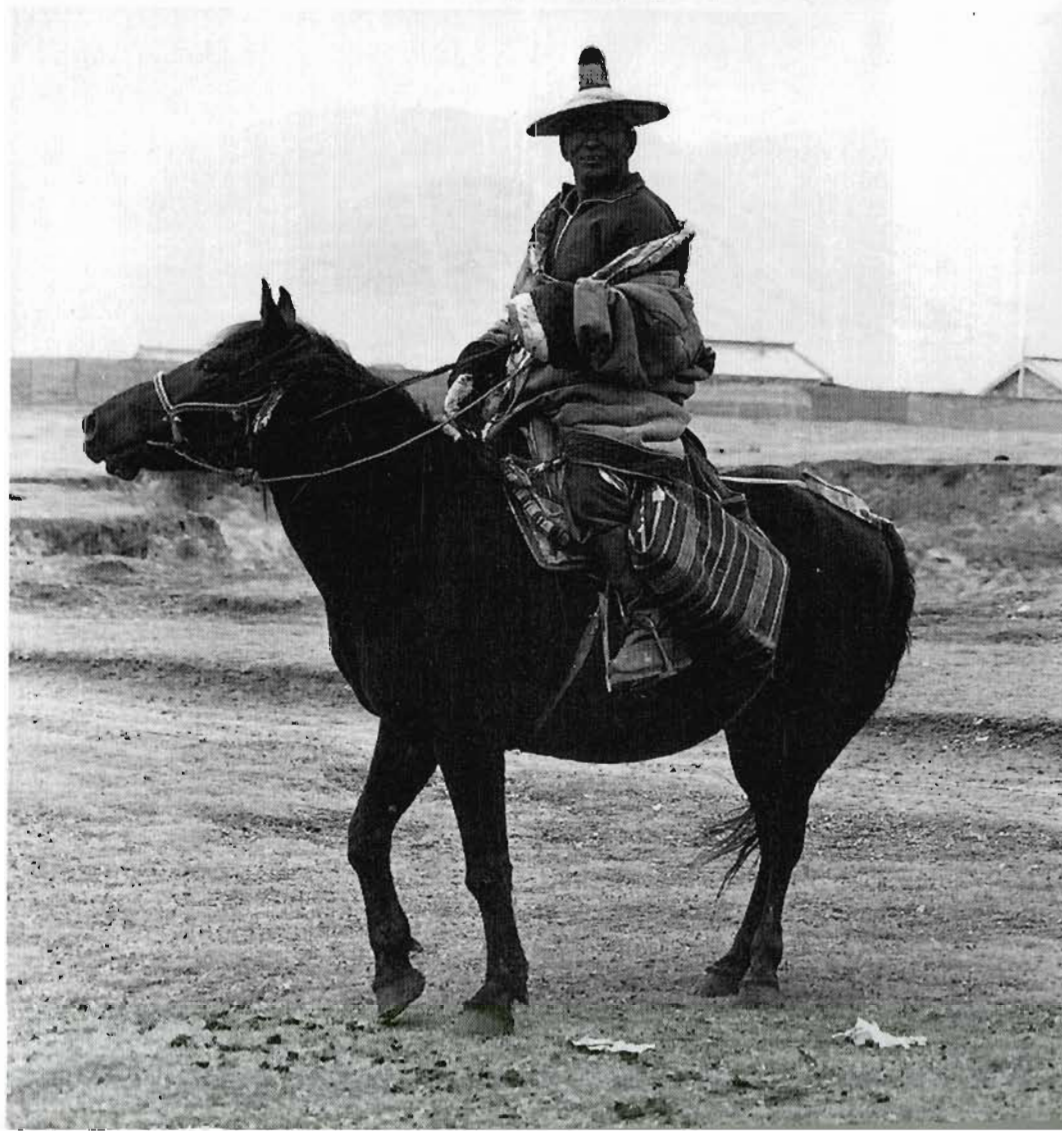
The classic nomads of the Tibetan Plateau, known in Tibetan as *drokpa* (high grassland people), are distinct from the settled agriculturalists of the lower valleys. The *drokpa*, or 'pure' nomads, traditionally practised no cultivated agriculture. Their lives were almost totally dependent upon animals. Another group of Tibetan pastoralists are the *sa ma drok*, or agro-pastoralists, who practice both cultivated agriculture and extensive animal husbandry. All of these herders, men, women, and children, are very adept at handling animals. It is the pure nomads, the *drokpa*, however, who have really mastered the skills of taking care of yaks, sheep, goats, and horses.



**Nomads, Henan
Mongol, Qinghai,
China, 1997**



Nomad woman and horse, Zeku, Qinghai, China, 1997



**Tibetan horseman,
Henan Mongol,
Qinghai, China,
1997**



Tibetan horseman, Kangding, Sichuan, China, 1996



Kazak horseman, Wild Yak Valley, Qinghai, China, 1990



Tibetan nomad woman, Phala, Tibet, China, 1997

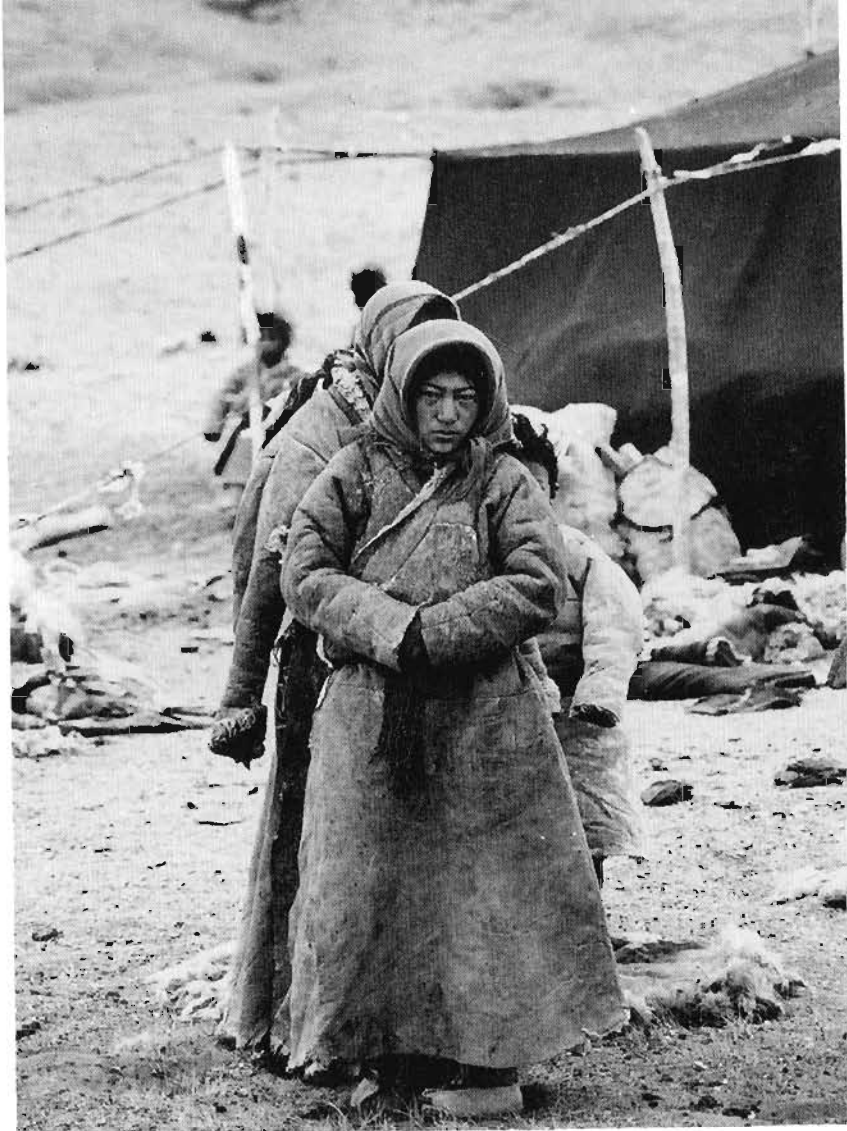


Nomad dancers, Namdo, Dolpo, Nepal, 1978

Nomads possess a great body of indigenous knowledge about the environment in which they live and the animals they herd. Unfortunately, the nomads vast ecological knowledge and animal husbandry skills are often not well recognised or appreciated by scientists and development planners working in pastoral areas. As a result, herders have often been left out of the development process, with neither their knowledge nor their needs and desires being considered by many governments and development agencies in introducing more 'modern' and 'scientific' methods of livestock production. The key to sustainable pastoral development in the Himalayas and on the Tibetan Plateau lies in incorporating and building upon the indigenous knowledge and skills that herders already possess when designing new interventions.



Old herders, Zhongdian, Yunnan, China, 1996



**Nomad woman,
near headwaters
of Yangtze River,
Qinghai, China,
1993**

**Nomad man,
Phala, Tibet,
China, 1997**



**Nomad woman,
Phala, Tibet,
China, 1997**





Nomad woman, Phala, Tibet, China, 1997



In northeastern Bhutan, a unique tribe of yak herding people are found in the region known as Merak-Sakten. Known in the Bhutanese language as *Brokpa*, these people migrated into Bhutan from the nearby Tibetan area of Lhoka centuries ago. According to historical biographies of people from Merak-Sakten, these herders settled in Bhutan in the 7th century, bringing their herds of yaks with them. These yak herders of Merak-Sakten are distinct from other pastoral groups in Bhutan with regards to language, customs and attire. All the men and women from Merak-Sakten wear unique round hats, made from yak hair, with five pointed appendages – almost as if they had large black spiders on their heads.

Herders, Sakten, Bhutan, 1990





Tibetan nomad women, Phala, Tibet, China, 1997

Women play a very important role in Tibetan nomad society. Since they bear and rear children, women directly influence future human resources. As managers of the household and tent, nomad women make vital decisions about the use of natural resources (grass and water). As herders, women are responsible for many of the activities regarding livestock production. Their decisions and actions have effects on range resources and livestock. Efforts to improve livestock productivity, conserve and manage rangeland resources, reduce population growth, and improve nomads' livelihoods will, therefore, have to focus on nomad women. These efforts will have to try and reduce women's time constraints; remove barriers to women's access to credit and extension advice; introduce technologies useable by and beneficial to women; and improve women's educational levels. Women are key actors in the sustainable development of nomadic areas in the Himalayas and on the Tibetan Plateau. Governments, donors, researchers, and pastoral specialists need to better acknowledge women's critical roles in nomadic livestock production.



Nomad woman, Phala, Tibet, China, 1997



Nomad women, Phala, Tibet, China, 1997



Nomad women, Phala, Tibet, China, 1997



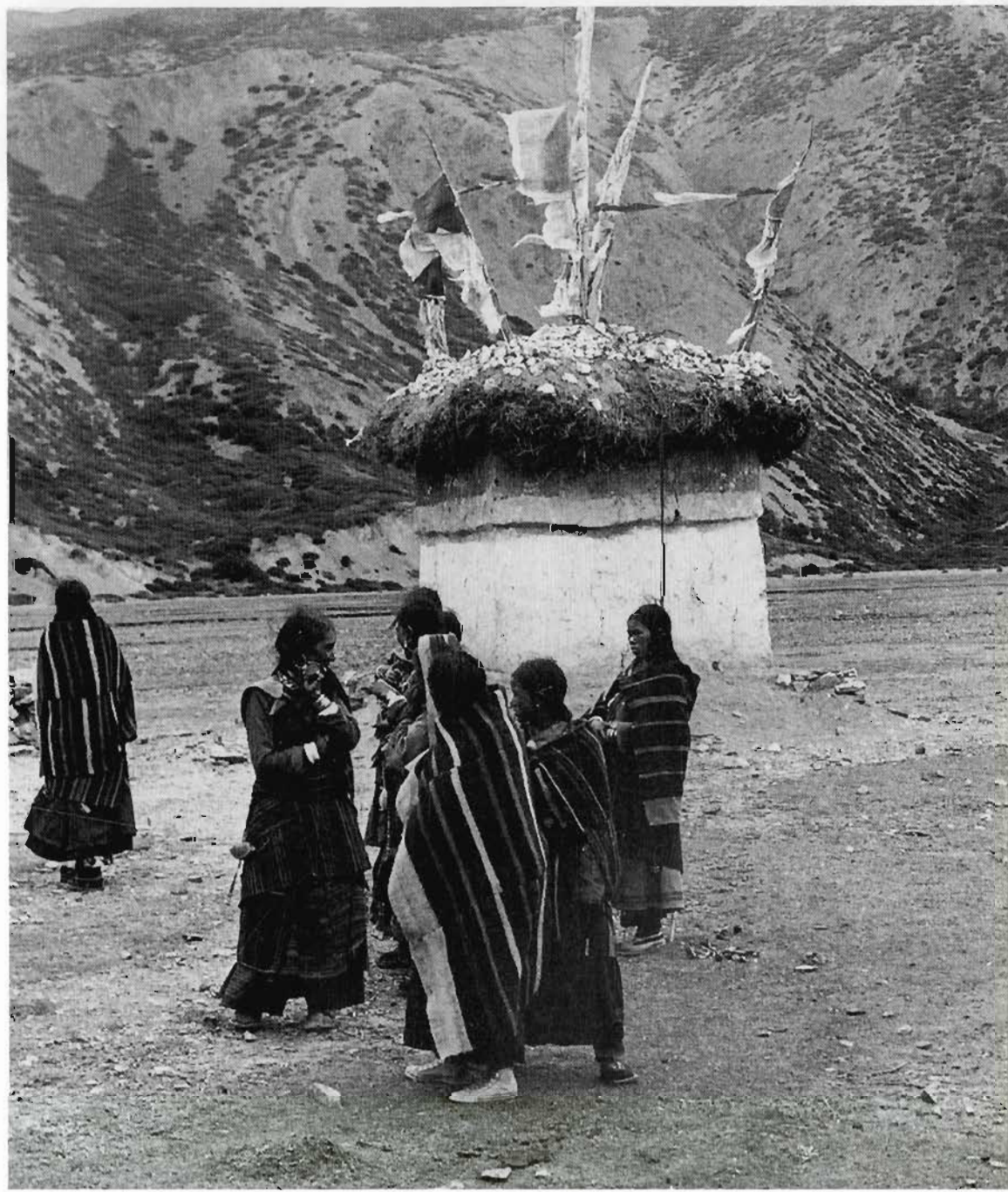
Looking out on the world, Namdo, Dolpo, Nepal, 1978

Nomads of the Tibetan Plateau and the Himalayas, as in other pastoral areas of the world, are often popularly imagined to be wild barbarians. Many people still believe that Tibetan nomads just wander freely across the grasslands with their animals, with no homes or fixed abodes. These romantic images, mistaken beliefs, and negative attitudes about nomads were often used as the basis for misguided pastoral development policies. Tibetan nomads, while proud and individualistic, and sometimes conscious of the adulation they are accorded by farmers and other sedentary peoples, are nevertheless bound by cultural norms and various ties to other social groups. Contrary to popular images, Tibetan nomads follow very well prescribed movements with their animals, often in a fairly small geographic area. Most Tibetan nomads are also already 'settled' and have houses in their traditional winter pastures and barns or simple sheds for their animals. In many ways, nomads on the vast Tibetan steppes are more constrained by relationships and the demands of their production system than are upwardly mobile people in urban areas who can freely move from one job to another.



Tibetan herder, Zhongdian, Yunnan, China, 1996

Nomads and stupa, Namdo, Dolpo, Nepal, 1978





Summer festival, Langtang, Nepal, 1976



Tibetan dancers, Solu, Nepal, 1977



Masked dancer, Sakten, Bhutan, 1990

Pastoral nomadic peoples of the Tibetan Plateau and Himalayas have cultures brimming with fascinating traits, many of which are linked to the annual cycles of pastoral production. Nomadic pastoralists in the Tibetan Plateau have historically had closer links to sedentary rulers and farmers than nomadic societies in other pastoral areas of the world. Tibetan nomads also rarely developed the autonomous tribal structure so characteristic of other pastoral societies, although there were some Tibetan nomad tribes, such as the *Golok* in modern-day Qinghai Province of China, that were more fiercely independent.

Tibetan nomads developed and maintained complex relationships with agricultural villages, as the nomads depended on farmers to provide them with barley grain, a staple of their diet, in exchange for livestock products. Unlike most other nomadic societies in the pastoral world, Tibetan farmers occasionally become nomads, often marrying into a nomad family. Language, religion, and many other cultural aspects were shared among nomads and farmers, helping to facilitate relationships. Many aspects of Tibetan nomadic culture are Buddhist, but vestiges of shamanism and local-spirit, or mountain-god, worship are also common to both nomads and farmers.



**Tibetan nomad
woman, near
Qinghai Lake,
Qinghai,
China, 1997**



**Hiding from
the rain,
Sakten
Bhutan, 1990**



Watching the horse races, Zhongdian, Yunnan, China, 1996

Tibetan nomads cannot be understood without an awareness of their long pastoral history and their position in modern Tibetan life. It is also important to keep in mind that Tibetan nomads have always made adjustments in their lives, both as rangeland conditions changed and as relationships with other nomads, farmers, and rulers evolved over time. Tibetan pastoralism has been adapting to changes for millennia. Today, nomads are still a vital element of the Tibetan landscape and the regional economy, and, given their remarkable capacity to adjust, nomads should be able to surmount any challenges they will face in future.

C H A N G E S



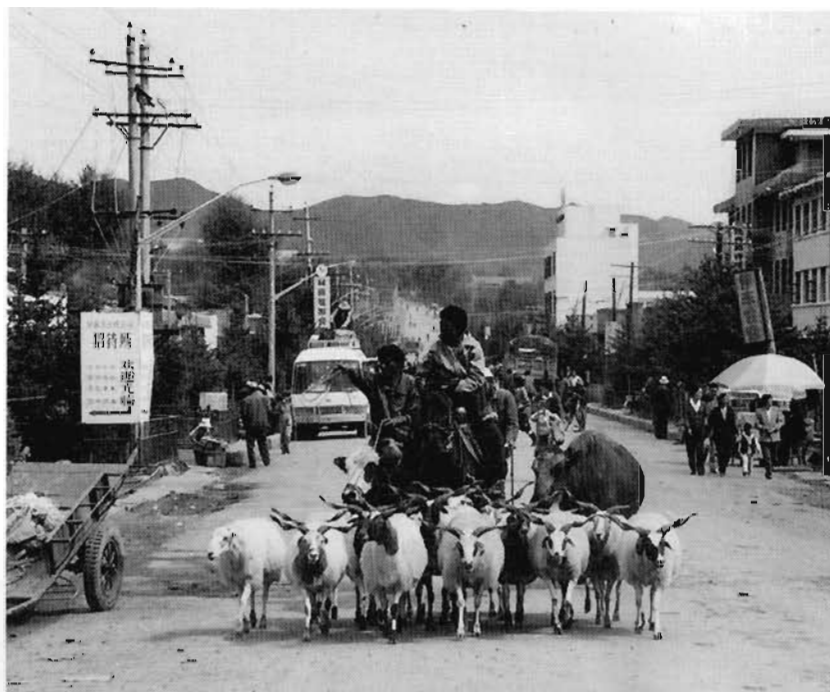


Nomads with little to do, Shuanghu, Tibet, China, 1993



**Nomads heading home,
Hongyuan, Sichuan,
China, 1997 [chapter
photo]**

Faster than a horse, Lugu, Gansu, China, 1996



Sheep being brought to market, Lugu, Gansu, China, 1996



Modern nomad way to travel, Damxung, Tibet, China, 1993

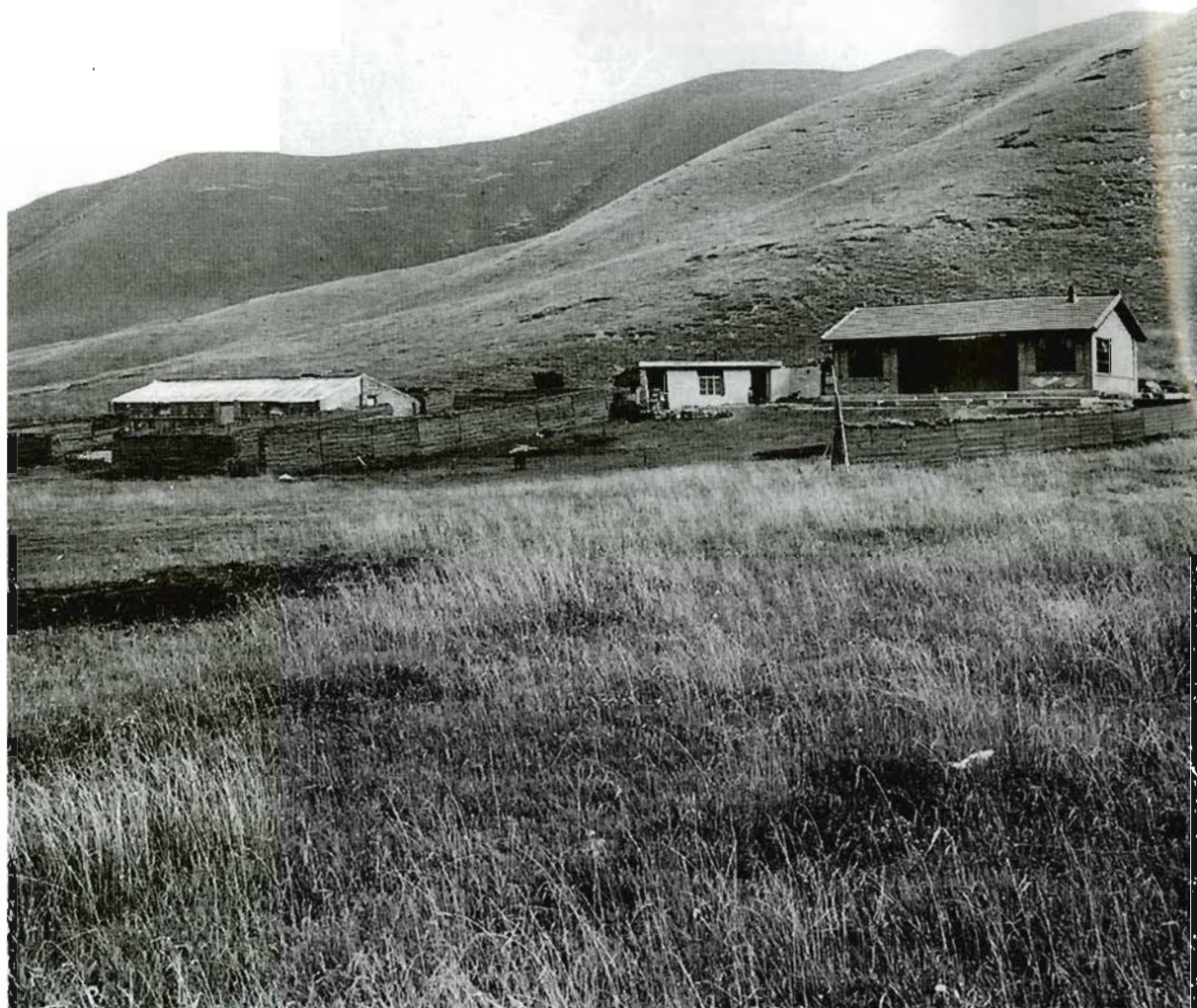
In recent decades, many changes have taken place on the rangelands that are transforming traditional rangeland use and conditions, pastoral systems, and the lives of herders dependent on rangeland resources. Nomads and their pastoral systems have always been confronted with events that change their lives – droughts that wither grass, winter storms and livestock epidemics that wipe out herds, and tribal wars that displace people and their animals – but the changes nomads are facing today on Himalayan and Tibetan rangelands are more profound and likely to have more significant, long-term implications on their way of life and the ecosystems in which they reside than any previous changes.



Road, truck and fences, Near Zeku, Qinghai, China, 1997

Incredible socioeconomic and political pressures have harried Tibetan nomads over the past five decades. Raising livestock on the harsh Tibetan steppes — a risky venture at the best of times — has often been exacerbated by hostilities, political repression, and unsuitable development policies. In some areas, growing human populations have brought increasing pressures from farmers extending cultivation on to grazing lands formerly occupied by herders. Renowned for their independence, nomads throughout the Tibetan Plateau have encountered processes of change, integration, and development that have pulled them into much broader spheres of economic production and Communist Chinese administration. These processes have often created new problems for nomads, but they have also opened doors for new opportunities.

Such new changes include the modernisation process itself, which has brought improved access and services to previously remote nomadic areas and increased demand for livestock products; the expansion of agriculture on to rangelands and decrease in the amount of grazing land available for herds; disruption in traditional trade networks, which were often an important part of pastoral systems; the expansion of the protected area system with increased regulation limiting livestock grazing; and, more recently, policies to settle nomads and divide rangelands into individual family parcels. In many cases, the changes have altered previous, often stable, relationships between pastoralists and their environment. Pastoral systems are still in a state of transition, and it is not yet clear what patterns will eventually emerge.



Tibetan herder's house and barn, Henan Mongol, Qinghai, China, 1997



Street scene, Henan Mongol, Qinghai, China, 1997



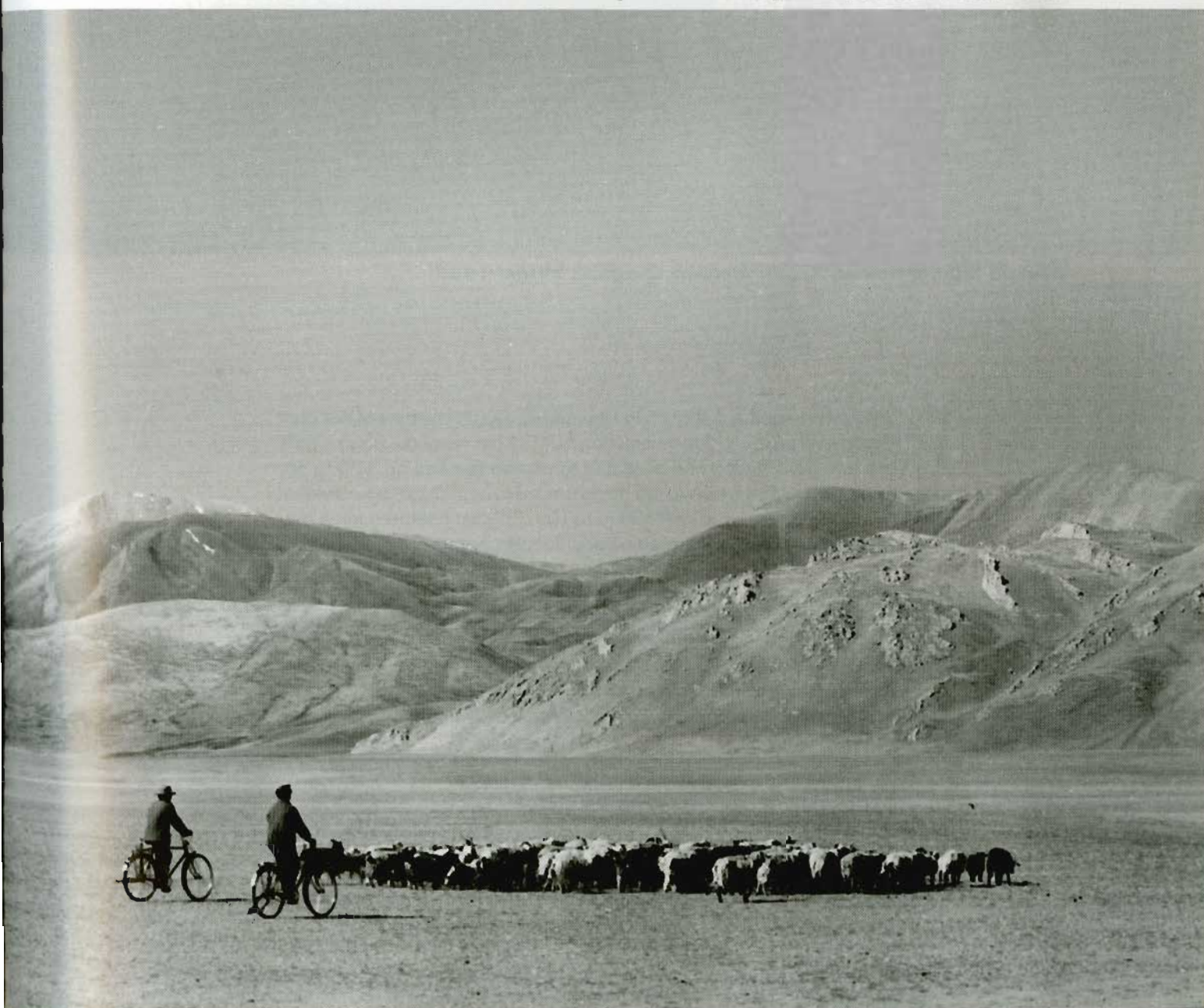
**Yak milk being collected for market, Hongyuan,
Sichuan, China, 1996**

**Nomads returning home from town, Hongyuan,
Sichuan, China, 1997**



With the increase in human population in the region, along with a rise in people's incomes, there is an increasing demand for livestock products from pastoral areas. Many nomads have now entered the market economy, selling their livestock products and purchasing goods they require, in contrast to traditional barter systems. Many pastoral families have greatly improved their standards of living. Nomads throughout the Tibetan pastoral areas of western China, who until a few years ago still lived in tents the year-round, have now built houses and barns and have erected fences around private winter pastures, although most herders continue to live in tents in the summer. Herders are also demanding improved social services (schools, health clinics, etc), as well as improved veterinary services and market outlets for livestock products. Keeping abreast of the changes taking place on the grasslands is an important task for pastoral researchers. These changes and the effects they have had - and are having - on the rangelands, livestock production, and socioeconomic dynamics of pastoral societies need to be analysed.

Modern way to herd sheep, Phala, Tibet, China, 1997





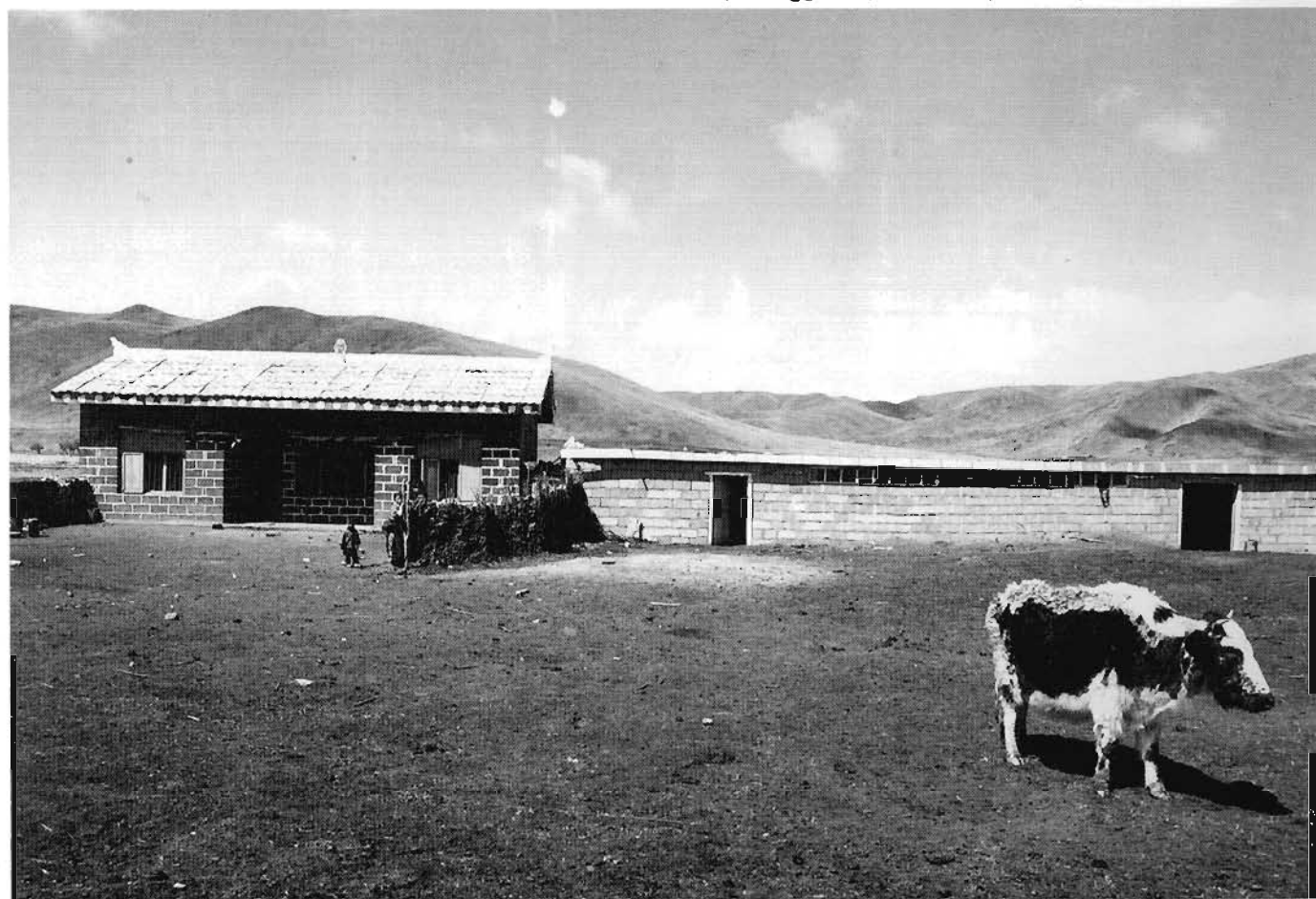
Tibetan nomad house, Henan Mongol, Qinghai, China, 1997

Pastoral development policies in Tibetan Plateau rangelands of Western China now promote the settling down of Tibetan nomads. Rangelands are being privatised and allocated to nomad families on a 30 to 50-year contract basis. Rangelands are being fenced to demarcate an individual nomad's land that has been contracted to him. Special pastures for winter grazing or for hay meadows are also being fenced. The growing of oats for winter forage is encouraged. Houses for nomads and barns for livestock are being constructed. Roads, schools, health clinics, and service centres are being established in nomad areas. The government hopes that such activities will lead to improved management of the rangelands, increased livestock off-take, and an improvement in nomads' livelihoods. Given the generally poor experience with settling of nomads in other pastoral areas of the world, it will be interesting to watch the process of sedentarisation as it unfolds on Tibetan rangelands.



New nomad house, Hongyuan, Sichuan, China, 1996

New nomad house and barn, Hongyuan, Sichuan, China, 1997



In many parts of the Tibetan Plateau, current pastoral development policies and development programmes are transforming pastoral nomads into commercial livestock ranchers, operating on well-defined grassland properties (or at least increasingly more defined with grasslands being contracted to nomads). What effect will this privatisation and enclosure, of what was once 'open range', have on rangelands in the future? Will nomads overgraze pastures that they view as their own property now? How will private pastures and fences affect traditional mechanisms for pooling livestock into group herds and group herding over large areas? Fencing is expensive, relative to the benefits. Is the huge investment being made in fencing Tibetan rangelands really economically sustainable? Is privatisation of the rangelands really the best approach to adopt in Tibetan pastoral areas where the low productivity of the land may make it uneconomic to create individual rights? These questions, and other related ones, need to be answered in order to better understand pastoral production systems and to be able to make wise decisions for the best use of the rangelands.

Tibetan nomad camp, Henan Mongol, Qinghai, China, 1997





Carts taking yak dung to market, Henan Mongol, Qinghai, China, 1997



Nomads riding into town, Henan Mongol, Qinghai, China, 1997

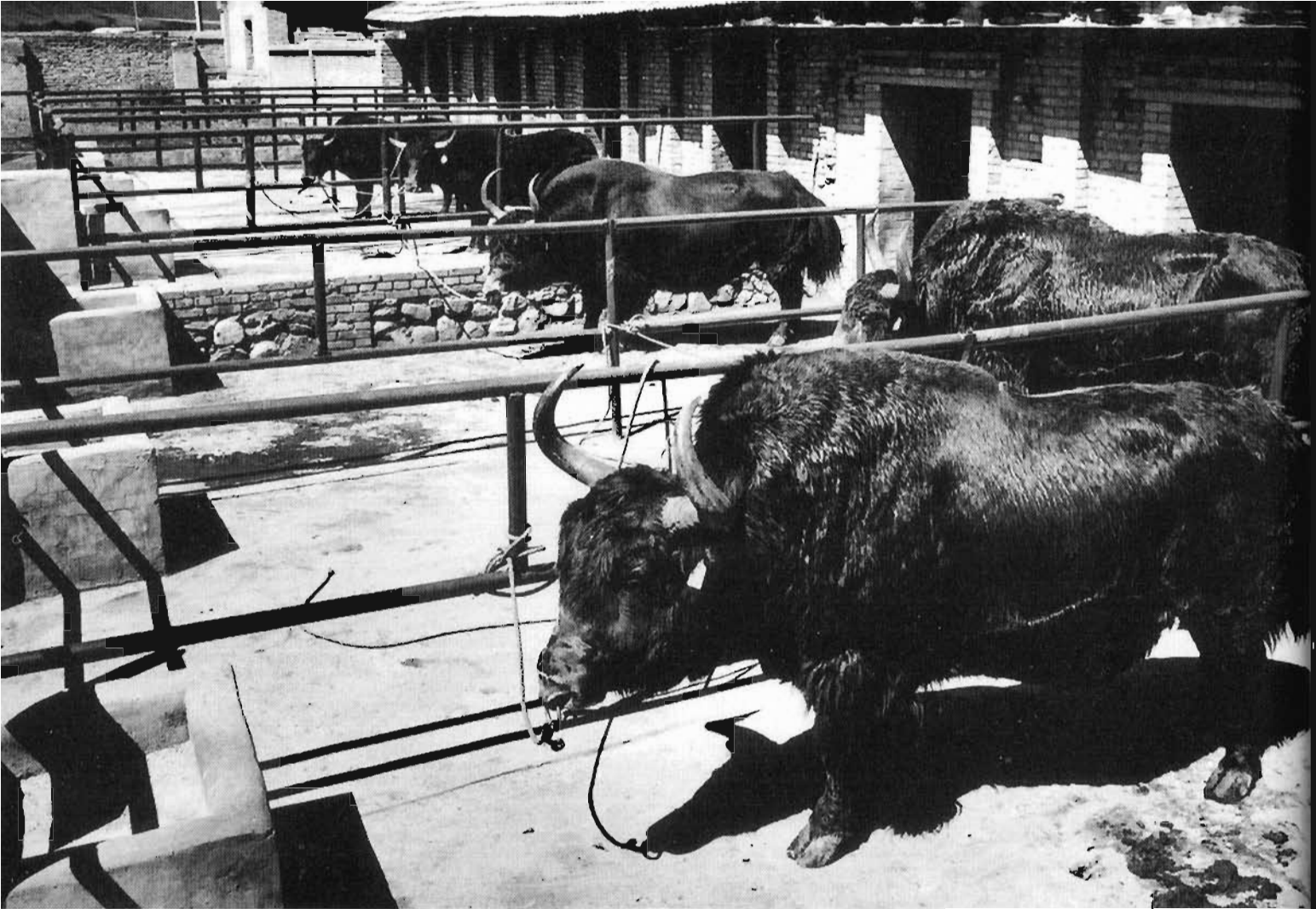


Wild yak skull, Chang Tang Wildlife Reserve, Tibet, China, 1994

Wild yaks characterise the rugged wilderness of the Tibetan Plateau. No other animal so evokes the raw energy and wild beauty of the Tibetan landscape. Standing almost two metres tall, wild yak bulls can weigh up to a tonne. Their horns, which can be a metre long, are still used as milk pails by Tibetan nomads. Wild yaks are magnificent animals. Their long hair hangs like curtains, almost sweeping the ground, and makes them appear even more massive than they actually are. Female wild yaks and their young congregate in large herds, sometimes made up of one hundred or more animals, while most bulls are solitary or live in small bachelor herds. The wild yak is a totem animal of the Tibetan wilderness and achieved mythic status long ago in Tibetan life. Superbly adapted to the rugged conditions of the highest plateau on earth, wild yaks are a keystone species: their presence identifies one of the last, great unspoiled ecosystems of Central Asia.



Wild yaks once roamed throughout the Tibetan Plateau and numbered in the millions. Now, only an estimated 14,000 wild yaks are left, and these animals can only be found in the most remote areas, far from the hunters' guns. Wild yaks are probably the wildlife species under the greatest threat in Tibet today. Despite the fact that wild yaks are officially protected under Chinese wildlife protection legislation, poaching of wild yaks continues and wildlife authorities are often ill-equipped to deal with organized gangs of poachers. Preserving the remaining herds of wild yaks is crucial for biodiversity conservation. Without the wild yak, the rangelands of Tibet will have lost one of its characteristic species.



**Wild yak stud bulls, Datong Yak Farm,
Qinghai, China, 1997**

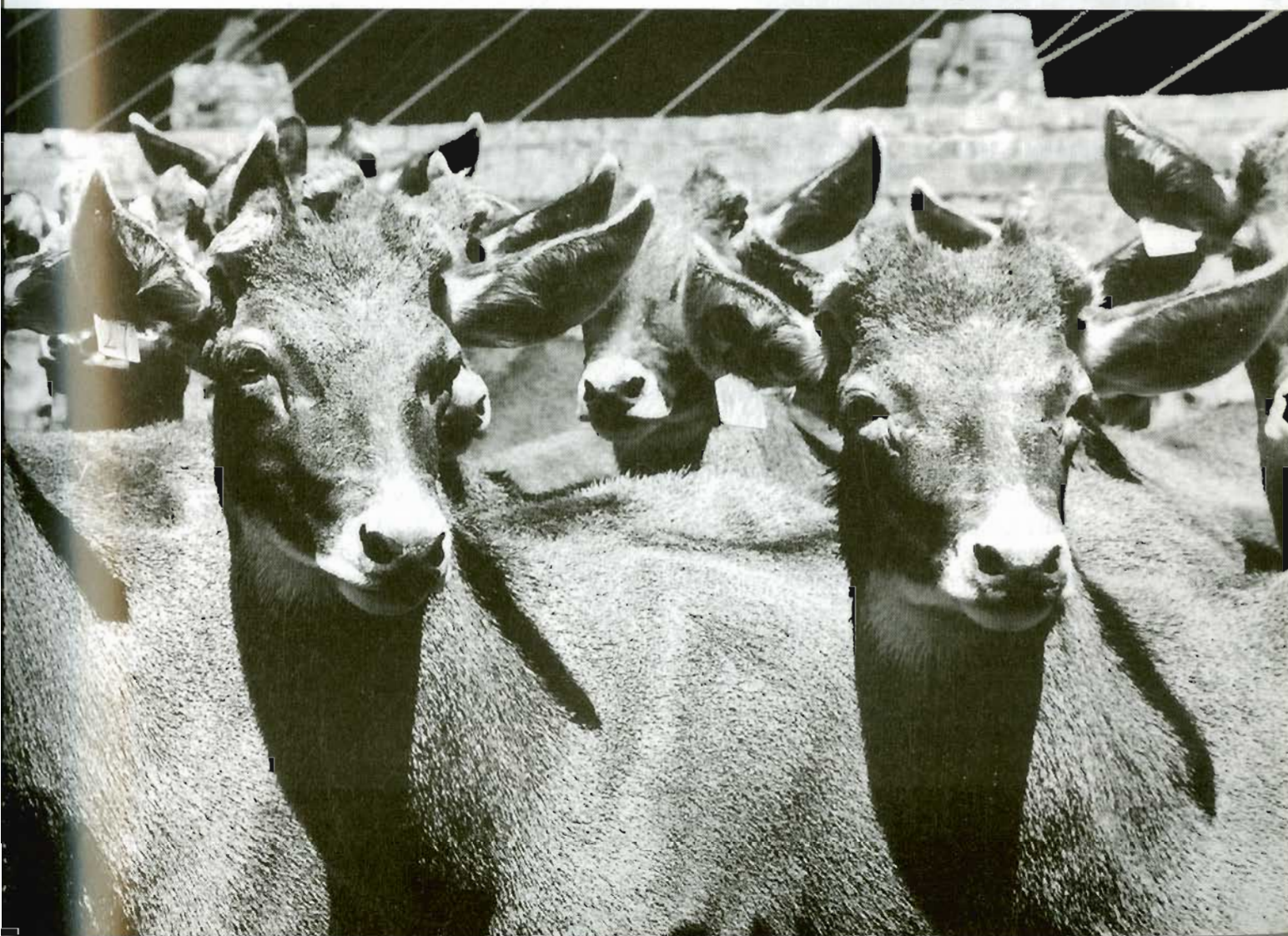
Wild yak bulls are now being used for cross-breeding programmes with domestic yaks to improve yak productivity in China. Semen is collected from wild yak bulls that were captured as calves and now raised on government farms. Wild yak semen is frozen and used in artificial insemination with domestic yak cows. The male F1 crosses from these matings are also used as breeding yak bulls to improve yak productivity. Domestic yak calves sired from wild yak bulls (and bulls that are 50% wild yak) are much bigger and more productive than pure domestic yaks. These programmes highlight the need to conserve and manage the remaining herds of wild yaks still found on the Tibetan Plateau of China.





Deer, such as the white-lipped deer which are native to the Tibetan Plateau, are being raised on government farms in China. Their antlers are harvested for medicinal purposes. When considering management of rangelands and pastoral development in the Himalayas and on the Tibetan Plateau, greater attention needs to be directed towards animal resources other than livestock that could be raised by pastoralists to earn additional sources of income. With increasing reliance on market economics and some visionary rangeland planning, some Tibetan nomads may be raising deer instead of yaks in the future. Of course, then they will be probably be competing in the international market with New Zealand's deer farmers – who are already well advanced in deer farming. Who knows? in the future, nomads in northern Tibet may also be managing large herds of Tibetan antelope in order to harvest their valuable wool.

**White-lipped deer, Datong Yak Farm,
Qinghai, China, 1997**





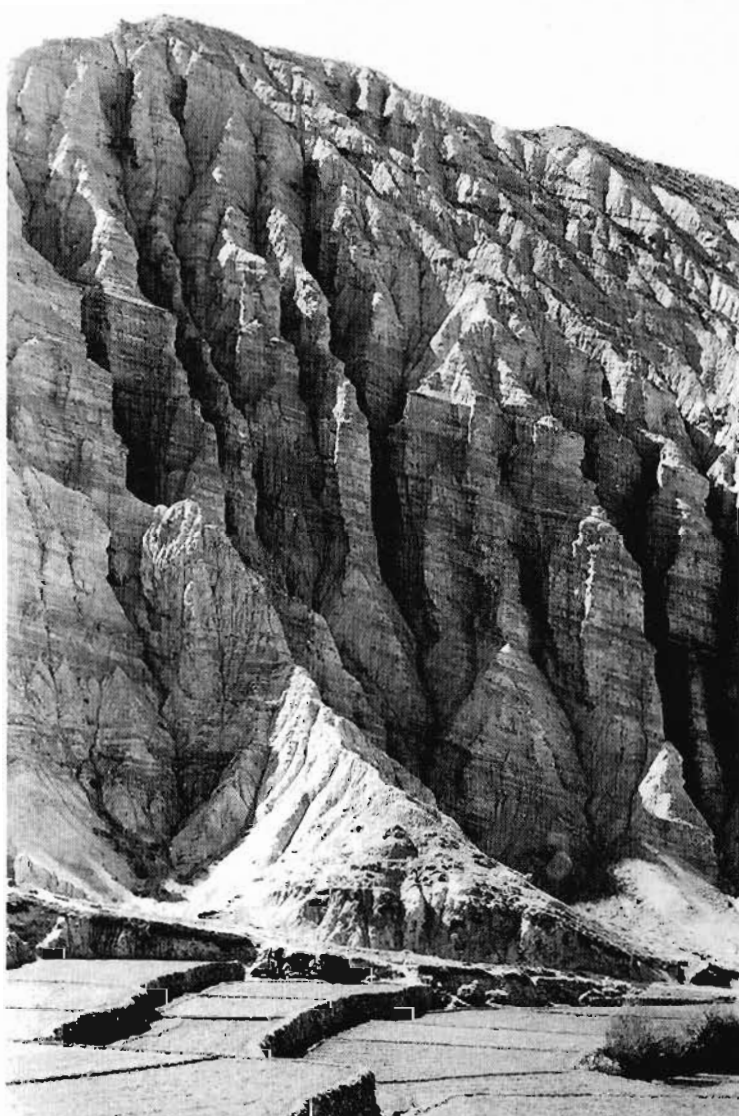
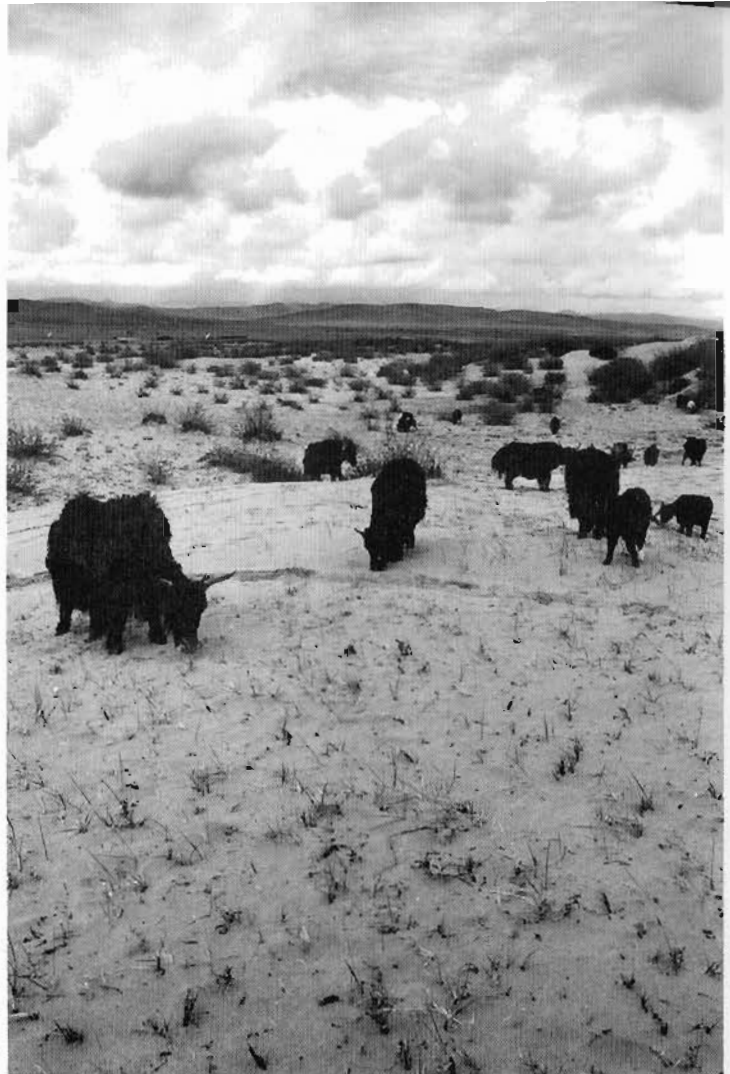
Rangelands, forest, and log trucks, Zhongdian, Yunnan, China, 1998

Rangeland degradation, loss of biodiversity, and increased marginalisation of pastoralists result from mismanagement of rangeland resources. The general lack of concern for rangelands in the Himalayas and on the Tibetan Plateau means that not enough, good ecological research has been carried out in these grazing land ecosystems and, therefore, rangeland dynamics are not well understood. This complicates proper assessments of the causes of rangeland degradation and decline in rangeland productivity and biodiversity.

While overgrazing by livestock is a problem in many areas, livestock are often wrongly blamed for vegetation changes and rangeland degradation. There is increasing evidence that a general climatic trend of desiccation may be responsible for much of the vegetation change and apparent degradation that is taking place. When the actual causes of perceived rangeland problems are misinterpreted, as is often the case on the Tibetan Plateau when the ecology of the rangelands is not well understood, efforts to address the problems are often frustrating and unsuccessful. Successful efforts to conserve and manage rangeland resources must address the full range of causes of rangeland degradation, loss of biodiversity, low livestock productivity, and marginalisation of pastoralists and embrace the opportunities that rangeland ecosystems and pastoral people offer for sustainable development.



**Yaks and sand
dunes, Zoige,
Sichuan, China,
1996**



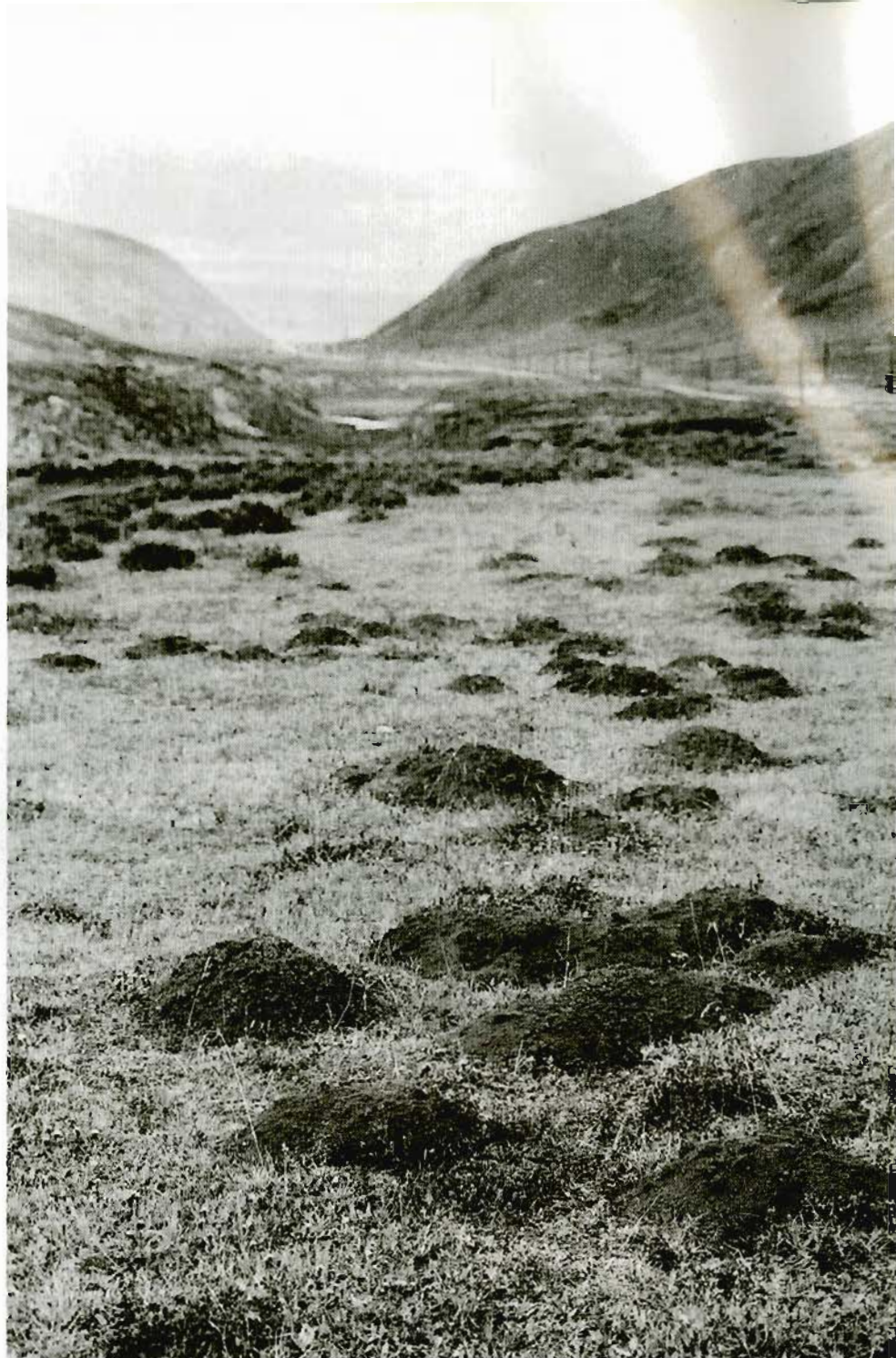
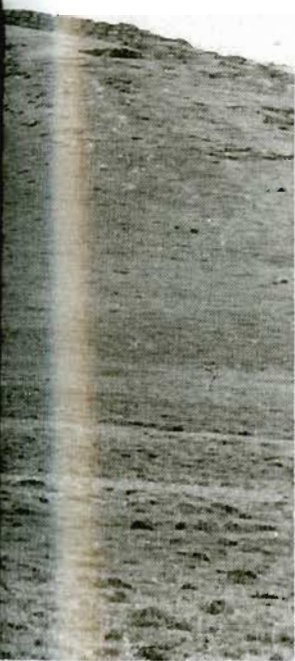
**Eroded landscape,
Mustang, Nepal,
1992**



Degraded rangelands ["black beach"], Zeku, Qinghai, China, 1997

Misconceptions about the sustainability of nomadic pastoralism on the Tibetan Plateau are widespread. Popular misconceptions include fallacies that livestock numbers have greatly increased in recent decades; livestock are the cause of environmental degradation taking place; degraded ranges could be improved if stocked at carrying capacity; large herds maintained by nomads are uneconomic and only a status symbol of wealth; grazing lands can be turned to more productive uses; and that new institutions and organizations need to be put in place to improve range resource management.

The realities are that, in many Tibetan pastoral areas, livestock numbers have not increased in recent years and current attempts to limit animal numbers may be ill conceived. Secondly, there is increasing evidence that a general climatic trend of desiccation and warming may be responsible for vegetation changes taking place that may be wrongly perceived as degradation due to heavy livestock grazing. Even if overgrazing is taking place, it is not livestock but people and their inappropriate policies and mismanagement of resources that should be blamed for degradation. It is also becoming increasingly apparent that existing paradigms for explaining the dynamics of rangeland ecosystems have not captured the dynamic nature of Tibetan rangelands and, therefore, traditional measures for range conditions and carrying capacities have not been effective gauges for management in pastoral systems. Thirdly, even if seemingly uneconomical, herders often will not be willing to reduce animal numbers, since large herds provide insurance against losses and competitive advantage in exerting control over grazing resources in addition to social status and livestock products. Fourthly, much of the land being used for grazing is marginal and unsuitable for cultivation, and ruminant livestock are the most efficient land use means to convert plants into products useable by mankind. Finally, pastoral societies have usually developed sophisticated ways of managing range resources which outsiders often do not understand or acknowledge.



**Mole-rat mounds destroying the grasslands,
Zeku, Qinghai, China, 1997**

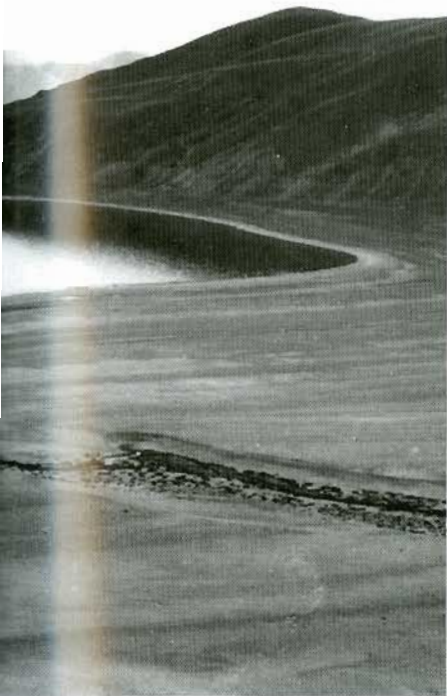
Rangeland degradation, illustrated by areas of rangeland that have lost their vegetative cover (known as 'black beach' in China) is an issue on the Tibetan Plateau. Large areas of this 'black beach' are found in the eastern parts of the Tibetan Plateau in *Kobresia* sedge meadows. While the causes of this degradation are still not well understood, it is believed by some researchers that the general desiccation, or drying up, taking place on the Tibetan Plateau may be responsible. The rangeland environment can no longer support *Kobresia* plant communities and the rangeland is going through changes to a plant community more dominated by drought tolerant grasses and forbs. Livestock grazing, often perceived as the cause of 'black beach', may actually just accentuate natural ecological processes taking place on the landscape. Small rodents such as pikas ('rabbit-rats') and zokers ('mole-rats') also cause considerable rangeland degradation.



Old beach lines of Mun Tso lake, Phala, Tibet, China, 1997

Many of the large lakes on the Tibetan Plateau are much smaller than they were thousands of years ago. Old beach lines, in some cases 40 metres above the present shore lines, indicate the degree to which lakes have dried up. This general desiccation that is taking place is also affecting vegetation and is especially apparent in the alpine *Kobresia* sedge meadow communities. Researchers have noted that, in many of these plant communities, the environment can no longer support sedges and the vegetation is changing to a grass steppe type. These vegetational changes have important implications for the future of the Tibetan Plateau rangeland ecosystem, as these sedge meadows provide vital grazing for livestock and wildlife. Reduced plant productivity in these areas could have serious repercussions for livestock production and pastoralism over a wide area, with critical implications for wildlife as well. These climate-induced vegetation dynamics need to be better understood and vegetation changes should be monitored to detect changes and to develop appropriate pastoral management plans.

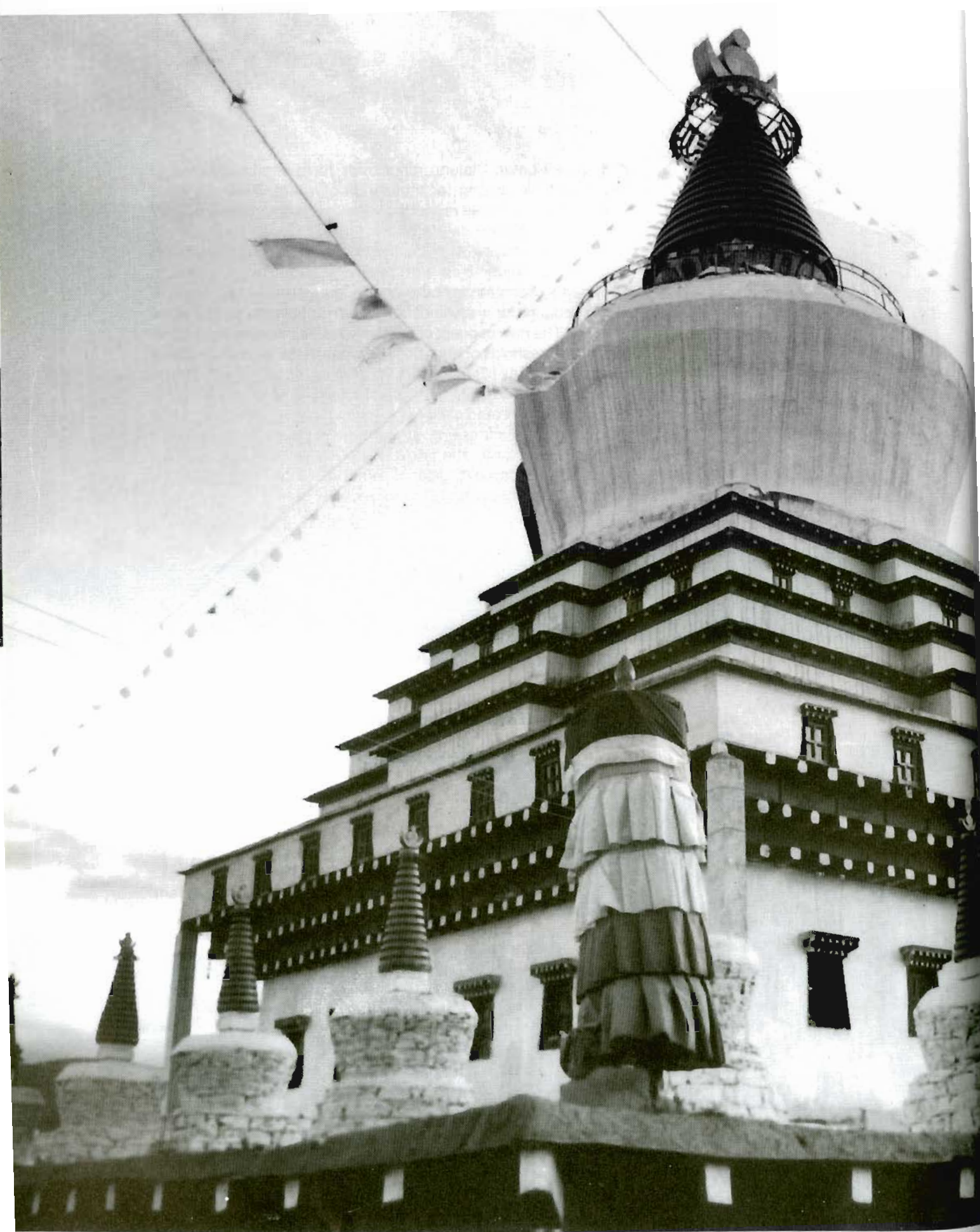




Since Tibetan Plateau rangelands have been subjected to livestock grazing for thousands of years, livestock have probably affected rangeland vegetation composition in many areas. Analysing the nature of these man-induced changes will help to explain ecosystem processes and the impact of livestock on the rangelands. New perspectives about non-equilibrium ecosystems, such as are often found in pastoral areas, provide fresh paradigms for analysing the Tibetan rangelands and pastoral systems. The new concept of relatively stable, multiple vegetation states with thresholds or transitions between these vegetation states is also emerging as a framework for analysing rangeland vegetation. These perspectives differ markedly from the Clementsian Paradigm of plant succession and plant climax communities, offering promise for improved descriptions and measurements of rangeland conditions. Exploring the relevance of these new concepts for Tibetan and Himalayan rangelands could have important implications for the future management of these pastoral areas.

Rangelands and mountains, Phala, Tibet, China, 1997





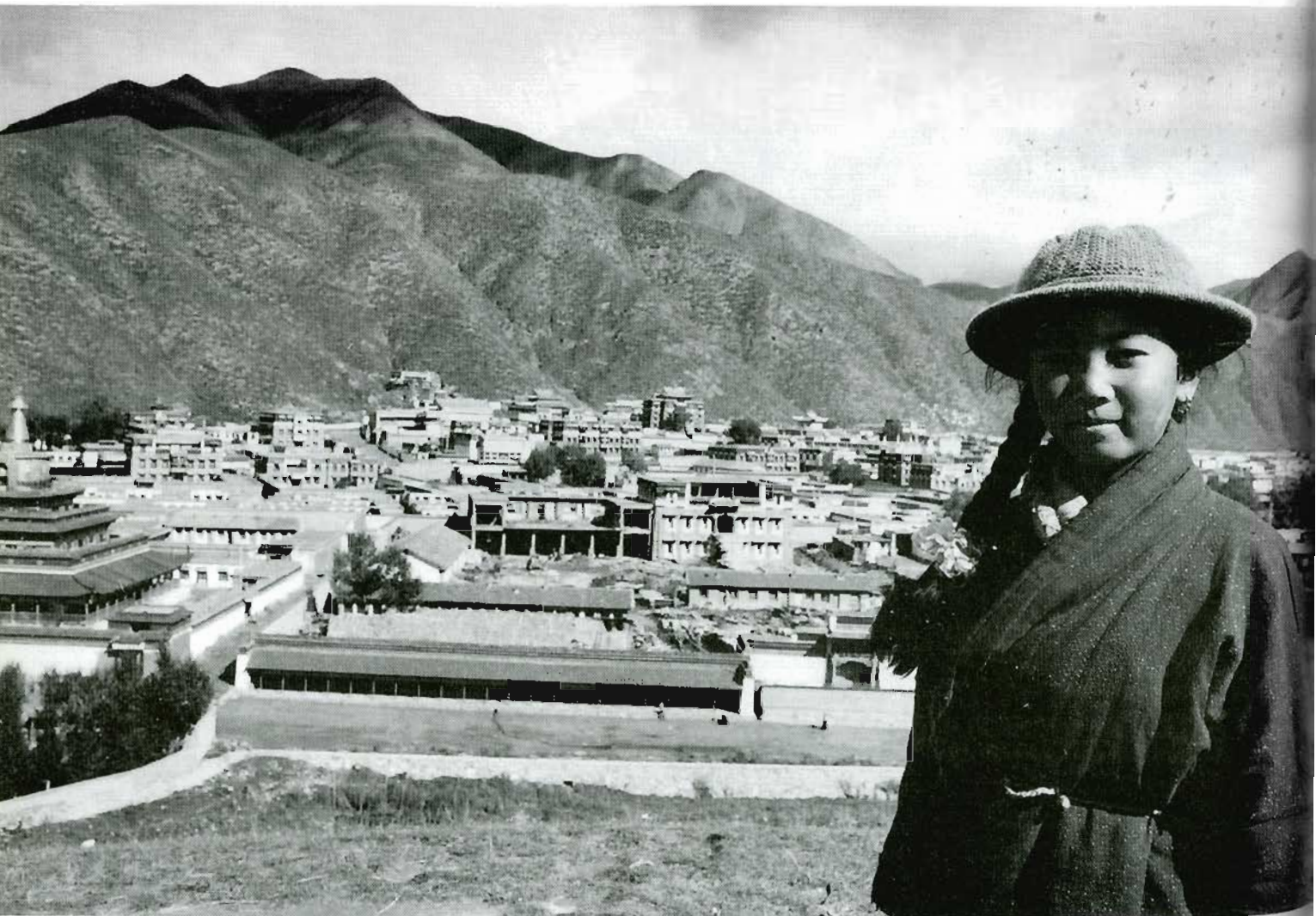
Stupa, Aba, Sichuan, China, 1996

In traditional Tibetan pastoral society, large monasteries often controlled vast estates of grazing land. There were often detailed, written prescriptions for the management of rangelands which allowed for adjustment of livestock numbers and their distribution or reallocation across the monastic estate, based on grazing conditions and changes in herd sizes. Records were also maintained of livestock numbers and animal production. Although many of these written records were lost in the upheaval that took place during the Cultural Revolution in the 1960s and 1970s, those records that survive can be a valuable source of historical information on livestock distribution and nomadic production parameters that would make for interesting comparisons with present day livestock practices.



In the late 1960s, when the Cultural Revolution swept China like a firestorm, the pastoral way of life for Tibetan nomads was torn apart. Overnight, pastoral systems that had been in place for centuries were stamped out. Almost all aspects of pastoral production and nomads' social lives became rigidly fixed by central government policies. Communes were established, nomads' livestock and assets were seized, and nomads were given specific jobs related to certain aspects of collectivised livestock production. In many areas, overall pastoral production fell and nomads' standards of living declined as a result of forced sales that had to be made to the government. In 1981, the commune system was abolished in Tibet and the communes' assets were allocated to individual nomads. Pastoral production soon returned to what it had been prior to collectivisation, although an administrative structure was now in place to provide social services and to try to regulate livestock numbers to prevent overgrazing.

Tibetan girl and Labrang monastery, Xiahe, Gansu, China, 1996



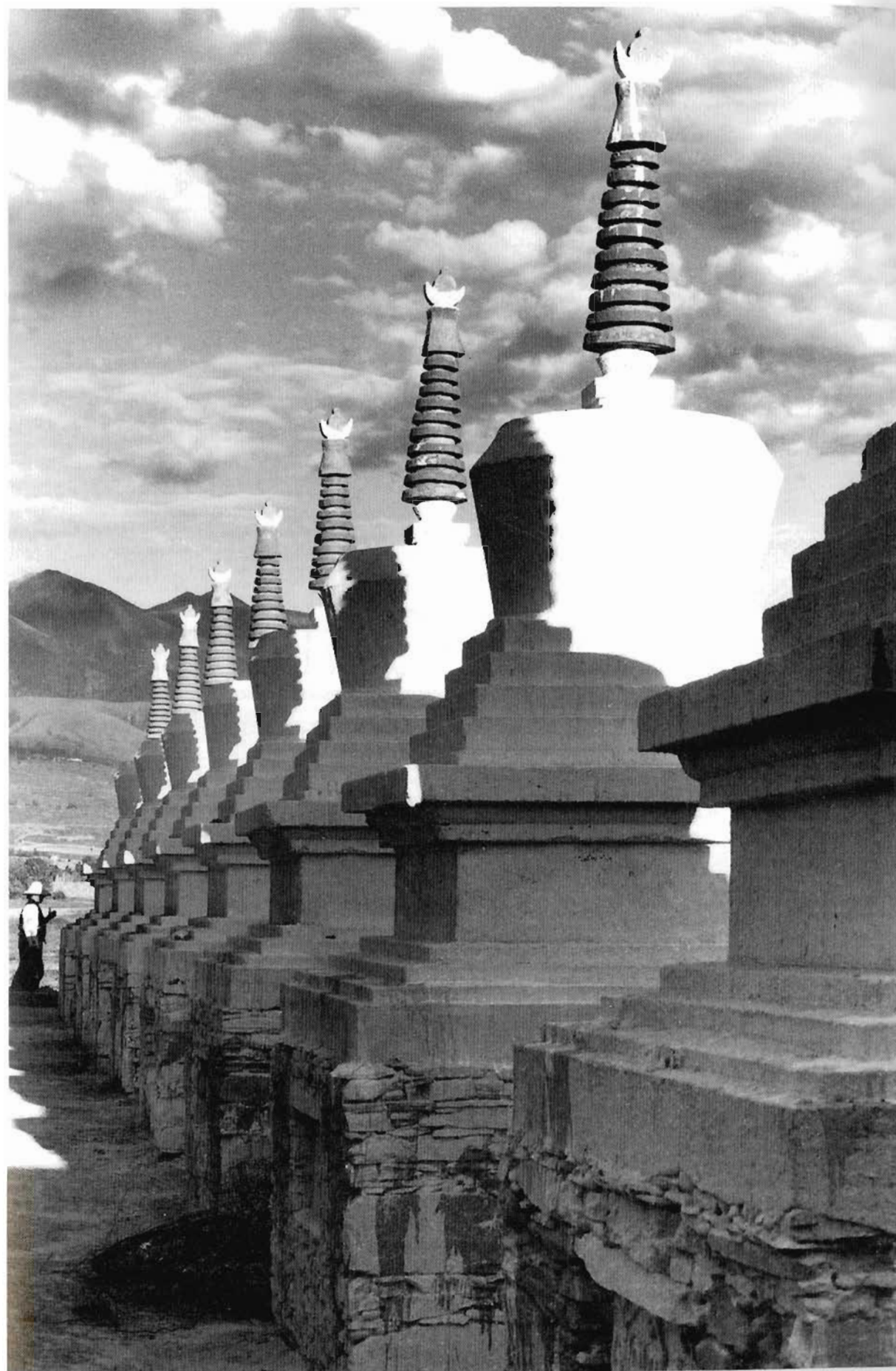
During the Cultural Revolution, thousands of monasteries were destroyed in Tibetan pastoral areas. In recent years, many monasteries have been rebuilt and nomads are again free to practice religion. Tibetan Buddhism is a significant factor on the lives of the nomads today, as it has been for centuries. Just as Buddhism has endured in Tibet, pastoralism is also likely to continue to thrive in the future on the high elevation grazing lands of the Tibetan Plateau. Nomads are likely to become more oriented towards commercial livestock production and they will be more closely linked to the market economy, but they will still practice nomadic pastoralism and move with their animals across the grasslands.

Monk and monastery, Hongyuan, Sichuan, China, 1986



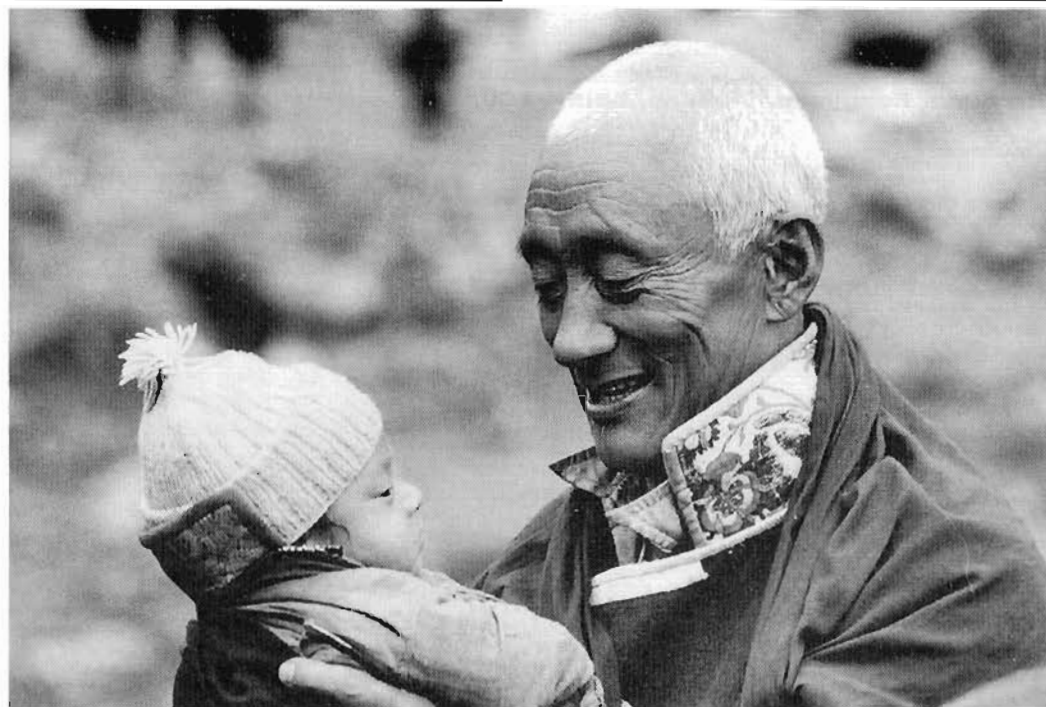


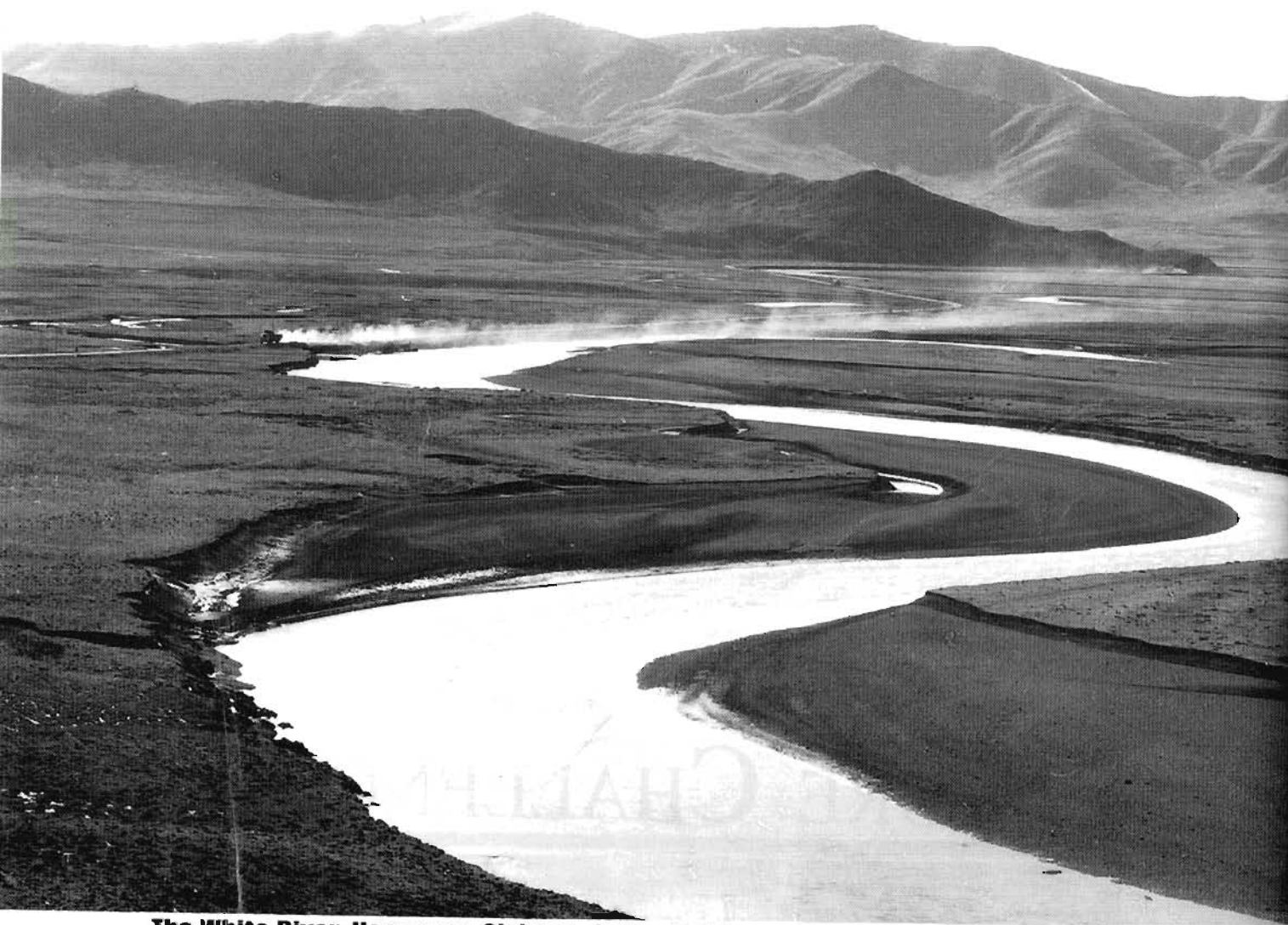
Stupa, Zamtang, Sichuan, China, 1998



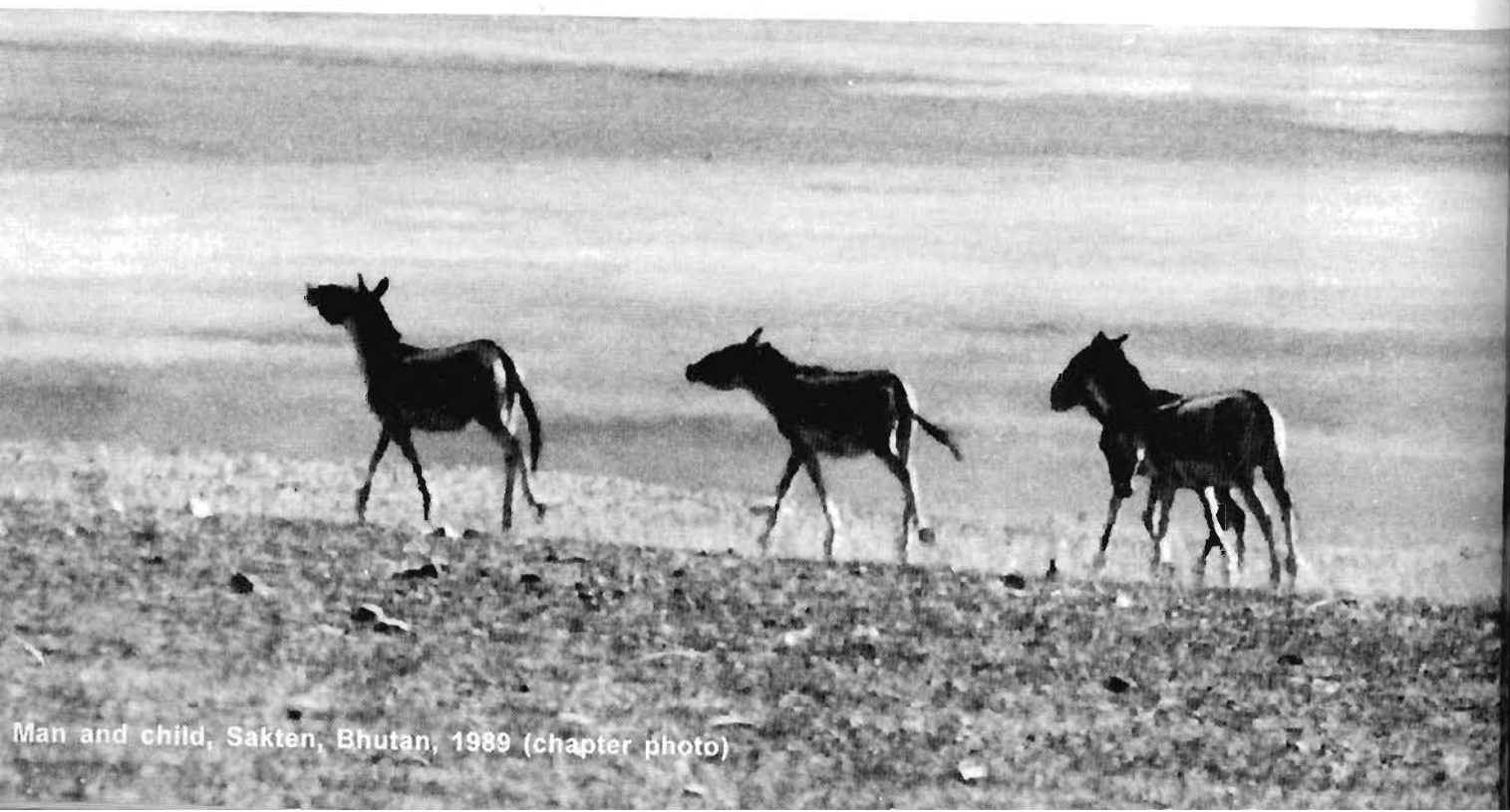
Stupa, Dawu, Sichuan, China, 1996

FUTURE CHALLENGES

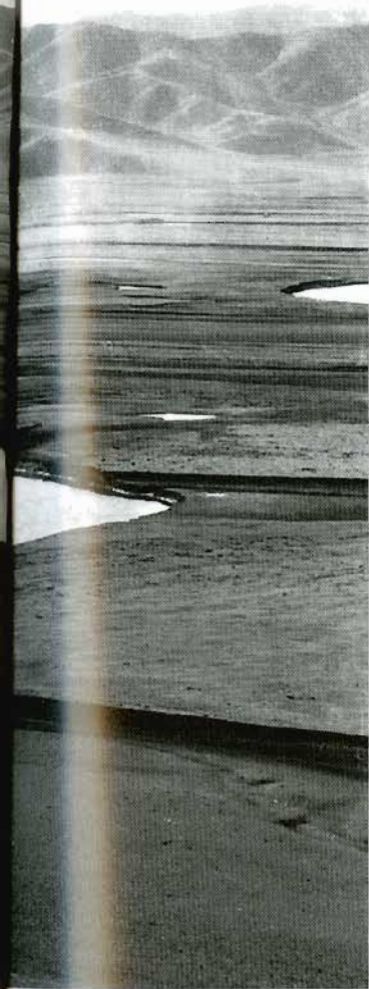




The White River, Hongyuan, Sichuan, China, 1997



Man and child, Sakten, Bhutan, 1989 (chapter photo)



The management of Tibetan rangelands is both a science and an art. It tries to augment the returns from rangeland resources (water, plants, animals) in ways that are desired by the herders who raise livestock on the grazing lands, other people who also make use of the rangelands, and the wider society through the proper use of rangeland ecosystems. Proper management of rangelands combines practices from the physical, biological, and social science disciplines. Since climatic, topographic, soil, and hydrologic factors affect rangelands, physical science skills are necessary. Biological science is required because range management deals with plants and the response of animals (both wild and domestic) that consume vegetation. Social science skills are necessary because the needs and desires of society determine how rangelands are used.

Scientific knowledge of rangeland ecosystems and technical skills are vital to managing rangelands, but range management and pastoral development are more than just a science. They are also an art. The scientific information available on rangelands needs to be synthesised and fabricated into practical and implementable management plans. Creating such plans requires the talents and perception to detect changes in rangeland vegetation that have taken place in the past, how different uses are currently affecting the rangelands, and then the ability to fashion plans to present range use and future demands. This 'feel' for the rangelands can only be achieved by spending considerable time in such areas looking and listening.

Tibetan wild ass (*kiang*), Phala, Tibet, China, 1997





Horse festival, Zhongdian, Yunnan, China, 1996



**Tibetan saddle,
Zoige, Sichuan,
China, 1997**



72-Year old Tibetan nomad, Zolge, Sichuan, China, 1997

The fact that many prosperous nomadic groups remain to this day on Tibetan rangelands bears witness to the extraordinary capacity of these grazing lands, as well as to the sustainability of their resources if used wisely. Maintaining rangeland productivity and biodiversity and, at the same time, increasing livestock off-take to meet growing demands and improve the livelihoods of nomads who depend on the rangelands for existence are challenging tasks.

Sustainable development of the pastoral areas of the Tibetan Plateau and those of the Himalayas requires a better understanding of the complex nature of the rangelands, greater appreciation for nomads and their way of life, and consideration of new information and ideas emerging about rangeland ecosystems and pastoral production systems. It may also require rethinking some existing pastoral policies in light of new information about rangelands, nomads, and range-livestock production practices.



Yak roundup, Hongyuan, Sichuan, China, 1997

The challenges facing the sustainable development of rangelands in the Himalayas and on the Tibetan Plateau are considerable. These grazing lands, however, do offer numerous opportunities for achieving the twin objectives of conservation and development of rangeland resources. Programmes stressing multiple use, participatory development, sustainability, economics, and biodiversity could be realised through complementary activities in range resource management, wildlife conservation, and pastoral development and livestock production. Properly managed, rangelands can continue to be sources for water, provide habitat for wild animals and grazing land for livestock, and contribute to overall economic development. Rangeland strategies must aim to maintain the condition of the range and to protect biological diversity. Designing more effective pastoral policies and rangeland development strategies requires improved knowledge of range ecosystem processes, better understanding of pastoral production systems, and more thorough analyses of the constraints and opportunities for improving the management of grazing lands.



Resolving rangeland management and pastoral development issues will require policies and approaches that integrate ecological processes of the rangelands with the economic processes of livestock production and biodiversity conservation. Economic valuation of rangeland resources requires consideration of both direct and indirect values. New policies for rangelands will also have to better demonstrate, in economic terms, the contribution grazing land resources make to overall economic development.

Those involved with managing rangeland resources and setting pastoral policies need to make the best use of the latest data available and any new ideas or emerging concepts on rangeland ecosystems and pastoral development. There is also a need to explore beyond the conventional thinking of many of the traditional range management concepts, developed largely in North America, in order to manage rangelands in the pastoral areas of the Himalayas and the Tibetan Plateau, where pastoral history is thousands of years old, more effectively.

Fences on the rangelands, Zolge, Sichuan, China, 1997





Milking goats, north of Rongma, Chang Tang Reserve, Tibet, China, 1993

Animal husbandry will continue to be the main land use in this high plateau environment. Livestock will be the primary source of livelihood for people residing in these pastoral ecosystems for many years to come. As such, much greater effort needs to be directed towards rangeland research and pastoral development. Many of the new perspectives emerging on rangeland ecosystem dynamics and pastoral production systems from other pastoral areas of the world provide fresh approaches and interesting challenges for analysing rangelands and pastoralism in the Himalayas and on the Tibetan Plateau. They also offer valuable, fresh frameworks for designing new, exciting range and pastoral research, suggesting possibilities for more sustainable development and conservation of these unique grazing lands.

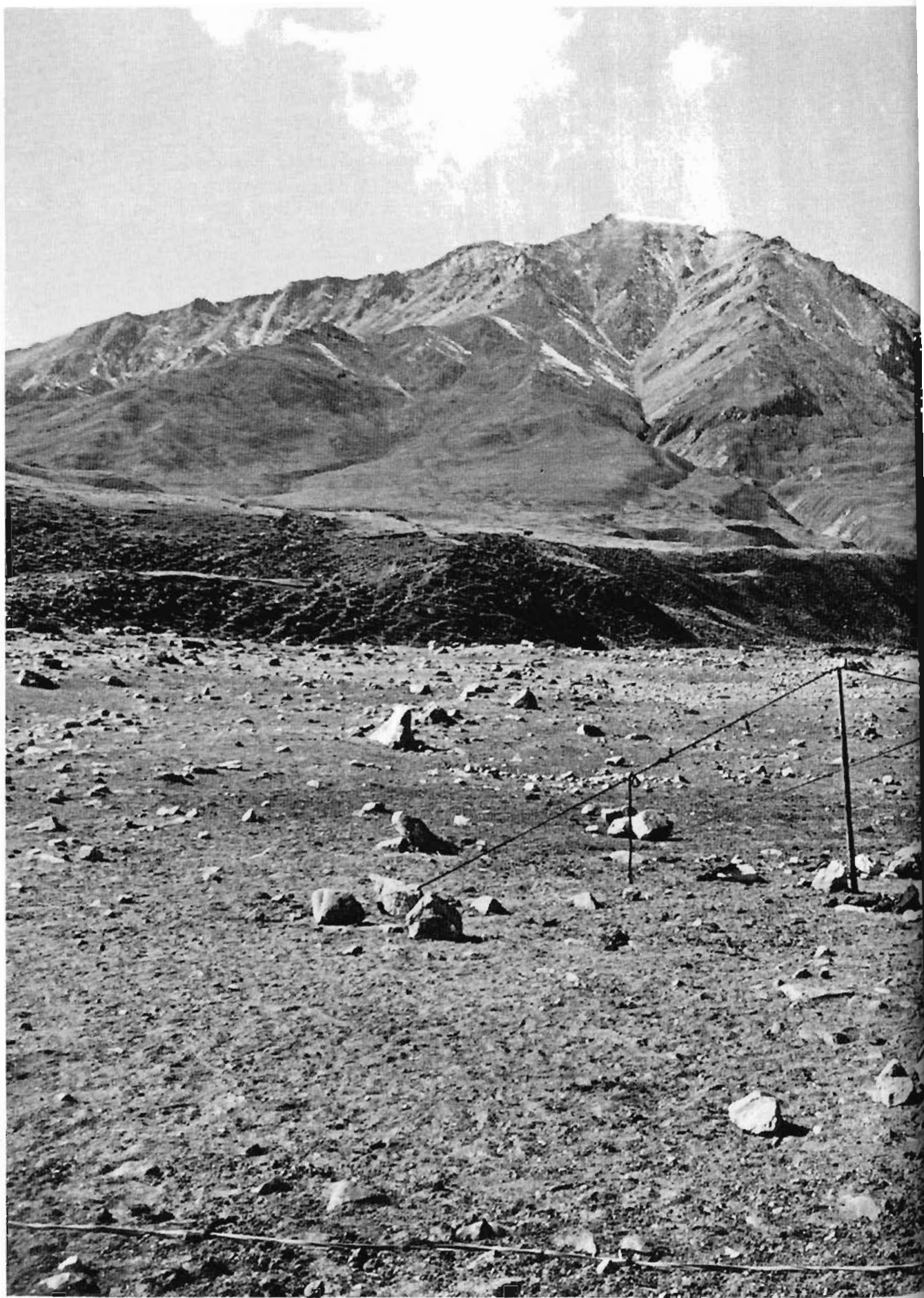




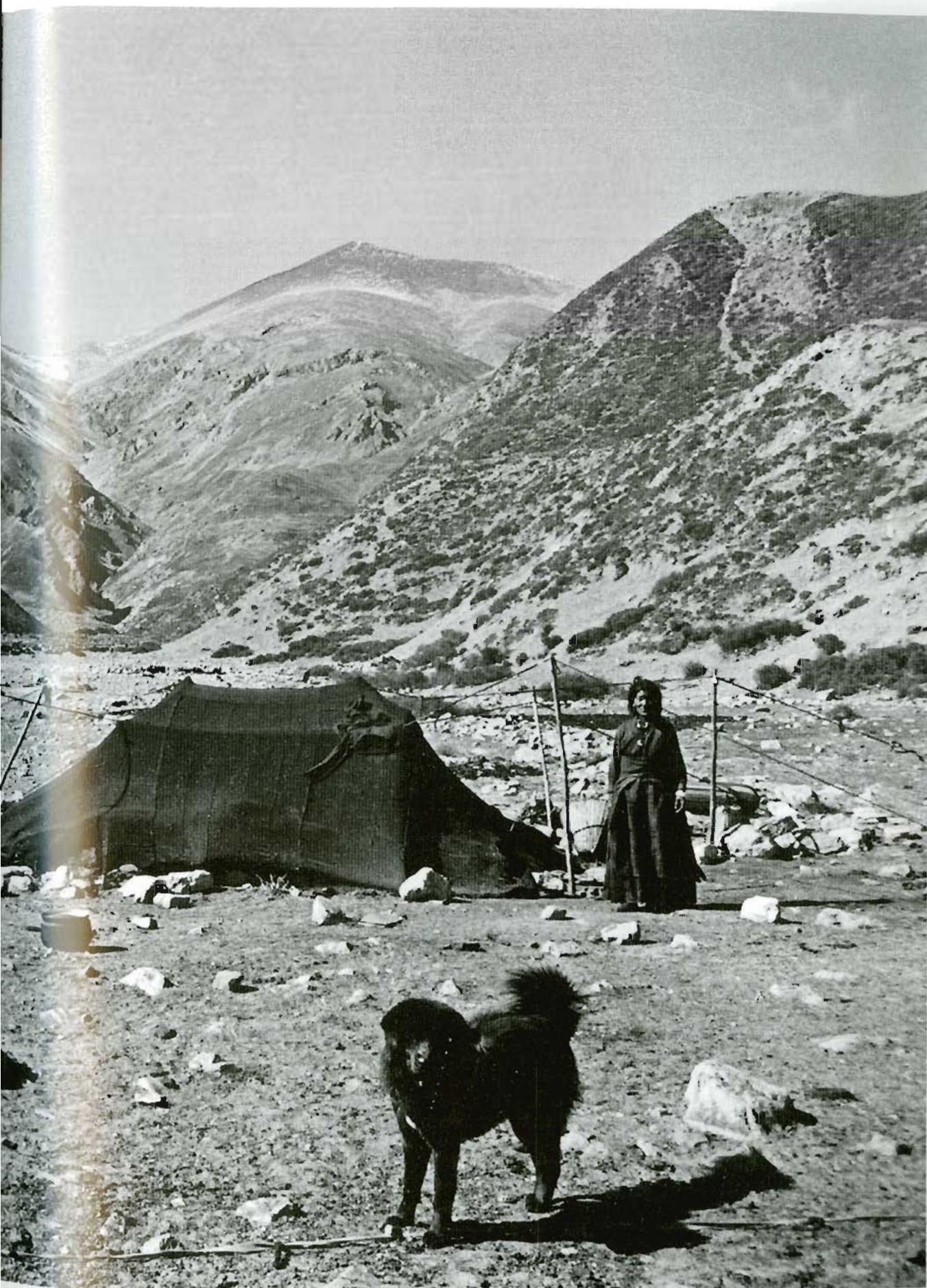
Many pastoral areas in the Himalayas and on the Tibetan Plateau are now included in a greatly expanded protected area system. Balancing biodiversity conservation and pastoral development in these parks and reserves is a major challenge. Innovative models for conservation that promote an integrated development approach offer new opportunities for protecting wildlife while, at the same time, improving people's livelihoods. However, in some key wildlife habitats there may have to be restrictions placed on livestock if wildlife is to survive.

Nomad family, headwaters of Yangtze River, Qinghai, China, 1993





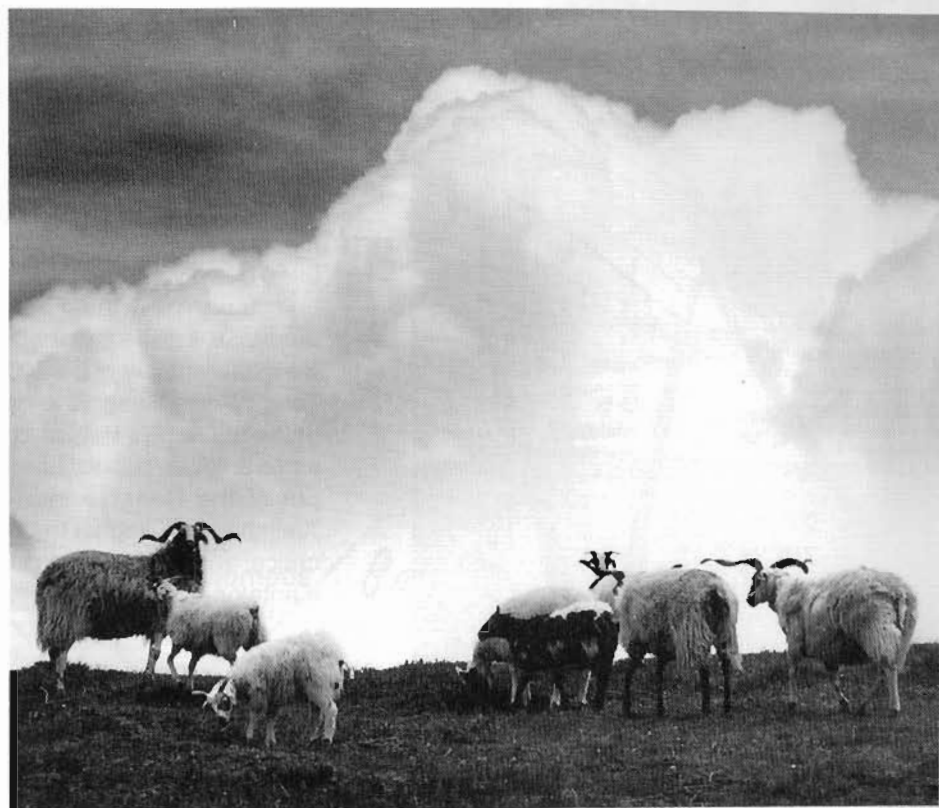
Nomad camp, Mustang, Nepal, 1992





Mountain rangeland, Mustang, Nepal, 1992

There are no simple solutions for addressing range resource management, biodiversity conservation, and pastoral development issues in the Himalayas and on the Tibetan Plateau. Due to the multifaceted dimensions of the problems, action will have to be taken on several levels. Policy dialogue will be necessary to establish appropriate range-livestock development programmes and incentive structures for pastoral areas. Mechanisms for increasing pastoralists' participation in the development process need to be improved. Human resource training and institutional development for organizations working in pastoral development need to be supported. Many of the tools are already available – the knowledge and skills of the herders, scientific data on rangeland resources, new technologies, and information systems – and new information, ideas, and technologies are being generated, but all of this must be integrated into a practical long-term strategy that includes saving rangelands, analysing them, and using rangeland resources sustainably and equitably.



Tibetan sheep, Hongyuan, Sichuan, China, 1996



**Tibetan nomad women,
Zamtang, Sichuan, China,
1996**

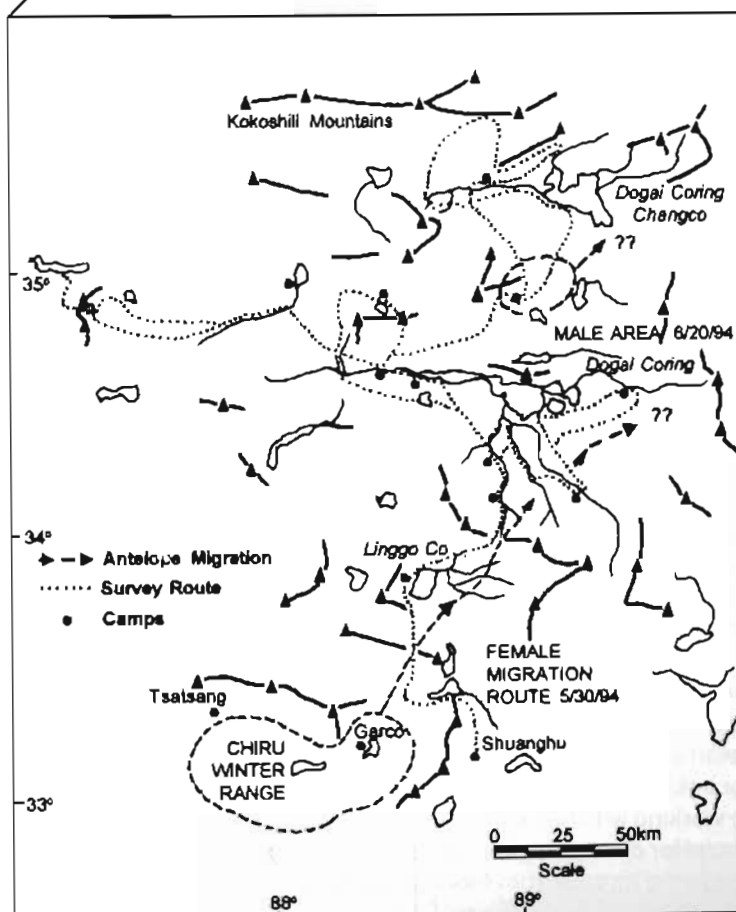
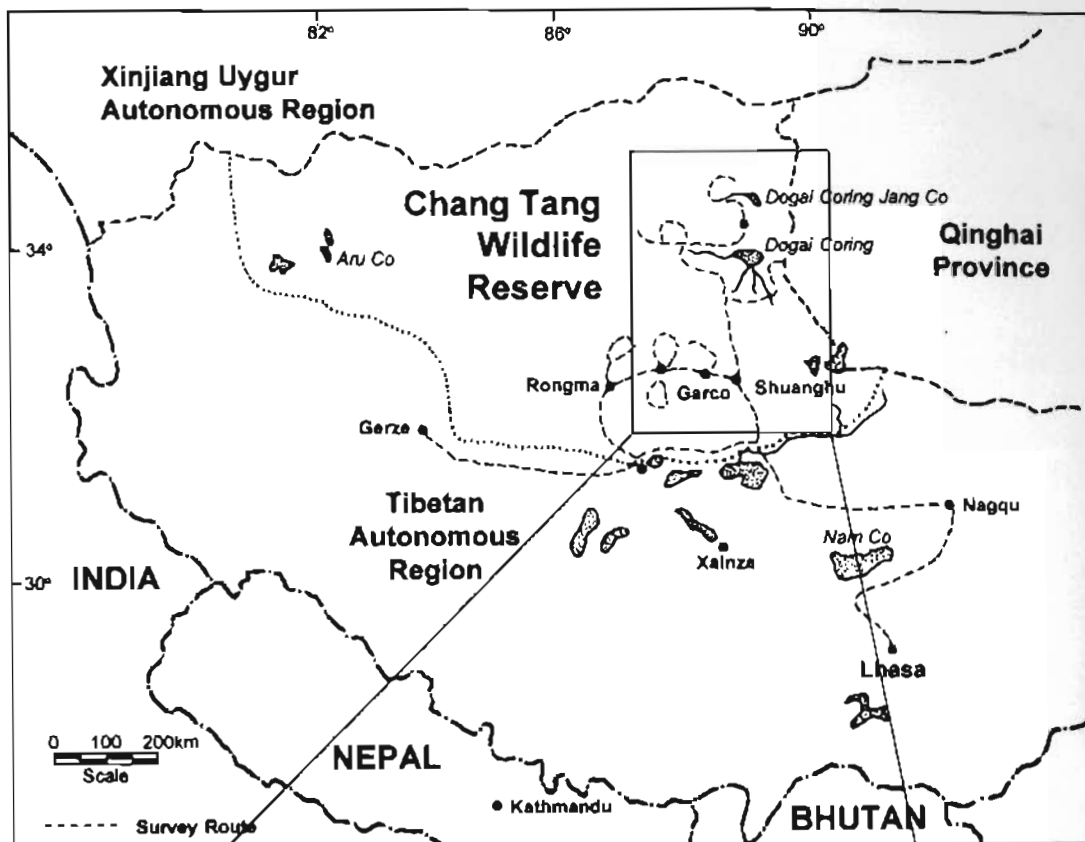


**Tibetan antelope horns
for sale, Zhongdian,
Yunnan, China, 1996**

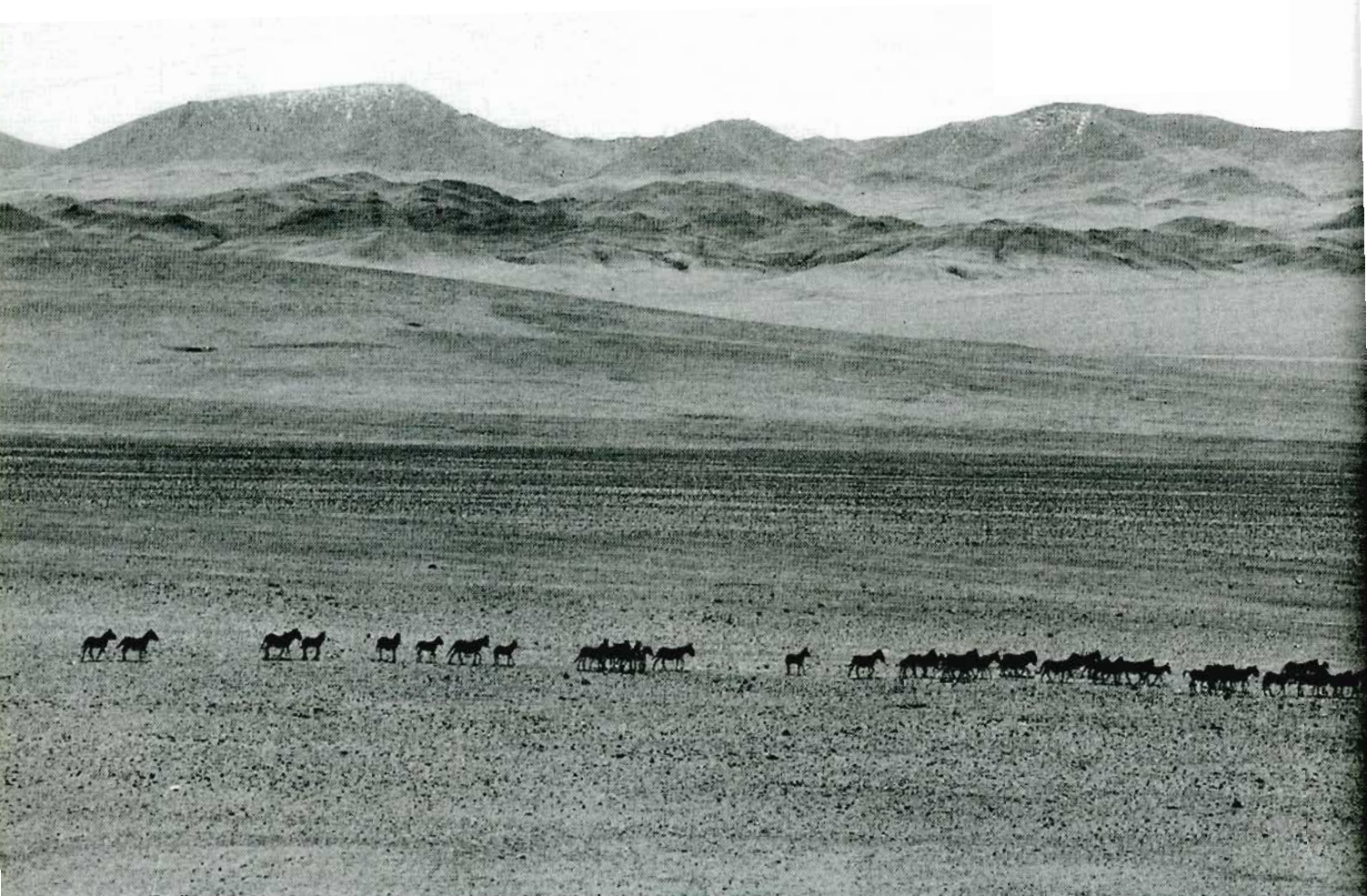
Tibetan antelope define the vastness of the Tibetan wilderness. Like caribou in Alaska and wildebeest in Africa, antelope migrate long distances across the Tibetan steppes. The antelope's migratory habit indicates the need for an enormous territory or home range. Sadly, in spite of being fully protected under legislation, antelopes have been heavily hunted in recent decades for the luxurious wool they produce. Known as *shatoosh*, it is the finest wool in the world. With the establishment of the 300,000 sq. km. Chang Tang Wildlife Reserve in northern Tibet, much of the antelope's habitat is now protected, but some antelope populations are known to migrate out of the Reserve into adjoining areas of Xinjiang and Qinghai to give birth. Protecting critical antelope habitats in these areas is vital if antelopes are to survive.

**Shrine to endangered species,
Lomanthang, Mustang, Nepal, 1992**



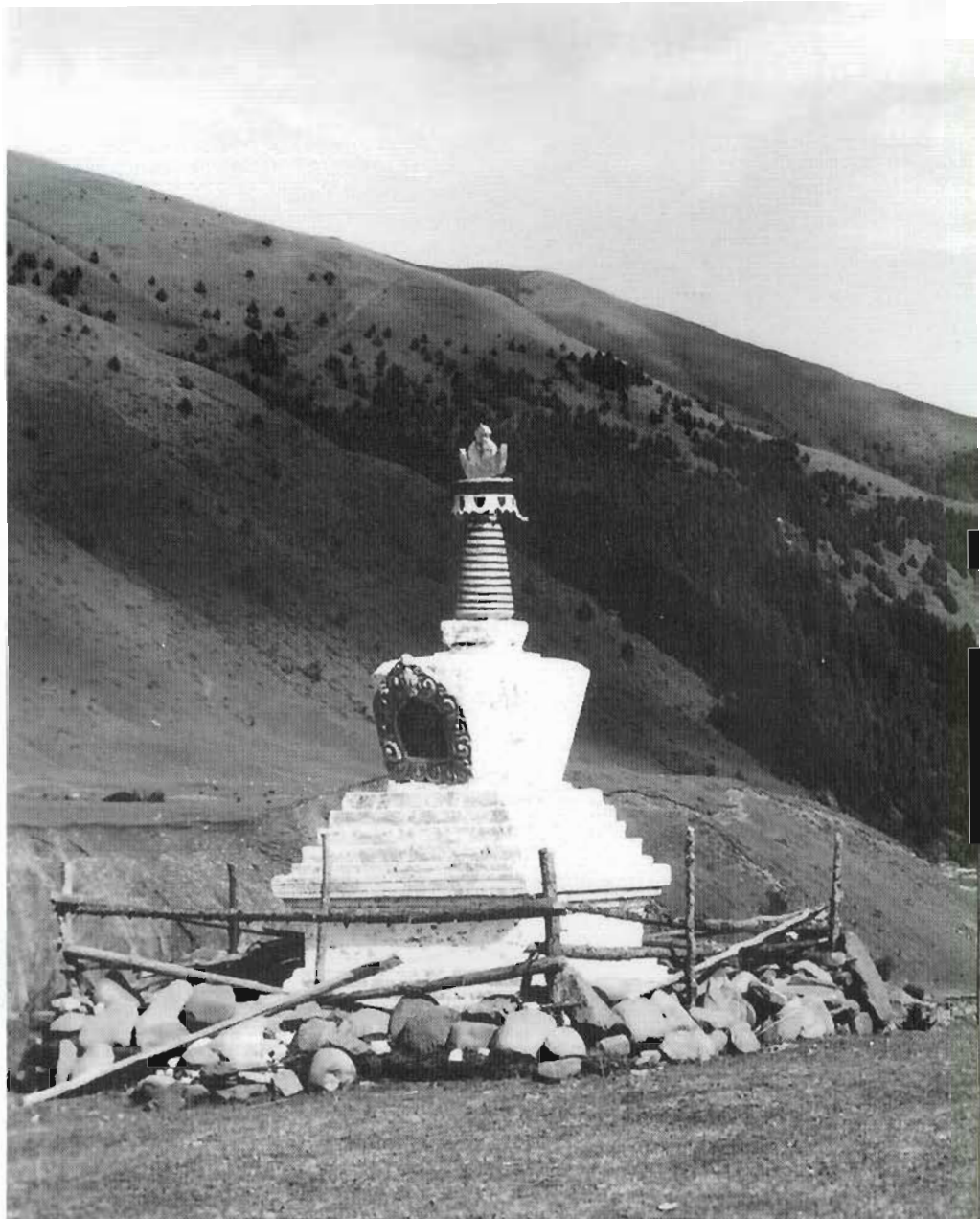


Map of Changtang Reserve



Tibetan wild ass and rangeland, Chang Tang Wildlife Reserve, Tibet, China, 1993

Designing new and innovative conservation and development programmes for rangelands that will protect the remaining herds of wild yaks, Tibetan antelope, and other wild animals requires a number of actions. First, there is a need to develop a much better understanding of rangeland ecosystem dynamics and animal-vegetation interactions. Second, more information on the ecology, status, and distribution of wildlife species is required. Regular monitoring of wildlife populations, especially antelope and wild ass, are also required. Third, there is a need for increased knowledge of pastoral production systems and nomads' use of important wildlife habitats. Such information is necessary in order to design management programmes that address the needs of both livestock and wildlife. Fourth, more thorough analysis of the constraints and opportunities for maintaining and improving rangeland biodiversity needs to be undertaken. Finally, modifications in policies and current approaches to management will have to be made. The illegal killing of wildlife, especially Tibetan antelope, must be stopped. Wildlife authorities will require additional training and support for enforcing wildlife protection regulations and reorientation to more participatory approaches to working with herders on protected area conservation and development. These actions are crucial for conserving biodiversity and ensuring sustainable pastoral development in the face of growing threats from modernisation.



Stupa, near Dawu, Sichuan, China, 1996

Nomad tent and rangeland, Rongma, Tibet, China, 1993





Rangelands with *Caragana* shrubs, Mustang, Nepal, 1992

The conventional concept of carrying capacity in range management is grounded in theories of plant succession and climax plant communities. Range management was built around the concept of range condition class, determining carrying capacities, and the manipulation of livestock numbers and grazing patterns to influence range condition. The relevance of the carrying capacity concept for planning livestock grazing in pastoral systems is being challenged, since it is often difficult to estimate carrying capacity in the highly dynamic ecosystems where pastoralism occurs. The difficulty of applying carrying capacity concepts means the notion of 'opportunism' is gaining favour as a management approach for livestock production in pastoral areas. Instead of considering 'average estimated carrying capacity', an opportunistic approach bases the grazing strategy on that year's forage production. Such an approach allows herders to adjust livestock numbers to the wide spatial variability found in forage production, establish better distribution of livestock to forage availability, and enable increased livestock production.

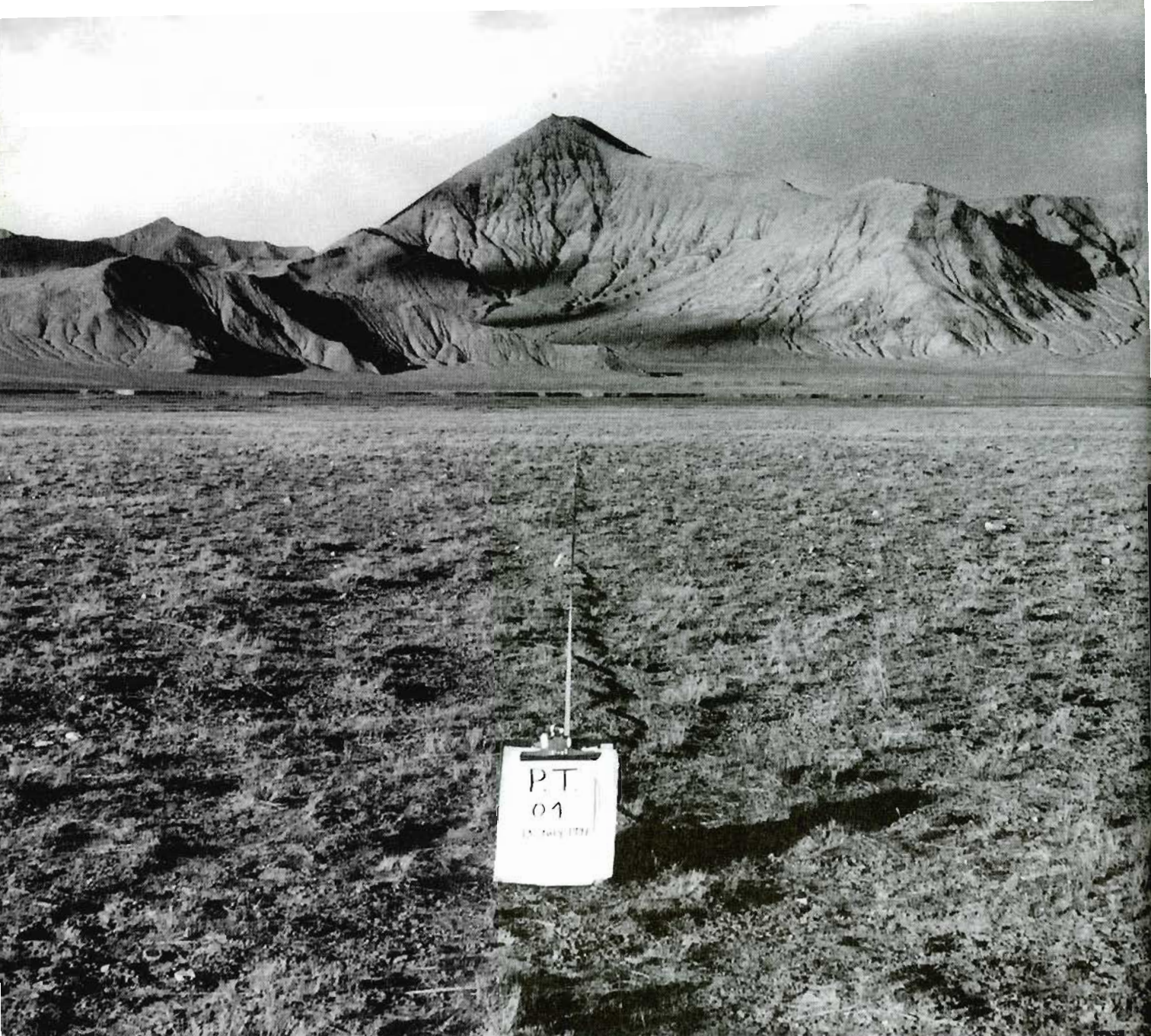
The optimal strategy for herders in highly dynamic environments where pastoralism is commonly practised, therefore, may be to exploit range resources during 'good times', when climatic conditions promote better forage growth, and to capitalise on outside resources during 'bad times' as the need arises. Opportunism is not new to pastoralists; many aspects of traditional pastoral systems embraced such opportunistic strategies. However, the adoption of opportunistic range management strategies on the Tibetan Plateau today has implications for the redesign of pastoral policies, most of which are currently based on carrying capacity concepts. Range research on Tibetan grazing lands needs to investigate further the usefulness of carrying capacity practices and the practicability of new models, such as opportunism, for managing livestock grazing.



Herders returning home, Garco, Tibet, China, 1993



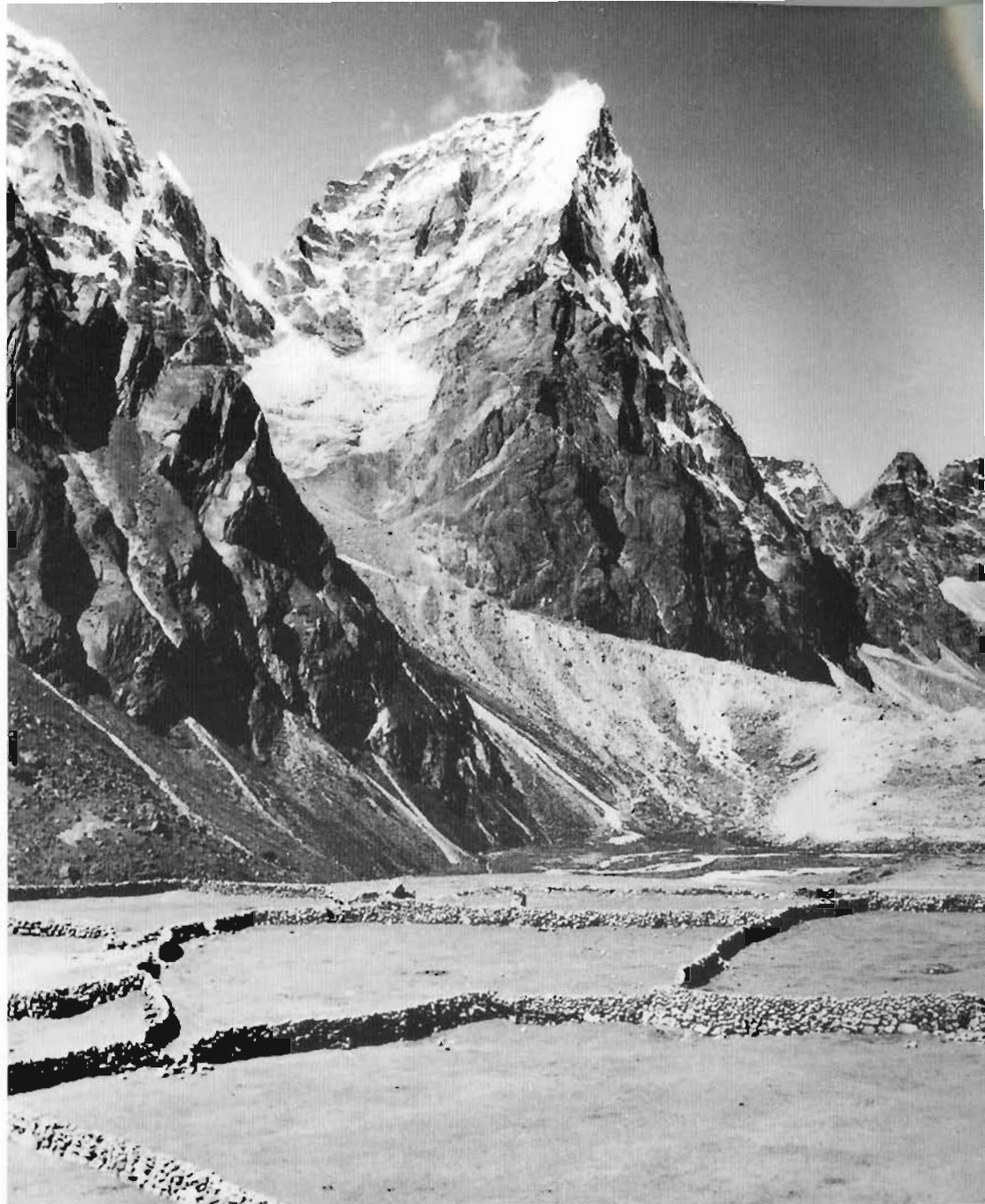
Yak herder, Langtang, Nepal, 1975



Vegetation transect and rangeland, Wild Yak Valley, Qinghai, China, 1991

Strategies for improved management of Tibetan rangelands and more sustainable pastoral development should aim to: maintain rangeland productivity, rehabilitate degraded areas, protect and enhance rangeland biodiversity, promote improved livestock productivity, increase livestock off-take, stimulate economic growth, create employment for nomads, and improve nomads' access to social services. Development strategies for nomadic areas in the Himalayas and on the Tibetan Plateau should also regularly analyse current pastoral policies and, as more information about Tibetan rangelands and pastoral production becomes available, policies should be refined or adjusted.

A key development intervention in many pastoral areas will be the development of hay meadows to provide supplemental forage to livestock in the winter and spring. Many nomads already practice hay-making so it is not a new technology, but the practice will need to be expanded if significant gains in livestock productivity are to be made. Hay can also help to prevent large livestock losses in the event of severe snow storms.



Hay fields and peaks, Pheriche, Khumbu, Nepal, 1992



An important grass, *Elymus nutans*, Khumbu, Nepal, 1992



Yaks and yak herder, Hongyuan, Sichuan, China, 1996

Since many of the yak-raising areas of the Himalayas and Tibetan Plateau are often remote, the yak and yak production systems have not received the attention they deserve from researchers and development agencies. The importance and value of yaks and yak production systems are generally not well appreciated. Yet, the future of the Tibetan pastoral areas, and the improvement in the livelihood and well-being of many Tibetans, will have to depend on yak production. Although, as a global species, yaks are not as important as other domestic animals, in Central Asia, where almost all of the world's 14 million yaks are found, yaks are an important animal, especially to the nomads dependent upon yaks for a living.

Yak research needs to be carried out to measure performance, survival, and reproductive characteristics among the different breeds of yaks that have been recognised. Such work would help determine the extent of yak genetic diversity in the yak population and would provide the basis for improved yak breeding programmes. This could then lead to improvements in yak production in the future. Breeding, nutrition and health, and yak herd management practices are all factors related to improving yak production, however, and superior yak breeding stock will never realise their potential if they are not well fed and managed. Yaks that are in poor nutritional condition have reduced production and fertility and are more susceptible to many diseases and health-related problems.



Yearling yaks, Langtang, Nepal, 1975



Yaks, Hongyuan, Sichuan, China, 1996

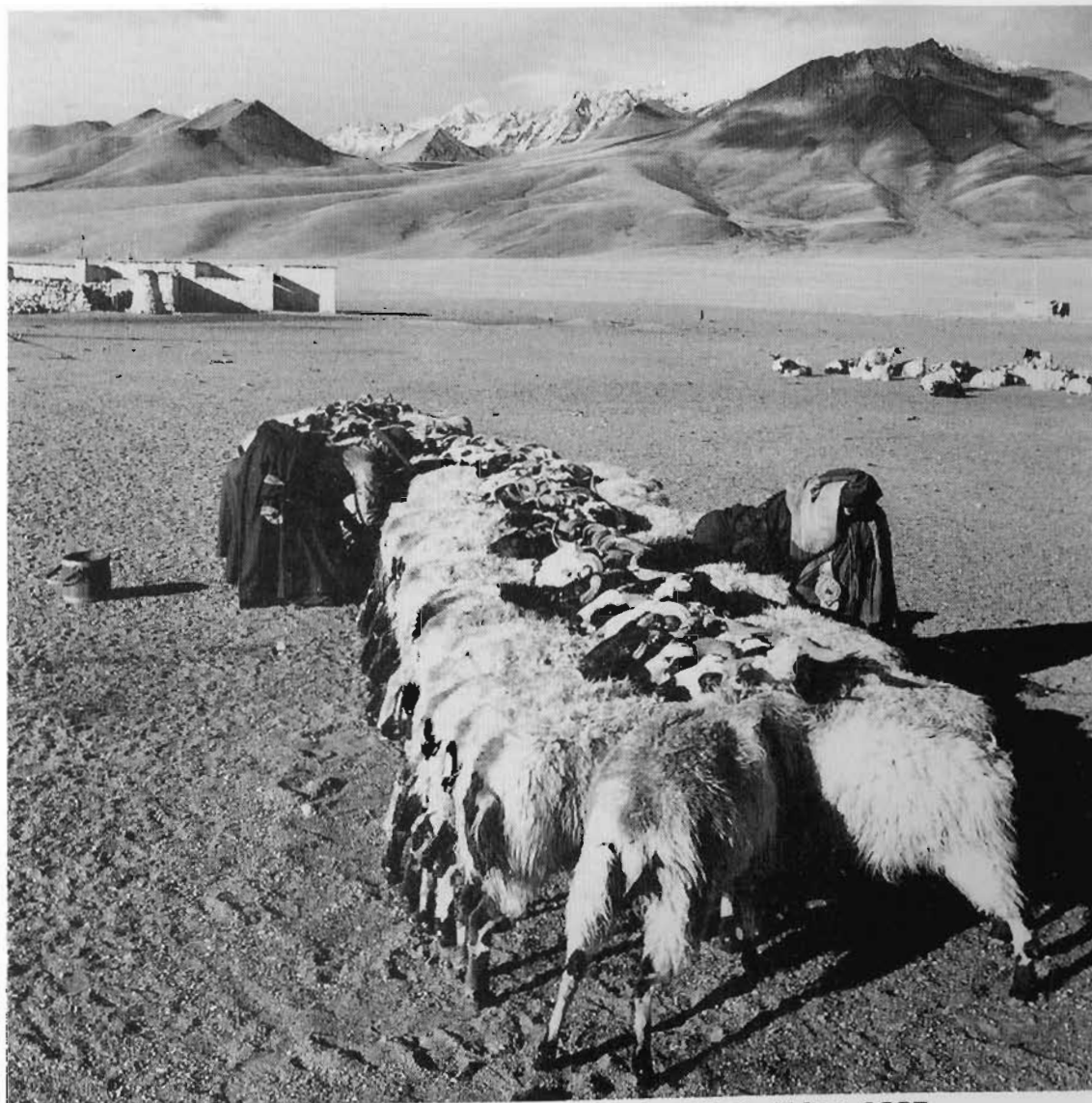


Sheep and nomad camp, Phala, Tibet, China, 1997

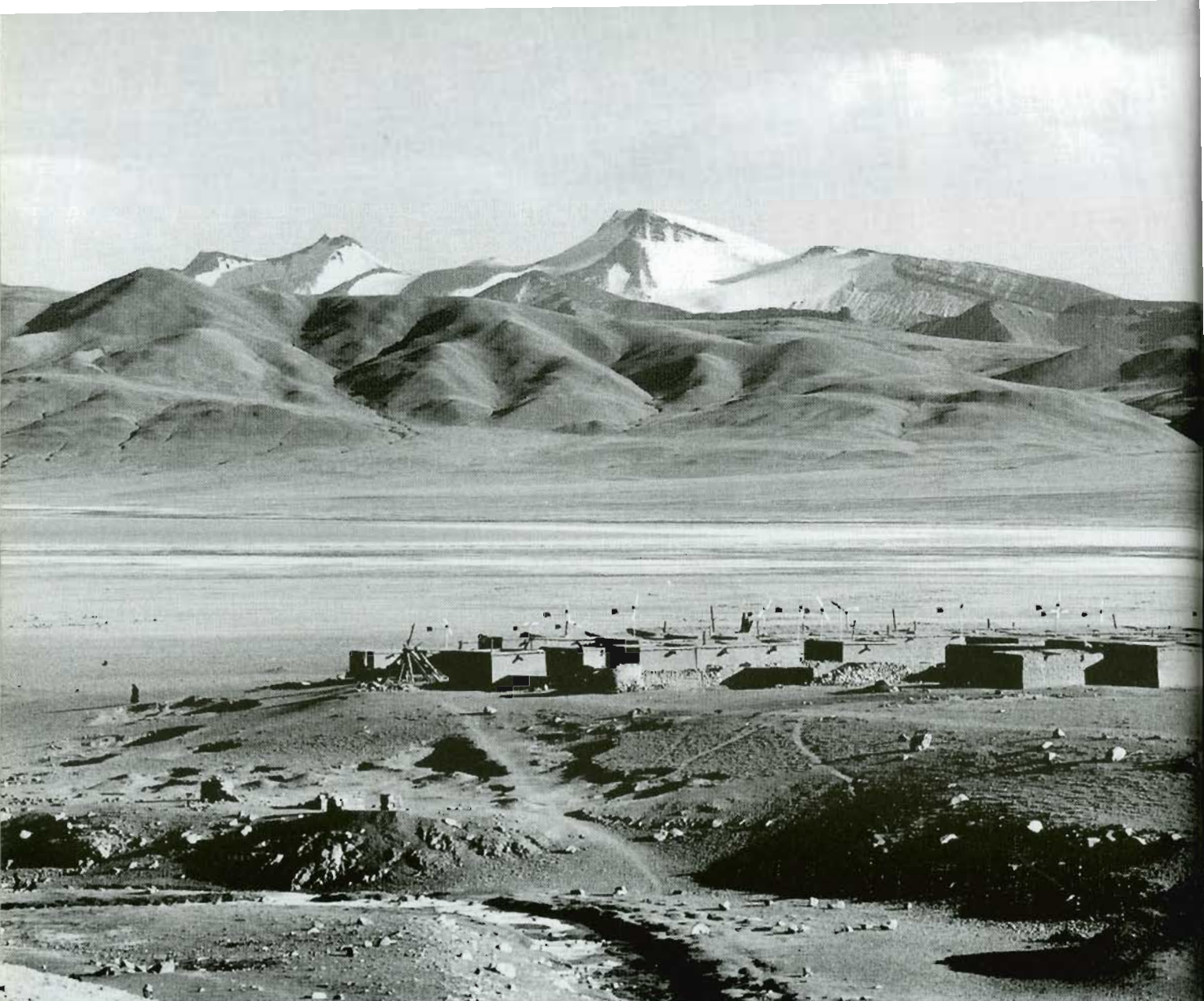
For Tibetan Plateau and Himalayan pastoral areas, it is imperative that greater efforts be directed towards developing a better understanding of current pastoral production systems. Pastoral production systems vary considerably throughout the region, and these differences need to be analysed. Why do herders in different areas maintain different livestock herd compositions? What are current livestock off-take rates and how do increasing demands for livestock products in the market place affect livestock sales? What constraints, and opportunities, for improving livestock productivity are recognised by the nomads themselves? What forms of social organization exist for managing livestock and rangelands? How have these practices changed in recent years and what are the implications of these transformations? Answers to these, and related questions, will help unravel many of the complexities of Tibetan pastoralism, of which we still know so little. Analyses of the socioeconomic processes at work in pastoral areas are a key challenge for researchers. It will also be important to determine which aspects of indigenous knowledge systems and traditional pastoral strategies can be used in the design of new development interventions for pastoral areas.



Nomad boy and goats, Rongma, Tibet, China, 1993



Milking sheep, Phala, Tibet, China, 1997



Settlement of Garco, Tibet, China, 1994

The settling down of Tibetan nomads and the privatisation of rangelands taking place now across much of the Tibetan Plateau present a complex situation. On the one hand, settling the nomads enables the delivery of improved social services to previously remote nomadic areas. Yet, this process also often reduces the spatial mobility of the nomads' herds, increasing the potential for overgrazing and rangeland degradation. Fencing can be a valuable tool for managing livestock grazing, but it is also expensive. The sustainability of many of the current pastoral development programmes on Tibetan rangelands, with their massive investment in fences and buildings, is questionable.

An important intervention for pastoral areas may be to try to reduce the isolationism that exists and to forge better links between nomads and external markets and resources. This means facilitating the movement of goods and livestock through trade or marketing systems and external economies, which can consume and distribute products to and from nomadic areas as they become available. By assisting in the movement of livestock and livestock products to markets, nomads' incomes and access to goods can increase, and their dependence upon the local pastoral environment for subsistence can decrease. With increasing accessibility of many pastoral areas, this is now becoming more feasible.



Oats being cut for hay, Henan Mongol, Qinghai, China, 1997

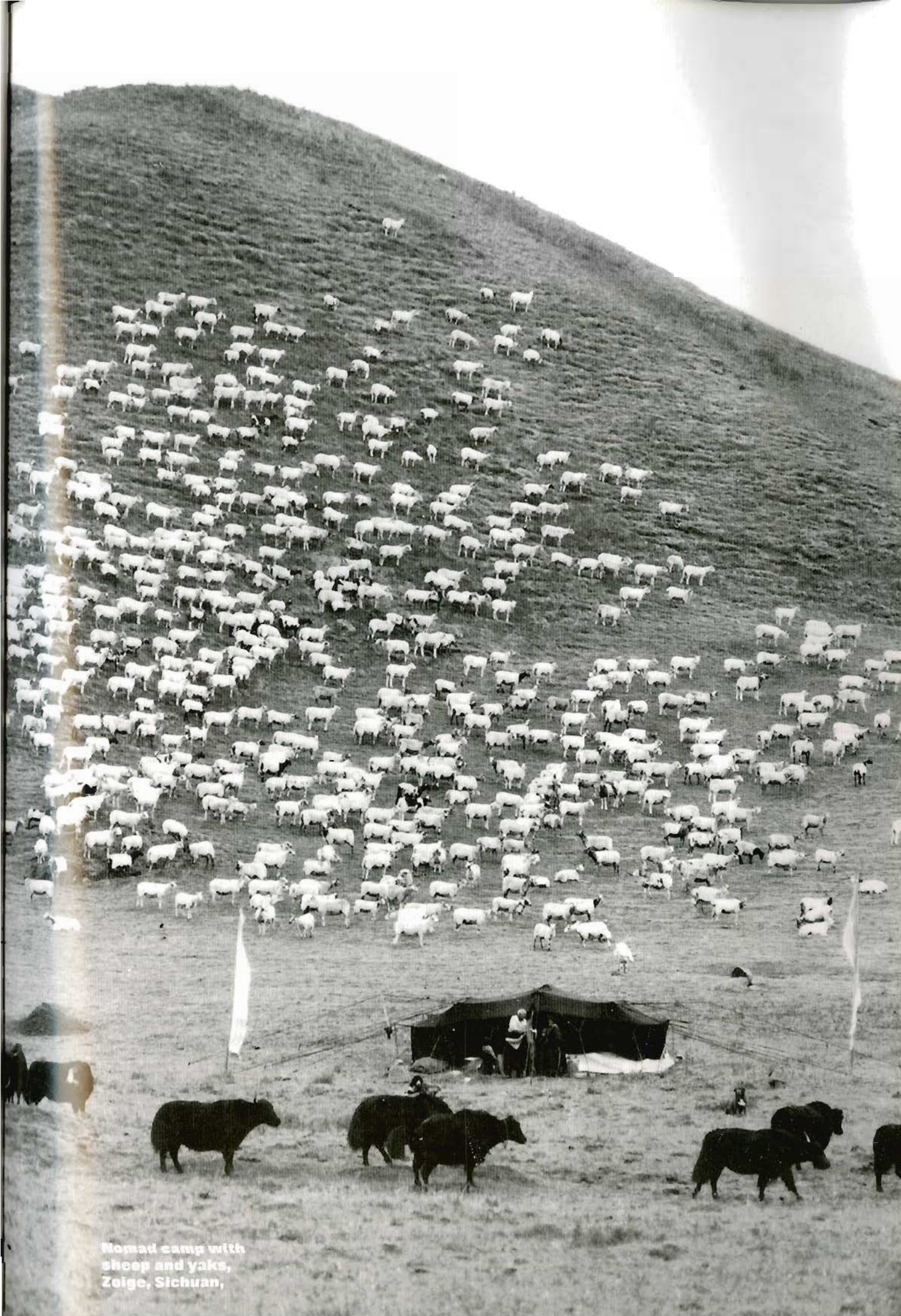


Nomad camp with tents and houses, Zeku, Qinghai, China, 1997

Pastoral development programmes must involve nomads themselves in the initial design of interventions. Herders' needs and desires must be heard and the vast body of indigenous knowledge pastoralists possess about rangeland resources must be put to use when designing new range-livestock development projects. An important message for pastoral policy-makers and planners is the need for active participation by the nomads in all aspects of the development process and for nomads to be empowered to manage their own development. New mechanisms for discussion, negotiation, and common action by all concerned about rangelands may be required in order to realise sustainable development goals in pastoral areas. Rangeland resources must continue to be available for future generations, as much as they should be used to improve people's livelihoods now. Without such provisions, rangelands will not be used in an equitable, sustainable manner.

Milking sheep, Phala, Tibet, China, 1997





Nomad camp with
sheep and yaks,
Zoige, Sichuan,



A Tamang Joke, Dhunche, Nepal, 1975

Nomad children hold the keys to the future wise use and development of the pastoral areas of the Himalayas and Tibetan Plateau. Unfortunately, in many nomad areas of Tibet, only about 25 per cent of the primary school age children currently attend school. Providing improved education for nomad children and vocational training for young adults to teach them new skills are some of the most important challenges facing the development of pastoral areas. While pastoralism will continue as the primary economic activity across much of the Tibetan Plateau and the Himalayas, the rangelands can only support so many livestock and a corresponding number of nomads. In many areas, the limit has already been reached. Since substantial increases in economic growth from livestock will be difficult to achieve in pastoral areas, an increasing number of young nomads will be forced to find employment elsewhere in the future. To be competitive, they will have to be educated and trained in skills other than herding yaks.



Young boys playing, Sakten, Bhutan, 1990



Yak breeding bull, Merak, Bhutan, 1990

The remarkable rangelands of the Himalayas and the Tibetan Plateau will experience a great and tragic emptiness if the productivity and biological diversity of these grasslands diminish. Unique pastoral cultures will be forced into transformation beyond recognition, while wildlife populations will be severely threatened. These consequences can be avoided if timely action is taken to evaluate the rangeland resources, to acknowledge the efficiency of many traditional pastoral strategies, and to appraise development alternatives for conserving and managing the Tibetan rangeland ecosystem realistically. These actions are crucial for ensuring sustainable economic development and environmental protection in the face of growing threats from modernisation. Only then will the long-term viability of the Tibetan fields of grass be secured for future generations.



Stupa and prayer wall, Saldang, Dolpo, Nepal, 1978



**Pastoral mother and child, Sakten,
Bhutan, 1990**



Prayer flags and Yellow River, near Solistang Gonpa, Hlongyuan, Sichuan, China, 1996



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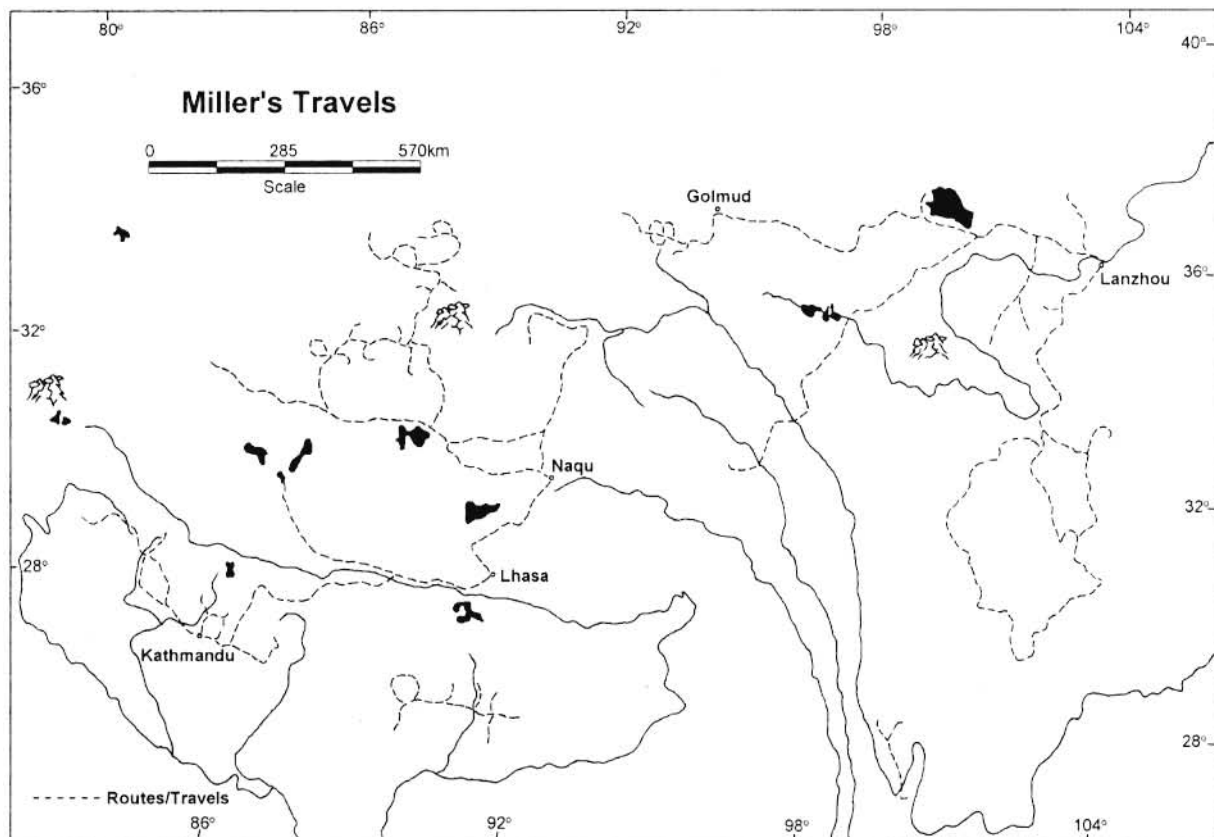
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Author



Daniel J. Miller in the Wild Yak Valley, Kunlun Mountains, Qinghai Province, China, 1991

Daniel J. Miller was born and raised on a dairy farm in the tall-grass prairie region of southern Minnesota in the United States. He first went to Nepal in 1974, where, as a Peace Corps Volunteer, he lived and worked with yak herders. He worked as a cowboy in Montana for many years and, since 1983, has been involved in range-livestock development and wildlife conservation in Bhutan, China, Mongolia, Nepal, and Pakistan. From 1995 to 1997 he was employed as a rangeland specialist for the International Centre for Integrated Mountain Development. In 1997, he was awarded an Honorary Professorship in the Grassland Sciences' Department, Gansu Agricultural University, Lanzhou, Gansu Province, China for his work on Tibetan Plateau rangelands. In total, Daniel Miller has made 15 separate trips to Tibetan pastoral areas in Western China and has made numerous treks in pastoral areas of Bhutan and Nepal. He is presently associated with the Institute of Land and Food Resources, University of Melbourne, Melbourne, Australia.

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REPEAT PHOTOGRAPHY



Repeat photography can be a valuable tool to provide insights regarding historic and contemporary changes in pastoral landscapes in the Tibetan Plateau and Himalayas. It can also help provide a better understanding of the impact of man and his animals on the rangelands over time and furnish insights into improved range management and pastoral development. Repeat photography is the precise replication and interpretation of historic landscape scenes. Older landscape photographs are replicated, or taken again, from the same position and ideally at the same season, time of day, and in the same weather conditions. If possible, older photographs should be replicated using the same camera equipment as with the originals. Comparisons between 2-3 or more photos at different times allow preliminary assessments of landscape change processes to be made. When combined with ground truth analyses of vegetation, especially disturbance patterns, discussions with local people knowledgeable about land-use patterns, and literature review, the sequential replication of photographs over time can provide accurate assessments of landscape changes.

Repeat photography has been used in the last thirty years in the USA to monitor rangeland condition and trends. In the last decade it has also been used in the Mount Everest region of Nepal to assess the patterns and possible causes of landscape and land-use changes. Repeat photography can clarify landscape processes and is becoming increasingly valuable as a management, policy-influencing, and monitoring and evaluation technology. Comparing old and new photos reduces uncertainty about landscape change and can qualitatively, and in some instances quantitatively, confirm changes in the landscape. For nomadic pastoral areas, repeat photography can provide significant insight on changes in rangeland conditions, historical and contemporary forest and shrubland loss, village and nomadic settlement growth, developments (fences, roads, etc.), impacts of grazing, and the effectiveness of management practices. Photographs can also be used to document changes in nomads' lifestyles. The following pages illustrate photos from this book that are believed to have potential for repeat photography.

