A Photo Essay of Himalayan and Tibetan Pastoralism

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Rangelands and Sheep, Zoige, Sichuan, China, 1997

Nomad Woman, Sakten, Bhutan, 1999

Rangelands and Yaks, Madoi, Qinghai, China, 1988

Tibetan rangelands are at the heart of Asia. These grazing lands form the headwaters' environment where many major 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.

Rangelands and Yaks, Madoi, 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. 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.

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

Chorang Village, Mustang, Nepal, 1992

Stupas on the grasslands, Hongyuan, Sichuan, China, 1997

Across most of the pastoral region of the Tibetan Plateau, the land is too cold and arid t1o support cultivated agriculture. 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.

Forest and rangelands, Maiwa, Sichuan, China, 1996

Nomad camp, Zoige, Sichuan, China, 1996

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.

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

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.

Mountain grazing land, Langtang Valley, Nepal, 1992

Rangelands, Mustang, Nepal, 1992

These high elevation rangelands are important for a number of reasons. First, they provide water and are the source for many major 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 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 major 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 livelihoods of pastoralists but also to contribute to overall economic development in pastoral areas.

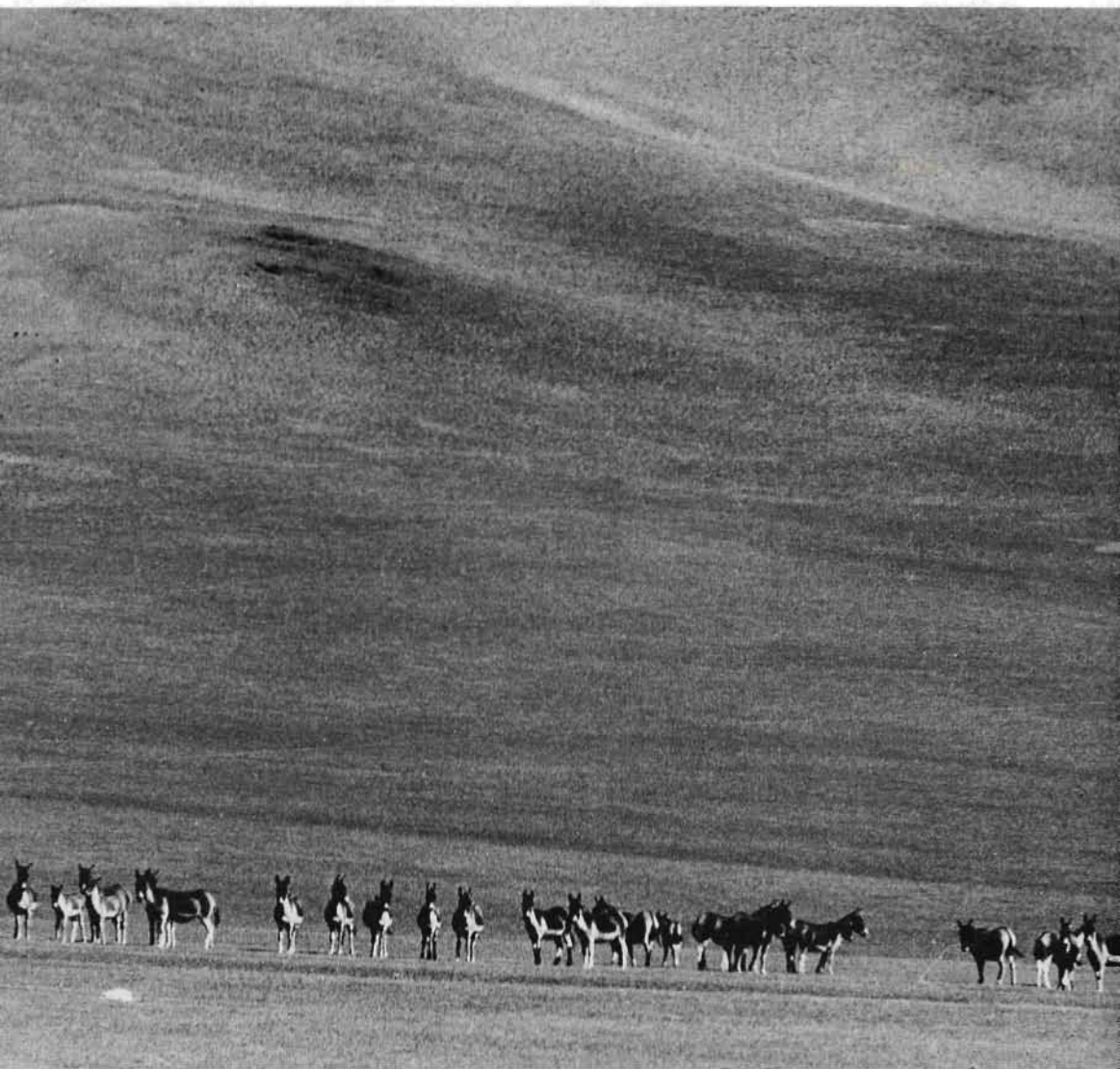
Grasslands with flowers, Maiwa, Sichuan, China, 1996

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 largely been ignored by previous development efforts due to remoteness and 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.

Rangelands of the Tibetan Plateau and Himalayas provide habitats for a wide variety of wildlife, especially ungulates, or large-hoofed, 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 like urial, ibex, and markhor appear along with the ubiquitous blue sheep and occasional *argali*. In the central Himalayas, Himalayan *tahr* and musk deer and, in 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 major migratory animals, yet the location of their birthing grounds is still unknown.

Tibetan wild ass (*kiang*), 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 to 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.

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

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 antelopes' 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.

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

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

Wild yaks once numbered in the millions, now, only an estimated 14,000 are left in the wild on the Tibetan Plateau and these animals can only be found in the most remote areas, far from the hunter's guns. Preserving the remaining herds of wild yaks is crucial for biodiversity conservation. Wild yaks characterise the rugged wilderness of Tibet. No other animal so evokes the raw energy and wild beauty of the Tibetan landscape. 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.

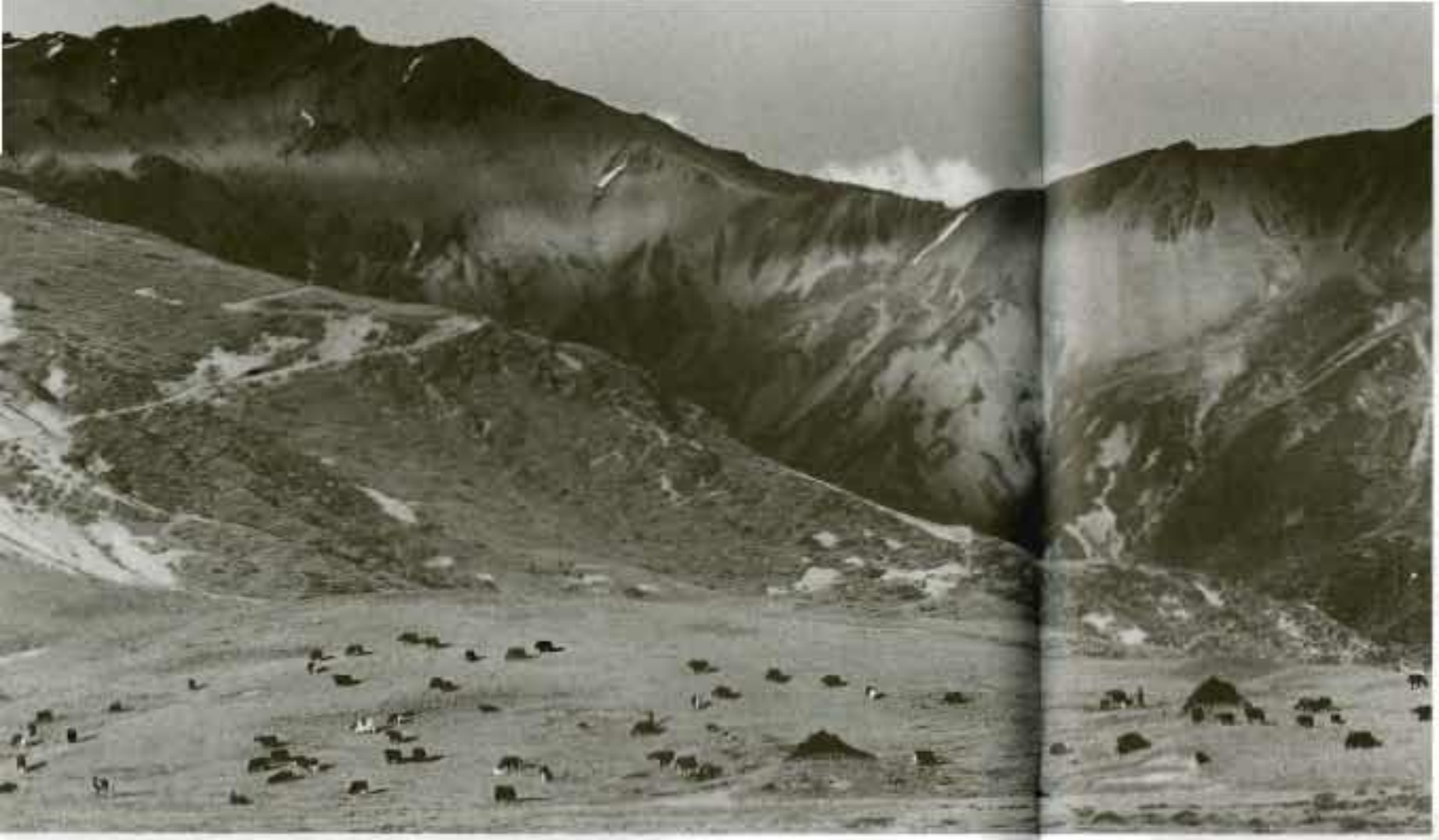
Nomad camp, northeast of Rongma, Chang Tang Wildlife Reserve, Tibet, China, 1993

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 Ch'iang, 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. 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 steppes were also renowned for their horses.

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.

Female yak, above Thimphu, Bhutan, 1986

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



Nomad camp and yaks, Soi, 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 to convert 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.

Nomad couple and tent, Phala, Tibet, China, 1997

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, bears witness to the extraordinary knowledge and animal husbandry skills of the herders. 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. Some old Tibetan herders have probably already forgotten more details about rangelands and yaks than many young scientists 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

Nomad woman, Phala, Tibet, China, 1997

Yak herd moving, Phala, Tibet, China, 1997

Pastoralists 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 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

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 as well as draught animals, 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 singlemost 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

White yak, Tianzhu, Gansu, China, 1996

Riding yak, Hongyuan, Sichuan, China, 1996

Milking yak-cattle hybrid (*dzo·mo*), Phijor, 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.

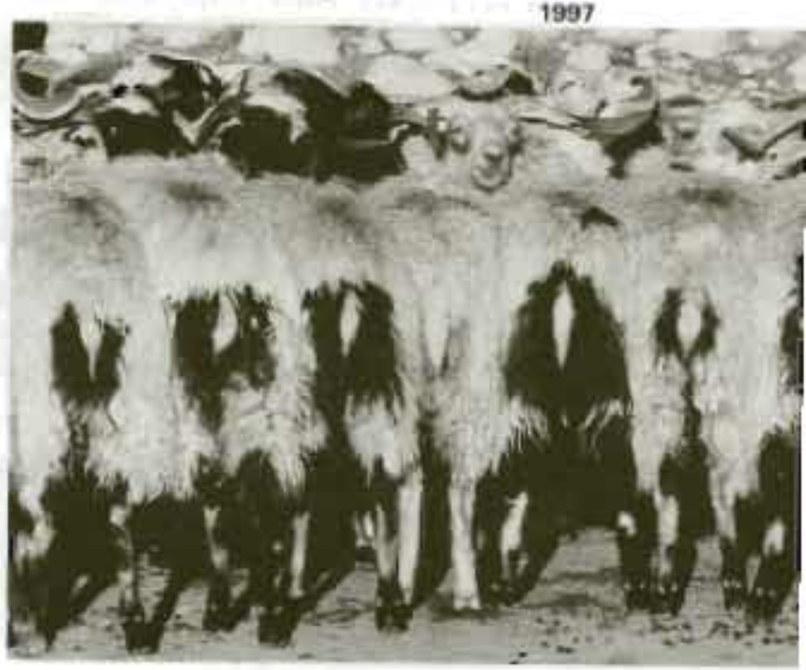
Nomad camp, Longri, Hongyuan, Sichuan, China, 1996

Sheep and rangelands, Baingoin, Tibet, China, 1994

Sheep are very important animals on 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 abrash, 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

Goats being milked, Phijor, Dolpo, Nepal, 1978

Combing out goat cashmere, 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 with 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.

Horsemen, Nagqu, Tibet, China, 1984

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

Tibetan Khampa horseman, Kangding, Sichuan, China, 1996

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 grasslands of present day western Gansu, eastern Qinghai, and northwestern Sichuan Provinces, the Tibetan area known as Amdo, has long been renowned for producing good horses. Horses bred from around Qinghai Lake were supposed to be able to run 1,000 // (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.

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 were exposed to various Central Asian weaving centres. In the eighth century AD, the Tibetan Empire controlled the Silk Route oasis-city states 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 starting 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, Phala, Tibet, China, 1997

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

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

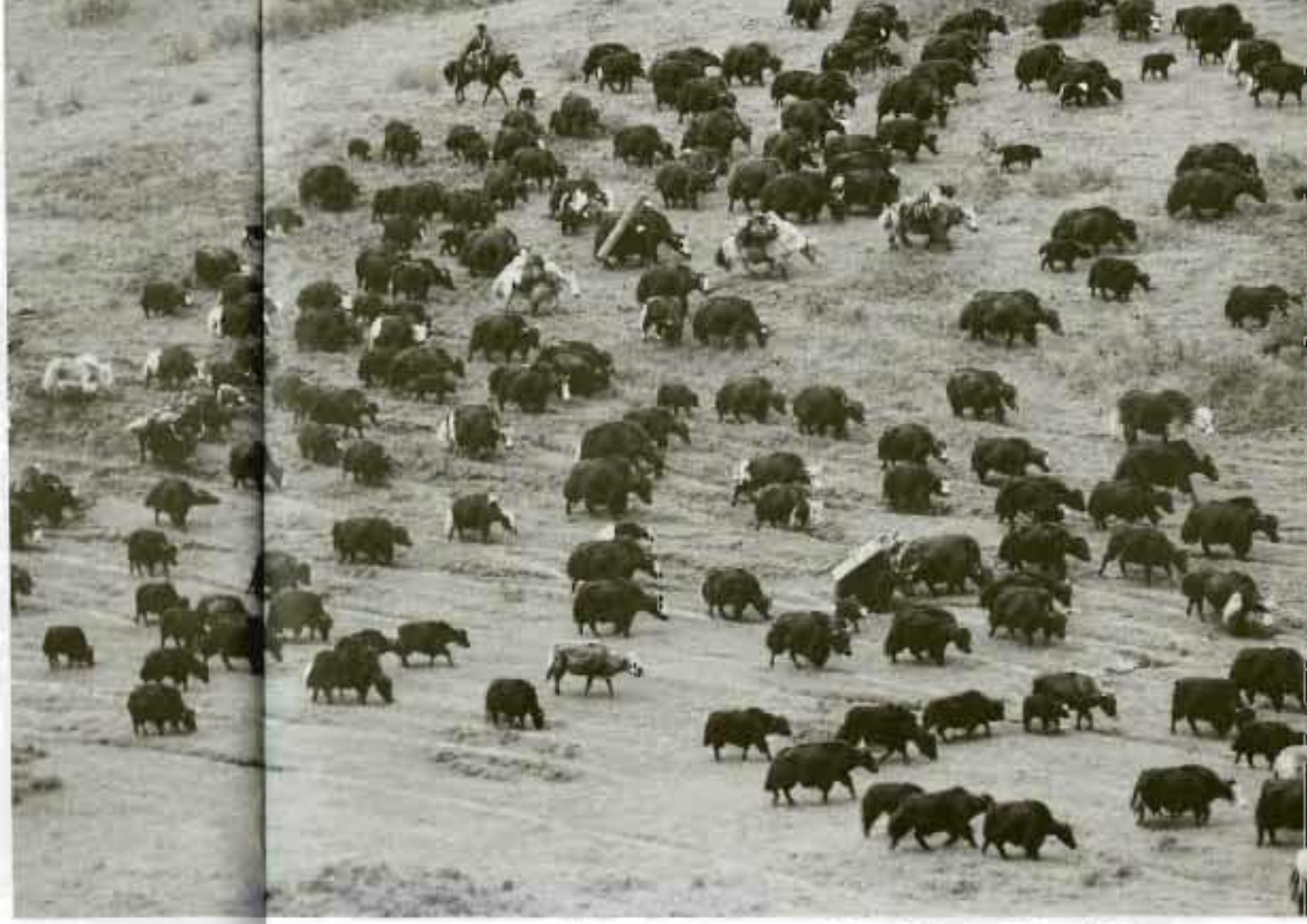
Yak hair tents are a prime example of the Tibetan nomads' skill in adapting to life on the vast, windswept plains of the Tibetan Plateau. Locally made from the long, coarse hair of the yak, Tibetan tents are very suitable to a nomadic lifestyle. They can be easily taken down and packed on yaks when moving 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.

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 figured out how best to use grazing land resources. Fortunately, many aspects of traditional Tibetan nomadic practices are being increasingly viewed by some researchers as highly efficient strategies for range management and livestock production.

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

Nomad moving to summer camp, Aba, 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.



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

The expanded 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 herders possess will be better appreciated and understood and used in designing more appropriate development interventions for pastoral areas. It also provides promise that the herders will be listened to and involved in the planning and implementation of development programmes in the future.

The walled city of Lomanthang, Mustang, Nepal, 1992

Trade and links with agricultural communities have always been an important feature 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.

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 BC. The opening of the Silk Road in the first century BC 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.

Village of Saldang, Dolpo, Nepal, 1978

Pastoralist trader, Namdo, Dolpo, Nepal, 1978

When analysing rangeland ecology and current pastoral production practices on 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 a major effect 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 in 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.

The foundation for the rise of strong nomad tribal federations, kingdoms and empires on the Tibetan Plateau were the rangelands. The boundless, fertile grazing lands, and the livestock grazed on them, helped create prosperous, pastoral-based cultures. Tibet's vast grasslands nurtured a prolific livestock industry. Tibet was rich with animals, wool, and butter. The pastoral landscape also assembled 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, people residing on the Tibetan Plateau would never have been able to develop into such an extraordinary civilization.

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

Horse races, Namdo, Dolpo, Nepal, 1978

Tibetan nomad Women, 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, 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 Himalayan and Tibetan Plateau lies in incorporating and building upon the indigenous knowledge and skills that herders already possess when designing new interventions.

Old pastoralists, Zhongdian, Yunnan, China, 1996

Tibetan nomad women, Phala, Tibet, China, 1997

Women play a very important role in pastoral society. Since they bear and rear children, women directly influence future human resources. As managers of the household and tent, pastoral women make vital decisions about the use of natural resources (fuel 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 pastoral peoples' livelihoods will, therefore, have to focus on pastoral 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 pastoral economies in the Himalayas and on the Tibetan Plateau. Governments, donors, researchers, and pastoral specialists need to better acknowledge women's critical roles.

Nomad woman, Phala, Tibet, China, 1997

Pastoral women, Phala, Tibet, China, 1997

Pastoral women, Phala, Tibet, China, 1997

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.

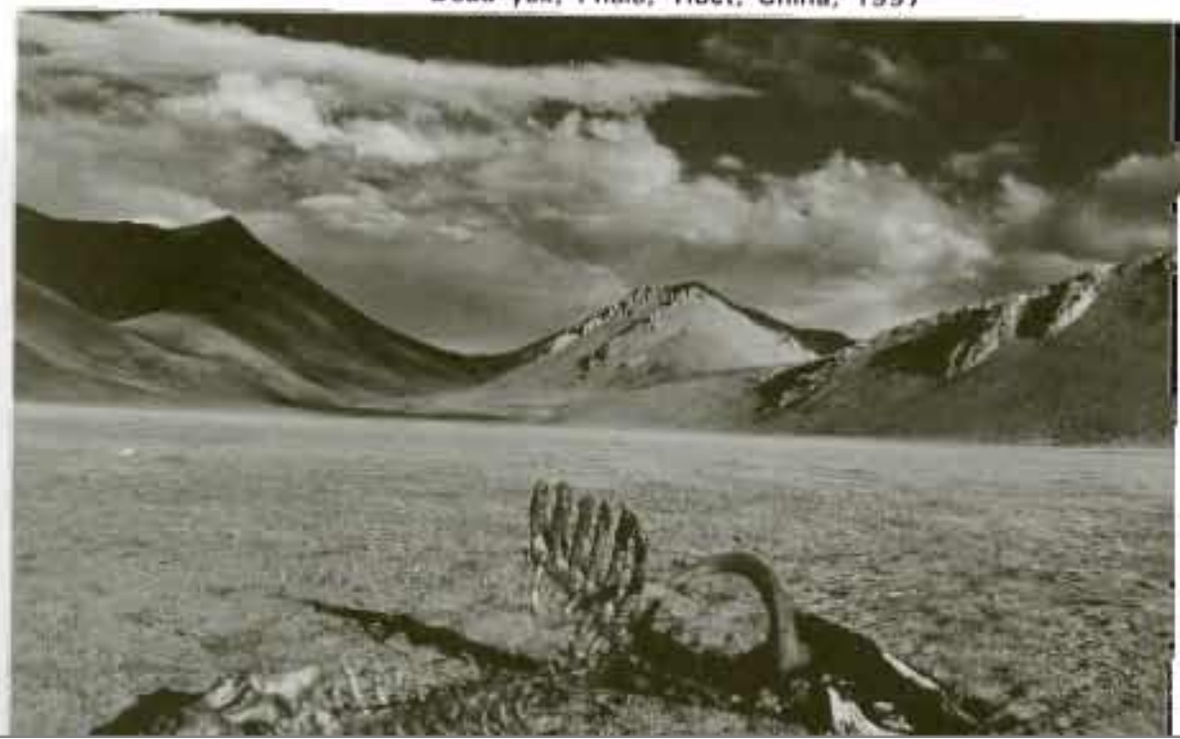
The White River, Hongyuan, Sichuan, China, 1997

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

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

Tibetan 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-equilibrial 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



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-equilibrial 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 new 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

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 better 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 further investigate 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

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

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

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

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.

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

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

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 onto rangelands, and decrease in the amount of grazing land available to nomads' 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

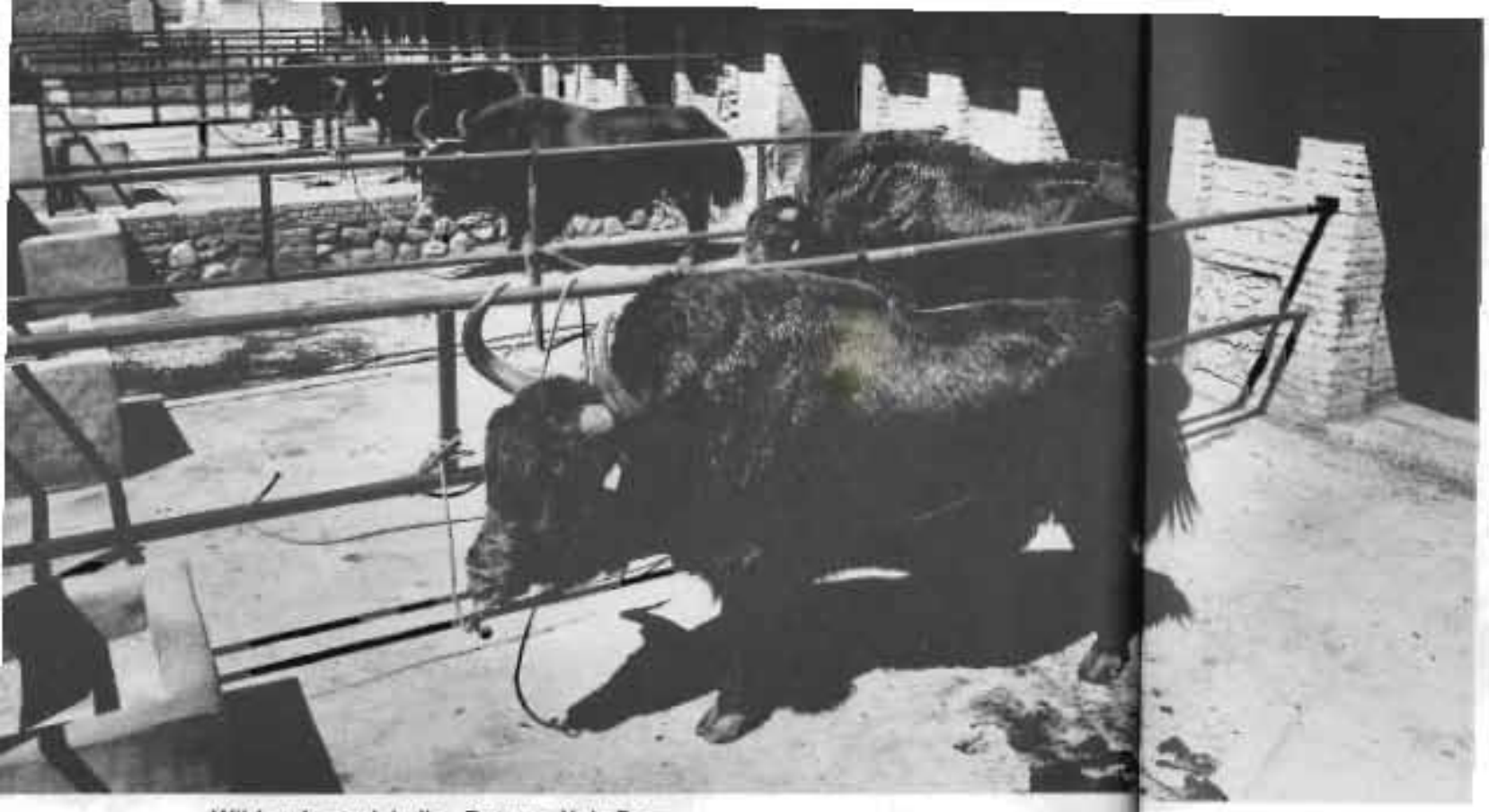
Street scene, Henan Mongol, Qinghai, China, 1997

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 peoples' 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



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 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.

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

Yak roundup, Hongyuan, Sichuan, China, 1997

The challenges facing the sustainable development of rangelands in the Himalayan and 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 Himalayan and Tibetan Plateau where the pastoral history is thousands of years old, more effectively.

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

Rangelands, forest and log trucks, Zhongdian, Yunnan, China, 1996

Rangeland degradation, loss of biodiversity, and increased marginalisation of pastoralists result from mismangement 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

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 dominated more 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.

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

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

Nomad camp, Mustang, Nepal, 1992

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.

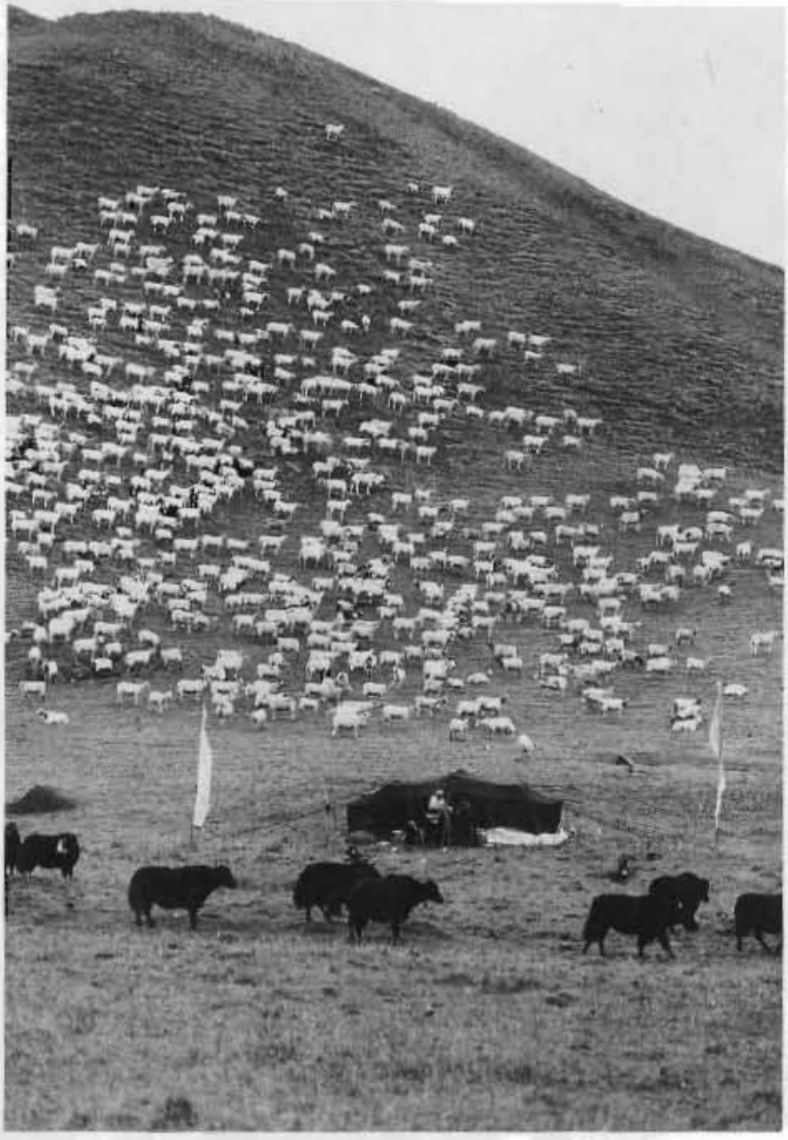
Nomad family, headwaters of Yangtze River, Qinghai, China, 1993

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



Nomad camp with sheep and yaks, Zoige, Sichuan, China, 1996

Pastoral development programmes must involve herders 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 herders in all aspects of the development process and for empowered herders 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 are not being used in an equitable, sustainable manner.

Milking sheep, Phala, Tibet, China, 1997

Horse festival, Zhongdian, Yunnan, China, 1996

Tibetan saddle, Zoige, Sichuan, China,1997

72-Year old Tibetan nomad, Zoige, 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 offtake 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 of some existing pastoral polices in light of new information about rangelands, nomads, and range-livestock production practices.

Yak breeding bull, Merak, Bhutan, 1990

The remarkable rangelands of the Himalayas and on 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 realistically appraise development alternatives for conserving and managing the Tibetan rangeland ecosystem. 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