

Traditional Nomadic Pastoralism And Ecological Conservation on Tibet's Northern Plateau

MELVYN C. GOLDSTEIN, CYNTHIA M. BEALL,
AND RICHARD P. CINCOTTA

Governmental concern with overgrazing and environmental degradation in the Tibet Autonomous Region of the People's Republic of China has resulted in local decrees requiring herd reductions. Using information collected during a 16-month field study, this paper presents a case study of one such order promulgated in 1987 in Phala, a nomadic pastoral group in the Tibet Autonomous Region. The Phala nomads believed the decree unjustified in their case and resented being forced to reduce their herds. This paper describes the operation of the current system of production and management, the system prior to 1959 (when the Chinese took direct administrative control), and the government's and the nomads' conflicting opinions of these. It presents evidence that current governmental policy may be based on flawed information about herd size and incorrect assumptions about the destructiveness of the traditional nomadic pastoral system of production and management. Local census data show no increase in herd size in Phala since the end of the communes in 1981 and the circumstantial evidence shows neither overgrazing nor environmental degradation in Phala. The authors suggest that components of the traditional system are efficacious and that one abandoned practice—periodic pasture reallocation—could be usefully reimplemented to prevent possible future environmental degradation.

Melvyn C. Goldstein, Professor and Chairman, Department of Anthropology, and Director, Center for Research on Tibet, Case Western Reserve University, Cleveland, OH 44106; **Cynthia M. Beall**, Professor, Department of Anthropology, Case Western Reserve University, Cleveland, OH 44106; and **Richard P. Cincotta**, Research Assistant Professor, Department of Range Science, Utah State University, Logan, UT 84322.

One of the world's largest pastoral areas is the Northern Plateau of the Tibet Autonomous Region of China. It is home to 500000 nomadic pastoralists who comprise 25% of Tibet's population. The position of the Tibetan nomadic pastoralists there is secure in the sense that they are not competing with farmers or the government for the same land: the Northern Plateau is too high for agriculture even with irrigation, and the government has no policy of either resettling nomads or expropriating their pastureland. The government, in fact, needs their products and would like to increase pastoral output, since wool, cashmere, and skins are among Tibet's main economic products (Chen et al., 1984). Tibet's nomads, moreover, have been allowed to revitalize their traditional values, beliefs, and customs under the new (post-1980) reform policies of the Chinese government, which also dissolved communes and restored the household as the basic unit of production. (The issues of security, economic value, and cultural revitalization are discussed more fully in Goldstein & Beall 1989, in press.)

However, as in other grassland areas of the world, a critical question



in Tibet is whether traditional systems of pastoral production and herd management are irrational and lead to overstocking, overgrazing, and deterioration of the rangeland environment on which the nomads depend (Barfield 1984, Ellis & Swift 1988). The government of Tibet believes the answer to this question is yes, and it has given regional authorities the discretion to implement programs to restrict livestock population growth through either periodic forced livestock culling or permanent per capita livestock limits.

In June 1987, the Tibetan regional government in Ngamring county decreed that its subordinate nomadic pastoral and agricultural communities must reduce their livestock numbers by December of that year. For Phala, a nomadic pastoral community, a reduction of 20% was ordered. The officials explained that this action was necessary because rapid livestock population growth since decollectivization in 1981 was degrading the county's grassland environment. The Phala nomads disagreed. This article explores the conflicting views of the government and these nomads in light of data from a study designed to collect sociocultural, economic, ecological, and biological information in Phala.

Methods

Study Area

Phala is a local-level administrative unit (*xiang*, a Chinese term that in Phala refers to the main local administrative unit analogous to a village) in Tsatsey district, Ngamring county, Sigatse prefecture, Tibet Autono-



Figure 1. Adult sheep and goats are often used to transport items such as grains and salt. Each animal carries 7.5 to 11.5 kg in a pair of locally woven, woolen saddlebags.

ous Region. It is located in the western section of the Northern Plateau, at the boundary of what Chinese refer to as the Northern Tibetan Plateau Subregion and the Ngari Plateau Subregion of the Qinghai-Tibetan Plateau (Ren et al. 1985). Located ~480 km northwest of Lhasa and 185 km north of the main east-west road, it is situated at altitudes ranging from

4850 to 5400 m at a latitude of 30°30'N and a longitude of 86°30'E. The climate is harsh. Daily temperature lows hover around 0°C in summer and from -28 to -40°C in winter; diurnal temperature variations of as much as 21°C are common. Annual precipitation is ~200 mm for the region and is monsoonal (estimated from graphed annual precipitation averages in Ren et al. 1985). About 75% of the annual average occurs in June through August (estimated from graphed monthly precipitation averages cited in Geelan & Twitchet 1974), often in the form of sudden snow- and hailstorms.

Phala was chosen as a study site that exemplifies the traditional nomadic pastoral way of life. It is far from areas affected by development projects and from Tibet's major east-west and north-south roads. Its 265 nomads (57 households) are organized into 10 small administrative subunits of two to nine tentholds, each called *dzuk*. Each *dzuk* is located in a physically separate home-base encampment. The present encampments are roughly similar in location and composition to those prior to 1959 when the Chinese took administrative control of Tibet. The Phala nomads raise local breeds of sheep, goats, yaks, and horses. Herd composition is ~87% sheep and goats, and 13% yaks. Horses are luxury items used almost exclusively for riding. They are neither milked nor eaten, and are owned by 25% of the families. The Phala nomadic pastoralists do not engage in any farming; the defining feature of their way of life is subsistence through livestock without recourse to farming.

Data Collection

The first two authors are anthropologists who spent 16 months in Tibet between 1986 and 1988, 10 months of it directly in Phala with the nomads. The third author is a rangeland ecologist who spent two months in Phala during the summer of 1987. The research team also included a Tibetan research assistant from Lhasa, and for some periods of time, a Tibetan cook and a Tibetan researcher from the Tibetan Academy of Social Sciences, the collaborating institution on the project. Several types of

data about pastoral production and the environment were obtained. The anthropological participant observation method was used in each encampment, and in-depth, open-ended interviews and reinterviews with every household head in Phala provided information on a range of topics including herd management, economics, household composition, perception of the environment, and the operations of this system during the traditional, pre-1959 period. Interviews with females provided histories of reproduction, including mortality data. Informal interviews and conversations on the entire range of topics under investigation were also conducted with nomads of all ages and sexes throughout the study area. All interviews were conducted in the Tibetan language. The authors were accompanied by no local and district officials nor were they restricted as to whom they could talk with or where or when they traveled within Phala. Formal and informal interviews with government officials provided the official perspective on the nomad's strategy of pastoral production.

Local xiang records provide longitudinal information on changes in herd size for each household since 1981. The commune period (1969 to 1981) data are less complete because many records were destroyed when it ended. However, a trunkful of original handwritten records remained with local nomad officials in Phala; the relevant ones were copied and translated. Information on the number of livestock redistributed at the time of commune dissolution derives from the original 1981 Phala xiang records. Several times during the study, individual households were also interviewed about herd size and composition.

Livestock diets were evaluated by obtaining hand-plucked forage selection samples for each livestock species from 15 daily, 30-minute foraging bouts between 1 July and 4 August 1987; and then using a "bitecount" technique similar to methods employed in studies of Ngisonyoka pastoralists in Kenya (Coppock et al. 1986). True livestock diets tend to be of higher quality than hand-plucked duplicates (Van Dyne & Torrell 1964). The cell wall fraction of dietary forage was determined by detergent techniques (Van Soest & Wine 1967). Crude protein was determined by the Kjeldahl nitrogen technique. Digestibility was determined using in vitro methods (Tulley & Terry 1963) with modifications (Van Soest et al. 1966).

Data on grazing intensity were collected from grazing exclosures; 16 grazing exclosures were established in June 1987 before the onset of the summer monsoons. Exclosures were 2.25-m² fenced areas, four in each of four different vegetation types. These were removed in mid-September 1987 after the end of the growing season; four 0.13-m² samples were clipped from inside the exclosure and four samples the same size were clipped from a grazed area 1 m from each exclosure. Biomass was estimated by obtaining live weights in the field and applying a correction factor determined from oven-dried samples (60°C for 48 hours).

Current State of Animal Husbandry in Phala

Government's view of Nomads

The government's perception of the nomads' system of production is similar to what has been called the mainstream view in other parts of the world. That is, that nomads are dangerously prone to overstocking and overgrazing, ultimately degrading or destroying the environment unless intervention and technology alter that system and restore a balance (Ellis & Swift 1988, Sandford 1983). In Tibet, this appears to derive from several lines of reasoning:

- Publicity within China about the progressive degradation of the nation's grassland environments has been widespread. For example, the English language *China Daily* newspaper (27 January 1987, discussing an article in China's *Economic Daily*) reported that 15% of China's grasslands had deteriorated by the mid 1970s and that this increased to 30% by the mid 1980s. It called for intervention and new programs to halt this process.
- Erosion in the pasture areas of some Tibetan agricultural villages may be evident (e.g., Simmons et al. 1989).
- Livestock numbers have supposedly increased rapidly since 1959.
- The nomads' livestock management system seems (superficially) to exemplify the mainstream view of pastoral systems, since the nomads invariably state that their strategy is to maximize individual herd size. Related to this is the fact that Tibetan society generally views the nomads as unsophisticated and backward.

The reasoning intrinsic to the first two points is not persuasive. One cannot meaningfully extrapolate from conditions in densely populated inner China (i.e. China excluding Tibet) to Tibet; nor in Tibet can one project from the situation in agricultural areas where barns and fodder are used, to the sparsely inhabited and strikingly different high altitude ecosystem of the Northern Plateau.

With respect to the third point, livestock census data that show large diachronic increases appear flawed. A major Chinese scientific expedition to study pastoralism on the Qinghai-Xizang Plateau, for example, claims a very high rate of herd increase since the Chinese took direct control of Tibet in 1959 – a 113% increase during the 23-year period from 1959 to 1981 (Chen et al. 1984). If this figure is accurate, the annual increase in livestock throughout Tibet over this period was 3.3% (a 21-year doubling time).

However, estimates of livestock growth using 1958 to 1959 as the base figure are highly suspect. There is no reason to expect a rapid increase in herd size immediately after 1959, since no technical innovations were introduced in the pastoral subsistence system of the Northern Plateau during the first decade of Chinese administration in Tibet. In Phala, for example, there was very little redistribution of livestock to the poor, and households basically continued to raise and manage their livestock as they had in the past until 1969 to 1970 when communes were established (Goldstein & Beall 1989). If anything, an observer would have predicted that the political chaos in Tibet would cause decreases. Phala nomads experienced disruption caused by the 1959 revolt, an abortive 1969-1970 rebellion, the turmoil of the 1966-1976 Cultural Revolution, and the 1969-1981 forced implementation of a pastoral commune. Report of substantial increases in the size of herds, therefore, may reflect political propaganda more than it reflects reality. Newly appointed (in 1959-1961) Tibetan officials may have felt pressure to demonstrate their own capability and the benefits of socialism to their superiors in Lhasa and Beijing; one way to do this would be to underreport livestock at the end of the old system (1959) so as to create the illusion of an increase in herds in later censuses (Clark [1987] issues the same caveat regarding governmental data on longitudinal livestock increases in Tibet).

A possible example of this is an article written by Tsung (1965) in *Min-tsu T'wan-chieh (Nationalities Unity)*. It claims that one well-known Northern Plateau area (Nakchuka) experienced an increase in livestock of 130% in the five years from 1959 to 1964 despite a dry spell, periods of continuous spring snow, and plagues in some pastures. This astounding success (doubling time of less than three years) is attributed not to technological advances applied to animal husbandry but rather to the overthrow of the feudal system and resulting unprecedented enthusiasm for production by the “liberated” nomads.

The present government’s view, however, is that this growth is real and is the outcome of the nomads’ strategy to raise as many animals as possible (fourth point above). A Chinese scientific expedition reports (Chen et al. 1984:51):

To date, the animal structure in Tibet is ... irrational ... [T]he increased rate of total animals had been the main criterion for measuring the development of animal husbandry and no attention has been paid to [the quality or yields] of animal products.

In this vein, one Tibetan official condescendingly commented that, “The nomads have to be educated to understand that just rearing more and more animals is not the answer.” The previously cited scientific report concluded (Chen et al. 1984:66, emphasis added):

The past production and general arrangement of animal husbandry in Tibet is basically the outcome of following the natural environment. *This kind of animal husbandry cannot fully use the natural grassland resources and animal species with high quality and good production, cannot meet the needs of people’s lives, and also cannot meet the requirement of national economic development and modernization of animal husbandry.* As a result, the main task for further development of Tibetan animal husbandry is to strengthen the construction of the grass production base, select good animal species with prominent economic features, arrange production rationally according to local conditions, and improve production management.

But is this true? Is the nomads' past production system irrational and unable to fully use the grasslands, produce quality products, and meet the needs of the people? Is this science speaking or is the classic stereotypic bias against traditional pastoral management systems influencing perceptions? After centuries of continuous occupation of the Northern Plateau, have conditions actually changed so drastically from 1959 to 1987 that external intervention is now necessary to save the environment from irreversible deterioration? The nomads of Phala strongly disagree with the mainstream view, and this study supports the nomads.

Recent Growth Patterns of Phala's Herds

The need to balance herd size with available forage is obviously fundamental to ecological conservation. A crucial question to the discussion is whether the Phala herds are actually increasing rapidly.

Animal census data from Phala indicate that herd size at the time of disbanding the Phala commune in 1981 with that in subsequent years until 1988 (Table 1) reveals an overall 8% decrease in herd size: a 4% decrease in the number of livestock in Phala between 1981 and 1987 and another 4% decrease after the reduction decree in 1987. Compliance with the 20% reduction decree actually amounted to a lower net decrease because the nomads could include animals that would normally have been for food.

Data from the preceding commune period (1969 to 1981) are available for only one "brigade" in Phala (roughly half the area). They reveal that the rate of livestock population growth has been low, at least since 1976. Comparing the 1976 and 1987 livestock records for this, the more productive half of Phala, reveals an increase of 4.8% for that 11-year period. This corresponds to a small annual growth rate of just 0.4% - a doubling time of 175 years.

Also available for that half of Phala were 1970 data for yaks and sheep. These reveal a 30% (233 animals) decrease in yaks and a 23% (505 animals) increase in sheep for a net 9% (272) increase for the 17-year period 1970 to 1987. However, since six sheep were traditionally considered equal to one yak, the decrease in yaks probably more than balanced the increase in sheep in terms of pressure on forage. Furthermore, because this is the more productive half of Phala, overall herd growth during this time for the whole area would certainly have been lower (or even negative) if figures for the less productive half of Phala had been available. (For example, the more productive half of Phala increased the livestock by 3% between 1981 and 1987, while the less productive half decreased by 11%.)

Given this, why did the regional officials force the nomads at Phala to reduce herd size? Part of the reason may derive from their extrapolation from conditions in the areas they knew best, the farming villages near the Ngamring county seat that maintain sizable numbers of livestock. The authors surmise, however, that county and district officials had quite likely had an incorrect impression that herd size had actually increase substantially in the nomadic sector between 1981 and 1987, specifically, that they inadvertently under-enumerated the number of livestock in 1981, the baseline year of commune dissolution, and thus overestimated the increase by 1987.

At the time of commune dissolution only the animals owned by the commune were divided equally among the members. Uncounted animals in the private holdings of each household, which remained their holding and which do not appear in the 1981 records. In Phala, these private animals totaled – 1800 goats. This means that the official animal total was ~20% lower than the actual number. Since these 1800 private animals are not taken into account, the records erroneously indicate an increase in herd size of 15% from 1981 to 1987 – a 2.4% annual growth rate. Officials in this county (and possibly others) were likely unaware of this discrepancy when they ordered the reduction of herds. Contrasting the flawed with the accurate data, it is easy to understand both the government's concern over high herd growth rates as well as the dismay of the Phala nomads at the 1987 government edict that double the existing 4% decrease in herd size.

The herds in Phala give no evidence of rapidly increasing; the government's assumption on this count is false. But, it is still possible that even the current relatively stable herd size is sufficient to overgraze.



Phala's Pasturelands

Circumstantial evidence strongly suggests a balance between livestock and pasture in Phala. The following factors do not unequivocally demonstrate the absence of overgrazing, but, taken in conjunction with the census data, they strongly suggest that the number of livestock does not exceed available forage.

Wild ungulates – such as antelope, wild asses, gazelles, and blue sheep – are abundant (herds are seen daily) and diverse near all the Phala home-base encampments. This situation is generally not found in areas where severe overgrazing has degraded rangeland, and wildlife has been driven out in favor of domesticated animals.

Qualitative indicators of overgrazing were absent. Plant communities were rich in species: the authors collected > 75 species of herbaceous plants from actively grazed rangeland and speculate that more are to be catalogued in other grazing areas. In most Phala pastures nearly every perennial grass plant could attain seed-bearing stage in 1987, which also suggests that degradation of the vegetational component was probably not occurring. Nor was severe erosion or soil compaction visually evident. Although large areas of Phala are sparsely vegetated, plant density appeared to be a function of seasonal soil moisture and soil texture rather than grazing intensity.

Because the difficult task of scientifically determining the carrying capacity of a pasture for livestock requires data obtained over a series of years, the authors could establish baseline, but not longitudinal, infor-

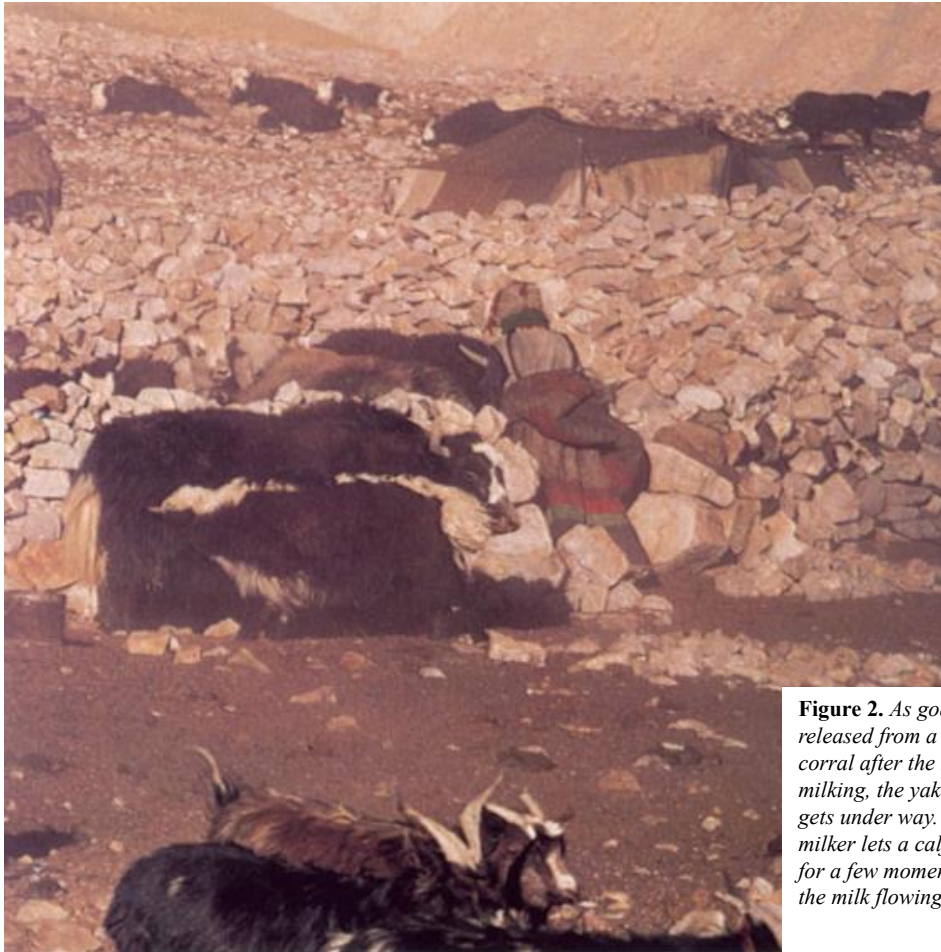


Figure 2. As goats are released from a stone corral after the morning's milking, the yak milking gets under way. The milker lets a calf suckle for a few moments to get the milk flowing.

mation from grazing exclosures. Significant removal of vegetation after one summer of grazing could be detected in only one of the four major vegetation types sampled: the Kobresia Hillock type, a community of sedges that occupies wet meadows. Remnant vegetation in this type was 50% of the ungrazed standing biomass, an amount that equals an often recommended limit for grazing. However, this observation may not indicate anything particular about wet meadow pasture, since extraneous factors confounded this site. The livestock pass through this area twice daily on their way to water, so it would be heavily grazed and trampled even under the most careful grazing management. Thus, these baseline exclosure data also suggest that overgrazing is not present, but a longer time frame is necessary to provide a definite answer.

Although pastures are generally used every year, the nomads reported that several households left some of their more distant fall pastures ungrazed in 1986 because they decided their nearer pastures were sufficient. This reserve area was small, but such reserves suggest that the number of animals is below the average carrying capacity (Ellis & Swift 1988). Similarly, in 1987 one home-base encampment allowed a household headed by an old man to remain at the site when the rest moved to their fall pasture because there was sufficient grass to sustain his animals and still leave enough for the rest when they returned three or four months later. Moreover, no pasture were reported to have been lost (in their memory) to erosion or any other forms of environmental degradation, although a few nomads commented that the amount of vegetation produced by some pasture areas seemed to have decreased somewhat since the creation of the communes in 1969. Others disagreed.

Encampment households have exclusive usufruct rights to their pasture but were still willing to accept a household from another encampment even though this could substantially increase the livestock using the recipient camp's pastures. This occurred on at least six occasions during the study. In one instance, the new household's livestock increased the total number of animals at the receiving camp by 44%. The nomads said that their pasture could sustain the additional animals.

The Tradition of Animal Husbandry

Pastoral Production and Management

Prior to 1959, the Phala nomads were part of Tibet's feudal economic and political system. Rather than a free-roaming, semiautonomous tribe, they were subjects of one of Tibet's greatest religious lords, the Panchen Lama, and were part of one of his huge pastoral estates (fiefs) known as *Lagyab lhojang* (~15540 km² in area). Their production system involved raising yaks, sheep, goats, and horses; harvesting their products; paying a portion to the lord as taxes; consuming a portion; and bartering yet another portion along with nonlivestock products, e.g., salt, to obtain other items such as grains and tea. As in the case today, no grazing land was irrigated, fertilized, or sown.

Animal husbandry on the Northern Plateau is based on effectively exploiting the single, short growing season during which both frost and dry, high-velocity winds are common. In Phala, green foliage first appears in late April to early May on spring-fed wet meadows and riverbanks that cover just a small part of the summer grazing area. The bulk is covered by plant communities that depend on monsoonal precipitation and these begin to play a role in livestock forage selection in late May or early June. Foliage is considered sufficient to wean newborn lambs and kids and begin milking only in mid June. The growing season ends in September. In mid May 1988, the livestock at two of Phala's lower-altitude (~5000 m) encampments were still foraging almost exclusively on dried foliage from the previous year and those in a third were foraging on new, wet meadow foliage as well. Livestock, therefore, feeds for eight to nine months on senescent biomass.

The Phala nomads prolong their herds' access to good quality pasture by moving along with their livestock annually between at least two encampments (with associated pastures). From a three-season (winter, spring, summer) home-base encampment, they move to a fall encampment for several months from mid to late September until mid to late December. The fall encampment is usually only one or, at most, two days distant and at the same, or higher, elevation as the home-base encampment. The foliage at the two sites does not differ seasonally; i.e., new vegetation does not continue to grow at the fall site after it has ended at the summer one. Rather, the summer site generally contains more earlier-blooming vegetation or is an area where the growing season starts slightly earlier.

This migration sequence enables the nomads: to use the growing foliage at the home base during summer; to use an area that has been left ungrazed all summer during the fall and early winter, giving livestock an additional three to three-and-a-half months of plentiful grazing; and to preserve a cover of senescent foliage at the home-base encampment that will suffice for the rest of the winter and spring. The sequence ideally enables livestock to lay down the necessary fat stores to survive the bleak winter and spring.

This system is embellished by some households that move parts of their herds again. For example, in the summer, secondary, satellite camps may be established at other pastures for the male and nonlactating sheep and goats; and in the spring birthing season, satellite camps may again be established for pregnant females if the household has appropriate pastureland and sufficient laborers to do so. Similarly, in late spring, if the nomads think the remaining senescent vegetation is inadequate, a household or households may move part of their herds from the home base to a satellite camp established in underused nooks and crannies of the home-base area.

This system, however, applies only to sheep and goats. Yaks are moved according to a considerably different sequence. Male yaks are left unsupervised in the mountains throughout the year until they are needed for transportation. Female yaks are herded daily and move with the sheep and goats to the fall pasture. However, when the latter return to the home base in December, the female yaks are normally moved to other ungrazed winter pasture areas where they forage primarily on mountain slopes on a sedge known as *bang* (*Kobresia* sp.). Because the mountain valleys are relatively small, the yak satellite camps move several times with their herds (within the general winter pasture area), almost always at altitudes ≤ 610 m higher than the main home-base encampment. However, they also are generally no more than one to two days from the home base, so contact is easy. Contiguous groups of nomadic pastoralists near Phala are reported to have migration systems with three or four main moves. These differences were explained on the basis of the characteristics of the local pastureland they controlled rather than different climatic conditions or growing seasons in their locales. All the pastoralists of the western Northern Plateau are adapting to an environment where their livestock must forage for eight to nine months on senescent vegetation.

The summer diet of goats, sheep, and yaks in Phala is equal or superior to high quality early-growth forage in other temperate regions. This assessment is based on the percentage of dry forage that is cell-wall content, dietary crude protein, and in vitro digestibility. The system of winter grazing on standing vegetation probably has little effect on pasture condition because carbohydrates are stored belowground in roots, rhizomes, and tubers. Heavy use of dormant foliage is generally not detrimental to plant survival and growth (Auen & Owensby 1988).

The nomads assert that their traditional system has allowed them to subsist on the Northern Plateau for centuries without destroying their resource base precisely because it fostered a balance between their highly adapted herds and their harsh environment. They argue that climatic conditions are so

harsh and so prone to periodic disaster years that sustained growth over the entire area is not possible. This is also the rationale for their individual herd-management strategy.

The nomads reason that on an individual household basis, increasing herd size during good years provides necessary insurance against the inevitable bad years when heavy snow or drought decimates their herds both directly and indirectly through making them more susceptible to disease and winter cold. Big herds, they say, can survive a large proportionate reduction with enough animals to recover quickly in subsequent good years due to the rapid reproductive rates of sheep and goats. Small herds may not be able to regenerate sufficiently before the household is impoverished and permanently relegated to the servant-laborer class. In other words, they argue, limiting individual herd size is irrational.

From the perspective of the nomads, the timing of such disastrous years is random. Despite all their hard work and skill, the threat of being victimized by the stochastic fluctuations of climate is always present. This threat has two aspects. First, climate and disease operate very unevenly and unpredictably and fluctuate tremendously year by year for the overall area. Second, these forces operate unevenly in single years – even in overall good years disaster occurs randomly within groups and even among households in single encampments.

Table 1 illustrates this unevenness on the group level. For each year from 1981 through 1986 herd size decreased. Of this decrease, 22% occurred between 1981 and 1984, 10% in one year (1983 to 1984). During the next two years the decrease was only 3%. But, a good summer precipitation in 1986 and a very mild winter in 1987 resulted in a one-year increase of 27%, nearly restoring overall herd size to the 1981 level.

Random unevenness at the encampment and household levels also operated, in part independently of the overall group trend. For example, in the 1988 spring birthing season some households lost only a few lambs and kids while their neighbors in the same home-base encampment suffered 100% neonatal mortality. Several encampments of an adjacent nomad *xiang* lost ~30% of its livestock during an unusual six-day snowstorm in 1986 while neighboring areas, including Phala, were unaffected. This situation exemplifies an abiotic, climate-driven system (cf. Ellis & Swift 1988).

Table 2 compares change in herd size among the households of three contiguous home-base encampments (*dzuk*) that are only about an hour's walk apart. It reveals that at the level of home-base encampment, the herd of one encampment increased in size over a five-year period (1981 to 1986) by 27%, but decreased by 23% and 18% for the other two. Despite Phala's overall livestock decrease of 25% from 1981 to 1986 (Table 1), *dzuk* B experienced a substantial increase. Herd size also fluctuated at the household level – for some households herd size increased while for others it decreased over the same period.

Consequently, while climate and disease may preclude sustained growth of livestock with respect to the large area of Lagyab lhojang over a period of many years, it seems clear that herd increases would probably also have occurred in some specific pastures such as those of *dzuk* B. Unless such localized pockets of sustained herd increase were countered, overgrazing and pasture degradation could have resulted in the ultimate loss of these areas, and thus, in the gradual reduction of the overall carrying capacity of Lagyab lhojang. The traditional estate system had a reallocation system that precisely performed this function.

Pasture Allocation

A unique feature of the traditional (pre-1959) pastoral system that is no longer in effect is the complex administrative system of pasture allocation and reallocation. The nomads' traditional feudal lord, the Panchen Lama, owned all pastureland and allocated plots of pasture to individual households (among his Lagyab lhojang nomad subjects) which then had exclusive usufruct rights over them for a given period of time. The nomads owned their livestock. The Lagyab lhojang estate was divided into thousands of named pastures of varying size, each with delimited borders recorded in a register book. These pastures were not fenced, but boundaries were enforced by the lord. Nomad households could use only their assigned pastures.

Each pasture was considered suitable for a fixed number of animals calculated on the basis of a unit locally *marke*. One *marke* of pasture in Lagyab lhojang was calculated as equal to 13 yaks, 78 sheep, or



Figure 3. *At ~3 to 4 months of age, the ears of all infants are cut with a distinctive family brand, and most male lambs and kids are castrated. Family members carry animals to a man, usually a hired hand from a low status family, who uses a knife to perform the operation at the corral entrance.*

91 goats (based on a conversion rate of one yak to six sheep or seven goats) in the 1940s and 1950s. Thus, access to a pasture with a one-marke rating would be allotted to a household with some combination of animals totaling 13 yaks, 78 sheep, or 91 goats. A pasture of two marke would be allotted to a household with twice that number. Each pasture was expected to sustain only what was considered an appropriate number of livestock. How these stocking ratios were originally constructed is not clear, but they were not frequently adjusted.

A triennial census of adult animals determined each household's herd size and its allocation of pastures and taxes. At each census, additional pastures were allocated to households whose herds had increased, and pastures were taken away from those whose herds had decreased. Households normally received multiple pastures. Each household's assigned pastures (and annual taxes) remained fixed during the three-year intercensus interval. This system, therefore, was traditionally controlled by high-level decision-makers—the lord's representatives—who, in conjunction with their appointed local nomad officials, transferred usufruct rights to pastures so as to ensure that each pasture contained the specified number of livestock.

Fluctuations in herd size in one pasture or groups of pastures, such as dzuk B above, were accommodated by shifting pastures among households within a single subgroup such as Phala; by shifting pastures between adjacent subgroups within Lagyab lhojang; or, in more extreme cases, by moving entire households and their herds from one of the 10 Lagyab lhojang subgroups to another. Thus, Phala has a long history of active management of the livestock – pasture balance despite the nomads' striving to maximize individual herd size.

Lack of historical data on herd sizes prevents testing the nomads' assertion that this system generated a long-term balance between livestock and pastureland. However, the diachronic persistence of this system is clearly evident. The nomadic, pastoral way of life has a long history in Tibet. It is mentioned indirectly in historic materials dating from the first Tibetan kingdom in the sixth to ninth century A.D. and specifically since the 11th century (Stein 1972). Archaeological research in Tibet is in its infancy and when nomadic pastoralists first utilized the Northern Plateau is uncertain; but recent excavations in southern and eastern Tibetan river valleys have uncovered Neolithic village sites at elevations as high as 3050 m. One of these, Karou, was radiocarbon-dated at ca. 5000 B.P. and evinced farming, hunting, and perhaps the domestication of pigs (CPAM 1985). Given the close association between the appearance of farming and animal husbandry in other parts of the world, such as the Middle East, it is reasonable to expect future archaeological excavations to reveal evidence of the domestication of sheep, goats and yaks or cows in Tibet thousands of years ago.

Table 1. Numbers of Livestock in Phala, 1981 to 1988*

Year	Yaks	Sheep	Goats	Total	Change from 1981	
					No.	%
1981	1211	6838	2738	10787		
1983	1164	5441	2929	9534	-1253	-12
1984	995	4548	2930	8473	-2314	-22
1985	909	4369	2963	8241	-2546	-24
1986	898	4276	2950	8124	-2663	-25
1987	1024	5425	3886	10335	-452	-4
1988	1054	4667	4213	9934	-853	-8

*Data derived from handwritten records found at the xiang headquarters and head counts conducted during the course of the authors' research.

The implication of this diachronic persistence is simple. The high livestock growth rates mentioned earlier in Chen et al. (1985) and Tsung (1965) could not have existed for long periods of time. For example, if the 3.3% annual growth rate cited by Chen et al. for the period 1958 to 1981 is applied to a hypothetical herd of 10000 sheep, goats, and yaks (for an area the size of Phala) of 1000 years ago at the start of the 11th century, there would be well over 3 quintillion head of livestock. In fact, a 1% annual growth rate for that period would today yield ~170 million head of livestock. But Tibetan records show that the total population of all domestic animals, encompassing all farming and nomad areas (and including pigs, chickens, etc.), was only 23 million in 1983 (Tshe 1983). Of course, if nomadic pastoralism were assumed to be present in Tibet for 2000 years, the figures would become ridiculous. Thus, the high livestock growth rates claimed above cannot be taken to be intrinsic to the traditional pastoral system. They obviously also cannot be argued to be the result of a post-1959 change in the extremely harsh abiotic environment, or to a dramatic reduction in herd mortality due to modernization. They simply appear to be flawed. Consequently, the authors suggest that the Phala nomads' traditional pastoral management system was well adapted to their harsh environment and enabled them to use the Northern Plateau's rangeland for intensive animal husbandry for centuries without exponential growth and consequent destruction of their resource base.

Table 2. Change in Total Number of Livestock for Households in Three Contiguous Home-base Encampments (Dzuk), 1981 to 1986 and 1981 to 1987

Household	1981	1986	Change from 1981 to 1986 (%)	1987*	Change from 1981 to 1987 (%)
DZUK A					
Household 1	361	321	-11	153	-58
Household 2	306	159	-48	213	-30
Household 3	296	262	-12	376	+34
Total	963	742	-23	760	-21
DZUK B					
Household 1	356	680	+91	634	+78
Household 2	501	782	+56	845	+69
Household 3	204	152	-26	136	-33
Household 4	245	96	-61	80	-67
Household 5	308	334	+8	345	+12
Household 6	40	60	+50	60	+50
Total	1654	2104	+27	2100	+27
DZUK C					
Household 7	218	156	-28	134	-38
Household 8	205	190	-7	187	-9
Household 9	--	--		164	
Total	423	346	-18	485	+15

Conservation, Development, and the Future

Although Phala shows no evidence of increased livestock numbers and environmental degradation since

decollectivization in 1981, it is not realistic to expect the government to adopt a laissez faire, noninterventionist policy in Tibet. "Development" of animal husbandry is a major government goal. Not only has considerable infrastructure been created (e.g., animal husbandry experimental stations in each of the Tibet's prefectures), but Tibetan officials have begun to invite Western development experts to assist in the "modernization" of the pastoral economy (Simmons et al. 1989) and the preservation of the environment (e.g., by establishing state parks). The impetus to increase livestock productivity under the "Four Modernizations" policy by the application of "science" is very strong in Tibet and likely to intensify in the years ahead.

However, intervening in fragile environments with complex ecological systems is a difficult undertaking, and many pastoral development programs in other areas of the world have resulted not in progress, but rather in destruction of the way of life of the inhabitants and an environment in poorer condition than before (Ellis & Swift 1988, Helland 1980, Sanford 1983, Swift 1977, Swift & Maliki 1984). To avoid this, it is extremely important that planners understand the traditional livestock management systems of the Northern Plateau's nomadic pastoralists—the Phala system is probably just one variant—and also that they utilize those systems as the foundation for development.

Far from being irrational exploiters of their resource base, the nomads of Phala are shrewd and practical animal husbandrists who could be valuable partners for the government if approached properly. They are open to change when they perceive new options to be appropriate to their particular environmental conditions and to their cultural values. For example, a few are experimenting with trucking sheep to a city three days away to sell, and a number have taken government loans as capital for trading. Many have obtained radios and cassette players during the past few years, and a variety of manufactured goods are popular. More significantly, when asked what kind of assistance they wanted from the government, a number suggested a more sophisticated system of pasture allocation. Although the nomads do not think that overgrazing is currently a problem in Phala, their leaders are concerned about the future, i.e., that some pastures such as dzuk B may become overgrazed as a result of terminating the traditional pasture reallocation system when direct administrative control of Tibet was assumed by China in 1959.

The impact of this change is not as great as one might expect because pastures were actually reallocated several times between 1959 and 1981 by happenstance. This occurred once in 1961 when the "mutual aid group" economic system was implemented and again in 1969 to 1970 when livestock communes were instituted (Goldstein & Beall 1989). The last reallocation occurred in 1981 when the communes were disbanded and their livestock divided equally among the nomad members. At that time pastures were allocated jointly and indefinitely to several households sharing the same dzuk. Currently there is no ongoing system of pasture reallocation to accommodate local fluctuations in the number of livestock, and there have been no happenstance reallocations since 1981. Each dzuk, in essence, has become a small commons permanently shared by several households.

Local differentiation in livestock numbers, however, has become noticeable in the seven years since 1981, and as seen in Table 2, the total herd size of some dzuk has grown while for others it has declined. Table 2 also shows considerable individual household variation (and therefore the underlying motivation for the traditional system's allocation of pastures on an individual household basis). If each of these dzuk had appropriate numbers of livestock for the pasture areas they were allocated when the commune ended in 1981, one must then infer that today some areas, such as dzuk A and C (Table 2), have excess pasture, while others, such as dzuk B, have too little. Nomad leaders, therefore, argue that the current system should be altered so that pastures are reallocated on the basis of herd size, as was done traditionally.

The nomads of Phala are not only open to change, but their traditional pastoral system cannot be assumed a priori to be destructive. Policy that treats nomadic pastoralists such as those in Phala as irrational and backward and ignores central components of their traditional system is not just shortsighted. It is potentially dangerous for both the well-being of the people and the conservation of the environment.

Conclusion

The available data from Phala provide no evidence that the traditional system of herd management has led to overstocking or overgrazing there. The livestock census data from 1970 to 1988 argue strongly against the presence of large-scale increases in herd size, and firsthand observations from 1986 to 1988 reveal that the problems associated with overgrazing in other parts of the world do not exist in Phala today. Therefore, the government's 1987 decision to force the Phala nomads to reduce herds by 20% appears unwarranted. While district officials in Tsatsey did not openly admit their mistake despite tactful presentation of data in 1981, when asked in summer 1988 whether they were planning to implement more reductions, they immediately replied negatively, adding that in the future they will look carefully at local conditions.

Their belated conclusion parallels the authors'-that local conditions on the Northern Plateau are so variable that development and conservation decisions must be made on the basis of micro-level data. However, at present, far too little is understood about the Northern Plateau's eco-systems for informed decisions to be made about intervening to force the nomads to alter basic components of their traditional system(s). It is essential, therefore, that systematic research on the current ecological status of the Northern Plateau's grasslands as well as on the effectiveness of the nomads' traditional methods be conducted before universal livestock reductions or limits are decreed, not to mention other drastic measures (e.g., the introduction of new species of livestock and forage), imposed in the name of science and progress. There may well be serious environmental problems in certain areas of the Northern Plateau, but the nature of these problems (and their solutions) must be ascertained area by area. The careless implementation of "Western" technology is as likely to create irreversible, iatrogenic degradation as it is to solve problems and improve the life of the nomads. The risk of the former is too great to use a "shotgun" approach to attempt to achieve the latter.

Protecting Tibet's unique Northern Plateau is not only a national but a world concern. However, the data collected in Phala raises serious questions about the validity of the government's claims of overstocking and inadequate pasture there, as well as the pervasive view that the nomads' traditional system is irrational and destructive. Furthermore, protecting the indigenous nomadic pastoralists and their way of life is also an important concern. It would indeed be tragic if, after surviving the destructive Cultural Revolution and revitalizing their traditional beliefs and customs, these nomads' way of life were gradually undermined and destroyed by modern notions of conservation and development based on faulty evidence, negative stereotypes, and untested assumptions.

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