

Poverty Among Tibetan Nomads: Profiles of Poverty and Strategies for Poverty Reduction and Sustainable Development ^[i]

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Introduction to the Tibetan Pastoral Area

The Tibetan nomadic pastoral area, located on the Tibetan plateau in western China, is one of the world's most remarkable grazingland ecosystems (Ekvall 1974, Goldstein and Beall 1990, Miller 1998c). Stretching for almost 3,000 km from west to east and 1,500 km from south to north and encompassing about 1.6 million sq. km., the Tibetan pastoral area makes up almost half of China's total rangeland area, equivalent in size to almost the entire land area of the country of Mongolia. As such, the Tibetan pastoral area is one of the largest pastoral areas on earth.

The Tibetan pastoral area sustains an estimated two million nomads and an additional three million agropastoralists and supports a large livestock population of some 10 million yaks and 30 million sheep and goats. Tibetan nomadic pastoralism is distinct ecologically from pastoralism in most other regions of the world (Ekvall 1968, Miller 2000). The key distinguishing factors that separate Tibetan nomadic areas from cultivated areas are altitude and temperature, in contrast to most other pastoral areas where the key factor is usually the lack of water. Tibetan nomads prosper at altitudes from 3,000 to 5,000 m in environments too cold for crop cultivation. Yet, at these elevations there is still extensive and very productive grazing land that provides nutritious forage for nomads' herds. Tibetan pastoralism has flourished to this day because there has been little encroachment into the nomadic areas by farmers trying to plow up the grass and plant crops. A unique animal, the yak also distinguishes Tibetan nomadic pastoralism, which is superbly adapted to the high altitude, cold environment. The wild yak is the progenitor of all domestic yak populations. The domestication of the wild yak, about 4,000 years ago, was a key factor in the development of Tibetan civilization.

The nomadic pastoral systems developed by Tibetan nomads were a successful adaptation to life in one of the most inhospitable places on earth (Clarke 1998, Manderscheid 2001a, Goldstein and Beall 1990, Miller 1998a). Over centuries, nomads acquired complex indigenous knowledge about the environment in which they lived and upon which their lives depended. Tibetan nomads mitigated environmental risks through strategies that enhanced diversity, flexibility, linkages to support networks, and self-sufficiency. Diversity is crucial to pastoral survival. Tibetan nomads keep a diverse mix of livestock in terms of species and class; they use a diverse mosaic of grazing sites, exploiting seasonal and annual variability in forage resources; and they maintain a diverse mix of goals for livestock production. The organizational flexibility of traditional Tibetan nomadic pastoralism, which emphasized mobility of the multi-species herds, developed as a rational response to the unpredictability of the ecosystem (Goldstein et al. 1990, Levine 1998, Miller 1999b, Wu 1997).

The economic viability and environmental sustainability of Tibetan pastoral production systems are under considerable scrutiny these days (Ciwang 2000, Sheehy 2000, Wu and Richard 1999, Yan and Luo 2000). Tibetan nomads are some of the poorest people in China and reducing poverty in the Tibetan pastoral areas is a daunting challenge. Many nomads are caught in a downward spiral of increasing poverty, frequent risk of livestock loss from severe snowstorms, physical insecurity, and rangeland degradation (Clarke 1998, Gelek 1998, Miller 2000). With rangelands increasingly being divided and allocated to individual households it is also becoming more difficult for nomads to increase livestock numbers, thus limiting their options to earn more income from increased numbers of animals and have a chance to rise out of poverty. Developing strategies to address poverty among Tibetan nomads requires an

understanding of China's approach to rural development and poverty reduction in the pastoral regions and better knowledge about the nature of poverty in Tibetan pastoral areas.

Background on Rural Development in the Pastoral Regions of Western China

In much of China's pastoral region, including the Tibetan areas, traditional livestock production and grazing management strategies have been greatly altered in the past several decades as the nomadic way of life has been transformed to one more oriented toward a market economy (Cincotta et al. 1992, Manderscheid 2001b, Miller 2000). Following the establishment of the People's Republic of China in 1949, the goal for agriculture has been to increase grain production, which resulted in the conversion of large areas of marginal rangeland to crop land; much of which was later abandoned as rain-fed grain production in the semi-arid areas proved futile.

Since the early 1980s, goals for the pastoral areas have been to increase livestock offtake, which has been promoted through the privatization of herds and rangelands, sedentarization of herders, intensive grazing management strategies, and introduction of rain-fed farming techniques for growing forage and fodder. Many of these developments were responses to economic objectives. In many cases, however, they have conflicted with the goal of maintaining rangeland ecosystem health and stability. In addition, they have not always been consistent with the local herders' own goals (World Bank 2001b). Longworth and Williamson (1993) concluded that the pastoral areas have been negatively affected by three sets of policy-related issues: population pressures; market distortions; and institutional uncertainties. These factors have interacted with the adoption of new technologies, including the opening of additional water wells and animal health programs; supplementary winter fodder/feed from agricultural byproducts; and cultivation of improved pasture, which in many cases has led to an increase in livestock numbers, thus, leading to rangeland degradation.

With the decollectivization of the agricultural sector, China has achieved remarkable agricultural and rural growth, greatly reduced poverty and addressed many environmental and natural resource degradation problems. The livestock sub-sector has experienced especially strong growth and rapid expansion during the past two decades and the livestock sub-sector has consistently outperformed the agricultural sector as a whole (Nyberg and Rozelle 1999). Average annual economic growth rates close to ten percent, combined with specific efforts to diversify regionally and within the sub-sector have contributed significantly to raise farmers' and herders' incomes and has improved the availability and variety of food and livestock products for local and export markets.

Reforms in the rural areas have been deliberate, gradual, and quite effective as the rural sector has moved away from a planned economy. The total number of people living in absolute poverty in the country has dropped to some 106 million, or about 11.5 percent of the population. The Chinese government has a strong commitment to poverty reduction, and the scale and funding of its poverty reduction program, and the sustained dramatic reduction of absolute poverty over the last twenty years of reform, are exemplary (World Bank 2001a). Replicating these accomplishments and improving sustainability in the future, however, will be more difficult as many of the potential gains from the transition reforms have been achieved and weak demand has now slowed growth.

A recent World Bank study (Nyberg and Rozelle 1999) concluded that future productivity gains in the agricultural sector will have to come from greater efficiencies of production, stimulated by market forces, and greater productivity of scarce natural resources through improved natural resource management and introduction of new technologies. Sustained rural development will also require more dynamic and effective rural institutions and financial systems, improved land tenure regimes, improved incentives for investing in agricultural development, liberalization of production, pricing and marketing policies, and

better targeted investments in rural infrastructure and social services. There is also evidence now indicating that an increasing share of the remaining rural poor are concentrated in China's western provinces, and mostly within remote and mountainous townships. The educational, health, and nutritional status of these remaining rural poor is deplorable, and minority peoples are known to represent a highly disproportionate share of the rural poor (World Bank 2001a).

Animal husbandry is one of the few major industries upon which further economic development of the strategically important pastoral areas in western China can be built. However, in the context of the Chinese agricultural sector, animal husbandry ranks a poor second in importance to grain production. Furthermore, within the animal husbandry sub-sector, pastoral livestock have not received as much emphasis compared to pigs, poultry and dairy cattle. Consequently, at the national level and even in most pastoral provinces, relatively few research or administrative resources have been devoted to pastoral livestock problems.

In addition to the emerging strategic and political significance of the pastoral area, the changing food consumption patterns in China have awakened new interest in ruminant livestock grazed on the rangelands. The growing consumer preference for milk and meat is forcing a reassessment of priorities within the Chinese animal husbandry sub-sector (Longworth and Williamson 1993). As China modernizes, the rangelands are expected to help meet the country's growing demands for livestock products in the future.

China is facing major difficulties dealing with the simultaneous problems of improving the livelihoods of the pastoral population while protecting and maintaining the numerous economic and environmental benefits provided by rangeland ecosystems (Smith and Foggin 2000, Sneath 1998). Current information on rangeland degradation suggests that current strategies are not working (Ling 2000, Liu et al. 1999, Liu and Zhao 2001). Rangeland degradation is caused by many complex factors, but it is hard to avoid the conclusion that the most fundamental underlying cause has been poor government development policies relating to the pastoral areas (World Bank 2001). Other problems include a general lack of applied, cross-disciplinary, and ecosystem-level research, which would provide a better basis for developing more integrated and sustainable rangeland management systems. A disproportionate amount of rangeland research is oriented to livestock and ways to maximize productivity from intensive livestock production, rather than understanding how livestock fit into the rangeland ecosystem and how to optimize production in an environmentally and socially sustainable way.

China is also facing a dilemma regarding the effective privatization of land tenure in the context of its pastoral areas (World Bank 2001b). A concerted effort is now underway to establish clearly defined individual private property rights to land by allocating grassland to individual herders on long-term contracts. This policy entails high transaction costs, both private and public. Strict interpretation of the policy by local officials also prevents the adoption of more innovative forms of group-based rangeland tenure systems, often based on the traditional grazing management systems.

Despite the growing awareness of and interest in the pastoral areas in Chinese policy-making circles, remarkably little research has been undertaken on a systematic basis in the pastoral areas. For example, while considerable effort has been devoted to surveying the extent of rangeland degradation, there have been almost no studies of the policy/institutional framework within which the degradation problem has emerged. Indeed, in China, rangeland degradation is widely perceived as a technical problem for which there are technological solutions (Longworth and Williamson 1993).

In China, many attitudes towards rangelands appear to be influenced by the notion that sedentary agriculture, particularly crop-based agriculture, is the superior development option. Rangelands are

viewed as systems to be controlled and modified, much like cropland, rather than to be managed as natural ecosystems. This view is reflected in many of the terms that are used in discussion of pastoral development such as “grassland construction” and “grassland ecological-engineering” (Miller 2002b). Development is focused on agronomic and production aspects instead of ecological sustainability. There appears to be little acceptance of the fact that most of the rangeland in China is of low productivity or that this situation is unalterable, either for ecological, technical and/or economic reasons (World Bank 2001).

There is a similarly narrow-minded view of the validity of traditional nomadic pastoral production practices (Clarke 1987, Goldstein and Beall 1991, Miller 2002b). The purposeful, seasonal movement of nomads’ herds is often viewed as ‘wandering’ and an unsound type of use of the rangeland, instead of an efficient utilization of forage. Traditional herd structures, perfected over centuries, are seen as ‘irrational’ and ‘uneconomic’. Nomads themselves are often perceived as ‘backward’ and ‘ignorant’ (Box 1). Nomads have played an important role in the rangelands of China for thousands of years. As such, the social dimension of rangeland ecosystems should be an important aspect of research and development in the pastoral areas of China but, unfortunately, it is not.

In China, both organizational divisions between academic disciplines and the intellectual assumption that view human beings as separate from their natural environment have impeded the integration of social and natural scientific research (NRC 1992). Chinese rangeland research primarily focuses on biotic interactions among soils, plants, and herbivores, with little attention paid to the behaviors and motives of the pastoralists. When Chinese researchers do focus on pastoralists, the information is typically limited to narrow economic parameters, reporting such figures as animal units, stocking ratios, and production/consumption levels (Williams 2002).

The issue is compounded by the rather narrow approach taken to rangeland ecosystem research in China. There has been a general lack of applied, interdisciplinary ecosystem-level research, which would provide a better basis for developing more integrated and sustainable rangeland and pastoral development programs. Researchers have generally neglected such topics as the effects of traditional pastoral systems on rangeland ecology, the dynamics of herd growth and traditional risk management strategies among nomads, and the impact of large numbers of Han Chinese farmers into pastoral areas to convert rangeland to cropland.

Box 1. Nomads “in the way” of Modernization

Chinese rangeland policy initiatives are informed by a long history of antagonism with the grassland environment and its native inhabitants. For centuries, Chinese literati viewed and described neighboring mobile populations and their homelands in the most disparaging terms. These derogatory Confucian attitudes were only strengthened by Marxist orthodoxy after 1949. The Marx-Lenin-Mao line of political philosophy viewed nomadic pastoralism as an evolutionary dead-end standing in opposition to national progress, scientific rationalism, and economic development. Mainstream Chinese intellectuals in the reform era still consider the land and people to be “in the way” of modernization – obsolete and disposable in their traditional composition.

Source: Williams (2002:10)

A serious re-evaluation of the approach being taken to rangeland management and pastoral development in China is needed (World Bank 2001b). While there is no doubt that China’s diverse efforts to prevent

particular types of land degradation are having positive effects in some areas, and there are some promising new productivity enhancing technologies for some locations, there has been insufficient adaptation of strategies and policies to suit local environmental or social conditions. The tendency has been to apply a “one-size-fits-all” approach, which is not acceptable given the diversity of rangeland ecosystems, the different pastoral production practices, and the cultural diversity of the people who rely on the rangelands (World Bank 2001b).

There is growing awareness among policy-makers in Beijing that the rangelands and the animal husbandry related industries in the pastoral areas are under serious threat (World Bank 2001b). There is also concern with the lack of economic development that has taken place in the pastoral areas of western China and the fact that minority pastoralists are some of the poorest people in China. Evidence of this is the development of the Great Western Development Plan that will target investments in the western provinces and autonomous regions, including Tibet.

In the Tibetan pastoral areas, stimulating agricultural growth, reducing poverty, and managing the environment are huge challenges. Here, complex interactive issues related to the environment, technology, policies, and human population growth greatly hamper development (Levine 1999, Miller 1998b, Richard 2000). The key issues for sustainable development in the pastoral areas of the Tibetan plateau are: widespread poverty; rangeland degradation; unsustainable livestock production practices; poor market development; and lack of community participation in the development process.

Poverty Among Tibetan Nomads

In China, the Tibetan pastoral areas exhibit some of the highest incidence and intensity of poverty. Poverty in the Tibetan pastoral areas is due to many factors but the major causes of poverty include: (1) the harsh environment, characterized by cold temperatures, sandy or infertile soils, drought, snowstorms; (2) low agricultural productivity; (3) lack of financing and access to modern technologies to improve productivity; (4) low literacy levels and poor education systems; and (5) poor health care systems. In addition, the relatively high rates of population growth and large family size have trapped many families in continuing poverty. Frequent natural disasters, such as snowstorms that decimate livestock herds, can greatly increase the levels of poverty in pastoral areas. In addition, nomads' incomes are usually low and their asset base is often small, conditions that frequently undermine their health, well-being, and potential to make improvements in their livelihoods.

Poverty exhibits certain common characteristics, but the Tibetan nomadic pastoral population and the poverty they experience have distinct features. The pastoral areas of the Tibetan Plateau have a small human population that is widely spread across physically isolated locations. Tibetan nomads are usually less healthy, less educated, and tend to experience poorer service delivery and declining employment opportunities than in other regions. Tibetan nomads usually face interlocking barriers to economic, social and political opportunities. They also lack a political voice because they are remote from the seats of power. These factors limit their access to basic infrastructure, undermine their ability to obtain social services, and in some cases reduce their rights to own or access land. Due to heavy reliance on rangeland-resource based livestock production systems, Tibetan pastoralists are very vulnerable to climatic changes and natural disasters. For example, the winter of 1997/98 was very severe across much of the Tibetan Plateau and an estimated 3 million head of livestock died in the Tibetan Autonomous Region alone, leading to greatly increased poverty among the pastoral population (Miller 1998b).

In the Tibetan pastoral area, the challenges for rural development are especially daunting. Despite the political and strategic importance of the region, rural economic growth has not been very significant. Poverty is still pervasive. Widespread poverty inhibits rural development as well as the capacity of the

region to seize new economic opportunities. Most Tibetan nomads have low cash savings rates and seldom participate in formal loan and credit programs. In general, nomads seldom take out loans to improve grasslands because it usually takes too long for returns to be generated. Most herders also simply sell animals to meet cash needs. There are also great differences between pastoral regions in terms of integration with the market economy and in the degree to which the production system has been transformed from nomadic to semi-nomadic or sedentary (Levine 1999, Manderscheid 2001b). Rapid economic differentiation among herders has meant that some are able to use market opportunities to their advantage, while others are only subject to market vagaries and depend largely on subsistence production. Distance from towns, roads, and markets are important factors contributing to poverty as are cultural practices.

Poverty in the Tibetan pastoral areas is extremely heterogeneous. Many of the poor herders, both individuals and households, are economically active and possess a mix of income sources while others, especially the elderly, disabled and women-headed households, have to rely on other families and government support for survival. Animal husbandry remains the primary source of income, employment and livelihood for Tibetan herders, and a flourishing livestock sector is necessary to reduce poverty. There are few alternative sources of income and employment outside of the livestock sector for Tibetan herders. This is in contrast to many other rural poor areas of China where poor farmers are turning to the rural non-farm sector for employment and alternative sources of income. Many of the rural poor from other parts of China also migrate to the cities in search of work, which is generally not the case for Tibetan nomads. Since livestock production on the Tibetan Plateau is very dependent on the vagaries of nature, there is great annual and interannual variation in income and consumption. This often leads to the poorest pastoral households experiencing considerable deprivation during tough times, which can have adverse long-term consequences for babies and young children.

Widespread poverty in the Tibetan pastoral area also affects rural communities and hinders their ability, and the government's ability, to provide adequate social services, maintain roads, and create economic opportunities. Tackling poverty in the pastoral areas is constrained because of the poor understanding of the nature of poverty in these areas – who the poor are and the obstacles they face – and lack of reliable information about the farming systems and nomadic pastoral production. To date, the nomads have not participated fully in the assessment, planning and implementation of development programs and policies that affect their lives. Government programs have generally taken a top-down approach and, despite their good intentions, have often been hampered because nomads themselves were not involved in the design and implementation of activities and by faulty assumptions about poverty and Tibetan nomads' pastoral production systems.

Reducing poverty among Tibetan nomads in Western China is a major development challenge. Efforts to reduce poverty and improve livelihoods of pastoralists must address the roots of rural poverty. Fully understanding rural poverty and defining an effective poverty reduction strategy are preconditions to action (World Bank 2000). Tackling poverty in pastoral areas is constrained because of the poor understanding of the nature of poverty – who are the poor and the obstacles they face – and reliable information about the pastoral production system.

Profiles of Poverty Among Tibetan Nomads

To better understand the nature of poverty among Tibetan nomads, profiles of poverty are presented for Naqu Prefecture in the Tibetan Autonomous Region. Naqu Prefecture encompasses about 400,000 km², or about one-third of the total land area of the Tibetan Autonomous Region. There are 11 counties in Naqu Prefecture, including 147 townships (xiang) and 1,527 Administrative Villages. The total human population of Naqu is about 340,000 people, in about 50,000 households. Nomadic herders make up

about 90 percent of the population and these nomads are almost totally dependent upon livestock for a livelihood. Naqu's rangelands support a livestock population of about 6.8 million animals, consisting of yaks, cattle, sheep, goats, and horses. Naqu is predominantly a nomadic livestock area and rangelands are estimated to cover about 87 percent of the total land area of the Prefecture. About 65 percent of the rangeland is considered to be useable rangeland. There is some crop cultivation that takes place in the lower elevation regions of Jiali Sokshan and Biru counties.

The proportion of different livestock species raised by nomads in Naqu Prefecture differs across the region according to rangeland factors and the suitability of the landscape for different animals. Herd compositions within a geographic area can also vary with the skills, preferences and availability of labor of the nomads. Across most of western Naqu Prefecture, sheep and goats are more common than yaks. For example, in Shuanghu County in northwest Naqu, yaks only make up four percent of total livestock numbers. In contrast, yaks comprise 53 percent of all livestock 400 km to the east in Jiali County. These differences can largely be explained by differences in vegetation between the two areas. In Shuanghu, the climate is drier and the dominant alpine steppe and desert steppe is better suited to goats and sheep. In Jiali, which is in the alpine meadow vegetation formation, there is more annual rainfall and the rangeland ecosystem is better suited to raising yaks.

The dynamics of poverty among Tibetan nomads can be better understood from Tables 1-6 which present data from Takring and Dangmo Townships in Naqu County. Many nomads interviewed indicated that an ideal herd for an average nomad family (about 5 people) to have a good life would be 40 yaks and 200 sheep/goats. However, as indicated in Table 1, nomads in Takring and Dangmo on an average basis only have about 30 yaks and 50-75 sheep/goats per family. This is considerably less than the ideal.

Table 1. Livestock Per Household in Takring and Dangmo Townships.

Township	Yaks/family	Sheep/family	Goats/family
Takring	31	38	12
Dangmo	30	52	15

Source: Township Records, 1999.

Table 2 depicts the number of animal sold and consumed per family, on an average basis for the two townships of Takring and Dangmo. The data indicates that the nomads in these two townships have very few animals to sell for cash income. Most of their production goes to subsistence for their own consumption. This reflects the fact that average herd sizes are quite low and provide little offtake for income earning purposes or to buy additional items the family may require.

Table 2. Livestock Sold and Consumed Per Family in Takring and Dangmo Townships.

Township	Yaks sold Per family	Yaks eaten Per family	Sheep sold per family	Sheep eaten per family	Goats sold per family	Goats eaten per family
Takring	0.49	2.17	3.97	10.74	0.12	2.86
Dangmo	0.84	1.81	1.73	8.25	0.07	1.49

Source: Township Records, 1999.

Table 3 shows the income earned per family from livestock and livestock products on an average basis for Dangmo Township. The greatest amount of income is earned from yaks and then from sheep. Yaks provide 74 percent of the total income from all livestock products for nomads.

Table 3. Income Per Family From Livestock Products in Dangmo Township.

Township	Sheep wool Sold/family	Goat cashmere Sold/family	Yak cashmere Sold/family	Yak sold Per family	Sheep sold Per family	Goat sold per family
Dangmo	30.8 <i>jin</i>	1.45 <i>jin</i>	11.86 <i>jin</i>	0.84	1.73	0.07
Value in RMB	@3 = 92.4	@70 = 101.5	@10 = 118.6	1428	432	7

Prices for live animals: Yak @ RMB 1700, Sheep @ RMB 250 Goat @ RMB 100. 1 *jin* equals 0.5 kg.

Table 4 depicts the total economic output from Dangmo Township for 1999. The data shows that yaks contribute a majority of the economic output, almost 60 percent of the total economic value. Although sales of wool and cashmere are important, raising sheep and yaks for home consumption and sale are key factors in pastoral production among Tibetan nomads in Naqu.

Table 4. Economic Output from Dangmo Township for 1999.

Product	Value (yuan)	% of total
12,200 <i>jin</i> of sheep wool @ Y 3.5	42,700	1.4
576 <i>jin</i> of goat cashmere @ Y 70	40,320	1.3
4,697 <i>jin</i> of yak cashmere @ 10	46,970	1.5
1,048 yak @ Y 1,700	1,781,600	59.6
3,952 sheep @ 250	988,000	33.1
617 goat @ Y 100	61,700	2.1
4 horses @ Y 7,000	28,000	0.9
	2,989,290	99.9

Note: includes total animals sold and consumed by the households. Not included is wool used and butter/cheese eaten. Very little butter/cheese is sold from Dangmo.

Table 5 shows total livestock numbers and total annual offtake by livestock species in Takring and Dangmo Township. Yak offtake, which includes animals sold and eaten makes up about 8 percent of the total herd. Sheep offtake is about 38 percent in Takring and 19 percent in Dangmo. Goat offtake is 23 percent in Takring and only 10 percent in Dangmo. The differences between Takring and Dangmo cannot be totally explained by livestock numbers per household as Takring actually has fewer sheep per

household, on an average basis, than Dangmo but has higher offtake. Some of this is probably due to access to markets as Takring is much closer to the main market in Naqu.

Table 5. Livestock Numbers and Total Annual Offtake in Takring and Dangmo Townships.

Township	Total yak	Yak	Total sheep	Sheep offtake & %	Total goat	Goat
		Offtake & %				Offtake & %
Takring	20,780	1,742 (8.4)	25,028	9,622 (38.4)	8,371	1,958 (23.4)
Dangmo	11,718	1,048 (8.0)	20,710	3,952 (19.0)	5,778	617 (10.7)

Source: Township Records, 1999.

Table 6 depicts the percentage of livestock, by species, that are either sold or consumed by the nomads. In Takring, of total yak offtake, only 18 percent are sold, but 82 percent are for home consumption. The ratio for sheep in Takring is 27 percent sold and 73 percent consumed by nomads themselves. What is interesting is that very few goats are sold, which probably reflects the low demand for goat meat in markets in Tibet. Goats are raised primarily for cashmere and as meat for the nomads themselves.

Table 6. Livestock Sold and Consumed for Takring and Dangmo Townships.

Township	Yak	Yak	Sheep	Sheep	Goat	Goat
	Sold & %	Eaten & %	Sold & %	Eaten & %	Sold & %	Eaten & %
Takring	320 (18)	1,422 (82)	2,598 (27)	7,024 (73)	81 (4)	1,875 (96)
Dangmo	332 (32)	716 (68)	686 (17)	3,266 (83)	28 (5)	589 (95)

Source: Township Records, 1999.

The type of information presented above helps understand the nomads' pastoral production system and has implications for development. For example, the data shows the importance of the nomads' livestock production for home consumption. There is little excess livestock or livestock products available for sale. Development interventions that improve nomads' risk management and strive to reduce livestock losses and improve productivity could result in additional animals for sale which could lead to improvements in nomads' livelihoods.

Nomadic pastoral production is labor intensive as yaks have to be milked, animals have to be herded and cared for, manure needs to be collected and dried for fuel, butter and cheese need to be made, water needs to be fetched, clothing and tents need to be woven, kids need to be looked after and fed and there are seasonal activities such as lambing, shearing, hay-making, and medicinal plant collecting that require extra effort. Households with inadequate labor to raise enough livestock have been especially affected and become trapped in poverty. Those families with adequate labor, but who have been poor managers of their livestock and grazing land also face difficulties. With the division and allocation of rangeland to households taking place across much of the Tibetan nomadic pastoral area, even poor households now have grazing land that belongs to them and if they do not have enough livestock they can rent pasture to richer nomads who have more livestock than the determined carrying capacity of their allocated rangeland.

The harsh environment of the Tibetan Plateau and especially periodic, heavy snowfalls compounds the labor problem and even affects those households with sufficient labor and who are good managers. Snow disasters can decimate herds and cause even rich nomads to become poor. Fencing of the more productive pastures to reserve them for winter/spring grazing, the growing of hay and the construction of livestock shelters greatly reduces the risk of losing animals during a bad winter. Many nomads, especially those who can afford the investments, are adopting pastoral risk management practices to reduce the danger of losing animals to winter storms. Reducing mortality of young lambs and yaks will provide the opportunity to earn more income and/or provide more food for the family, since a large portion of nomads' livelihoods comes from the home consumption of sheep and yaks and the sale of animals. This can be accomplished by: (1) improving livestock management, especially at lambing; (2) growing hay to feed in winter, especially during later stages of pregnancy and lactation for sheep; (3) fencing winter/spring pasture and deferring grazing on it during the growing season so that forage is available in the winter/spring; and (4) improved marketing of animals to reduce number of animals being kept over the winter.

For poor nomads with few or no livestock at the current time but who do have rangeland allocated to them, a sheep distribution program, which provides adult female sheep to nomads can be a means to reduce poverty. This is especially true if it is designed so that after 3-4 years the nomads return a number of sheep so that other poor households can benefit. Livestock herd projections indicate that a nomad family that is given 50 adult ewes would be able to build their herd up to about 100 ewes in four years, even with giving back 40-50 ewe lambs in the 4th year, and still sell the male animals every year (or a combination of household consumption and sale). If a sheep distribution program were linked with rangeland development and forage development (growing of oats for hay to be fed in the winter) and an improved livestock shed for lambing, the risk of losing animals in the winter would be greatly reduced. Improved road access to what were previously quite remote nomad areas also now allows nomads to take more advantage of markets for livestock.

Tibetan nomads face considerable challenges in adjusting their traditional pastoral production practices to the new rangeland tenure arrangements now in place with the division and allocation of grazing land to households and the general 'settling-down' of nomads. Opportunities for individuals to greatly expand livestock numbers are now limited because herders must balance livestock numbers with the carrying capacity of the rangeland. Nomads are compelled to become livestock ranchers and to optimize animal productivity on finite amounts of grazing land. This requires greatly improved management of the rangelands and livestock, rehabilitation of degraded rangeland, more efficient marketing of livestock and livestock products, and, for some nomad households, a move away from livestock production to other cash income-earning activities.

Nomad Vulnerability and Livestock Losses

The winter of 1997-1998 was the worst in recent history for much of the Tibetan nomadic pastoral area. Unusually heavy snowfall in late September was followed by severe cold weather, which prevented the snow from melting. Additional storms deposited more snow and by early November grass reserved for winter grazing were buried under deep snow. Yaks, sheep, and goats were unable to reach any forage and started to die in large numbers. By early April 1998, it was estimated that the Tibetan Autonomous Region (TAR) had lost over 3 million heads of livestock (Miler 1998b). Naqu Prefecture in the north was especially hard hit but many areas in the TAR were affected. Losses in Naqu Prefecture alone were estimated at about one million animals, or about 15 percent of the Prefecture's total livestock population. In Nyerong County as a whole, one of the areas hit hardest, 30 percent of the livestock died and some townships within the county lost as many as 70 percent. Many townships in Nyerong and other counties lost 40 to 50 percent of their domestic animals. Almost one quarter of a million nomads were affected and

hundreds of families lost all their animals. Economic losses from livestock deaths alone were estimated at US\$ 125 million in the Tibetan Autonomous Region.

Nomads suffered greatly as a result of the heavy snowfalls. Because the snow came so early, many nomads were caught with their animals still in the summer pastures and were unable to drive the livestock to winter quarters where some hay and feed was available. Many nomads were unable to sell animals they had planned to market in the fall of 1997, or even to barter livestock for barley grain they require. As a result, nomads lost not only their animals but also their source of income to purchase necessities they require. Many families fed whatever grain they had for themselves to their livestock to try to save the animals from dying. Before the snowstorms began, it was estimated that 20 percent of Naqu Prefecture's 340,000 nomadic population were considered to be living in poverty. As a result of the livestock losses experienced during the winter of 1997-1998, it is estimated that about 40 percent of the nomad population in Naqu Prefecture were facing poverty. Many other nomads, although still technically above the poverty line, had their livelihoods reduced. The effect of the winter of 1997-1998 will reverberate among the affected nomads for many years to come, as it will take considerable time for nomads to build up their herds again.

The devastating effect of severe snowstorms is illustrated in Tables 7-10 for Nyerong County, Naqu Prefecture of the Tibetan Autonomous Region. Nyerong County as a whole lost 24 percent and 20 percent, respectively, of their yak and sheep population during the severe winter of 1997-98. Sangrong Township was especially hard hit. In Sangrong, total livestock population in 1998 was less than half what it was the previous year (Table 8). On a household basis, the losses were especially severe with average number of yaks per household dropping from 44 to 18 and sheep declining from 63 to 28 (Table 9). Some Administrative Villages within Sangrong Township were especially affected by the severe winter losses with livestock numbers per household declining drastically (Table 10).

Table 7. Livestock Data for Nyerong County, 1998.

	End of 1998 Population	Herd Com- position (%)	% Females	Death Losses 1998	Death Loss in % of total	Offtake Sold & eaten	Offtake in % of total nos.
Yaks	129,189	32.8	53.4	43,880	23.8	10,853	5.9
Sheep	219,105	55.6	51.1	63,002	19.1	48,386	14.6
Goats	38,650	9.8	58.5	8,007	15.3	5,549	10.6
Horse	6,760	1.7	42.2	1,184	14.9	0	
Total	393,704						

Source: County Records.

Table 8. Livestock Population For Sangrong Township, Nyerong Co. 1996-1998

	1996	1997	1998
Yak	12,653	13,631	5,670
Sheep	20,461	19,570	8,826
Goats	2,848	2,800	1,470
Horse	425	401	314
Total	36,387	36,402	16,280

Source: Township Records.

Table 9. Numbers Of Class Of Animals And Sheep Equivalent Units (SEUs) Per Household And Per Person In Sangrong Township, Nyerong County For 1996-1998.

	1996	1997	1998
yaks/household	40.8	43.9	18.1
Sheep/hh	66.0	63.1	28.2
goats/hh	9.2	9.0	4.7
SEUs/hh	285.0	297.9	128.3
SEUs/person	56.5	58.8	25.5

Table 10. Household And Livestock Data For Three Villages In Sangrong in 1996-98.

	Village # 9		Village # 11		Village # 12	
	1996	1998	1996	1998	1996	1998
Households	24	26	25	27	30	30
People	122	135	120	122	153	155
Yaks	1312	632	1134	374	1293	462
Sheep	2483	814	1803	410	2290	791
Goats	210	70	194	69	369	132
Horses	28	18	39	23	61	36
yak/household	55	24	45	14	43	15
sheep/household	103	31	72	16	76	26
goat/household	9	3	8	3	12	4
Horse/household	1.16	0.69	1.56	0.85	2.03	1.2
SEUs/houshold	390	159	314	91	313	114
SEUs/person	77	31	65	20	61	22

Source: Township Records

Tables 11-13, present data from Dangmo Township, Naqu County, Tibetan Autonomous Region that also helps illustrate the impact of severe snowstorms on nomads and how these climatic events can contribute to poverty. Table 11 shows end of year livestock population for the years 1995-1998. The number of yaks declined from 11,268 to 10,551 and sheep numbers declined from 20,345 to 18,188 between 1997 and 1998. Table 12 shows total offtake and total number of livestock that died, by species, for years 1995-1996. Table 13 shows percent offtake and percent death loss of the total herd for each species. Although losses from the severe winter of 1997/98 were not as great as in Sangrong Township, losses were still high, with 11 percent death loss in sheep and over 7 percent in yaks. In 1998, numbers of animals that died were almost equal to number of animals eaten and sold.

Table 11. Livestock Population for Dangmo Township, Naqu Co. for 1995-1998.

	1995	1996	1997	1998
Yaks	12,077	11,058	11,268	10,551
Sheep	21,509	21,713	20,345	18,188
Goats	5,062	5,142	4,051	4,890

Horse	593	592	593	591
Total	39,241	38,505	36,257	34,220

Source: Township Records

Table 12. Livestock Offtake And Death Loss In Dangmo Twp. For 1995-1998.

	1995		1996		1997		1998	
	Offtake	Died	Offtake	Died	Offtake	Died	Offtake	Died
Yak	615	340	1,011	990	1,115	450	966	920
Sheep	3,076	805	3,417	1,443	4,527	1,573	3,083	2,748
Goats	400	211	596	353	703	342	532	535
Horse		29	5	38	18	29	17	59

Source: Township Records.

Table 13. Percent Offtake And Death Loss Of Total Herd For Dangmo Township, Naqu County, Tibet, 1995-98.

	1995			1996			1997			1998		
	Off-take	died	Total									
Yak	4.7	2.6	7.3	7.7	7.6	15.3	8.7	3.5	12.2	7.7	7.4	15.1
Sheep	12.1	1.9	14.0	12.8	5.4	18.2	17.1	5.9	23.0	12.8	11.4	24.2
Goats	7.1	3.7	10.8	9.8	5.8	15.6	13.8	6.7	20.5	8.9	8.9	17.8
Horse	0	4.6	4.6	0.8	5.9	6.7	2.8	4.5	7.3	2.5	8.8	11.3

Source: Township Records.

Elements of a Poverty Reduction Strategy for Tibetan Nomads

The profiles of poverty among Tibetan nomads described above shows the diverse nature of poverty among Tibetan nomads and the many challenges they face. In addition to a lack of animals and income to meeting basic human needs, many nomads also lack basic services such as health and education. Poor nutrition is also a problem. Reducing vulnerability, powerlessness, and inequality are critical challenges in pastoral areas. A poverty reduction strategy for Tibetan nomads should encompass the main determinants of poverty, promote economic opportunities, facilitate empowerment, reduce vulnerability, and determine exit strategies (World Bank 2000).

Promote economic opportunities for poor nomads. The main determinant of poverty reduction is a robust rural economy with sustained growth and efficiency. This requires improving agricultural productivity, fostering non-farm activities, developing rural infrastructure, and expanding markets. A strategy for poverty reduction for Tibetan nomads should promote rural incomes and employment by fostering economic growth in livestock and non-farm sectors, liberalizing access and removing market distortions, and increasing accessibility to infrastructure, knowledge, and information systems. Such measures would lead to faster access to and accumulation of productive assets (human, physical, natural, and financial) controlled by the pastoralists and/or increase returns to those assets. Public policy choices to increase incomes and assets of nomads include:

- providing greater security for those assets they already possess, e.g., strengthening rights to rangeland and improving or preserving adults' health status;
- widening market access by nomads to productive assets, including land, labor, and financial services;
- facilitating micro-finance arrangements to promote the accumulation of assets;
- providing infrastructure, such as roads, electricity, and other local public goods; and
- accelerating the production and transfer of appropriate new technology for rangeland and livestock production.

For nomad' children, the priority is to ensure adequate nutrition, followed by access to health care and education. The existence of well functioning institutions and the efficiency of government expenditure directly affect these opportunities.

Facilitate empowerment of nomads. Empowering nomads to take more charge of the development that is affecting them is essential for poverty reduction. Sustainable development in the Tibetan pastoral areas should encourage a social, legal, and policy framework that enables nomads to more effectively influence public decisions that affect them and/or reduce factors that hinder their ability to earn a better livelihood. Since development activities that affect nomads depend on the interaction of political, social, and institutional processes, a poverty reduction strategy should ensure that the political environment is conducive to civic participation, and that government programs are decentralized and transparent. Actions to facilitate empowerment of poor nomads include:

- improving the functioning of institutions to facilitate economic growth with equity by reducing bureaucratic and social constraints to economic action and upward mobility;
- laying a political, social, and legal basis for inclusive development by establishing mechanisms for participatory decision-making;
- creating, sustaining, and integrating competitive markets and related institutions that provide agricultural inputs and outputs;
- reducing social barriers by removing ethnic and gender bias and encouraging the representation of nomads in community, provincial and national organizations;
- fostering local empowerment and decision-making through decentralization of administrative, fiscal and political structures;
- strengthening the participation of nomads in public service delivery;
- eliminating biased pricing structures and other policies that negatively affect herders and the rangeland environment; and
- increasing public expenditures in pastoral areas.

How can Tibetan nomads be empowered and put more in charge of their own future? It is becoming increasingly clear that local-level nomad organizations, or pastoral associations, provide a path to empower nomads. Pastoral associations are not new to Tibetan nomadic societies as traditional grazing management practices often relied on group herding arrangements and informal group tenure of rangelands. In many areas, vestiges and new variations on traditional pastoral organizations exist. However, the legal and regulatory frameworks often do not support local-level nomad groups and group tenure arrangements. Pastoral associations could help facilitate the participation of nomads in the design and implementation of development programs, improve the government's understanding of pastoral systems, contribute to formulating more appropriate rules for rangeland use, and reduce the level of government resources required for monitoring rangelands. Pastoral associations could not only provide a formal means for nomads to more effectively manage their rangelands, but to do a better job of marketing their livestock and livestock products as well. Empowering nomads requires a thorough understanding of pastoral production systems, knowledge of existing group arrangements and the incentive structures that

exist for group actions and new institutional arrangements. A change in attitudes towards nomads and their production systems is also required.

Reduce the vulnerability of the poor nomads. Poverty entails not just an inability to guarantee basic needs, but also a vulnerability to unexpected fluctuations both in future real income and access to public services. Nomads throughout the Tibetan plateau are exposed to considerable risks that affect their livestock production system and their livelihoods. Risks are also associated with markets, service delivery, and the very foundations of society and polity. Many of these risks are highly localized while others are more general. For many nomads, natural disasters in the form of severe winter snowstorms poses one of the greatest risks and increases their vulnerability to remaining trapped in poverty. To address this problem, measures need to be taken to reduce *ex ante* exposure to risk and improve the *ex post* capacity of the poor to cope with risk. Priority actions to reduce *ex ante* exposure of nomads to risks might include:

- developing early warning systems for droughts and snowstorms;
- improving public services, such as roads and health clinics;
- producing and transferring appropriate range-livestock technology to herders, which improves livestock productivity; and
- improving market accessibility for nomads to sell their livestock and livestock products.

Possible priority actions to improve *ex post* capacity to cope with risks could include:

- facilitating livestock restocking programs to replace animals lost in the disasters.

Provide exit strategies for poor nomads. One of the primary goals of a poverty reduction strategy is to promote broad-based economic growth that helps the poor climb out of poverty, but in some cases in the pastoral areas this goal may be difficult to achieve. One reason is that the natural resource base cannot support the growing human population. Severe rangeland degradation in some areas is already calling into question the sustainability of current livestock production practices. In such cases, possible exit strategies for tackling poverty could take the form of migration of some people out of the most degraded areas and establishing social support programs to assist the poor. In some pastoral areas, permanent out-migration may be the most cost-effective mechanism for reducing poverty.

Effects of Policies and the Economy on Poverty. Macroeconomic policies and institutional reforms as well as the quality of local governance have a profound affect on poverty in pastoral areas. This is because they affect the rate of economic growth, which is the single most important macroeconomic determinant of poverty. They also influence the allocation of government funding and shape the type of economic growth. Steady economic growth creates more jobs and increases incomes, thus helping to reduce poverty. Growth also increases tax revenues, enabling local governments to allocate more to health and education, which work indirectly to reduce poverty.

Measuring Progress in Reducing Poverty. It is important to monitor progress in reducing poverty among nomads. Not only is monitoring an effective way to inform others about the state of nomads' well being and encourage debate on development approaches and priorities, but it also helps promote evidence-based policymaking by senior decision-makers. This allows more feasible poverty reduction goals and targets to be determined for the future. Monitoring requires selecting poverty indicators and setting poverty reduction targets. Poverty indicators should be reliable, quick and cheap. It is better to identify a few indicators and measure them well rather than measure a number of indicators poorly. Indicators should also show the direction of change in tackling poverty. Once indicators are chosen, a baseline needs to be established to measure future progress.

A recent World Bank (2001a) report on rural poverty in China concludes that the key issue related to poverty reduction is not allocating more funding, but the more efficient and effective use of available resources. Findings from the study also indicate that both the problems and the development opportunities facing the western mountain areas have been underestimated, largely because of a lack of an appropriate framework to develop local strategies and programs. The widespread poverty in Tibetan pastoral areas suggest that efforts should be expanded and improved to ensure that the broader gains of economic and rural growth in the country are more widely shared among the poor, nomadic Tibetan population.

Future Challenges

The Government of China has placed high priority on the sustainable development of the pastoral areas in western China, including the Tibetan areas. This is evident in the Western Development Strategy which emphasizes two main objectives: (1) to reduce economic disparities between the western and other regions; and (2) to ensure sustainable natural resources management. In addition, while sustainable growth in agriculture and ensuring food security was one of the five key areas of China's development strategy articulated in the Ninth Five Year Plan, in the 10th Five Year Plan, there has been a noticeable shift in the focus away from increased quantities of agricultural products towards improved quality and more ecologically sound types of production. Thus, China appears committed to address rangeland degradation and poverty in the pastoral regions. However, it is confronting major difficulties in dealing with the simultaneous short and long-term tradeoffs, such as improving the welfare of people living in pastoral areas and protecting and maintaining the numerous economic and environmental benefits provided by rangeland ecosystems.

A critical crisis is emerging as China attempts to transform the traditional Tibetan nomadic pastoral system to one more oriented towards a market economy. Livestock development has been promoted through the privatization of herds and rangeland, intensive grazing management strategies with the construction of fences, and introduction of rain-fed farming techniques for growing forage. Many of these interventions have been responses to political or economic objectives and while they have improved the delivery of social services, in many instances, they have conflicted with the goal of maintaining rangeland health and stability. Programs to settle nomads, to divide and allocate the rangeland to individual herders, and to fence the rangeland fundamentally alter the mobile nature of Tibetan nomadic pastoralism and jeopardize many worth aspects of the indigenous pastoral systems. These attempts to foster sedentary livestock production systems have a high probability of destroying the highly developed pastoral system that has existed for centuries on the Tibetan plateau. Both the rangeland environment and the nomadic pastoral culture are under threat in areas where the culture of mobile pastoralism has been eliminated or substantially reduced.

Stimulating agricultural growth, reducing poverty and managing the environment are monumental tasks in the Tibetan pastoral areas of Western China. In these grazingland landscapes, complex interactive issues related to the environment, technology, policies, and human population growth greatly hamper development. There is a vicious cycle of increasing human populations leading to pressure to convert rangelands to cropland and to increase livestock stocking rates to maintain rural incomes. This leads to rangeland degradation, reducing the capacity of the pastoral areas to support livestock and the human populations that rely on them. Rangeland degradation is an increasing problem in many areas, calling into question their sustainability under current use. Furthermore, much of the economic growth and inappropriate development policies have contributed to unsustainable use of natural resources and degradation of the environment. Given the seriousness of the problems related to livestock production in the pastoral areas, new approaches that better integrate livestock production with improved range management, more efficient marketing of livestock and livestock products, a focus on poverty reduction, and pastoral risk management are warranted.

Poverty alleviation experience internationally, and elsewhere in China, demonstrates the benefits of adopting an integrated approach to tackling poverty – an approach that involves social and economic development as well as environmental management. Investments in education and health can greatly foster long-term sustainable development in pastoral areas. For Tibetan nomads, the challenge is determining how to target funding better and to ensure that resources allocated for poverty alleviation actually reaches the poorest sectors and families in the pastoral areas.

Despite their extent and importance, the Tibetan pastoral area has received limited attention from range ecologists and nomadic pastoral specialists. The lack of information limits the proper management and development of the pastoral area. Rangeland ecosystem dynamics are still poorly understood and scientific data on ecological processes are limited. Many questions concerning how rangeland vegetation functions and the effect of grazing animals on the pastoral system remain unanswered for the most part. There is a great need for more in-depth analysis of the relationship between herbivores and the vegetation resource and the relationship between domestic livestock and wild herbivores in the pastoral areas.

The poor perception of the rangeland environment and traditional Tibetan livestock and grazing management systems, along with the limited support for pastoral development and rangeland resource management, needs to be counterbalanced by fresh perspectives and new information regarding rangeland ecosystem dynamics and pastoral development. It is becoming increasingly apparent that many of the existing paradigms for explaining the dynamics of rangeland ecosystems have not captured the vigorous nature of the rangeland ecosystems of the Tibetan plateau and, therefore, traditional measures for range conditions and carrying capacities may not be effective gauges for management. Emerging research findings on the dynamics of semi-arid rangelands, indicate that non-equilibrium models for describing pastoral system dynamics and state-and-transition models for explaining vegetation succession are valuable concepts (Ellis and Swift 1988, Westoby et al. 1989, Laycock 1991, Fernandez-Gimenez and Allen-Diaz 1999). These fresh perspectives and concepts provide new frameworks for rangeland monitoring and offer promise for improved analyses of rangeland ecosystems on the Tibetan plateau. They also suggest new possibilities for innovative approaches to designing improved, and more sustainable, rangeland management and pastoral development.

The socio-economic dimensions of Tibetan pastoralism are also not well known (Clarke 1992, Goldstein and Beall 1989, Levine 1998, Miller 1999). Greater efforts need to be directed towards developing a better understanding of current nomadic pastoral production systems and how they are changing and adapting to development influences. Practices vary considerably across the pastoral area and these differences need to be analyzed. Why do nomads in different areas maintain different livestock herd compositions? What are current livestock offtake rates and how do increasing demands for livestock products in the marketplace affect future livestock sales? What constraints and opportunities for improving livestock productivity are recognized by nomads themselves? What forms of social organization exist for managing livestock and rangelands. How have these practices changed in recent years and what are the implications of these transformations? Answers to these, and related questions, will help unravel many of the complexities of current pastoral production systems on the Tibetan plateau, of which we still know so little about.

Although there is much in common across the Tibetan pastoral areas there are also striking regional differences that need to be addressed at local community levels. This calls for strengthened community participation and the development of sustainable participatory mechanisms for community-based rangeland resource management. Improved analyses of the socioeconomic processes at work in Tibetan pastoral areas are urgently required (Box 2). It will also be important to determine which aspects of indigenous knowledge systems and traditional pastoral production strategies can be built upon and used in the design of new rural development interventions for tackling poverty and managing rangeland resources.

Box 2. The Role of Social Scientists in Pastoral Development on the Tibetan Plateau

Ecological environments are constructed and transformed by complex and reciprocal interactions between human populations, animal populations, and the physical forces of nature that occur across local, regional, and global scales. At any scale of analysis, these interactions are understood only incompletely, and the great variety of perspectives across many disciplines are all instrumental in the effort to promote human understanding of socially defined environmental problems. Anthropologists can contribute substantially to the effort by situating human decision-making behaviors within specific communities of known individuals to observe how practices of local resource management are both constrained and enabled by powerful social forces that are not necessarily obvious or material. The attempt to broaden the interpretive framework for understanding human-environment relationships in this way should be welcomed by all.

Source: Williams (2002: 202).

In addressing poverty and implementing pastoral development in the Tibetan pastoral area, one is faced with problems of *two* production systems (Dyson-Hudson and Dyson-Hudson 1991). On the one hand, there is the traditional pastoral production system, which can be seen as an evolutionary response to environmental pressure; it is a pattern for survival that has proved successful insofar as Tibetan nomads continue to exist. On the other hand, there is also another system, which is a new pattern for survival (and increased livestock production), based on the technical rationale brought in from the outside but not yet adjusted to social factors and subjected to the test of time; its technical innovations are promoted by development projects and technical specialists. It is in dealing with problems which relate to the entire pastoral system, including the interaction of new and old strategies, that require much more careful analysis when planning pastoral development.

Policies and development strategies for the Tibetan pastoral areas need to consider the ecological constraints inherent in the arid and semi-arid ecosystems, the interests and aspirations of the local pastoral population, and alternative methods of meeting social objectives for the pastoral areas. Sustainable development of the pastoral areas also needs to recognize the significance of nomads' indigenous knowledge of the environment and management of rangeland resources. Range and livestock development can no longer ignore local circumstances, local technologies, and local knowledge systems (Miller 2002, Wu 1998). Traditional pastoral production practices have been tried and tested. In many cases, they are still very effective and are based on preserving and building on the patterns and processes of the rangeland ecosystem (Box 3).

Box 3. Tibetan Nomads' Indigenous Knowledge Systems

Over hundreds of years, Tibetan nomads acquired intricate ecological knowledge about the rangeland ecosystems in which they live and upon which their livestock production economies depend. Nomads' husbandry of land, water, plant, and livestock resources and their strategies are highly skilled, complex and organized, reflecting generations of acute observation, experimentation, and adaptation to a harsh environment. Local climatic patterns and key grazing areas were recognized, allowing nomads to select favorable winter ranges that provided protection from storms and sufficient forage to bring animals through stressful times. Forage plants were identified that had special nutritive value. Other plant species were known for their medicinal properties or as plants to be avoided since they were poisonous. A wide diversity of livestock and grazing management techniques were employed which enabled nomads to maintain the natural balance of the land upon which they were dependent. For example, nomads usually raise a mix of livestock species; each species has its own specific characteristics and adaptations to the environment. This multi-species grazing system maximizes the use of rangeland vegetation. Maintaining mixed species herds is also a risk management strategy employed by nomads to minimize loss from

disease or harsh winters.

The organization of traditional Tibetan nomadic pastoralism, which emphasized multi-species herds, complex herd structures, regular movements of livestock, and linkages with agricultural communities developed as a rational response to the unpredictability of the rangeland ecosystem. Complex forms of social organization within nomadic pastoral societies also developed that aided allocation of rangeland resources and, through trade networks with other societies secured goods not available within the pastoral systems. Pastoralism evolved through long-term adaptation and persistence in a harsh environment and the grazing and livestock management systems that developed were rational responses by herders to the resources and risks of an inhospitable environment. Nomads mitigated environmental risks through strategies that enhanced diversity, flexibility, linkages to support networks, and self-sufficiency. Diversity is crucial to pastoral survival. Nomads keep a diverse mix of livestock in terms of species and class; they use a diverse mosaic of grazing sites, exploiting seasonal and annual variability in forage resources; and they maintain a diverse mix of goals for livestock production. The organizational flexibility of traditional nomadic pastoralism, which emphasized mobility of the multi-species herds, was a fundamental reason for Tibetan nomads' success on the Tibetan plateau.

The expanded appreciation for the complexity and ecological and economic efficacy of Tibetan pastoral production systems is encouraging. It provides hope that the vast indigenous knowledge nomads possess will be better understood and used in designing new interventions. Greater awareness of the need to understand existing pastoral systems should also help ensure that the goals and needs of nomads are incorporated into new programs and that nomads become active participants in the development process. Pastoral development programs must involve nomads themselves in the initial design of interventions. Tibetan nomads' needs and desires must be heard and the vast body of indigenous knowledge they possess about rangeland resources must be put to use when designing new range-livestock development projects. An important message for pastoral policy-makers and planners is the need for active participation by the nomads in all aspects of the development process and for empowered nomads to manage their own development.

Given the generally poor experience with settling nomads in other pastoral areas of the world, it will be interesting to watch the attempts to foster more sedentary livestock production systems on the Tibetan plateau. What effects will the privatization of rangelands have on rangeland condition? Will nomads overgraze pastures that they view as their own property now? What effect will private rangeland and fences have on traditional mechanisms for pooling livestock into group herds and group herding? What kinds of rangeland monitoring programs are needed to look after the privatized rangeland? These will be important questions to seek answers to in the future.

China needs to re-orient its policy objectives for the rangelands and pastoral areas, not only in terms of range management and livestock production, but also in the management of rural development itself. The traditional approach of maximizing agricultural output is no longer relevant to current circumstances in China. The need now is for ecologically and economically sustainable development of the pastoral regions, neither of which is consistent with output maximization (World Bank 2001b). Policies and development strategies for the Tibetan pastoral area should be based on much better consideration of ecological constraints, the interests and aspirations of the Tibetan nomads themselves, and alternative methods of meeting social objectives.

The challenge for the future is to balance the diverse cultural, social and economic needs of Tibetan nomads with the need to maintain the rangeland resources and conserve the biodiversity and cultural heritage of the Tibetan pastoral landscape. Because of the importance to the nation and the international

community, China needs to do a much better job of managing the Tibetan pastoral region for cultural, social, economic, and ecological sustainability and diversity. Although there is much in common across the pastoral areas there are also striking regional differences that need to be addressed at local community levels. This calls for strengthened community participation and the development of sustainable participatory mechanisms for community-based rangeland resource management.

Participation by local people in the planning and implementation of pastoral development programs in Tibetan pastoral areas remains weak. A top-down approach still prevails, stemming from the attitude that the government knows best what is good for herders. Frequently, inadequate consultation with nomads, bureaucracy, poor understanding of local needs and constraints impede nomads from participating in decisions and render development programs ineffective and unsustainable. In the Tibetan pastoral areas, the varied social and cultural differences of the different nomad groups is a strong argument for pursuing participatory approaches in order to enable access and more equitable distribution of potential development benefits. Reducing poverty among pastoralists is also going to require increased attention to women and their role in range-livestock development (Box 4).

In summary, sustainable pastoral development in Tibetan pastoral will require: (1) greater concern about the welfare of the nomads; (2) increased concern about rangeland degradation and ecosystem processes; and (3) the political will to address the problems. Concern and political will, however, are not enough. There also has to be improved human resource capability to design and implement suitable policies and actions. Lack of capacity at the local level is one of the main constraints to more sustainable pastoral development and rangeland management in Tibetan pastoral areas. It will be necessary, therefore, to foster an enabling environment for local-level capacity building among Tibetan nomads. This must take into account the local variability and site-specific conditions related to climate, soils, ecology, livestock production, and socio-economic factors (Oygard et al. 1999).

Box 4. Nomad Women and Their Role in Poverty Reduction

Throughout the Tibetan pastoral area, women play a very important role in the pastoral economy. 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 (e.g., fuel, water). As herders, women are responsible for many of the activities regarding livestock production. Their decisions and actions have effects on rangeland 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 the pastoral areas. The government, donors, researchers, and pastoral specialists need to better acknowledge pastoral women's critical roles.

Conclusion

The challenges facing pastoral production, environmental conservation and sustainable development in Tibetan pastoral areas are considerable. Opportunities do exist, however, for improving the management of rangeland resources, increasing livestock productivity, and bettering the livelihoods of the pastoral population. Programs stressing multiple use, participatory development, sustainability, economics, and biodiversity could be realized through complementary activities in range resource management, livestock production, and wildlife conservation. Implementing such programs requires a better understanding of the rangeland ecosystem, greater appreciation for nomads and their way of life, and consideration of new

information and ideas emerging about nomadic pastoral systems, rangeland ecology, and rural development and poverty reduction.

Livestock production on the Tibetan plateau can be sustainable because rangeland ecosystems can tolerate the disturbance caused by livestock grazing. Much of the rangeland of the plateau is surprisingly resilient to livestock grazing; overgrazed rangeland can recover from livestock grazing naturally as long as the disturbance is not too great. Ecological processes that sustain rangeland for livestock also support wildlife, biodiversity, and other natural resource functions.

Sustainable pastoral development in Tibetan pastoral areas depends heavily on the local-level users of the rangeland resources; the Tibetan nomads. It is at this level that rangeland resource use decisions are made on a daily basis. It is also at this local level that awareness, incentives and institutional and infrastructure conditions must be appropriate in order to secure sustainable rangeland management and poverty reduction (Oygaard et al. 1999).

In the past, policies for developing the pastoral areas emphasized economic growth at almost any cost with insufficient attention paid to promoting efficiency and rangeland ecosystem sustainability. In recent years, rehabilitation of degraded rangelands has become an important feature of national programs, but the focus is almost entirely on investment in “technical fixes” and/or “quick fixes” with little attention paid to the underlying social and administrative issues which are often at the heart of the rangeland degradation and poverty problem. Development strategies for the Tibetan pastoral areas need to adopt an integrated ecosystem approach that views livestock production as just one important aspect of an overall rural development and poverty reduction strategy.

For the Tibetan pastoral areas, the development approach needs to move from a focus of sustaining livestock outputs from the rangelands to one of sustaining ecological processes and a wide variety of goods, services, conditions and values. Ecological sustainability requires maintaining the composition, structure and processes of the rangeland ecosystems. The concept of ecological sustainability provides a foundation upon which the management of the rangelands can contribute to goals of economic and social sustainability.

There are no simple solutions to addressing poverty among Tibetan nomads. Due to the multifaceted dimensions of the problems, actions will need to be taken on several levels: at the central policy level; at the university and research center level; at the level of range and livestock extension services; and at the herder level. Promoting more sustainable pastoral development in the Tibetan pastoral area will require policies and approaches that integrate ecological principles regulating rangeland ecosystem functions with the economic principles governing livestock production and general economic development processes.

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