

The privatization process of rangeland and its impacts on pastoral dynamics in the Hindu-Kush Himalaya: The Case of Western Sichuan, China

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Abstract

Profound changes in the last four decades in China has greatly affected traditional Tibetan pastoral production systems. The Chinese government is implementing an ambitious rangeland intensification scheme throughout the Plateau in response to perceived rangeland degradation. Traditional production systems have been altered ever since the Collective period of the 60's and 70's, but now, once communally managed rangelands are being "privatized" under the Household Responsibility System. In one such programme in Western Sichuan, the government provides aid to settle nomads by providing a house, a barn, fenced pasture, and artificial grassland, on a 50 year lease. These changes have far-reaching implications for pastoralism in the future. On the one hand, settlement and intensively managed livestock production brings improved access and services to previously remote nomadic areas. In contrast, it can have negative effects in terms of biodiversity conservation and social cohesion. Accompanying settlement is a corresponding reduction in the spatial mobility of livestock herds which means more condensed grazing pressures on residual open areas, thus reducing plant species diversity and productivity. This is exacerbated by climate change in the region. In addition, the allocation process has led to social conflicts, a breakdown of traditional institutions, and a deepening division between rich and poor, as wealthier nomads can more easily acquire inputs. Communal rangeland management systems are recommended as an alternative to "privatization" through collaboration with government agencies responsible for land management. However, collaboration requires fundamental changes in policy, primarily assuring secure tenure to communal groups, and providing legitimate legal rights and support to local institutions. It also requires more *inclusive*, participatory methods of rangeland research and planning, that translate directly into management action.

Introduction

For centuries, pastoralism has been the basis of survival in much of the Hindu Kush-Himalayan region of South and Central Asia. The vast rangelands and forests of the region have historically provided ample forage resources for a diverse array of livestock breeds, suitably adapted to the

various conditions prevalent in different ecological zones. These animals have formed the economic mainstay for diverse cultural identities. However, due to a multitude of factors, rangeland resources, the base of pastoralism, are increasingly under pressure to sustain a growing number of livestock and to meet the increasing demand for livestock products.

In today's market oriented environment, there is a growing trend to promote increased agriculture and livestock production through intensification of rangeland. Generally, intensification measures are initiated through changes in tenurial arrangements from communal to individual, based on the assumption that pastoral strategies involving the use of grazing commons are inefficient. Despite the extensive documentation of the efficacy of indigenous pastoral systems in the HKH region (Rai and Thapa 1993, Ura 1993, Richard 1994, McVeigh 1994, Saberwal 1996, Wu 1997a and b, Miller *in press*), negative perceptions pervade pastoral policy and management throughout the developing world (Sanford 1983, Narjisse 1996). In a world dominated by agricultural societies, policies are often implemented by people who do not recognize or appreciate these indigenous pastoral systems, nor seek to understand the environmental and socio-economic constraints under which they operate.

Pastoralists throughout the world have been swayed by the diverse motives and aims of governments, development planners, academicians, and within the pastoral community itself, in the process to modernize and transform their nomadic way of life. Large sectors of, or even entire, pastoral societies have been involved in centrally planned development programs coordinated by national governments, especially in Central Asia. Since the 1950s, numerous demographic and economic changes have occurred on the Qinghai-Tibetan Plateau, specifically, triggering changes likely to significantly transform the traditional pastoral system (Miller 1995; Wu 1997a; 1997b). Individual pastoralists have sought to cope with these pressures by different adaptive mechanisms. However, the result of powerful external forces is that pastoral cultures are increasingly found at the fringe, with little input in terms of providing alternative skills, and too far away from centers of power for most to care. Therefore, the socio-economic consequences and the decision-making processes of China's new pastoral policies is an important area of investigation on the Qinghai-Tibetan Plateau. So far, little research information on this topic has materialized.

The Case of Western Sichuan

Western Sichuan is part of the eastern extension of the Qinghai-Tibetan Plateau and is located in Sichuan Province, administratively. Of the total 236,000 km² area of Sichuan, rangelands comprise 139,000 km². The plateau landscape is characterized by broad valley bottoms and rugged mountains, situated at an average elevation above 3,500 m a.s.l., and dominated by alpine meadow vegetation. Owing to the high altitude and the related harsh environment, cropping is not practiced in most areas of the Plateau, and livestock grazing offers the most feasible land use for hardy animal breeds tolerant of the cold, such as Tibetan sheep and yak. Animal husbandry is the representative economy throughout this region, and has supported Tibetan nomadic pastoralists for thousands of years.

The Change from Traditional to Modern

For thousands of years, the hardy pastoralists of the Qinghai-Tibetan Plateau have been immensely successful not only in utilizing the vast rangelands but also in conserving the grazing capacity of these

high frigid lands (Wu 1997a). Pastoral communities have remained stable for centuries, particularly through flexible responses to short-term variations in climatic conditions. They evolved a system employing migratory, semi-sedentary and deferred grazing practices to produce ample quantities of animal products for their own households and for trade. The communal discipline demanded by the system was established through strict adherence to a set of institutional arrangements dictating all aspects of community life. Land itself was the property of powerful landlords and monasteries, but the nomads themselves dictated the day to day management of range and their livestock, allowing for wealth accumulation among individual households (Goldstein and Beall 1990).

1958 marks the beginning of modern pastoral development, beginning with the settlement of nomads in western Sichuan. During the 1970s, under the *Gongse* (people's commune) system, ownership of livestock became communal rather than individual, radically altering traditional pastoral management patterns. Attempts were made to grow winter forage crops, improve access to veterinary facilities, and construct winter livestock shelters. Livestock were pastured on State land, but despite the changes, traditional movements to seasonal pastures were still made and allowed.

After 1978, mainly from the beginning of the 1980s, the government of China recognized the need for corrective measures and made a major shift in policy. The rural reforms introduced the "Household Responsibility System" that restored many of the incentives for herdsmen to increase pastoral output and productivity through private ownership of livestock. It slowly moved away from State control and ownership (centrally planned economy) towards a more market-oriented economy with policies to encourage private sector initiatives and investment. Communal livestock were divided among every family, but the tenure of pastures still belonged to the State and land was not individually allocated.

The Process of Rangeland Privatization

The introduction of household livestock contracts evidently raised problems about communal access, given the results of the previous collective period and consequent weakening of traditional institutional control on pasture access. In the case of the Qinghai-Tibetan Plateau, when communal livestock were divided among households, the rangeland remained the property of the State. Under this situation, pasture was open to every household in a *Zu* (family group) on an equal basis, thus, supposedly a situation of open access. Without control of pasture resources, the situation can lead to one of overstocking and overgrazing, which is the true embodiment of Hardin's (1968) hypothesis of the "tragedy of the commons".

In order to change this perceived situation, the government in the early 1990s launched a large integrated rangeland development programme, entitled "Integrated Socio-economic Development in the Pastoral Regions". In 1995, Hongyuan County and Litang County of Sichuan Province were involved in the project as two of 25 demonstration counties in western China. Based on the government's documents, this programme aims to:

- 1) substantially increase livestock off-take and pastoral incomes through more intensive management, such as sedentarization and fencing the open rangeland;
- 2) raise the nomads' enthusiasm for rangeland management through the privatization of rangelands;
- 3) rationalize land use by limiting livestock numbers to carrying capacity; and

- 4) increase the nomads' level of technological capability and strengthening their marketing sense through the improvement in rural infrastructure.

In reality, the government began programs to settle nomads and divide rangeland between individual households in the Tibetan areas of Sichuan Province ten years ago, but the scale was mainly limited to hay fields and small spring pastures. Starting in the traditional winter grazing lands, each nomad family was allocated an area of rangeland on a long-term contract (50 years) in what was essentially a privatization of the previously communally managed grassland. Land allocation was based on the supposed carrying capacity of the rangeland and the number of livestock each family had. The construction of houses for nomads, sheds for livestock, fencing, and development of artificial pasture was also heavily subsidized. In Hongyuan County, for example, every settled household received aid to construct a 70 m² house, a 80 m² shed for animals, and a 20 m² barn for storing hay. Among the 1,600 households selected for demonstration, 500 *mu*¹ of pasture per household was fenced, including 2 *mu* artificial pasture and 8 *mu* semi-artificial pasture. This program, deemed a success by officials, was later expanded to privatize other seasonal grazing lands, not just the winter pastures.

The division of rangeland to private households is one of the most complex activities in this programme. In the fall of 1995, Sichuan provincial government issued "Measures for Contracting Pastures of Sichuan Province" in order to guide and force the implementation of the development plan. In 1996, a special working group was set up in Hongyuan, which is responsible for organizing, training and managing the affairs of this programme. The division of rangelands was carried out in 1997 and a license for rangeland use, good for 50 years, was given to every nomad household. The completed allocation process resulted in 70% of the total rangeland being contracted as winter pasture, on which the grazing time must be for 8 to 9 months, thereby restricting mobility that was traditionally practiced in the past and reducing flexibility in response to short term variations in conditions.

Comparisons to Other Rangeland Areas of the Plateau

Allocation of winter pasture

Policies and approaches regarding how winter pasture has been allocated differ among counties, prefectures and provinces of China, depending on local socio-economic conditions and the mind-set of local officials. In Hongyuan County, Sichuan, and Dari County, Qinghai, pasture allocation has been based on the number of livestock, compared to Tibetan areas in Gansu Province, where pasture size has been determined based on the number of people in the household.

Different areas have also been experimenting with winter pasture allocation for quite some time. In Tianzhu county, Gansu, in the Qilian Mountains located at the far NE corner of the Tibetan Plateau, some households have been fencing and growing hay and adjusting livestock numbers for quite some time (for the past 24 years). This trend was also noted near Heibei Alpine Research Station north of Xining in the Qilian Mountains of Qinghai. Currently all families within these areas now have fenced winter pasture and hay fields, and supposedly no one grazes their animals outside allotted

¹ One ha = 15 *mu*.

boundaries. This has been possible because:

- 1) they have received significant inputs from adjacent research stations (GAU and Heibei) and government line agencies;
- 2) the valley bottoms containing most of the winter pasture are relatively small compared to the winter pasture areas of the Inner Plateau area, thus, during the collective period in the 60's and early 70's, all communal winter pasture was fenced, meaning that individual parcels within this area were cheaper to later enclose; and
- 3) the Qilian Mountains have had good infrastructure for quite some time via rail and road network, thus can better facilitate livestock offtake.

Consequently, Tibetans in the Qilian Mountains have modernized quite rapidly and become relatively wealthy compared to Tibetans of the inner Plateau area.

The Grassland Law of China states that land belongs to the government, thus areas allocated to families can be adjusted. For example, in Tianzhu, since the time of initial land allocation, relative family sizes have changed, thus dictating need for pasture readjustment. Now the local leaders are starting the process of reallocation to accommodate those families that have increased in size and require more livestock. So in reality, the "privatization" of China's grasslands is really not privatization at all, but rather, a long term leasing system that is still subject to adjustment by government should the perceived need arise. Local leaders in Tianzhu are only now grappling with how to address this issue. The question here is to what degree the larger community will be part of the decision making process.

For those areas where land has only recently being been divided, the process on paper sounds very pragmatic and equitable. According to local extension officials in the grassland stations responsible for overseeing the allocation process, individual parcels are determined considering their potential to produce forage, the topography, and access to water, and are divided into condition classes - of good, medium and poor. Allotments may not necessarily be one contiguous piece of land, but rather an amalgam of relative proportions of land classes. Each family will get a small portion of good pasture, a medium portion of medium pasture, and a large portion of poor quality pasture, which are then distributed through a lottery. Pastures are supposedly delineated by the grassland station personnel with local community input. However, some government staff question the effectiveness with which local authorities allocate land. What are the realities of such allocation? In some areas, all available winter pasture is now fenced and locals do not graze their animals outside their allotment, mostly in places that have a long history of fencing such as in Tianzhu. In areas where this allocation programme is new, such as in Hongyuan County, only "demonstration" sites and wealthier families have the resources to fence, creating overgrazing problems on those common areas surrounding the enclosed pastures. This trend has been noted elsewhere in Inner Mongolia where enclosures have led to social stratification and conflict arising between those who can afford to fence and those who can not (Williams 1996, Thwaites *et al* 1998).

Local government grassland stations and local leaders have responded to this issue in some areas by allowing groups of households to pool their individually allotted grasslands and fence as communal land, yet still receive inputs from the government for fencing and artificial grassland. Local households indicate the benefit of this in terms of both material and labor costs; it is cheaper to fence communal pasture, and it eliminates the problem of access to individual areas. Herders here, as elsewhere in Inner Mongolia (Thwaites *et al* 1998), recognize that allocation of grazing land can lead

to conflicts regarding access to watering points and controls over trespassing animals. However, many households within these communal groups expressed the desire in the future to at least fence small plots for hay production, once they have the income to do so. This communal approach varies from place to place and depends on the local government. In Dari county of Qinghai province, families that decide to group together as a commune give up their right to hold individual herds and revert to the collective system of the past. In Tibetan areas of Danna Prefecture, southern Gansu, families can band, but they still maintain rights to individual herd ownership. When asked how they regulate herd size, some families indicated that they mutually agree upon how many livestock each family can maintain, based on family size. These numbers are then regulated within the group. The decision to group as a commune is also dependent on wealth; most families that band are relatively poor and tend to form groups with those with strong kinship ties. Maqu County of Danna Prefecture shows a wide diversity in approach, based on the needs and desires of the communities themselves; from entire villages either individually or communally fencing and managing winter pasture, to villages with smaller sub-groups of families pooling labor and financial resources.

Allocation of Summer Pasture

In most places on the Plateau, summer pasture has not yet been allocated to individual households, but this process is slated for the summer of 1999 in many areas, including Hongyuan. It will be interesting to observe this process as it unfolds. Summer rangeland, unlike winter pasture, tends to be more remote, more rugged, covers more area, and does not contain permanent settlements. Questions about equitable allocation and issues of cost for fencing, maintenance, and access will certainly arise. Many local farmers believe that the costs will be prohibitive given the few months that they use these pastures. Although some say they would like to fence these areas, they don't believe it would be feasible and again raise questions about the fairness of access. These issues are not just recognized by households, but by some government staff as well. In Zhongdian county in NW Yunnan, the local grassland station plans to limit the allocation of individual pasture to winter areas only, given the difficulties associated with dividing summer pastures.

Current and Predicted Impacts of Privatization

In western Sichuan, as elsewhere, the "modernization" of nomads has been occurring since collectivization, especially pronounced during the Cultural Revolution (Wu 1997b). However, before the implementation of the present Grassland Law, this had been mainly in the form of semi-sedentarization, where semi-permanent housing was provided to nomads in their winter settlements (which were already semi-permanent to some degree), while in summer they still migrated to seasonal pastures. Current programmes differ in that now individual households are heavily subsidized, given improved structures along with surrounding winter grazing land, supposedly adequate to provide for livestock herds through much of the year. Theoretically, sedentarization offers opportunities for improving access to infrastructure and fosters long term investments in land productivity through the application of innovative technologies. There is no question that from a livestock production standpoint, winter pasture allocation and fencing potentially have a number of advantages over communal access, as indicated by local herders in many areas (Goldstein 1998, John Davis pers. comm., Richard unpl. data). Reasons stated include: 1) locals can better protect small hay fields thereby reducing potential conflict; 2) reserve pastures can be set aside for critical periods in late winter and early spring when otherwise relatively little winter forage is available; and,

3) it facilitates ease of veterinary care for individual herds. However, the changes from a long ranging and mobile herding system to a short-range and sedentary one bear the potential for some negative effects.

1) Increasing Risk of Environmental Degradation

Declining mobility. Lack of mobility has been identified as a key factor leading to the degradation of rangelands throughout many areas of Central Asia (Sneath 1998, Thwaites *et al* 1998, Williams 1996, Richard and Miller 1998, Kerven and Alimaev 1998). Nomads' ability to track environmental conditions and mobilize herds to seek pockets of good forage is effectively eliminated as more areas become partitioned. Consequently, winter pasture areas tend to be overgrazed and remote summer pastures tend to be destocked. Because enclosure of pastures almost always accompanies settlement, the general trend is that more productive rangeland areas (such as valley bottoms and lower slopes) are fenced first, leaving residual open range prone to faster degradation, especially in areas where some winter areas are fenced and others are not.

The emerging trends toward short-range herding systems on the Plateau are already having deleterious effects on alpine vegetation. Effects of overgrazing have been documented in Hongyuan and Litang Counties, Sichuan, around permanent water sources and in the immediate vicinity of permanent settlements. In addition, a distinct decline in the condition of vegetation in term of grass yield and plant diversity has been found in areas surrounding enclosures after only two-year's implementation of the programme. Ecological studies conducted in Inner Mongolia revealed similar trends (Li 1993), especially pronounced near larger towns and near permanent water sources (Thwaites *et al* 1998). Given that the area of allocated winter pastures in demonstration areas of Western Sichuan has expanded to 70% of the total rangeland area and that households are cultivating winter forage crops in artificial pastures, it was reported that nomads will not move unless the carrying capacity of winter pastures is overloaded. As a result, the new sedentary pastoral system has lost the flexible mechanism to respond to environmental changes, resulting in overgrazing, especially on common lands outside the fenced areas.

Summer Pasture Condition. There is concern that increasing livestock survivability during the winter months may affect long term summer pasture condition (Miller *in press*), especially in more populous areas with limited seasonal pasture availability (Wu 1997b, Thwaites *et al* 1998). In subsistence livestock farming systems in high elevation areas of the HKH and Tibetan Plateau, winter climate has dictated livestock numbers because of limited forage in winter and occasional snow disasters, thus summer pastures tend to be underutilized. Yet now, subsidized winter forage improvements and better veterinary care are improving herd survivability through the long winters, thereby increasing stocking densities on summer range, especially considering the lack of market outlets for livestock goods. Long-term increase in livestock numbers can have devastating consequences as was noted in research conducted in Kazakhstan. Here, years of heavy subsidies for winter feed by the Central Soviet government allowed for drastic increases in sheep production that put undue stress on summer pastures, leading to serious long-term decline in both pasture and livestock productivity (Kerven and Alimaev 1998). Subsequent privatization schemes resulted in an end to subsidies and thus a major crash in the sheep industry, thus reducing pressure on grassland, but creating serious economic hardship for communities. Areas of the Tibetan Plateau have not experienced such heavy subsidies until recently, but this raises questions regarding both long-term

ecological and economic health.

To date, very little ecological research has been conducted in the Qinghai-Tibetan Plateau to look at trends in summer pasture condition, both for livestock production and other benefits it provides such as wildlife habitat, medicinal plants, fuelwood, and watershed functions. In addition, little has been done to increase options for destocking rangelands before the onset of winter, which could help to alleviate the need for heavy winter feed subsidies thus reducing potential stocking pressures in both winter and summer rangeland. Simultaneously it would allow animals to be sold when they are fat, boosting local income, rather than disposing of carcasses that are the victims of starvation.

Loss of Biodiversity. As previously stated, enclosures have been found to decrease plant species diversity across a partitioned landscape (Wu 1998, Li 1993). Research elsewhere has also shown that large scale fencing can impact wildlife populations, such as with antelope in the western Great Plains of the U.S. (Yoakum *et al* 1996) and with other large ungulates (Kindschy 1996). With increasing intensification, wildlife are also viewed as potential competitors for forage, thus hunting is encouraged to reduce populations of migrating herds, such as in Western Sichuan (Wu 1998).

Contrastingly, in areas that are still communally grazed, maintenance of a diverse herd structure and high mobility are found to compliment wildlife populations, both in the Tibetan Plateau (Miller 1997) and abroad (Steinfeld *et al* 1997). Although the goal of local herding communities is not necessarily species conservation, their grazing practices have ensured species diversity in the process of meeting utilitarian needs, mainly through the maintenance of mobility (Wu 1997b). Attempts to “rationalize” livestock production also strive for a utilitarian goal, to improve livestock production, but rarely are the impacts to biodiversity taken into account. As it stands, current policies related to grasslands do not provide incentives for conservation, thus, reduced mobility resulting from prevailing land use policies is contributing to lower species diversity.

Global Climate Change. As a consequence of the high sensitivity of alpine ecosystems to global warming, changes in alpine vegetation are likely to be more pronounced than in any of the other natural biomes (Boer & Koster 1992), which is already proving to be a challenge for cold-climate pastoral production systems. Alpine vegetation is among those types of vegetation that will most likely show a response to elevated CO₂. To date, it is unknown to what extent increased CO₂-levels will translate into increased biomass production and how it will alter vegetation boundaries and community composition, but the prediction is that tree line will expand (Lee *et al* 1998), reducing the alpine area available for livestock husbandry (Wu 1999).

In addition, increasing temperature and timing of precipitation are also having an effect on grassland production in many areas of the HKH (Zhang *et al.* 1998, Miede 1988, Richard 1994) and in Inner Mongolia (Ellis, unpublished data). Oral testimony in these regions indicate a general drying up of the rangelands, exhibiting decreased production which is not necessarily associated with an increase in livestock numbers as so often claimed. Hence, the high-frigid rangeland ecosystem of the Qinghai-Tibetan Plateau will exhibit dynamic fluxes with global climate trends. The combined affects of shrinking grazing lands due to expanding timberline, expanding agriculture, and inflexible tenurial arrangements, merely exacerbate the problem of alpine dessication.

A foreseeable issue is that management of the presently fixed territories of pastures will not response

flexibly to climatic fluctuations, because the concept of establishing rights to the use of specific areas of land is inconsistent with the traditional mechanism of opportunistic mobile livestock keeping. Traditional responses are based on rainfall, yet despite decline in grass productivity accompanying climate change, nomads continue to increase herds in some areas (Thwaites *et al* 1998). This behavior is because traditional responses are based on the need for mobility rather than adjusting livestock numbers; the latter is a foreign concept. Thus, in fixed systems, without consistent monitoring by government land management staff, the potential for overgrazing is high (Miller *in press*).

Expanding Agriculture. Tibetans and other ethnic groups residing in the transitional cropping zones located at the fringe of pastoral areas have traditionally raised high altitude crops such as barley and wheat to supplement their pastoral livelihood. Yet in recent decades, market forces and government policies have encouraged the expansion of these agricultural areas from valley bottoms on to marginal land more suitable for grazing than the plow. Recent fluctuations in the market have favored production of rape seed over livestock. Thus vast areas of once prime grazing land are now being tilled under in order to reap short term gain from sale of crops. This trend has been noted in many pastoral areas of China (Zhang 1992), yet considering that most residents of these areas will continue to rely on subsistence pasturing, policies that encourage agricultural expansion only exacerbate an already existing shortage of forage resources due to declining rangeland productivity. In light of the current drying trend, this activity contributes more to soil loss and degradation than livestock grazing, yet little effort has been made to regulate land use in these areas through price controls and land use zoning.

2) Increasing Production Risks for the Individual Herd Owner and for the Livestock Industry

One of the main purposes of settling nomads is to maintain proper livestock numbers on the rangeland through destocking prior to onset of winter, to provide access to modern amenities, and to practice some form of 'modern' grazing techniques. If pastoral areas are sparsely populated and include access to reliable summer pastures, sedentarization may not be a problem. Neither of these two conditions, however, can be met at present in Western Sichuan, nor in many other areas of the Plateau. Current socio-economic conditions also do not favor compulsory destocking on a large scale, first off because it would jeopardize the already narrow subsistence base of nomads. Although there is increasing demand for livestock products in Chinese urban areas, especially for meat, the limited infrastructure to handle the glut of destocked products is poor in nomadic areas, including product storage and processing units. In addition, the government maintains price controls that keep meat prices artificially low to favor urban demand (Wu 1997a).

It should also be stressed that pastoralists are nearly all engaged in multi-resource economies and their strategies are geared not just for current production but for the long-term security under quite severe environmental fluctuations (Scholz 1995). Intensifying market structures for single products such as meat undermines the diverse base upon which these pastoralists depend. Without continued support by the government, these systems are likely to fail, resulting in declining livestock productivity and household income.

In effect, the Chinese government has tried to convert nomadic pastoralism to a ranching system, or the so-called "rationalization" of animal husbandry, but the economy is still essentially subsistence-

based, thus investments are difficult to bear by individual households. While there is no question that winter pasture allocation has contributed to improving income for some households in the region, the vast majority of inputs require heavy subsidies from the government. In many areas of the Plateau, only wealthier families have been able to complete all four of the government's allocations, a house, a barn, fence, and artificial pasture. Questions arise regarding the feasibility of expanding initial "demonstration" programmes due to limited government funds. Even if funds were available, the high investment required for fencing and building implies an economically unsustainable system that could hurt the nation's economy as well.

Impacts of Commercialization – Ad Hoc or Planned? Pastoralists on the Tibetan Plateau, as those elsewhere, have been romanticized as being self-sufficient individualists, relying on the harmonious relations with land and community to survive. In reality, nomadic groups were never really self-sufficient; they always relied on trade with sedentary communities for grains, fodder, and other products (and often banditry) to supplement their livelihood (Chang and Koster 1994, Goldstein *et al* 1991, Wu 1997). Therefore the claim that a shift from a subsistence to market economy will radically alter the traditional pastoral way of life is not necessarily a given fact. Many authors argue that pastoralism formed the historic basis for capitalism (review by Chang and Koster 1994). Pastoralists are by nature entrepreneurial, engaging in multi-resource exploitation, and making investments in their herd as "natural capital". Impacts to their culture would depend on the way in which external forces such as markets and policy shape the trend. In many parts of the world, pastoral cultures have remained quite strong in the face of expanding capitalism, while others have rapidly assimilated into the milieu (Chang and Koster 1994).

Demographic and economic changes are triggering adaptive responses in nomadic societies of the Plateau, such as toward market driven livestock production, thus traditional barter economies and associated systems of cooperation are declining in importance, especially those adjacent to population centers, increasing reliance on cash income and widening the gap between rich and poor (Miller 1995, Wu 1997a). However, the culprit is not necessarily commercialization *per se*. Rather, a complex array of factors is leading to its demise, primarily narrowly focused development policies and programmes that ignore the complex relationship between intensive agricultural and extensive pastoral systems, that disrupt traditional land tenure, and that maintain artificially low prices which do not reflect the true cost of production.

As a result of price controls in China, more industrial livestock operations are being established near urban areas, especially monogastric production (poultry and pigs), to meet the high demand for meat (Steinfeld *et al* 1997). This reduces the demand for large ruminant animals, especially those far from centers of population such as on the Plateau. Current production trends will favor this over the long term, thus animal production on the Plateau will continue to remain primarily subsistence based, unless policies are implemented to favor more land-based systems. To date, policies have not been supportive to nomadism, which has begun a negative process toward both cultural and rangeland productivity decline. Until policies are in place which support nomadic mobility, this trend will most likely continue.

3) Accelerating the Breakdown of Traditional Institutions

Traditional mobile livestock raising is founded upon a traditional social system, which secures the

realization of multiple resource goals beyond those purely economic (Behnke 1984). In western Sichuan, as in other areas of the Qinghai-Tibetan Plateau, communal based local institutions have been weakened or even eliminated without being replaced by an effective local administration in the past four decades (Goldstein *et al.* 1991). The excessively centralized settlements, undue expansion of enclosed pastures, irrational encouragement of longer grazing periods in winter pastures along the main roads, and abandonment of seasonal migration will inevitably result in higher input levels per household and breakdown in systems of social cooperation and conflict resolution. With the enthusiasm of modernization, people often ignore the fact that a nomadic society responds in its entirety to the change of environment and the availability of resources. Simply focusing on pasture or livestock development fundamentally ignores the tight linkages between culture and the land and often results in long-term failure of such projects, not to mention the unintended social consequences that occur with changes in tenure and resulting breakdown of traditional institutions.

4) Changing Demographics

Many Han Chinese have migrated to Tibetan settlement areas to start businesses. While few have actually picked up livestock rearing as an occupation, they have rapidly filled a niche in these expanding urban areas as demands for services increase, such as for hotels, restaurants, etc. This has led to conflicts in some areas as these people increasingly become wealthier while surrounding pastoralists struggle to make ends meet. These migrants have a competitive advantage over local residents. For one, they come from regions with better access to education, thus more business savvy, and policies are in place that favor dispersion of Han Chinese into remote, sparsely populated areas of China (Thwaites *et al.* 1998).

In addition, fixed grazing systems tend to reduce the ability to accommodate expanding herd size, thus limit options in the animal husbandry sector for subsequent generations. As seen in other areas of the HKH and abroad, as options for animal husbandry decline, viable livestock operations are increasingly becoming concentrated among wealthier households, because of the higher transaction costs associated with acquiring sufficient grazing land (Jodha 1995, Saberwal 1996, Narjisse 1996). Those who can't afford to maintain herds will most likely be forced to seek alternative employment, yet options are limited due to lack of education and competition by immigrants. Similar trends have been observed in other pastoral cultures of the world where unfavorable terms of trade for pastoral products resulted in a shift in livelihood to migratory wage labor and an end to prosperity (Chang and Koster 1994).

Reshaping the Rangeland Development Paradigm

The modernization process has definitely improved access and services to remote regions, but at the cost of pastoral culture and biodiversity (Wu 1998). Pastoralists receive little recognition for their skill in using scarce resources in a sustainable manner. Instead they are viewed as a low input – output system, inefficient in classic economic terms. But if conservation of the rangeland resource is given an economic value, these systems turn out to be highly efficient.

Many prosperous nomadic groups still exist on the Tibetan Plateau, testifying to their adaptability to prevailing socio-economic and environmental conditions, such as in eastern Ladakh (Richard 1998), and western Tibet (Miller 1998, Goldstein *et al.* 1991). The commonalities among these still intact

pastoral areas are the presence of effective communal institutions and relatively little interference by government in land tenure and management. Sneath (1998) looked at the geographic region of northern China, Mongolia, and southern Siberia and found that areas in the best condition were places that exhibited low land fragmentation, experienced relatively late land tenure changes by centralist governments, and consequently still possessed relatively strong local institutions capable of controlling communal pasture access. These characteristics have also been found in pastoral areas of Africa where communal range management has been found to be more productive than private ranching schemes (de Haan 1998, Scoones 1996). These characteristics of success can and should be translated into new and innovative policy that supports nomadism, rather than undermines it.

When devising rangeland development programmes on the Tibetan Plateau, the following factors should be considered:

- ◆ The high frigid rangelands of the Tibetan Plateau are a marginal resource. They will never be areas of high output livestock production.
- ◆ The indigenous rationale for rangeland use has been based on the perception of a human-environment relationship, which has dictated pastoral movements across a harsh, heterogenous landscape.
- ◆ Indigenous knowledge systems should form the basis to development approaches and policies. They need to be carefully studied, assessed and incorporated on a case by case basis. Therefore, technological interventions should enhance, not replace indigenous systems.
- ◆ Traditional social systems and local level decision making are vital to the functioning of pastoral systems. How do tenure and intensification policies affect local perception of community and social responsibility?
- ◆ “Rational” livestock management through rangeland intensification requires an effectively operating market that facilitates the optimum destocking of livestock before the onset of winter. Without this market infrastructure, local herders will continue to follow subsistence strategies of herd maximization in order to reduce risk associated with winter livestock losses.
- ◆ Benefits from rangelands are diverse. Given the diverse values of rangelands, diversification has always been fundamental to survival of Tibetan pastoralists and will continue to be so in the future, especially in light of increasing human population and the need to reduce reliance on livestock. How do we value these products and integrate their management in to development programmes?
- ◆ Considering this, policies should focus on multi-resource benefits of these rangelands, such as biodiversity, and to identify livestock production systems that function in tandem with conservation goals and objectives. Traditional systems based on mobility have been found to be the most amenable to such goals.
- ◆ Instead of initially focusing on increased production, focus on value addition (in terms of both cash and subsistence value) for products already produced on the rangeland, thus increasing the incentive to explore areas of technical intervention, provided that they fit within the cultural norms of the society.
- ◆ To understand current and future options requires a comprehensive framework for analyzing rangeland issues, requiring careful assessment of the potential of the landscape and its people (institutions, capacity, and aspirations).
- ◆ In non-equilibrium systems, long-term flexibility in management and policy is required to adjust to future changes on the range.

For areas such as the Tibetan Plateau that are by nature low in productivity, options for large scale industrial livestock production are limited. But small improvements can and should be made at the household and community level to help boost production of livestock and health of rangeland. For one, winter hay fields are proving to be a vital resource, especially in light of declining range productivity due to climatic change (the drying up) in the region. These hay fields, primarily oat, have been found to exhibit production that is five times higher than native grassland (Zhang 1992) and can be stored for use during the critical forage period in late winter and early spring. Local communities in many areas of the Plateau have also readily adopted this technology, indicating its appropriateness. Fenced spring pasture also helps provide forage during lean times, while reducing pressure in nearby winter pastures that are beginning to green up at the onset of the growing season. These pastures can also help defer summer grazing to help boost summer pasture growth. These small fenced systems do require relatively high costs to initially start, but over the long-term are relatively inexpensive to maintain, easily offset by the increased livestock production and income. In areas where fencing winter and spring corrals has been traditionally practiced, turf and manure are often the primary fencing materials.

However, fencing winter hay and grazing lands requires a change in tenure from communal to “private” or to a communal system where access to hay and spring grazing resources are tightly controlled by the group. Both are equally viable options that should be decided upon by the communities themselves and be given support in terms of access to loans and subsidies. Large scale pasture allocation raises a new set of issues regarding long-term sustainability in terms of cost and rangeland health. All options need to be evaluated on a site-specific basis, keeping in mind the socio-economic and ecological realities such as potential to intensify, skills of local government staff and households, and the area’s biodiversity attributes. Underlying all options is the need for greater collaboration among government staff and the local farmer.

Policies that Promote Collaborative Rangeland Management. Given the limited funds available for fencing vast areas of rangeland on the Plateau, pastoral systems will continue to be defined through a combination of both individual and communal tenurial arrangements. Communal management, despite the rhetoric, can be effective, especially if given legitimization and support by governments. Considering the limited human and financial resources available, collaboration amongst pastoralists and government offers a win-win situation. However, to ensure collaboration requires fundamental changes in policy, primarily assuring secure property rights and tenure to communal groups, and providing support and legitimate legal rights to local institutions.

Barriers to Policy Change. Such changes are not easy in today’s context. First and foremost it requires a significant shift in philosophy amongst policy makers themselves toward one of power devolution and collaboration. The government of China has shown its desire to learn from past mistakes through the series of policy reforms witnessed in the last two decades. In reality, however, implementation of these new policies is subject to the whim of local officials, and success of reforms has varied from place to place. In addition, aspirations are changing among pastoralists themselves. Many want what their urban counterparts have; access to better education, health care, and economic opportunity. Yet these are difficult to acquire in a mobile system. Conflict resolution will also be a major challenge to implementing new policies, especially in areas where government interference and inconsistent land use policies have lead to range wars. Lastly, skills are lacking in innovative technologies and extension approaches. Despite these barriers, in reality local customs

still prevail in most areas, and those programs that are most effective have been ones where local officials are part of the traditional decision making body. People here as in other parts of the HKH maintain greater respect for their own customary (or *de facto*) rules than those of central governments (*de jure*). Bringing the policy maker into this mainstream will be the greatest challenge.

The Role of Rangeland Science to Address Future Change

Bridging the Knowledge Gap Among Disciplines Regarding Global Change. How to alleviate the negative effects of global climate change and enhance the ability of the society as a whole to adapt to global warming in the future is still a question for development planners and academics. Therefore, an effective exchange of information across disciplinary boundaries is a prerequisite for proper insight into the complex response of ecosystems and socio-economic systems to climatic change.

Incorporating Social Sciences in Rangeland Research. Of the natural resource fields, rangeland science is one of the most multi-disciplinary in terms of technological and marketing approaches. But we have failed to consider the social aspects in our research, be it determining optimum stocking rates, boosting forage production, or designing optimum production models. Often traditional pastoral systems are branded as unproductive, yet typical approaches to analyzing range systems rarely consider the fact that pastoralists themselves do not control the factors that determine where they graze; available pasture is dictated first and foremost by the environment, and further restricted by competing societal interests (Richard and Miller 1998). In reality, there is often a compromise between what we perceive to be “scientific” rangeland management and operations at the household or community level, especially in a subsistence economy. This perceived dichotomy should be investigated in order to find the proper overlap in such divergent world views.

In addition, our scientific views have been strongly shaped by outdated production-oriented modalities that view the resource as a commodity for future extraction, an ideology embraced during the formative years of the agriculture and commercial forestry sciences (Richard and Miller 1998). While ecological values have been recognized in this paradigm, important intangible benefits from rangelands such as culture, wildlife, fertility, wood, and water are often neglected. Issues regarding biodiversity are gaining momentum in the rangeland sciences, yet often livestock and pastoralists are viewed as major threats to conservation, despite the lack of evidence in most pastoral areas.

Changing the Research Paradigm from Extractive to Inclusive. The future of rangeland science field depends on its ability to determine ecological changes across the landscape in response to changing environmental (e.g. climate change) and socio-economic forces (e.g. global markets and government policies), and to help devise realistic policy and marketing strategies that fit the prevailing conditions and cultures. To do this requires effective two-way communication among policy makers, government agencies responsible for land management, and most importantly, the millions of people dependent on the rangelands for their subsistence and income. Without this vital flow of information, the extensive documentation of rangeland research that is available is meaningless. Classic approaches to applied research are *extractive*, meaning that the information upon which to base decisions is mainly gathered by an outside research team. While techniques such as Rapid Rural Appraisal has helped the outsider to understand the pastoralist’s world view, the pastoralist himself is rarely involved in the process of information gathering, analysis, or decision-

making. We as range professionals should promote and adopt more *inclusive*, participatory methods of rangeland research and planning, that translate directly into action at the ground level, thereby fostering two-way lines of communication among stakeholders. In this paradigm, all relevant stakeholders are in some way involved in all phases of the action research and planning process. While basic research is important for understanding rangeland ecosystem dynamics, this type of research could be part of a larger participatory framework, or serve as one “tool” in an overall methodology of iteration, innovation and action (Fisher and Jackson 1998). We must bridge disciplines and divergent world views in order to accurately assess social and rangeland capital and to unlock the potentials that they hold.

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