

2 Integrated Research on Pastoral Production Systems



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Integrated Research on Pastoral Production Systems

In this chapter, we provide summaries of the oral presentations at the Lhasa workshop related to integrated pastoral production research. To date, much of the research related to rangelands that has been conducted in the Hindu Kush-Himalayan region has addressed mono-sectoral issues such as livestock husbandry or forage development. The papers presented in this section offer a more multi-disciplinary perspective, ranging from rangeland ecology and foraging behaviour to *de facto* customary arrangements for the management of pastures and other rangeland resources.

The first four presentations summarise research conducted in the Gilgit region in the Northern Areas of Pakistan coordinated by the Macaulay Land Use Research Institute, UK, in collaboration with the Aga Khan Rural Support Programme. These papers address the forage and livestock situation in the light of current socioeconomic factors that are influencing farmers' behaviours and resource use patterns.

The following two presentations summarise research work supported by ICIMOD's Regional Rangeland Programme and will be published in detail separately. Abdul Wahid Jasra from the Pakistan Agricultural Research Center presented findings from a socioeconomic study of pastoralism in Balochistan. He discusses the changes in practices that have evolved in response to varying socioeconomic and environmental pressures in the region including: the Afghan wars, drought, increasing exploitation of ground water for tube well irrigation, and a lack of consideration for migratory communities by the Balochistan government. A brief overview is then given of future plans for the restoration of juniper rangelands in the province through inclusion of both sedentary and migratory communities.

Phuntsog Tsering from the Ladakh Department of Sheep Husbandry, India, Yeshe Dorje from the Livestock Research Institute, TAAAS, and Tsering Norbu from the Tibetan Academy of Social Sciences gave an overview of pashmina production systems research conducted in the Chang Tang of eastern Ladakh and western Tibet. General trends are documented in each region and then comparisons are drawn across the border. In both regions, conservation remains a key policy focus and pastoralists struggle to adapt to new protectionist policies and development practices, which often prove to be government mandates that are at odds with each other.

A film by Sanjay Barnela and Vasant Sabarwal of Moving Images illustrated the lifestyle of the Gaddi herders of Himachal Pradesh, India and the recent socioeconomic forces that are negatively influencing their livelihoods. Extensive interviews with herders, government officials, and academics reveal various

perspectives regarding pasture health and allegations of over-grazing. The film highlights the conflicts that arise when pre-existing customary rights are ignored in the formulation of land use policies, and the social and ecological consequences when local community voices are ignored.

Yildiz Aumeeruddy-Thomas presented highlights of research from a WWF People and Plants initiative in Dolpa, Nepal regarding medicinal plants and their use and conservation status. She first presents an overview of the cultural significance of medicinal plants in the local medicinal system and then describes the relationship between grazing practices and medicinal plant use and extraction in the high pastures of Pungmo village. She argues that medicinal plant management should be incorporated into existing customary institutional systems that regulate grazing, which are viewed as effective mechanisms for control.

Finally the paper by Tony Banks describes *de facto* tenurial arrangements for the management of pastures and their potential as a basis for improved rangeland management in the rangelands of the Altai mountains in Xinjiang, China. He argues that these common property institutional arrangements are effective at minimising exclusion costs, realising economies of scale with respect to herd supervision, providing social insurance via equal access rules, and helping to abate environmental risk.

Agropastoralism In the Northern Areas of Pakistan – A Systems Approach to Research

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Background

The mountainous Northern Areas of Pakistan lies at the junction of the Karakoram, Western Himalayan, and Hindu Kush mountain ranges. The Western Himalayas create a rain-shadow over the region, shielding it from monsoon rains and leading to its semi-arid condition. Typical annual precipitation in the valley floors is 150 mm; temperatures can drop well below freezing in winter, while in summer, heat trapped in the barren valleys can send temperatures above 40°C.

The region has undergone rapid development during the last 20 years due to two main factors: construction of the Karakoram Highway, leading to dramatic improvement in the communication infrastructure and a new network of 'jeepable' roads throughout the region; and the activities of the Aga Khan Development Network and other agencies. The Aga Khan Rural Support Programme (AKRSP) has become increasingly interested in the indirect effects of these changes.

The agro-pastoral system found in the Northern Areas entails subsistence arable cropping, fruit production, livestock production, and to an increasing extent, cash-

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cropping. Livestock are kept by the vast majority of households and are an important component of the local economy; they are managed according to a system of transhumance. Animals are kept in villages in winter and subsist on a diet of cereal crop residues and alfalfa; they are moved to high pasture areas in summer. The region's livestock production system involves conversion of inputs – mostly feed, in the form of forage or fodder, and labour – to outputs – milk, butter, meat, draught, transport, fibre, dung, income, and tradition. Of the several existing constraints to improving livestock productivity in the region, the largest is shortage of winter fodder. Mature cow body condition scores plummet between the months of October and March and increase steadily until October of the next year. Another issue is that there is less labour available for livestock raising than there was in the past, and cash crops are seen as more valuable. Increases in education give children less time to herd livestock in the short term and less of an inclination to continue this way of life in the long term.

The project

The research project was established in 1998 by AKRSP to assess the impact of development change on local livestock enterprise. The project had three components – pasture ecology, livestock production, and socioeconomics. A single study design was used to allow final synthesis. The design included villages from three agro-ecological zones – single, transitional, and double-cropping – and two geographical transects differing in ease of access – the Karakorum Highway (KKH) and Gilgit-Ghizer Region (GGR). Within each of the villages, approximately 20 households were selected for socioeconomic study. Of these six or seven were selected per village for more intensive study under the livestock production component of the project. As the three project components were closely interrelated in the study villages, we adopted a systems approach including the following four steps:

- define the boundaries of the system of interest,
- define the objectives of the system,
- describe the resources,
- describe the components and their interactions.

One of the main activities of the project was village workshops, which were held at the end of the second year. At these workshops, representatives from each study village met for the purpose of giving feedback and comments. Preliminary findings were presented, and suggestions were made for improving the system.

Findings and recommendations

The situation in the dry temperate range type of the two transects is similar; production and utilisation are high only between March and June, and available biomass is relatively high from March to December, leaving only two winter months of low available biomass. In both transects, there is potential for increased spring grazing of this range type. However, production and utilisation in the alpine range type (grazed during summer and critical for recovery of live weight and body condition in preparation for the coming winter) differed between the two transects. The alpine range of the GGR transect had slightly lower production but nearly twice the utilisation of the KKH transect. Thus, summer pastures of the GGR transect are more heavily utilised and are being grazed at closer to their carrying capacity than are those of the KKH transect. Nonetheless, livestock in the GGR transect gain more live weight and body condition during summer than do those in the KKH transect.

Although livestock of the GGR transect gain more during summer, feed available to them during winter was only 0.8 of that required, whereas in the KKH transect, winter feed was 1.2 of the requirement. This relative lack of feed in the GGR transect was reflected in inferior livestock kidding and milking performance.

Other differences were also found between the two transects. Labour input per animal was significantly higher in the GGR transect. Households in the GGR transect depended relatively more upon farming, pensions, and labouring for their incomes; whereas households of the KKH transect (where people tend to be slightly more educated) depended more upon potatoes and private business. Both transects depended upon livestock for about 12% of their income.

Potential ways to increase livestock production in this region include increasing winter fodder availability, improving pasture utilisation, reducing livestock numbers, and improving marketing possibilities.

- Winter fodder availability may be increased through a combination of land development, changes in cropping patterns, introduction of new green crops or increase in cereal crops, and improved feeding systems.
- Pasture utilisation improvements should be conducted by pasture committees and might include earlier movement to dry temperate pastures in spring, and in the KKH transect, increased utilisation of alpine pastures, although the latter is complicated by low labour availability.
- Reduction in livestock numbers would reduce required labour and might increase individual animal productivity. Potential problems with this are centring of risk on fewer animals and impacts on culture and traditional management.
- Improved marketing would increase economic returns to livestock production. This might be accomplished through local or regional markets or through a market monitoring information system.

The next three papers present the detailed findings of the three project components.



Productivity and Use of the Pasture Resources of the Northern Areas of Pakistan

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Background

There are three range types in the semi-arid Northern Areas of Pakistan – foothill, dry temperate, and alpine; these differ in altitudinal range and type of vegetation supported. The foothill range type is usually near villages and is grazed by livestock during winter. These same livestock, managed under a transhumance system, graze the dry temperate range type during spring while moving towards the alpine range type, which is grazed only during summer when it is free of snow. Livestock also use the dry temperate range type during autumn while returning to the villages.

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Pastures in the Northern Areas fall under communal, state, and private ownership. The most common of these is communal, in which pasture resources are owned by a defined group of users and institutional arrangements exist for the use of resources. Ownership of state pastures lies with the Northern Areas government, but villages have grazing rights in those areas. Khunjerab National Park is an example of a state-owned pasture area. In the case of private pastures, individuals develop the pasture area in question for grazing or grass cutting, and hence establish secure claims to future benefits from that pasture.

Each village or cluster of villages has an institutional body for managing pastures, primarily consisting of experienced herders from the village. Such an institutional body uses consensus to make various decisions. These decisions usually relate to one of four main topics: 1) grazing schedules; 2) distribution of pasture to different households, tribes, or clans; 3) grazing fees charged to other villages wishing to use local pasture resources; or 4) penalties imposed on those not following the mutual agreement.

The only comprehensive information available on land use of the Northern Areas is based on the interpretation of 54 Landsat Satellite Thematic Mapper images at a scale of 1:250,000, carried out in 1990-1991 by the Forest Sector Master Plan (ADB and UNDP 1992). The accuracy of this information is doubtful, however, since widespread impossibility of interpretation of images - due to cloud cover and the rugged nature of the terrain - left almost 65% of the total area unclassified.

The present project

This study was conducted as part of the Agri-Karakoram Project, with the broad objective of gaining information about the ecology of mountain pastures that exist in the Northern Areas of Pakistan. The study had two main objectives. The first objective was to classify and characterise the vegetation communities present and their distribution within the study area. The second objective was to measure the biomass, production, and utilisation of the vegetation and identify the key differences in pasture use between the two geographical transects, determining where possible the causes of any differences found.

The extent of pastures varied among study villages. A preliminary survey was conducted at the start of the study to devise criteria for the selection of study pastures, and then an assessment was made of the approximate area per pasture available for livestock utilisation associated with each village. This information was gathered from herd owners and shepherds.

All pastures of the foothill and dry temperate range types were selected as study pastures for study in any given village, as there were relatively few. Sub-pastures within the main pastures were then selected to cover the full range of vegetation types, uses, altitudes, and aspects present within each pasture. In selected sub-pastures, 30m transects were laid randomly across hill contours, and quadrats were placed at 10m intervals along these transects. Quadrat size varied according to range type, with larger quadrats used in alpine range types, and smaller ones used in the dry temperate and foothill range types.

Production, utilisation, and available biomass parameters were measured using a paired cage plot method. In each sub-pasture area, cages were set up at six points.

These were paired with uncaged plots of the same dimensions to allow combined quantification of herbage production and utilisation. Grazing was allowed on the uncaged plots, whereas the caged plots remained ungrazed during each sampling period. Vegetation was clipped to ground level from both caged and uncaged plots simultaneously on all clipping dates, which were designed to cover both the main periods of livestock use and the growing season.

Results and conclusions

Results include data on several topics, including surface material distribution of pastures; information about the three plant communities (alpine, temperate, and foothill); effects of altitude and slope; seasonal variations in production, utilisation, and biomass; and transect variation in production and utilisation. Results show that vegetation ranged from very sparse shrubs in foothill pastures, to more dense shrubs in dry temperate pastures, to forb or grass dominance in alpine pastures. Production, utilisation, and biomass increased with altitude, probably because of increased water availability from snowmelt. Water availability also governs the movement of transhumant livestock under semi-arid conditions.

The two main conclusions of this study relate to use patterns of two different range types. The first conclusion is that mean forage production of dry temperate pastures overall appeared to be higher than utilisation during the spring season. The second is that much heavier use of alpine pastures in one transect raises two questions requiring investigation: 1) Why is the use three times heavier than in other transects?; 2) Despite this heavier use, why does animal condition improve faster in that transect than in others? These conclusions indicate two potential areas for modification of use patterns to gain maximum benefits from the available forage resources.



Availability and Utilisation of Stored Feed Resources and Their Impact on Livestock Production in the Agro-Pastoral System of Northern Highlands of Pakistan

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Background

The Northern Areas of Pakistan has undergone rapid socioeconomic change in the past two decades, partly as a result of the construction of the Karakoram Highway (KKH), which bisects the region into more-developed and less-developed areas. In the present study, two regions were selected – the KKH transect, accessible and developed, and the Gilgit Ghizer Region (GGR) transect, relatively inaccessible and underdeveloped. Within each transect, one village was selected per agro-ecological zone (AEZ). These AEZs included the single cropping zone, with one crop per year; the

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transitional cropping zone, with sometimes one and sometimes two crops per year; and the double cropping zone, with two crops per year. In each village, six or seven households (hh) were selected for study using a stratified random sampling technique. The study reported here was designed to assess the impact of socioeconomic change resulting from improved infrastructure on the livestock enterprise. To this end, nutritional inputs and productive outputs were compared in a series of villages differing in degree of accessibility to the KKH. This study represents the first rigorous, quantitative assessment of seasonal aspects of livestock production in the region.

Project implementation

In October 1999, the volumes of all stored roughage resources within individual households' storage areas were estimated, and roughage mass was calculated using estimates of average density derived from sub-samples of the various roughage types. The approximately 1,100 animals associated with study households were ear-tagged for identification and weighed before feeding, and their body condition scores were taken. Herd metabolic weights were also estimated.

To assess depletion of stored winter feed resources for livestock, the above measurements were taken at each household approximately every 50 days for 12 months. Metabolisable energy (ME) requirements for maintenance of live weight were calculated using AFRC (Agricultural and Food Research Council) guidelines. Sufficiency of ME in early, mid, and late winter was then calculated by dividing estimates of stored ME resources in each household by the estimated total ME requirements of each household based on their complement of livestock. Data on reproductive performance was collected by interviewing farmers about which animals had given birth on which dates. Milk production of all lactating cattle was measured for one full day each week by a trained member of each study household, as well as once by the author during each village visit.

Results and discussion

The study results provide detailed quantitative information on various aspects of livestock enterprise in the Northern Areas of Pakistan, including herd composition and weight, livestock trading, stored feed resources, patterns of feed utilisation, and livestock productivity and reproductive rate.

Inventories of herd composition indicated that cattle are the dominant livestock species within this mixed mountain agriculture system, and domestic milk production is the primary purpose for which livestock are kept. Cattle were more abundant on a household basis in the GGR transect, perhaps reflecting a greater demand for milk and butter by these comparatively large households.

There is evidence that animals in the GGR transect were fed lower-quality feed during winter. Body condition score was higher at the start of winter in the GGR transect than in the KKH transect, but GGR animals lost condition more rapidly as the winter progressed. Animals in this transect also produced less milk than those in the KKH transect and exhibited lower reproductive performance.

Despite the poorer road infrastructure in the GGR transect, trading of livestock and fodder was more prominent there than in the KKH transect, reflecting the greater

economic reliance placed on livestock in this transect, where opportunities for other sources of income are limited. The larger herd sizes in the GGR transect also allowed larger numbers of animals to be traded. Furthermore, lucerne was grown on marginal land on a larger scale in the GGR transect for subsequent sale at market.

This study demonstrated the important nutritional role of summer pasture off-take on renewing livestock condition for the period of winter food scarcity. Furthermore, by recording livestock parameters in transects differing in their degree of development, this study allowed the impact of developmental change on the livestock enterprise to be assessed and future trends to be predicted. Efficiency of various livestock production and reproductive parameters was higher in the KKH transect than in the GGR transect, reflecting the more advanced stage of development found along the KKH. Matching of feed resources with requirements led to greater output per animal. The reasons for the reduced animal numbers in the KKH transect may relate to a decreased need to store capital in livestock due to more awareness of other ways of saving. Decreased availability of labour for livestock tending in both summer and winter may also play a role. Finally, a reduced reliance on livestock as a source of income with increasing prominence of cash crops, such as potatoes, may have diverted effort away from livestock. Livestock are still regarded as an important component of the domestic subsistence economy in both transects. If livestock are to become a means of generating cash income, then issues of livestock product marketing and competition from external sources must be addressed.



Human and Economic Issues Associated with Livestock Production in the Northern Areas of Pakistan

Jürgen Clemens¹

Background

Livestock are an important component of rural livelihood strategies in the mountainous Northern Areas of Pakistan, where animal husbandry has traditionally been integrated into mixed crop-livestock systems also including irrigated farming and forest and rangeland utilisation. However, farm economies in this region are changing due to improved transportation facilities, education, access to markets, male off-farm employment, and activities of government programmes and non-government organisations.

Agro-pastoral management systems in the Northern Areas usually cover huge vertical ranges, from irrigated valley bottoms to montane and alpine rangelands, the latter used as common property resources. High-altitude summer pastures are frequently not used to their full potential. However, farms in the irrigated belt in the lower valleys are generally too small for self-sufficiency, so the land available for growing winter fodder is limited. Therefore, the main constraint to livestock productivity is scarcity of winter feed, causing the number of animals in the region to decline significantly during the cold season. Lack of labour for herding livestock is considered the second major constraint. Therefore, utilisation of certain alpine pastures has been reduced,

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and some animals are being stall-fed or grazed year-round near homesteads. Other strategies to decrease labour inputs to summer pastures include reduced herd sizes, joint management systems, and paid external labour.

Farming – especially growing potatoes – is now perceived to be the most important economic activity in the area. Conversely, products of the livestock sub-sector tend to remain within farm households, and this sub-sector appears to be little affected by increased accessibility to markets. In spite of increasing meat and milk demands within the region, only a few livestock owners have so far engaged in regular marketing of animal products. This situation further decreases the proportion of irrigated land committed to growing winter fodder for livestock.

Previous surveys of the total livestock population in the Northern Areas have generally indicated decreasing herd sizes per household – due to off-farm education and employment opportunities – and an increasing total livestock population – due to increases in human population and the fact that a minimum number of animals is required to meet household needs. However, the latter is not generally supported by recent estimates based on existing data on human population and individual livestock holdings.

The present project

This paper, based on a recent study of farm household economics carried out as part of the Agri-Karakoram Project, assesses the current status and trends of the livestock sub-sector in the Northern Areas of Pakistan – especially regarding total livestock population, herd composition, and economic importance of livestock – as well as issues pertaining to agro-pastoral management strategies and marketing potential. The study analyses within a wide socioeconomic framework current and predicted changes in the livestock sub-sector resulting from improved transport infrastructure and subsequent external commodity supplies, as well as better opportunities for education and off-farm employment. The approach consists of several steps, including assessment of existing secondary data, informal and formal surveys in sample villages, and in-depth interviews with experts and resource persons at different levels. Special focus was placed on farmers' own perceptions of the ecological, socioeconomic, and cultural frameworks of animal husbandry; which are important determinants of local management strategies. The goal of this adaptive research was to identify feasible and sustainable management interventions to improve livestock production.

In the six project study sites, farmers' own experiences and perceptions of herd size changes were analysed as an alternative source for assessment of livestock trends in the Northern Areas. Reasons offered by farmers for increases and decreases in livestock holdings show a clear correlation with labour availability. Respondents mainly attributed decreases to the lack of family members to tend animals or to the recent division of their fathers' joint households. Other important reasons for keeping fewer animals were disease; lack of fodder and grazing areas; and sale, slaughter, or natural death of animals.

Suggestions

The analysis of existing livestock data for Northern Pakistan shows both consistent trends and conflicting results, especially regarding overall patterns of the livestock

population. There also remain knowledge gaps with regard to the contribution of animal husbandry to overall farm and household incomes.

Thus far, gaps in human food production in mountain regions of the Northern Areas of Pakistan have been easily overcome by regular purchases of subsidised staple food supplies, such as wheat. Animal feed, however, cannot be obtained in sufficient quantities. Thus, there is a huge need for increases in cropping potential in the region to fulfil both human and animal demands. Successful strategies include the development and irrigation of additional land, as well as changing cropping patterns to increase the net area sown (this can be done through wider introduction of winter cereals, selection of more location-specific cereals and fodder crops, or use of multipurpose trees). However, farming communities have reservations about development interventions. More holistic approaches are needed that place special focus on farmers' perceptions, participation, capacity building, and integration into decision-making processes. This also holds true for sustainable utilisation of rangeland resources. Local communities are the major stakeholders in these natural resources, and their direct integration into the identification of priorities and the implementation of management strategies is a prerequisite for successful development activities. Thus, further recommendations for increasing rural incomes in the Northern Areas of Pakistan must be based on identification of economically and ecologically feasible management interventions and consideration of farmers' own priorities and capabilities.



The Changing Pastoral Systems of Balochistan, Pakistan: Endangered Migration

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Background

Balochistan, the largest province of Pakistan, stretches over 34.7 million hectares and comprises 44% of the country. Production potentials of Balochistan rangelands are low at 30-280 kg/ha/year. Under the prevailing harsh climatic conditions, these ranges do not produce enough forage to fulfil the needs of livestock year-round. This necessitates seasonal migration of flocks in search of food and water. Therefore, pastoralism is the main use of natural resources.

Over centuries, pastoralism has passed through various stages in response to the prevailing socioeconomic and environmental conditions. All pastoralists in this region probably originated as nomads. With the passage of time, socio-political advances in their communities combined with other forces (such as extreme weather conditions, water and feed shortages, and security threats) have changed migratory habits. Hence, a process of sedentarisation began among nomadic pastoralists, which led to the segregation of pastoralists into various groups – nomadic, transhumant, and sedentary.

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Nomadic pastoralists in Balochistan do not own land, and thus depend completely on livestock production on freely accessible rangelands. They roam year-round, following specific routes and patterns of migration with their flocks of 200-700 sheep and goats per household. These are primarily Afghan tribes affected by border closures and subject to extreme poverty.

Transhumant pastoralists are seasonally sedentarised. They have specific, seasonal camps in the highlands during summer. At these camps, they undertake rain-fed crop cultivation, from which they may derive up to one-third of their total income. Although their herd sizes, at 60-200 animals, tend to be smaller than those of nomads, their major income source is always animal production.

Sedentary pastoralists are transhumants that have permanently settled and do not practice any type of migration. Sedentary and transhumant flock sizes are comparable. Many of these communities have acquired valley bottom land and engage in horticultural tree cultivation, exploiting valuable groundwater through tube-well irrigation.

These pastoralist communities are currently undergoing remarkable transformations due to various socioeconomic motivations and compulsions. These encourage settlement of pastoralists, migration of landless farmers to urban areas for alternate employment opportunities, and most importantly, the breakdown or weakening of traditional pastoralist decision-making mechanisms that has probably accelerated possibly irreversible degradation of rangelands.

Results

This study investigates and documents the prevailing socioeconomic systems of pastoral communities and their recent trends in highland Balochistan under the influence of the following elements:

- the high rate of increase in human and livestock populations, and the consequent degradation of rangelands;
- government policies that have consistently encouraged underground water mining for value-added agriculture, particularly orchards; and
- the Afghan war, which blocked traditional migratory routes and caused an influx of refugees with animals.

Rapid rural appraisal surveys were conducted important components of which were transect walks, observations, gender aspects, mapping, and semi-structured interviews. Various characteristics of each pastoral community were explored to sort the communities into categories. These characteristics included major income and subsistence sources, feed resources for animals, livestock and lifestyle, migration, and social profile. Secondary information was then used to substantiate survey findings.

The results indicate that few traditional migratory or nomadic pastoralists now exist. Many of the remaining nomadic communities have adjusted to the socioeconomic changes and engage in more commercial enterprises, depending on the opportunities presented. Many are Afghan refugees and do not own flocks. Instead, during summer, they establish camps in the urban suburbs with access to good livestock markets. If these opportunists observe a downward trend in the daily market price of sheep, or if

they manoeuvre a good price deal, they buy a few animals, up to 20 at a time. Being a regular visitor of the market, they use their market intelligence to fetch good deals by interacting with those from the rural areas who have poorer knowledge of animal prices.

Many migratory groups, whether transhumant or nomadic, have been forced into low-wage jobs, as a result of extreme drought in the past several years. This has been exacerbated by excessive overgrazing due to high numbers of Afghan refugees moving into the province and the lowering of the groundwater table through tube-well irrigation, reducing the overall productivity of the rangelands.

Actions

In Balochistan, the sustainability of pastoralism, along with conservation of natural resources, must rank as a top priority at various decision-making levels to avoid sudden socioeconomic instability. This requires rehabilitation actions in partnership with all classes of pastoralists. While considering this study as a diagnostic one, the National Aridland Development and Research Institute (NADRI), in collaboration with its provincial partner institutions, has been looking at juniper forests as the entry point where all users of forests and rangelands could effectively be included in conservation and rehabilitation projects. Meanwhile, NADRI, in collaboration with the provincial Forest Department, has established nurseries to produce fourwing saltbush seedlings for large-scale plantations in degraded juniper zones. In the long run, fourwing saltbush would relieve grazing and fuelwood pressure on juniper forests.

In the first phase, over 0.5 million seedlings have been planted, with greater than a 90% success rate. To compliment this on-going rehabilitation programme, the International Centre for Integrated Mountain Development (ICIMOD) is sponsoring another study to identify secondary users and to focus on pilot migratory communities to be involved in future rehabilitation and management actions.



Balancing Pashmina Production and Wildlife Conservation In the Chang Tang of Tibet and Ladakh

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Background

The Chang Tang region covers a vast area of the Tibetan plateau, spanning 1,200 km in the Tibet Autonomous Region (TAR), China, and Ladakh, India. With an average elevation of 4,000-5,000 masl and an annual precipitation of less than 100 mm, it is one of the harshest inhabited places on Earth. Much of the region offers vital habitat for globally important wildlife species, such as blue sheep (*Pseudois nayaur*), Tibetan gazelle (*Procarpa picticaudata*), Tibetan argali (*Ovis ammon*), 'kiang' or Asiatic wild ass (*Equus kiang*), Tibetan antelope (*Pantholops hodgsoni*), black-necked crane (*Grus nigricollis*), wild yak (*Bos grunniens*), and snow leopard (*Panthera uncia*). Two of these

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species are endangered – snow leopard, prized for its pelt, and Tibetan antelope, rapidly being hunted to extinction for its fine underbelly hair. The Chang Tang is also home to the Changpa, some of the last truly nomadic people, who have increasingly found themselves at the fringes of modern development in a rapidly changing world.

In order to survive this areas' cold and harsh environment, herders have been rearing livestock here for thousands of years and have created a rich and unique pastoral culture. Although sheep and yak are important for producing the necessities of life in the Chang Tang, pashmina (cashmere) is the major source of monetary income. The Chang Tang provides ideal ecological conditions for fibre production, and thus produces some of the finest-quality pashmina and sheep wool in the world. The study areas in both Tibet and Ladakh have been well known for their high-quality pashmina goats for centuries, fetching increasingly higher, although volatile, prices in international markets.

Traditionally, Tibetan pashmina was traded or sold to Kashmir, India. However, in the 1960s conflict with India closed the border, and the Chinese government developed a monopoly on purchasing pashmina. An advantage of this is that the government is better able to control pashmina prices. However, more savvy local traders would prefer the option of trading on the open market, in order to capitalise on higher prices when they occur. Over the last three decades, pashmina production has increased, and the government has implemented programmes to improve breeding and winter forage availability, but these have met with limited success.

On the Ladakh side, pashmina is still sold primarily to Kashmir, although supplies are also taken across the border to Tibetan markets when prices are more favourable there. Local Changpas often find themselves at the mercy of Kashmiri middlemen, who exploit local herders by offering lower than market prices for their pashmina, or they trade for staples.

A severe shortage of winter pasture resulted from the border closure, exacerbated by an influx of Tibetan refugees and their herds. Thus the Changpas of Ladakh have become increasingly dependent on Indian government subsidies to supply them with feed, fodder, and veterinary services. Development interventions in this region have been largely unsuccessful due to their top-down nature and lack of understanding of the local socioeconomic realities and lack of political will to address the monopoly on pashmina held by Kashmiri traders.

Given its economic importance in the international fibre arena, and the conservation significance of the region where such fibre is produced, ICIMOD helped to support transboundary research regarding pashmina production and the ecological status of the rangelands upon which these animals depend. Both regions have great potential to develop, improve, and expand their pashmina production for the economic benefit of the local people, but this must be balanced with conservation initiatives. This poses challenges for the development of pashmina in these regions, although efforts are beginning to address this perceived conflict.

Results

Table 1 summarises and compares the major issues and findings across the two study areas. In general, both areas have experienced similar trends with regard to

pashmina production and conservation. However, important differences exist regarding infrastructure development, marketing, and access to social services, which are highlighted below.

Table 1: Major issues and characteristics of the two Chang Tang study areas in Rutok County, Tibet and Nyoma Administrative Block, Ladakh

Tibet – Rutok County	Ladakh – Nyoma Block
Government controls pricing of pashmina	Pashmina pricing controlled by traders
Education poor	Mobile schools and centralised boarding schools top priority to establish in near future
Transportation limited – poor road network	Good network of roads (except two villages)
Poor access to international markets for pashmina (controlled by government)	Poor access to domestic pashmina market
Exploitation by some traders but minimised by competition with government pricing	Stronger exploitation issue in Ladakh – no government pricing scheme
People lose subsidy for snow disasters if they sell privately (pay 10% tax and lose subsidies for improvements)	No penalty for private selling (of pashmina) – government gives subsidies regardless of markets
Health care major issue	Health care being addressed by Ladakh government
Livestock-wildlife conflicts problem	Livestock-wildlife conflicts problem
Changing socioeconomic patterns – more goats, increasing settlement	Changes in lifestyle – desire for settlement in some areas
Influx of Hui Muslims (with livestock and trading)	Influx of Tibetan refugees and their livestock
Wildlife conservation focus by government	Wildlife conservation focus by government
Winter pasture shortage – poor intervention by government	Winter pasture shortage – limited intervention by government
Conservation housed in Animal Husbandry Bureau – more closely linked with primary livelihood	Conservation housed in Department of Forestry – poor integration with Sheep Husbandry Department
Pasture management mandated to Animal Husbandry Bureau	Pasture development mandated to Department of Forestry – do not know what to do
Water management big issue	Water management big issue
Hunting of animals by Chinese Army, government officials	Army now involved in hunting control
Chinese Army not engaged in public works	Indian Army more involved in community development
Historical impacts of Cultural Revolution – low-lying areas converted to agriculture, loss of <i>Myricaria</i> shrublands	No major conversion to agriculture in low valleys (beyond traditional farming areas)
No feedbanks – focus placed on fencing and reserve pastures	Feedbanks established – concentrates transported from the Punjab
Yak dung used for fuel – impact on wood not known – need to identify trends	Now have cooking fuel throughout the Chang Tang
Solar lighting in almost all households	Solar lighting in almost all households
Some full ‘settlements’ established	Trying to provide new tents, no infrastructure for settlement
Low potential for eco-tourism due to restricted status of area	High potential for eco-tourism
‘Amchi’ (traditional healer) medicine still used but not supported by government – needs follow-up	Amchi medicine used and promoted
Top-down decision making at the county level	Supportive government structure for participatory development (Autonomous Hill Development Council)

Actions taken

Ladakh

During this project, it became apparent that several issues needed immediate attention. Among them are improving the nutritional status of the Changpa people and changing the migratory system to benefit children and the aged. There is also a need for pasture improvement and increases in available land and water resources. The top-down policy followed by the government in implementation of programmes to benefit the Changpas has proved ineffective in alleviating or mitigating herders' concerns. Therefore, planning at the grass-roots level is now being encouraged by the Ladakh Autonomous Hill Council.

Various stakeholders have taken the initiative to address issues identified during this study.

- The Ladakh Autonomous Hill Council has called meetings among stakeholder groups to identify research and development gaps and to promote better coordination among organisations, promoting a conservation ethic for the Chang Tang region.
- Plans have been proposed for improved boarding schools and mobile medical clinics.
- The Sheep Husbandry Department has initiated forage development in the Chang Tang area, using participatory planning methods from training programmes.
- infrastructure is still tremendously impaired, although much improved recently seen through government programmes.
- Development of a pashmina cooperative to promote local processing and marketing.

Tibet

Progress has been slower on the Tibet side of the border, mainly due to greater remoteness and lack of local staff to implement participatory planning exercises. However, the following has been achieved as a result of this study.

- Training of Ali Prefecture and Rutok County officials and government staff to build skills and ensure support.
- A small-scale study was conducted at the local level to gauge interest in one township community for an improved breeding scheme.
- The project and research results were publicised through the media, and copies of reports were provided to other organisations.

Pastoral Politics (Summary of Film)

Sanjay Barnela¹ and Vasant Saberwal¹

Background – the Gaddi and their lifestyle

Gaddi pastoralists have been herding goat and sheep in Himachal Pradesh, northern India, for many centuries. They migrate over distances in excess of 300 km between the alpine meadows of the high Himalaya in summer and the forests of the Siwaliks and lower Himalayan ranges in winter. There are currently approximately 100,000 Gaddi, and they earn their livelihoods through a combination of cultivation and herding.

Most disputes among the Gaddi are settled internally, without need of interference from outside. For example, if an animal from one herd strays into another herd (a common occurrence on the unfenced grasslands), the owner simply looks through the other herd, sorts out his animal, and takes it back to his own herd. This is facilitated by the unique earmarks put on each Gaddi herder's livestock and by the mutual trust among herders.

The sheep are sheared thrice a year. As payment, one sixteenth of the wool goes to the shearers. Owners also keep some wool for blankets, coats, and dresses, and the balance is sold. Wool is the single largest contributor to the Gaddis' income.

These herders begin their migration to summer pastures in May and make the return trip to winter pastures in October; they often move slowly, sometimes stopping for up to a month at various locations en route. On the way, they graze their animals along roadsides and in streambeds, as well as on Forest Department lands, village common lands, and pre-harvested privately owned grasslands. They are allowed to graze village commons and grasslands free of charge, and in return they pen their livestock at night on fallow fields belonging to villagers, providing them with valuable fertiliser. This custom of cooperation has existed for well over a century.

In both the summer and the winter pastures, the Gaddi have grazing rights to clearly defined grazing areas, and so each herder returns to the same grazing runs year after year. Nonetheless, obtaining sufficient winter forage is often problematic. This is due to a variety of factors. First, the expansion of cultivation into common pastures and forests has reduced the extent of the grazing grounds. Second, the Forest Department has closed a large number of forests to grazing on the grounds that Gaddi grazing is responsible for large-scale degradation. Third, there is a profusion of weeds, in particular *Lantana camara*, over much of the land grazed by the Gaddi in winter, again leading to an overall reduction in available forage.

Problem

The Forest Department is interested in raising Himachal Pradesh's forest cover to a minimum of 50%. This is seen as necessary for the purposes of improved water and soil conservation. Gaddi grazing is presumed to reduce forest regeneration, and is thus restricted on some lands. However, many people feel that there is a problem with the assumption that it is only tree cover that is capable of providing these environmental services. It is commonly accepted that vegetation such as grasses and shrubs are also capable of protecting the soil and conserving water, as long as there is adequate overall vegetation cover. Given such a position, the question that needs to

¹ Moving Images, New Delhi, India

be asked is not whether Gaddi grazing is leading to a reduction in forest cover; rather it is whether Gaddi grazing is leading to reduced vegetation cover (grasses and shrubs), and whether this reduction in vegetation is of a magnitude that will have a negative impact on soil and water conservation in the hills.

While there is little data to demonstrate a link between Gaddi grazing and vegetation cover in Himachal Pradesh, the winter forest areas, summer alpine pastures, and privately owned lands that the Gaddi graze all have abundant vegetation. Whether or not this is adequate to conserve soil and water resources remains to be seen.

Importantly, however, there are no data to support the other view – that Gaddi grazing is responsible for negatively altering the water and soil regime. In the absence of such data, the Forest Department's hostility to Gaddi grazing, prevalent for well over a hundred years, is something of a mystery. A variety of historians have suggested that this antagonism of the Forest Department has more to do with a dislike of their nomadic lifestyle than with concern for forest regeneration.

This feeling of the Forest Department, and many other people in India, that nomads are primitive and should be brought into the mainstream of society, has affected many young Gaddi herders, who now want to move into towns and take up other occupations. Other herders do not see a problem in continuing with their traditional occupation, and seek to continue herding. However, the seeds of division within the community are sown, and it remains to be seen how the Gaddi will respond over the next few decades.

Conclusions

The Gaddi have unsurpassed knowledge of the vegetation, seasons, and altitudinal zones in their area, and this has enabled them to carve out an ecological and economic niche for themselves within an intensely used landscape. Gaddi land use occurs alongside numerous farming communities, resulting in biomass production far greater than either the cultivation or herding systems are capable of generating on their own. By stymieing rather than encouraging traditional herding practices, the knowledge that allows such resource use is being lost. Simultaneously, a self-sufficient, highly distinctive, and trained community is beginning to move out of a traditional lifestyle but finds few opportunities in a highly competitive job market.

The Gaddi may choose to quit herding and begin alternative lifestyles, but they should make that choice willingly, not be forced into it by policies and an environment that are unsupportive of their current lifestyle. However, support is not likely to be forthcoming, if the Himachal Pradesh Forest Department is required to meet a target of 50% forest cover over the coming years. Can policies of the Forest Department be reformulated to be more inclusive of traditional forest users such as the Gaddi? Are we willing to conduct research to examine whether or not the Gaddi degrade the lands they graze, or will we continue to assume that irrational, primitive herding practices must make way for the dictates of scientific forestry? Will we assume that a marginal community must make way for the 'betterment of the nation' and that, in this age of fast-paced technology, we have nothing to learn from a traditional community that has been managing these lands far longer than the scientific foresters who call for their displacement?



Medicinal Plants within the Context of Pastoral Life in the Village of Pungmo, Dolpo, Nepal

Yildiz Aumeeruddy-Thomas¹, Yeshi Choden Lama², and Suresh K. Ghimire³

Background

Dolpo is a cultural area inhabited by the Dolpo-pa in what is today the administrative district of Dolpa, bordering the Tibet Autonomous Region (TAR) to the north, Mustang district to the east, and Jumla and Mugu districts to the west. Part of Dolpo has been incorporated into Shey Phoksundo National Park (SPNP), established in 1984 to conserve the unique trans-Himalayan ecology and biodiversity. The largest national park in Nepal, SPNP covers an area of 3,555 sq.km and is inhabited by about 3,000 people, whose livelihoods have been affected by the establishment of the Park. Political upheaval in TAR and the subsequent closure of the Tibetan border in 1959 also had major effects upon local economies and livelihoods in Dolpo, where the Dolpo-pa had had traditional rights to graze their cattle in Chang Tang, TAR. Since then, the Dolpo-pa have instead grazed their herds in pastures located in lower Dolpo or in the neighbouring districts of Jumla and Mugu.

Pastoralism in Dolpo dates back 1,000 years. Indeed, Dolpo is known to have been colonised in the seventh and eighth centuries by people from the ancient kingdom of Zhangzhung, located in western TAR. Studies conducted on pastoralism in Dolpo all confirm that the economy of the local agro-pastoralists is an intricate management system and way of life including integrated agriculture, pastoralism, and trans-Himalayan trade and based on the social dynamic of a communal regulatory system.

Pungmo is one of the major settlements of Phoksundo Village Development Committee, located in the upper part of lower Dolpo. Pungmo has 30 households and 159 inhabitants. There are two customary pasture areas of Pungmo village, Gunasa to the northwest and Pungphu to the north. Although not formally owned, these pastures are surrounded by landmarks recognised by all inhabitants of Pungmo and neighbouring villages. Medicinal plants in these pastures are mainly collected for health care, rather than trade. Culturally Tibetan, the Pungmo community depends upon subsistence agriculture, seasonal trade, and animal husbandry for their livelihood, with yak and yak-cattle crossbreeds ('dzo') constituting the main types of livestock.

The present project

Medicinal plants in Dolpo are crucial for both human and animal health. Since 1997, the WWF-Nepal People and Plants project has developed a systematic study of the medicinal plants of Dolpo, their roles in the local health system, and the status of the amchi (traditional healer) profession; aiming at supporting the conservation of medicinal plants in Dolpo and improving public health. The case study developed in this paper is the result of investigations by various researchers working within this programme during the last five years. It examines the interaction between medicinal plant use and pastoralism in the Dolpo region through a detailed example of pastures

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in Pungmo village, located inside SPNP. It focuses on how medicinal plant management is integrated into the overall life of a high pasture area.

This paper uses oral history to explore Gunasa pasture and the origins of Pungmo village. The relationship of this community with its high pasture areas is described by analysing local landscape names and geographical and religious landmarks. Particularly, we show how pastoral activities are intricately linked to cultural and religious worldviews, as well as to rituals and pilgrimage ceremonies. Pasture management is discussed in the context of the two customary institutions responsible for managing resources in Pungmo, the 'Yulgigothe' and the 'Dratsang'. Present rotational pasture management systems relating to overgrazing issues, including internal control systems, are also described. Finally, we discuss local knowledge related to the overall distribution and diversity of medicinal plants in Gunasa. Based on work during the last four years on medicinal plant management in Gunasa and a scheme developed by the WWF-Nepal People and Plants project in Dolpa, we discuss perspectives for medicinal plant management in relation to pastoralism.

Conclusions

The very large pasture areas available, along with a sophisticated rotational system, seem to have thus far ensured the maintenance in Gunasa of high-quality rangelands with diverse medicinal plants. However, after researching these species, it is clear that each species of medicinal plant reacts differently to different grazing pressures. For example, many species are perennial herbs, whose underground parts regenerate even though the upper part may have been grazed. Moreover, some species may be grazed less than others because of toxic chemical components or specific morphological characteristics, such as spiny leaves or twigs, which deter animals. The resistance of these medicinal plants to grazing may depend on the period during which they are grazed or trampled. No studies exist to date that have analysed in detail the reactions of particular medicinal plants to different grazing pressures and timings. In Gunasa, according to the amchis, no major species has yet been greatly decreased, although species such as *Nardostachys grandiflora* are found in the largest quantities in the most remote areas.

This paper attempts to place medicinal plant management in the overall context of pastoral life, seen here as a social unit. It stresses the need to fit any new management system into local social and cultural dynamics and to try to articulate these new management systems into the larger context – in this case, the overall management system of SPNP, for which two models are proposed. The Park, with its low number of guards and lack of precise knowledge about medicinal plants, cannot protect these species without a close association with the local people. This work also attempted to highlight the importance of man-environment relationships in this high pasture area, as well as in many other areas in Dolpo and throughout the Himalayas. Such landscapes can be interpreted as cultural landscapes, carved over time during the very long process of interaction among societies, livestock, and the environment.



Community-based NRM among Kazakhs In the Tian Shan and Altay Shan Mountains of Xinjiang

Tony Banks¹

Background

Most of Xinjiang's fertile rangelands, and the majority of its 1.2 million mobile pastoralists, are found within Yili Kazakh Autonomous Super-prefecture. Starting in Yili Valley in the central Tian Shan mountains, the super-prefecture stretches north along the Kazakhstan border to the Altay mountains of northern Xinjiang. Virtually all of the rangelands in the region are utilised on a seasonal basis and are considered winter, spring/autumn, or summer range. Although some 80% of pastoral households in Xinjiang have been officially 'settled', settlement has not changed the essential seasonal migratory patterns.

In 1984, communes were de-established in Xinjiang, and legal and regulatory frameworks for pastoral tenure have evolved since. Contemporary rangeland policy in Xinjiang emphasises the assignment of rangeland use rights to individual households and the establishment of exclusive rangeland boundaries via fencing. Stocking rates for individual household pastures are to be derived, monitored, and enforced by Grassland Supervision Stations, run by the Animal Husbandry Bureau.

There are, however, exceptions to the rule of individual household use rights. One of the key characteristics of contemporary pastoral tenure in Xinjiang is the persistence of group tenure arrangements, which are usually established on a kinship basis. The origin of these pastoral groups dates back to 1985, when commune rangelands were initially distributed to small groups of households, rather than to individual households.

A second key feature of pastoral tenure is the presence of fuzzy boundaries. There has been virtually no fencing of rangeland boundaries in Xinjiang. Instead, monitoring and enforcement of boundaries is undertaken through direct observations and actions by community members in the field.

Although rangeland policy prescribes to Grassland Supervision Stations the tasks of calculating and enforcing stocking rates for household pastures, these tasks remain incomplete. In Yili Prefecture, for example, stocking rates for household pastures have yet to be calculated. In Altay Prefecture, stocking rates have been ascertained and are specified in households' grassland use contracts but are not monitored or enforced.

Results

The focus of this paper, based on extensive fieldwork in Yili Kazakh Autonomous Super-prefecture, is on the institutional arrangements governing rangeland use, with a particular focus on pastoral arrangements. This paper first describes the *de facto* institutional arrangements found in the field, drawing extensively from pastoralists' own explanations for these arrangements. It then attempts to explain these arrangements in terms of the social and economic benefits they generate for pastoralists and to briefly evaluate deficiencies in these arrangements from a resource management perspective.

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During discussions with pastoralists, the following four social and economic objectives underpinning contemporary pastoral tenure were identified: 1) minimisation of exclusion costs; 2) realisation of economies of scale with respect to herd supervision; 3) provision of social insurance via equal access rules; and 4) abatement of environmental risk.

- 1) Exclusion activities at the village and group pasture level are subject to economies of scale, and collective ownership of pasture facilitates the capturing of these economies. Exclusion from village pastures during seasons of non-use is achieved by the collective placing of 'grassland protector' households in different seasonal pastures year-round.
- 2) Because pastoral households graze different types of livestock in different pastures at the same time of year; and simultaneously cut hay, cultivate crops, and herd livestock in pastures over one hundred kilometres distant; spatial demands for labour are high. These households must thus economise their labour expenditures.
- 3) Two main characteristics of pastoral tenure in the case study region help guarantee households access to pastoral resources. First, the area of pasture to which the household is entitled remains based on the households' population and labour force in 1985, despite the polarisation of household herd sizes (and wealth) since decollectivisation. Second, access is facilitated by group tenure arrangements, which guarantee member households (and their offspring) access to all group pasture.
- 4) There is considerable climatic variability in the Yili Kazakh Autonomous Super-prefecture, and extreme climatic events, such as prolonged droughts or severe snowstorms, periodically occur. This induces a relatively high degree of variation in the spatial and temporal distribution of accessible forage in the region, and thus exposes pastoralists to a significant degree of environmental risk. The pastoral tenure system must thus help to facilitate the abatement of this risk.

Recommendations

Win-win institutional change, both preserving the benefits associated with existing institutional arrangements and remedying their deficiencies, should be the intermediate goal of rangeland policy. The household ranch model is incompatible with this goal in the context of contemporary Yili Kazakh Autonomous Super-prefecture. Given the absence of alternative proven models, what is required is a learning-oriented, experimental, and participatory approach to institutional change. The practical implication is that more pilot projects are needed that address pastoral tenure and natural resource management issues. The strengthening of existing group tenure arrangements constitutes one potentially promising pathway to institutional improvement.