

# 4

## Human and Economic Issues Associated with Livestock Production

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### Introduction

Livestock form an important component of rural livelihood strategies in the mountainous regions of northern Pakistan. Different spheres of the farm economy and their integrated cropping-livestock systems – ‘mixed’ (Rhoades and Thompson 1975), ‘combined mountain agriculture’ (Stöber and Herbers 2000), or ‘mixed crop-livestock farming systems’ (Tulachan 2000) – are linked interdependently with one another. The Farm Household Model developed by FAO (1993) provided the framework for this study. This model focuses on physical or monetary resource flows, such as draught power and dung as agricultural inputs, fodder crops or crop residues as feedstuffs, or animal products as outputs for consumption and income generation. It also stresses the interdependence of the ecological, socioeconomic, and social settings. A simplified model for the Himalayas also distinguishes between subsistence farming systems and easily accessible areas with higher degrees of commercialisation (Tulachan 2000).

This chapter reports the results of a study of farm household economics carried out as part of the Agri-Karakoram Project. The study analysed 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. These changes are discussed within the wider socioeconomic framework.

The study focused particularly on farmers’ perceptions of the livestock sub-sector, since the indigenous perception of the ecological, socioeconomic, and cultural framework of animal husbandry has been recognised as an important determinant of local management strategies. Understanding such indigenous perceptions also contributes to the success of rural development interventions (see Waters-Bayer and Bayer 1994; Tulachan and Neupane 1999). In combination with quantitative surveys, the integration of qualitative issues and participative tools provided additional insight for assessing the potential and constraints of the local livestock subsystem. The aim was to produce information that, in conjunction with the information presented in Chapters 2 and 3, would help to identify appropriate management interventions for forthcoming development

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activities in close co-operation with regional development institutions and the local communities.

## **Methods**

The study involved several linked phases and methods. Existing secondary data, scientific literature, and consultancy reports were reviewed. An exploratory study was carried out in each of the six study villages (see Chapter 1 for details of the project design). This relied on rapid rural appraisal techniques such as interviewing key informants and transect walks. This was followed by a baseline survey of approximately 40-60 households in each of the study villages in which data were collected on household size, numbers and types of animals, land area, cropping patterns, and marketing of crop and animal products. A more detailed survey of approximately 20 households per village (sampled to be representative of herd size) was also carried out to collect information on farmer perceptions, and more detailed information on the economic importance of livestock within the farming system. These 20 households per village included those used in the study of livestock performance and fodder interactions (Chapter 2).

## **The livestock sub-sector – recent trends**

Previous surveys of the livestock population in the Gilgit Region of the Northern Areas of Pakistan have mostly indicated decreasing herd sizes per household and an increasing total livestock population. Generally two major reasons are given for the total increase: the growth of the human population and the families' strategy of keeping a minimum number of animals for their own needs and as an asset for emergencies. Decreasing individual herd sizes are driven by the households' response to changes in the off-farm sectors, such as off-farm employment and education (Streefland et al. 1995).

However, recent information on the livestock population provides no clear impression of general trends for the last 25 years in the Gilgit region, and figures are not readily available from existing sources for the total livestock population. Only indirect estimates of the livestock population are possible, based on the trends of the rural population and individual livestock holdings. Table 4.1 shows data for the human population and estimates of the livestock population for the Gilgit region. The estimates of the livestock population for 1998 are calculated from the actual number of households in the human population census data, and information on the herd size per household taken either from the 1996 government livestock survey (Estimate 1) or from an economic survey for 1997 by the Aga Khan Rural Support Programme (AKRSP; Estimate 2). The alternative estimates of the total livestock population in 1998 indicate either an increase of 88% or a decline of 12% from 1980, against an increase of the rural population of 55%. The large differences in the estimates of the livestock population probably result from the fact that the different data sources use different definitions and methods of data processing. The government livestock census primarily presents data for households that rear particular kinds of animals and disregards households not reporting particular species; thus the animals per

household value used for Estimate 1 is much higher than that used for Estimate 2. This means that it is difficult to get sound estimates of the total livestock population.

**Table 4.1: Human and livestock populations in the Gilgit region (Gilgit and Ghizer districts), 1980 to 1998**

	1980	1998	% change
Human population (rural areas)			
Total	197,775 <sup>1</sup>	296,699 <sup>2</sup>	+55.0
Number of households	25,380 <sup>1</sup>	36,111 <sup>2</sup>	+42.3
Livestock population			
Animals per household	23.4 <sup>3</sup>	31.1 <sup>4</sup> (Estimate 1) 14.5 <sup>5</sup> (Estimate 2)	+32.7 -38.0
Total animals	593,892 <sup>3</sup>	1,114,859 <sup>4</sup> (Estimate 1) 523,610 <sup>5</sup> (Estimate 2)	+87.7 -11.8

<sup>1</sup>1981 data; <sup>2</sup>census data; <sup>3</sup>GoP (1983) <sup>4</sup>based on 1996 government livestock survey data; <sup>5</sup>based on Aga Khan Rural Support Programme 1997 economic survey

Individual case studies have also been conducted. Kreuzmann (2000) gives an example of the general decline of individual herd sizes in Hunza in the context of socioeconomic changes. More case studies are given in Ehlers and Kreuzmann (2000). Case studies, however, do not cover a wider regional level, and indirect assessments and further empirical fieldwork are still needed.

The farmers' own perceptions of changes in their herd sizes were studied for the six study villages of the Agri-Karakoram project. The farmers' perceptions, however, also show great variation (Table 4.2).

Overall, most farmers surveyed in 2000, especially those living along the Gilgit Ghizer Region (GGR) transect, indicated that they had reduced or maintained their livestock numbers within the previous five years. However, the majority of farmers in the transitional cropping zones (Minapin and Gahkuch-Bala villages), with the potential to grow a second crop at least every second year, and in Morkhun, the single-cropping village of the Karakoram Highway (KKH) transect, reported increasing the number of animals they kept, although it is not possible to generalise about changes in the different cropping zones with only two villages surveyed per zone.

**Table 4.2: Changes in herd size – farmers' perception<sup>1</sup>, 1995-2000**

Change in livestock numbers	Percentage of households	
	Overall	Range
Less	48.1	30.4 - 76.2
Same	12.4	4.6 - 21.7
More	38.8	9.5 - 59.1
No definite answer	0.8	0.0 - 4.8

<sup>1</sup> Based on the question: Does your household now own more or less animals than 5 years ago?

Labour availability was the most common reason given to explain decreases in livestock numbers. More than 20% of respondents attributed decreases mainly to the lack of people within their families for tending animals (rank 1); recent division of the father's joint household was another important factor (rank 7). Nüsser and Clemens (1996) and Kreutzmann (2000) also identified lack of labour as a factor related to keeping less livestock. Other important reasons for keeping fewer animals were disease (ca. 15%), lack of fodder and grazing areas (ca. 13%), sale of animals (ca. 12%), and slaughtering and natural death of animals (each ca. 10%). Respondents with increased livestock numbers generally attributed such increases to the animals' natural reproductive output (rank 1; 50% of all answers); about 13% of the respondents pointed to increased fodder supplies, supplemented by more awareness of, and personal interest in, livestock rearing (ca. 9%) both of which hint at a more rational farming approach. Increased needs of bigger families were of minor importance (ca. 7%).

At the regional level, existing data suggest that the percentage share of all cattle including yaks and yak-cattle crossbreeds (dzo and dzomo) in total livestock holdings nearly doubled between 1976 and the mid-1990s, and total livestock holdings also increased. The mean number of cattle per household was relatively stable, however, (with some variation among the different data sources) but there was a decrease in total herd sizes per household with fewer goats and an even more significant decline in the number and percentage share of sheep. Recent development activities have sought to change the latter trend and convince farmers to replace goats with sheep, since sheep are considered to have less grazing impact on natural pastures and forests.

The changes in favour of cattle are generally attributed to the higher labour demand of goats and sheep with regard to grazing and herding activities. At the same time, recent development activities have promoted the permanent keeping of smaller numbers of more productive dairy cows around the farmers' homesteads instead of sending animals to high pastures (see below). A similar situation of more livestock but fewer animals per household has been reported for the Nepali and Indian Himalayas recently, with a significant increase in the number of dairy animals, and especially improved Jersey crossbred cows, in those valleys with good access to markets (Tulachan and Neupane 1999).

A recent report on Gahkuch-Bala based on information given by local farmers also indicated an increase from 15 to 47% in the proportion of cattle, and decrease from 60 to 30% of goats in the overall livestock holdings (Ahmad et al. 1998).

The mean total herd size in the present study varied between 7 and 42 animals per household (Table 4.3). Livestock numbers did not show clear patterns between transects and zones. Cattle outnumbered goats and sheep in both the transitional zone villages Minapin and Gahkuch-Bala; goats were still dominant in three villages; and sheep holdings per household were generally lower than those of cattle with the exception of Morkhun, where sheep outnumbered both goats and cattle. Many households kept no sheep. The major extremes occurred along

the KKH transect, which showed the largest and smallest herds as well as the highest and lowest shares of goats. However, interpretation and generalisations of herd sizes must also consider factors other than altitude and accessibility, such as fodder and pasture resources, grazing and management traditions, and off-farm influences.

	Double cropping zone	Transitional zone	Single cropping zone
GGR transect	Bargo-Bala	Gahkuch-Bala	Darkot
Cattle	4.3	7.8	4.9
Yaks and crossbreeds	0.0	0.0	0.1
Goats	8.7	5.4	9.5
Sheep	0.9	2.5	2.7
Total	13.9	15.7	17.2
KKH transect	Bunji	Minapin	Morkhun
Cattle	6.3	3.2	4.0
Yaks and crossbreeds	0.0	0.1	1.0
Goats	30.5	2.9	12.1
Sheep	5.1	0.9	13.2
Total	41.9	7.1	30.3

Farmers generally perceived cows and bulls to be their most important animals (Table 4.4), although they only comprised 13 to 40% of the total numbers. These perceptions relate directly to the reasons for keeping livestock (Table 4.5). By far the most important reasons for keeping livestock were the production of milk, butter, and dung. Keeping animals to provide transport was more important in the more remote GGR transect than in the KKH transect, which had a better road infrastructure.

Around half of farmers (52.7%) indicated they had a surplus of animal dung, while around 40% had insufficient supplies for their crop production. In some villages with easy access to summer field settlements and high pasture corrals, animal dung is even brought down to the cultivated land by tractor and trailer, jeeps, or donkeys. However, only a quarter of farmers in the survey sold or exchanged surplus dung, and only two (8.5% of those surveyed) bought animal dung from others (Table 4.6). Thus, there appears to be a very limited market for animal dung; additional fertiliser demands are generally met by purchasing chemical fertilisers. The percentage of fertiliser users was highest in those villages with the highest percentage of farmers who grew potatoes as a cash crop (Minapin, Morkhun, and Darkot) (Table 4.7). In general, wheat and potatoes received the highest fertiliser inputs, from either animal dung or chemical fertiliser.

**Table 4.4: Farmers' perceptions of the most important livestock species (% of households in which each species is important – multiple answers possible)**

	Double cropping zone	Transitional zone	Single cropping zone	Overall
<b>GGR transect</b>				
Cows	91	91	67	83
Bulls	9	18	38	22
Goats	45	9	38	31
Sheep	5	9	19	11
Donkeys	41	45	43	43
Yaks/crossbreeds	0	0	0	0
All species	0	0	5	2
No species	5	0	5	3
<b>KKH transect</b>				
Cows	62	90	83	78
Bulls	10	0	0	3
Goats	57	20	13	30
Sheep	5	0	13	6
Donkeys	29	40	0	22
Yaks/crossbreeds	0	5	17	8
All species	0	0	4	2
No species	0	0	0	0
<b>Both transects</b>				
Cows	77	90	75	81
Bulls	9	10	18	12
Goats	51	14	25	30
Sheep	5	5	16	9
Donkeys	35	43	20	33
Yaks/crossbreeds	0	2	9	4
All species	0	0	5	2
No species	2	0	2	2

In addition to the irrigated land, all study villages had access to other productive areas, such as pastures, forests at different altitudes, and irrigated areas at higher altitude summer settlements. Donkeys were still the major means of transporting farming goods like seed, fertiliser, crops, residues, or fuelwood between these areas. Many households still relied on animals for transport to some extent. However, recent road construction projects to higher settlements, such as the Boibar Valley above Morkhun, have reduced the importance of animals for transport; none of the farmers surveyed in Morkhun kept animals for transport.

**Table 4.5: Reasons for keeping livestock (% of households - multiple responses possible)**

	Double cropping zone	Transitional zone	Single cropping zone	Overall
<b>GGR transect</b>				
Milk	95	100	90	95
Butter	36	23	19	26
Meat	23	23	24	23
Draught power	0	9	24	11
Transport	9	18	33	20
Fibre	9	0	14	8
Dung	91	91	86	89
Income	0	0	0	0
Tradition	0	0	0	0
Other reasons	0	0	0	0
<b>KKH transect</b>				
Milk	95	80	61	78
Butter	48	20	9	25
Meat	14	5	22	14
Draught power	0	0	0	0
Transport	10	25	0	11
Fibre	5	0	13	6
Dung	62	85	87	78
Income	19	5	22	16
Tradition	0	15	17	11
Other reasons	0	10	4	5
<b>Both transects</b>				
Milk	95	90	75	87
Butter	42	21	14	26
Meat	19	14	23	19
Draught power	0	5	11	5
Transport	9	21	16	16
Fibre	7	0	14	7
Dung	77	88	86	84
Income	9	2	11	8
Tradition	0	7	9	5
Other reasons	0	5	2	2

**Table 4.6: Percentage of households trading various agricultural and livestock products**

	GGR Transect			KKH Transect		
	Double cropping Bargo	Transitional Gahkuch	Single cropping Darkot	Double cropping Bunji	Transitional Minapin	Single cropping Morkhun
Sold livestock	35	23	46	38	42	30
Bought livestock	17	36	21	25	15	11
Sold milk	0	0	0	0	0	0
Sold butter	6	12	18	15	12	11
Sold dung	8	0	16	10	0	0
Bought dung	4	0	5	0	2	2
Sold straw	10	0	14	5	15	13
Bought straw	12	16	33	3	12	11
Sold lucerne	62	17	6	15	15	13
Bought lucerne	17	17	17	23	12	11
Sold fruit	59	77	0	20	88	78
Sold vegetables	54	16	0	13	85	76
Sold potatoes	29	8	54	0	93	83

**Table 4.7: Use of animals and tractors for draught power and use of chemical fertilisers (% of households)**

	Double cropping zone	Transitional zone	Single cropping zone	Overall
<b>GGR transect</b>				
Animals used for ploughing	50	95	95	80
Tractor hired for ploughing	36	4	19	20
Tractor hired for threshing	82	86	62	77
Chemical fertiliser used	41	18	76	45
<b>KKH transect</b>				
Animals used for ploughing	71	30	9	36
Tractor hired for ploughing	33	85	100	73
Tractor hired for threshing	81	85	100	89
Chemical fertiliser used	46	95	100	81
<b>Both transects</b>				
Animals used for ploughing	60	64	50	58
Tractor hired for ploughing	34	43	61	46
Tractor hired for threshing	81	86	82	83
Chemical fertiliser used	44	55	89	77

Increased mechanisation has slowly replaced bulls and oxen for draught power over the last decades (Pilardeaux 1998). However, more than half of all households, and almost all households in the more remote parts of the GGR transect, still reported using animals for ploughing. Complete substitution of tractors for draught animals is unlikely even in villages with easy road access because the availability of tractors is not assured all year round. In remote parts of the villages, and at summer field settlements at higher altitudes, fields cannot be ploughed by tractors at all. Furthermore the cropping patterns often do not allow access for tractors – e.g., if the first crop of barley is already harvested and surrounding fields still have a standing crop of wheat or maize. However, mechanised threshers have substituted most of the animal power inputs during the post-harvest work, at least for wheat and barley at accessible sites (Table 4.7). Although draught power and transportation were still provided by bulls or donkeys in many cases, many households did not actually keep male animals, preferring to borrow those of neighbours or relatives for breeding and other purposes. Only in the most remote villages in the GGR transect was draught power given as a reason for keeping livestock (Table 4.5).

### Land holdings and cropping patterns

In mixed mountain farming systems, both human livelihoods and livestock rely heavily on irrigated farming and integration with cropping. The size of individual landholdings is also important. The average size of landholdings in each of the six study villages is shown in Figure 4.1. Saunders (1983) estimated the area of land required for self-sufficiency in the double cropping zones of the Northern Areas of Pakistan to be 1.5 to 2 hectares, and in the single cropping zones to be 2.5 to 3 hectares, using some general assumptions such as a mean household

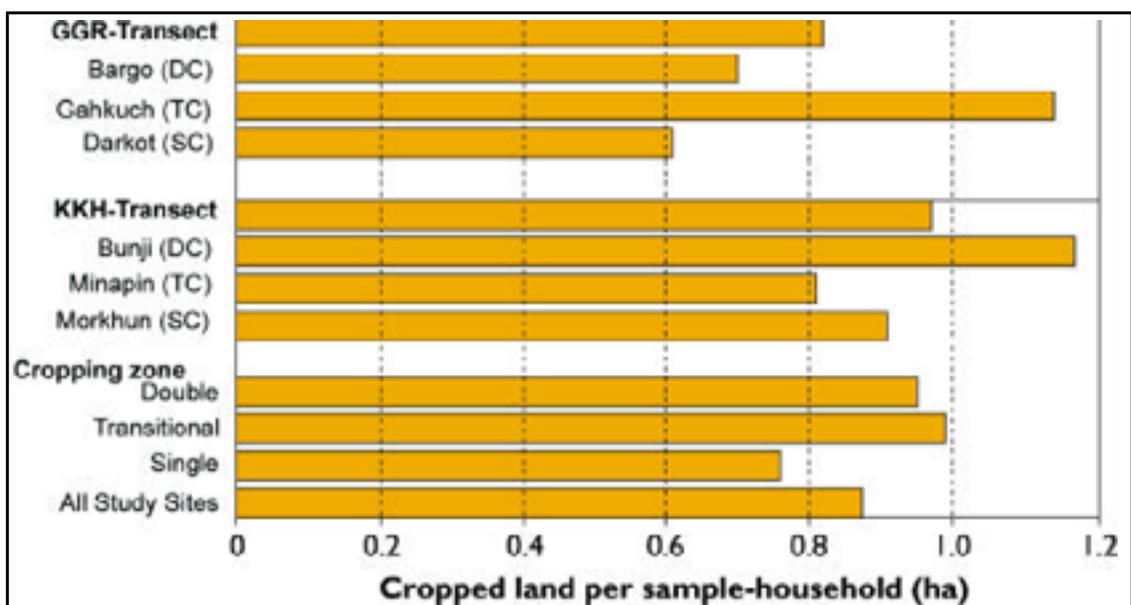


Figure 4.1: Mean area of cropped land (first and second crop) per sample household (2000) (DC = double cropping zone; TC = transitional zone; SC = single cropping zone)

size of seven to eight persons, careful intensive husbandry, reasonably fertile soil, current management practices, and a moderate living standard. In general, the average landholding per household did not reach those levels even in the double cropping zone. Only a few farming households had enough land to be self-sufficient, with most relying heavily on external supplies of staple foods such as wheat and wheat flour. These are provided by government supply structures at subsidised rates, at least to government warehouses at regional administrative centres. Not only are landholdings small, they are also frequently fragmented as a result of population growth and inheritance traditions.

The cropping patterns in the study villages reflected major changes from previous subsistence farming systems caused, among other reasons, by the assured supply systems for staple foods. For Darkot, Minapin, and especially Morkhun, the cultivation of potatoes as a cash crop has only been made possible through the improved road access that provides both subsidised food supplies and the marketing facilities for table and seed potatoes sold to the markets of ‘down country’ Pakistan. The increased cultivation of potatoes as opposed to cereals has, however, led to lower animal feed resources, as these are traditionally derived from crop residues – potato crops do not produce by-products suitable for animal feed. This was partly compensated for by development of previously barren land with new irrigation schemes providing a potential especially for growing leguminous fodder crops such as lucerne, as seen in the villages of Morkhun and Minapin (Figure 4.2).

Not all irrigated land was cropped, especially in the transitional zone villages Minapin and Gahkuch during the second crop season. Different reasons were

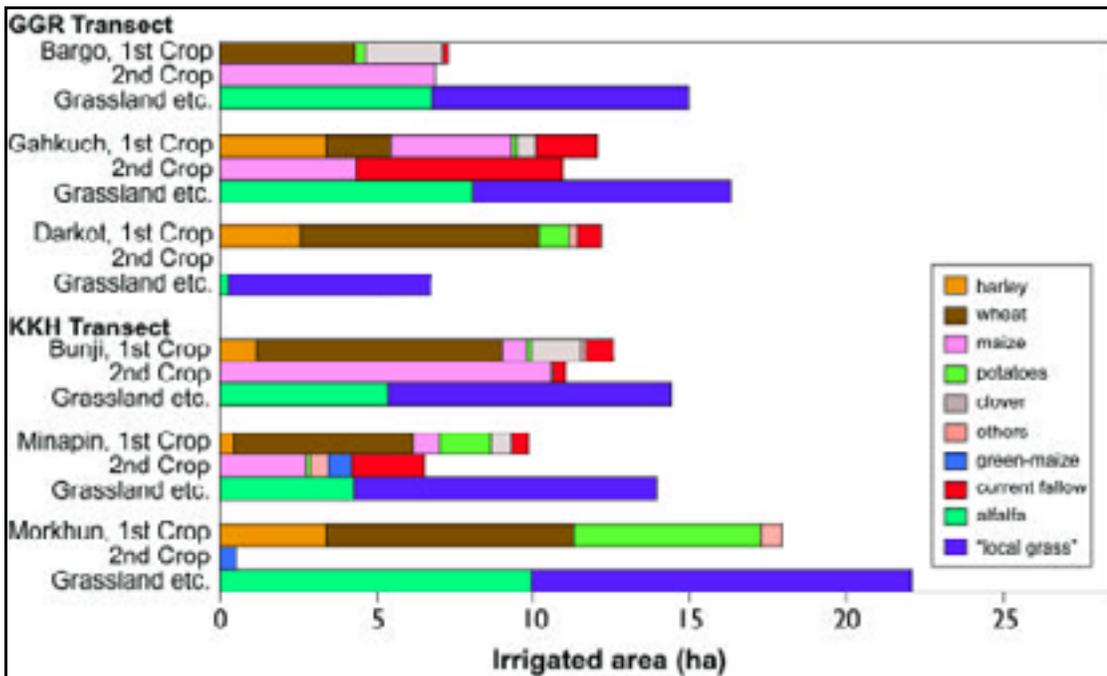


Figure 4.2: Cropping patterns in the study sites (2000); areas reported are for 20 households

given by farmers for leaving land fallow. These reflected crop rotation patterns and the availability of water for irrigation, as well as farmers' changing attitudes and preferences. In the transitional zones, a second crop of maize is only possible after a first crop of barley, which has a short growing period. If wheat or potatoes are the first crop, land must be left fallow for the rest of the growing season. Equally, the second-crop potential was often limited by the scarcity of irrigation water, for example in Gahkuch. Growing of buckwheat, at least as a catch crop, has been reduced drastically due to labour shortages and to the availability of year-round supplies of wheat, which is the primary bread-making cereal. Only a limited area of green-maize, which is often sown as a catch crop for animal feed, is grown (Figure 4.2).

These patterns of land use are generally similar to those found in several other studies of the changing farming systems in the Northern Areas of Pakistan (Khan and Khan 1992; Kreuzmann 1993; Nüsser and Clemens 1996; Streefland, Khan, and Lieshout 1995).

### The economics of the livestock sub-sector

The farmers' perceptions of the importance of livestock to household income are shown in Figure 4.3. Respondents considered farming in general, and in the upper parts of the KKH transect the marketing of potatoes in particular, as their most important source of income. This reflects the direct cash income, for example, from potatoes, as well as the important production of staple crops, such as wheat and maize for human consumption and crop residues for the winter feeding of animals. The second most important source of income was cash income from off-farm employment. Income from livestock was ranked third, followed by seasonal labour, running a business (e.g., a general store), and income from pensions. Most of the households sold animals and animal products only occasionally (see below). The survey probably underestimates the indirect income, in kind, from livestock.

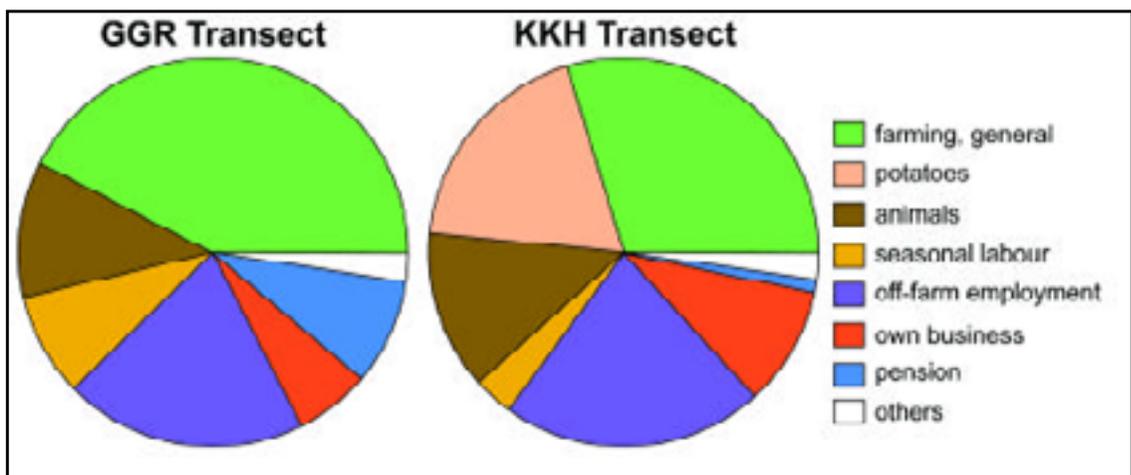


Figure 4.3: **Farmers' perceptions of important sources of income. Based on the question: Which source of income (cash or kind) is the most important to your household? Multiple answers possible.**

The data from AKRSP's Farm Household Income and Expenditure Survey for 1997 indicate that when assessed both in cash and in kind, the biggest contribution to total farm income in the Northern Areas is actually from livestock. Livestock's share of the total farm income ranged at the regional level from 37 to 43%, compared to crops and vegetables with 32 to 36% (AKRSP 2000). The income from livestock had increased from 22 to 33% of gross farm outputs and from 7 to 29% of net farm income compared to earlier surveys (Bhatti et al. 1994, data from 1991; Malik 1996b, data for 1994). The data from the 1997 survey did not show large differences between socioeconomic groups in terms of main source of income. Wealthier groups earned about 43% of total farm income from livestock, compared to 36% for the bottom quintile (AKRSP 2000). The AKRSP data also showed that most animal products and services remain within the individual farm economies: only 10% or less of these products were sold (Malik 1996b).

Between 23 and 46% of farmers in the villages in the present study sold at least one animal in 1998/99 (Table 4.6). Most goats and sheep were sold in late summer after fattening, during winter, or in cases of financial crisis (Figure 4.4). The percentage of households selling livestock was not related to the ease of access to markets or road infrastructure (Table 4.6). The lowest percentage of farmers selling livestock was in Gahkuch, close to Gahkuch Pain, the administrative headquarters of Ghizer district, while the highest percentage was in Darkot, the most remote village in the study.

Fewer households sold livestock products than sold animals; butter was only sold regularly by 12% of the sample households. Most butter is kept for fresh consumption or stored (for several years) for family ceremonies such as marriages and funerals. None of the surveyed households sold fresh milk; milk is sold in other villages, but fresh milk sales are insignificant at the regional level.

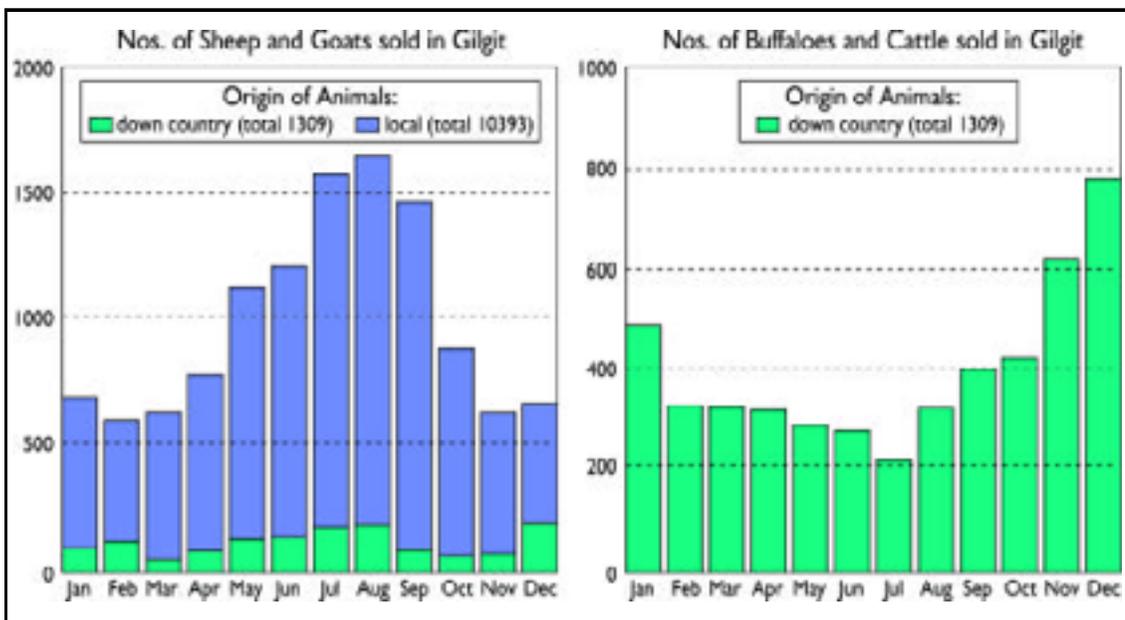


Figure 4.4: Livestock sales and external inflow of animals to Gilgit town (1998). Source: Malik (undated). Down country = Pakistani lowlands

Many households fill supply gaps (quantitative or seasonal) by purchasing UHT milk packs or milk powder brought to the Northern Areas from the Pakistani lowlands (Dietrich 1998).

Meat supplies at the local and regional levels are important triggers of livestock economics and the individual households' economies. Meat is not a regular component of family diet in the villages (Herbers 2000). It is mostly consumed during autumn and winter after slaughtering some of the households' own animals or as dried meat over winter. The tradition of 'nasalo', slaughtering before the winter and preserving the meat, is common all over northern Pakistan (Snoy 1993; Nüsser and Clemens 1996; Herbers 2000). Meat is also eaten at family ceremonies such as marriages or funerals; small ruminants, preferably goats, are kept for this purpose.

Despite the generally low demand, there are still gaps in the meat supply in the Northern Areas which might be explained by the demand from the army, the increasing human population, or (until 1990) increasing numbers of tourists. The number of slaughtering places for buffaloes in the Gilgit bazaar increased from 2 in 1985 to 15 in 1990 (Kreutzmann 1993). But as a result of the lack of marketing structures for locally produced livestock, most of the meat demands are met by imports of live animals from 'down country' as well as by animals smuggled from Afghanistan (this study; Kreutzmann 1996 for Chitral) or China. Overall, the policies and structures at different levels discourage marketing of local livestock. From 1974, the national government's subsidy policies for grain and fuel encouraged the transport of live animals and animal products towards the mountains and not vice versa (World Bank 1990); animal products accounted for around one-third of all goods arriving in Gilgit at the beginning of the 1990s (Khan and Khan 1992). Cull water buffaloes from 'down country' are brought to market places of the Northern Areas by traders, especially from the North-West Frontier Province of Pakistan and the imported animals are slaughtered by local butchers. The meat prices are generally fixed by the local administration in favour of urban customers, the fixed beef prices (50-60 Rupees per kg in 2000) undercut those of locally produced meat, especially mutton (90-100 Rupees per kg). In 1998, nearly 4,800 water buffaloes and lowland cattle were sold in Gilgit Town (Malik undated). Imports are highest in winter, when the meat consumption of the local population (but also the availability of locally produced animals) is traditionally the highest (see Figure 4.4). Imports of live animals are also common in other parts of northern Pakistan, for example in Baltistan (Allan 1998) and Chitral (Dittmann and Nüsser 2002).

### **Constraints to livestock productivity**

Farmers were asked for their views on the major problems of keeping livestock. Lack of fodder, especially for overwintering of animals, was perceived as an important constraint to livestock production and productivity (Figure 4.5). However, traditional management strategies had been developed to adjust herd size according to the available fodder supplies, such as the sale of animals during

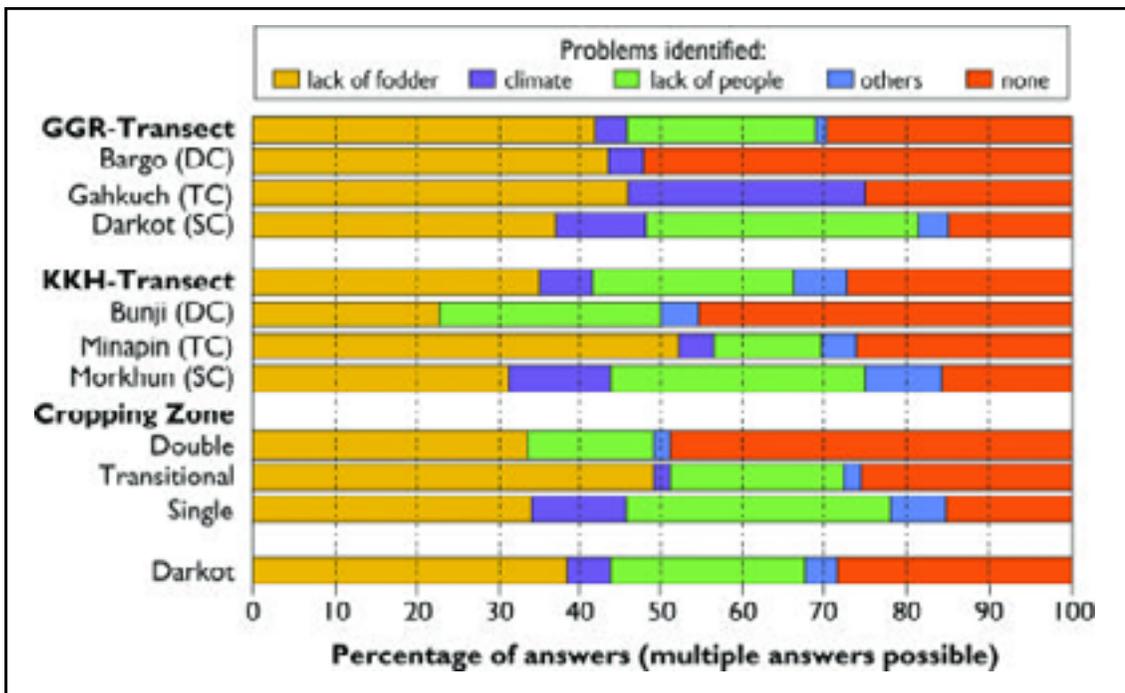


Figure 4.5: **Farmers' identification of major problems of keeping animals. Based on the question: What are the major problems of keeping animals according to your own experience? Lack of fodder includes insufficient grazing areas; other includes losses through predators** (DC = double cropping zone; TC = transitional zone; SC = single cropping zone)

autumn or slaughtering at the beginning of the winter (the 'nasalo' tradition, see above).

The quantitative measurement of fodder supplies and requirements in this project (Chapter 2) supports this view and agrees with previous findings of quantitative and qualitative fodder gaps in the Northern Areas, especially during winter and spring (e.g., Wardeh 1989).

Even so, almost 60% of the farmers in the six study villages actually assessed their fodder resources as being in surplus (Table 4.8). However, there are only limited sales of locally produced fodder, so that farmers with insufficient fodder cannot readily supplement their resources by additional purchases. Within this study, regular purchases, especially of alfalfa hay or feed concentrates, were more prominent along the GGR transect and in villages at higher altitudes.

In areas close to regional market centres, livestock are increasingly kept for income rather than family use. Farmers in Bargo benefited both from the agro-ecological potential of the double cropping zone and from their proximity to Gilgit. The milk animals kept to meet the demands of the urban population place high demands on fodder and thus the prices of lucerne hay reach high levels, especially during winter and spring. Lucerne can be cut at least three times per year in Bargo and clover up to five times, and sale of lucerne and clover seed is common. This example indicates an awareness among a small sector of the

**Table 4.8: Percentage of households with surplus and deficit of fodder (farmers' perception based on 129 sampled households)**

	Fodder supplies from own resources		
	Surplus	Barely sufficient	Deficit
% of households	58.7	28.5	12.7

population of the income generating potential of agriculture, an awareness that is still not widespread in the Northern Areas. Although the leguminous crop lucerne has been an important component of the crop rotation for quite a long time (Singh 1917), it has only recently become widely cultivated, and this as a part of recent land development schemes. Lucerne serves to improve soil fertility and overcome local fodder shortages, which have been exacerbated by changing cropping patterns such as the intensified cultivation of potatoes instead of cereals (for example in Minapin and Morkhun).

The next most important constraint to keeping livestock that farmers identified was the lack of labour and time for herding animals, especially for the movement of animals to higher altitude pastures in summer and their subsequent herding. In three of the six study villages – Bunji, Morkhun, and Darkot – this issue was perceived to be as severe as the lack of fodder resources (Figure 4.5). Two major reasons were given for the labour shortage: the increasing absence of men from the villages due to off-farm activities and permanent employment, and the growing number of children attending school.

The problem of labour shortage is met by reducing the herd size, by keeping more animals permanently near the farmsteads, and/or by several households jointly managing their livestock. These trends have been observed within the Northern Areas in other studies (Nüsser and Clemens 1996; Kreutzmann 1993, 2000; Stöber and Herbers 2000). Within the project's study villages, several households have recently not only engaged relatives to tend livestock but also hired semi-professional herders for payment either in kind or in cash, for example in Gahkuch-Bala. In other villages, labourers were hired for payment on a seasonal basis for agricultural work, including grazing, for example in Morkhun, or loan defaulters were engaged for this work until the loan was repaid, for example in Bunji. The issue of labour availability at the individual household level is one of the major driving forces affecting utilisation of pastures at a community-wide level (see below).

Other reported problems included weather (heavy rain or snow during summer) and losses due to predators, which were generally of minor importance but more relevant in the single-cropping, higher altitude areas. The proportion of householders that reported no problems in keeping livestock was much higher in the villages in the double cropping zones.

## Utilisation of pastures

Strategies of rangeland management by agro-pastoral communities in northern Pakistan have been perceived repeatedly as exploitative and unsustainable, especially in documents related to conservation programmes. For example, “In this region, pastoralism is an important land use and economic pursuit. Most of the rangelands are common village or tribal property and are not subject to regulated grazing. Coupled with nomadic grazing, the alpine pastures and other grazing grounds have been ruthlessly exploited” (Ahmad 2000). These statements are, however, not supported by empirical evidence. Surveys of the grazing potentials of alpine pastures so far conclude that in many of these pastures the potential has not yet been fully utilised (Chapter 3; Klötzli et al. 1990; Nüsser 1998). However, differences have to be considered in terms of the seasonality of pastoral migration cycles and the pastures’ altitudes. For example, as stated by Khan (2000), “although winter rangelands are highly over-grazed in Northern Pakistan, summer pastures in the upper montane and the alpine zones are not fully used”.

The vast majority of farmers thought that the winter pastures of their village could not maintain more animals (Table 4.9), but the results for the summer pastures were more variable. In all the villages apart from Gahkuch, more than half of the farmers thought that the summer pastures could maintain more livestock. These perceptions generally reflect the observed levels of utilisation reported in Chapter 3, where the estimates of utilisation rate suggest that many mountain (summer) pastures could be used to a greater extent for grazing livestock.

**Table 4.9: Percentage of farmers who thought that their village pastures could carry more animals<sup>1</sup>**

	GGR Transect						KKH Transect					
	Bargo DC		Gahkuch TC		Darkot SC		Bunji DC		Minapin TC		Morkhum SC	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Summer pastures	64	36	32	68	52	48	62	38	86	14	57	43
Winter pastures	10	90	5	95	0	100	5	95	30	70	49	51

<sup>1</sup> Based on the question: Do you think that the summer/winter pastures of your village can sustain more animals? DC = double cropping zone; TC = transitional zone; SC = single cropping zone

The mountain summer pastures in northern Pakistan are still used as part of the agro-pastoral land-use system, and village communities traditionally enforced this by banning all animals, except one milking animal per household, from the cropped area during summer. This tradition, however, is currently undergoing significant changes. Although many continue to send their animals to the mountain pastures (often tended by a relative or hired shepherd), others keep

more of, or even all, their animals within the villages year round and graze them on a daily basis along field boundaries and on uncultivated land (Figure 4.6).

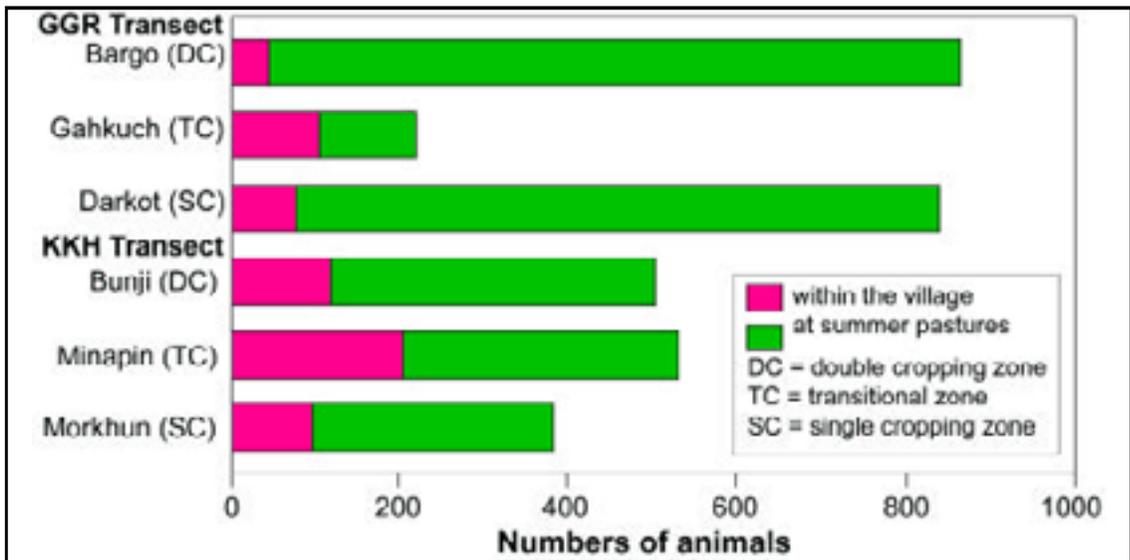


Figure 4.6: **Number of animals sent to pastures or retained around the homestead during the summer**

In Minapin, 12 of the 20 households surveyed kept most of their animals close to the homestead throughout the year, and five households did not send any animals to summer pastures. In Bargo and Gahkuch, 15 and 13 households, respectively, out of the 22 surveyed in each village, kept most animals close to the homestead throughout the year. Nearly one-third of households in Bargo did not send any animals to the summer pastures at all (8 of 22).

The differences between villages that sent or did not send animals to summer pastures could not be explained on the basis of agro-ecological zone, accessibility to the road network, local facilities for education, or off-farm employment. Where the traditional agro-pastoral grazing cycles were maintained, it appeared to be mainly by using labour inputs external to the household or through joint family systems. The substitution of joint systems for single household systems is increasingly common in northern Pakistan (Nüsser and Clemens 1996; Stöber and Herbers 2000). Often, this is also driven by the direct and indirect impacts of the increased tourist treks, which mostly lead to alpine pasture areas and give them a new economic value. Changes in Minapin, the major base for treks to the Rakaposhi range, even led to the abandonment of one pasture settlement in 1999 due to local labour constraints. At the time of the study, individual livestock owners in Minapin were herding livestock on mountain pastures on a rotational basis for only a few days per summer, and could thus spend more time on off-farm activities.

## Conclusions

The overall trends in livestock numbers in the Northern Areas of Pakistan are not clear; there are conflicting estimates of livestock numbers. There are also considerable gaps in knowledge regarding the contribution of animal husbandry to overall farm and household incomes.

Changes in external socioeconomic driving forces, especially off-farm employment and education, have been considerable and have had indirect effects on the livestock sub-sector and the agro-pastoral grazing system. Many individual households are decreasing their household labour inputs at summer pastures through several strategies such as reduced herd sizes, permanent summer grazing of animals around their farmsteads, joint management systems, and paid external labour.

At present, there are few marketing incentives for local livestock owners, and several policies discourage commercialisation in the livestock sector. Thus, livestock and animal products still remain overwhelmingly within the household economies, irrespective of ease of access to road infrastructure.

In general, agro-pastoral livelihood conditions are limited significantly by scarce resources of cultivated land and consequently by shortages of fodder for winter feeding. Recent changes in the cropping patterns in favour of selected cash crops, especially potatoes, have increased the local fodder gaps, and traditions of inheritance will cause further land fragmentation. At present, gaps in the food supply for people can be overcome by purchasing subsidised staple food supplies such as wheat. But only a small market has developed for animal fodder. There is a marked need to increase the cropping potential within the Northern Areas to fulfil both human and animal demands. Possible strategies include the development and irrigation of additional land, changing cropping patterns in favour of increasing the net area sown – for example, with the wider introduction of winter cereals; selection of more location-specific cereals and fodder crops (even as catch crops); and planting of multipurpose trees. Development projects and government institutions have taken up selected issues since the 1980s (Whiteman 1985). However, farming communities still have reservations against these specific interventions. More holistic approaches with a special focus on farmers' perceptions, participation, and capacity building, such as on-farm trials, are still needed. Farmers must also be integrated into the decision-making process. This also holds true for the sustainable use of rangeland resources. Local communities are the major stakeholders of 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. Further recommendations for increasing rural incomes in northern Pakistan must be based on the identification of economically and ecologically feasible management interventions, and take into consideration the farmers' own priorities and capabilities.

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