Section II
Economic and Cultural Geography

8

ANIMAL HUSBANDRY AND UTILIZATION OF ALPINE PASTURES IN THE NANGA PARBAT REGION OF NORTHERN PAKISTAN: COMPARISON OF RAIKOT AND RUPAL VALLEYS

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Introduction and Objectives

This work presents case studies of pasture utilization in the valleys of Rupal and Raikot, Nanga Parbat. The natural pasture resources and the rights of access and utilization constitute a framework in which the present potentials and limitations of resource management are determined. Apart from these internal factors, recent demographic and socio-economic developments and their effects upon traditional systems of utilization should be assessed. Such an integrated approach aims at highlighting the problems of sustainability and carrying capacity within resource management in the different valleys. One can compare the valleys of Raikot and Rupal in respect of their different ecological potentials and limitations as well as their particular territorial rights of access, which are historically based.

For the valleys of Rupal on the southern and Raikot on the northern declivity of Nanga Parbat (Fig. 8.1), it is important to take into account the following aspects: the high rate of population growth (sometimes above 4 % per acre); the improved accessibility to the 'modern world' via the Karakoram Highway (KKH); the extension of jeep roads up to side valleys and the impact of these developments on the intensity and efficiency of high mountain agriculture and high pasturing in particular. It has yet to be seen whether or not the population pressure will lead to over-exploitation of pasture phytomasses; whether the indigenous strategies of local farmers are flexible enough and whether or not the new exogenous influences with their new income and survival opportunities (tourism and labour migration) will lead to definite changes in this 'traditional' form of subsistence economy.

The Agro-pastoral Ecology and Economy

Animal husbandry and high pasturing form an integral part of 'mixed mountain agriculture' (in the sense of Rhoades & Thompson 1975: 537; Kreutzmann 1989a: 148, 1994: 338). This agricultural strategy of mountain farmers is in effect in the whole area of the Hindu Kush, the Karakoram, and the northwestern Himalayas and is described for various other high mountain regions of Northern Pakistan. (In this context compare Snoy 1975, Grötzbach 1984, and

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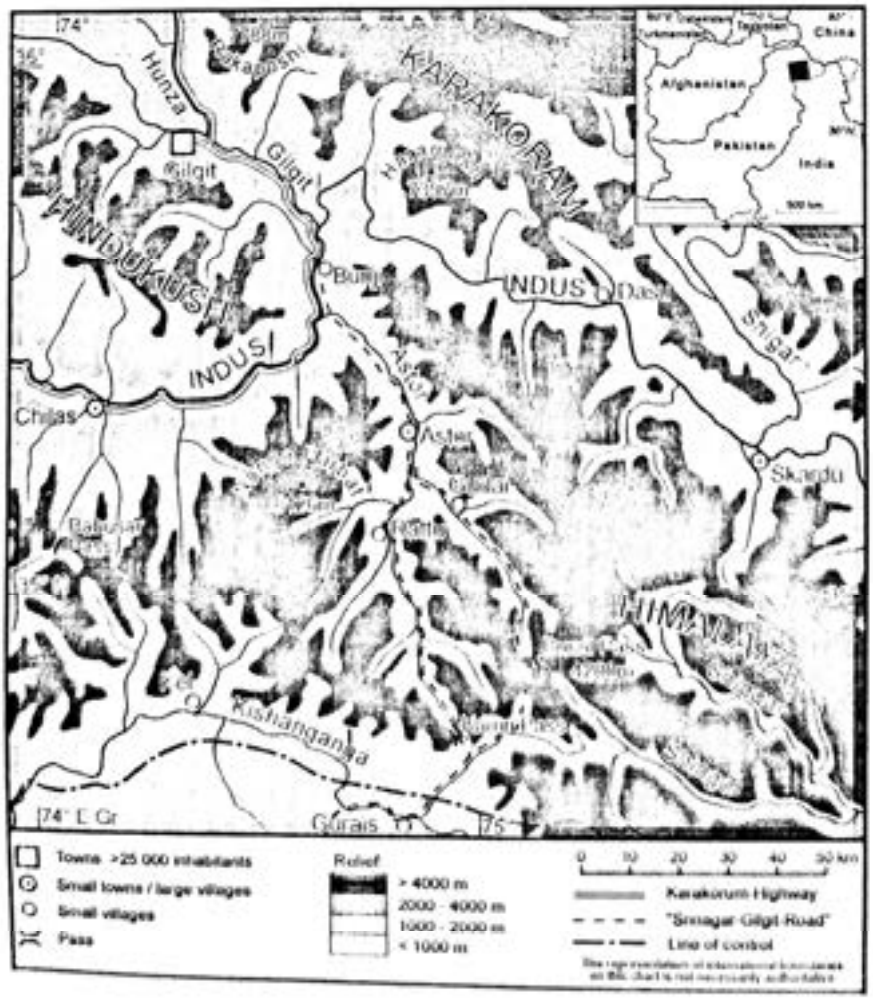
Ehlers 1995 for Bagrot; Kreutzmann 1989a, 1993, and Klötzli et al. 1990 for Hunza; Grötzbach 1989 and Schickhoff 1993 for Kaghan; Haserodt 1989 for Chitral; Langendijk 1991 for Ishkoman; Butz 1993 for Shimshal; Herbers & Stöber 1995 for Yasin; Clemens & Nüsser 1994 for Rupal; Uhlig 1976, Khan 1991, and Snoy 1993 for the entire region.) Irrigated crop cultivation and pasture economy are interdependently connected and cover different agro-ecological zones to assure the subsistence of the mountain farmers and to allow a wide spread of agrarian risks. In this context, bovines are still needed for ploughing and thrashing on the fields without road access and their manure is required for the replenishment of the cultivated soils. On the other hand, livestock rearing is only possible in combination with crop cultivation, because hay and crop residues are needed for stall-feeding in winter. Fodder shortages in winter present the primary limiting factor of animal husbandry in the whole mountainous region. Therefore, the number of animals kept depends on the fodder availability in the cold season. During the summer and the transitional seasons, pastoral migrations allow the utilization of different pasture ecotops in the montane and Alpine stages. The distinct spatial distribution of pasture resources dictates the seasonal and vertical pattern of utilization. The two fundamental reasons for this agro-pastoral strategy are lack of pasture resources close to the permanent settlements and rules forbidding the keeping of animals during the vegetation period of the cultivated crops near the households in the permanent settlements. While the upward movement of the herds is dependent upon snow conditions and the fodder situation in the cultivated areas, the downward movement can only be determined after harvesting.

Fig. 8.1 Nanga Parbat Region (Northern Pakistan)

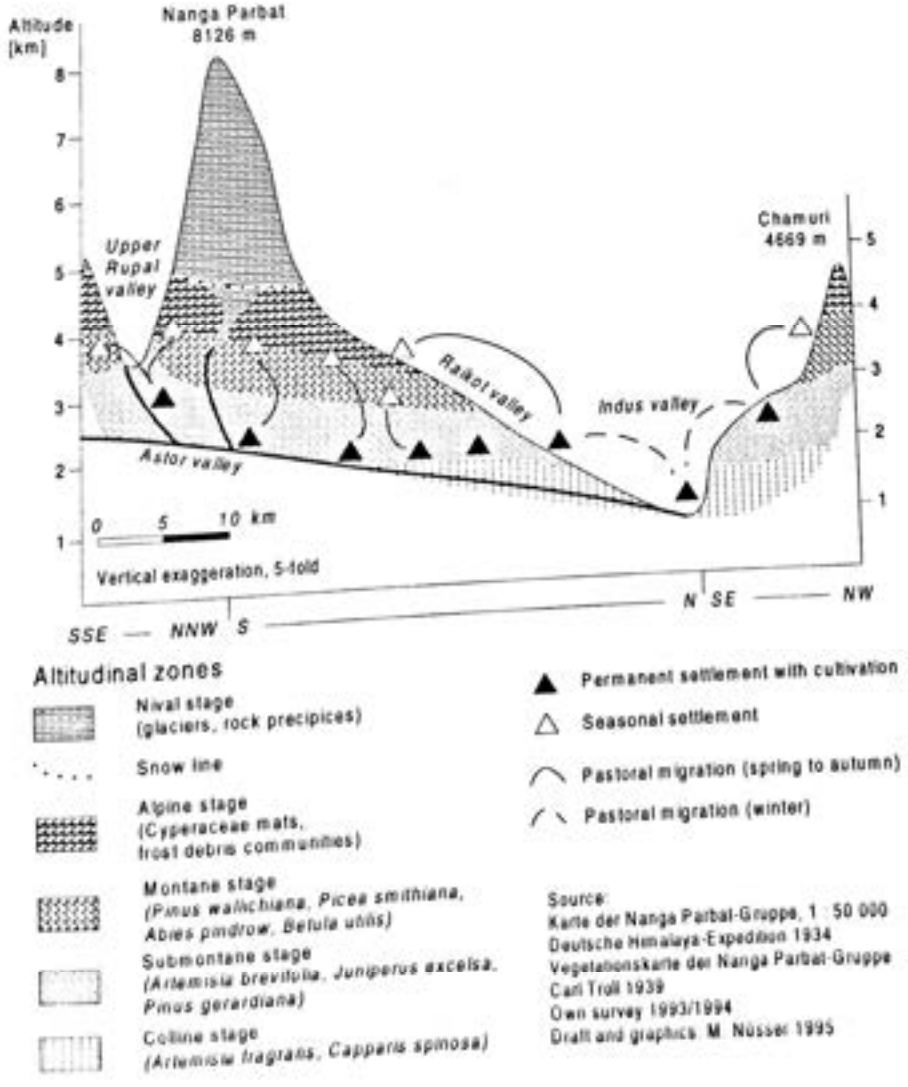


According to Troll (1939: 157–58), there are two types of summer settlements in the upper valley zones: the 'summer field settlement' and the 'summer pasture settlement.' The first is characterized by supplementary irrigated agriculture and the latter by its pastoral use only. *Nirril* and *Rung* (Shina) are the indigenous terms used for all seasonally occupied settlements. The majority of summer-field settlements are located in the belt of moist coniferous forests, whereas summer pasture settlements are mostly to be found in the sub-Alpine and Alpine stages (Fig. 8.2).

Case Study Rupal

The Rupal valley is a high valley to the south of the Nanga Parbat group and releases its waters into the Astor River, which is a tributary of the Indus River. The altitude of the valley bottom stretches between approximately 2500 and 3700 metres on a distance of approximately 24 kilometres leading from west-southwest to east northeast. Owing to its altitude, the Rupal valley is a single cropping area with dominant cultivation of summer grains. The most important crop is wheat followed by recently introduced maize and potatoes. Barley reaches the highest limits of grain cultivation (up to 3340 m) due to its short ripening period (Troll 1973: 46; authors' own observations). Maize is cultivated up to approximately 2750 metres.

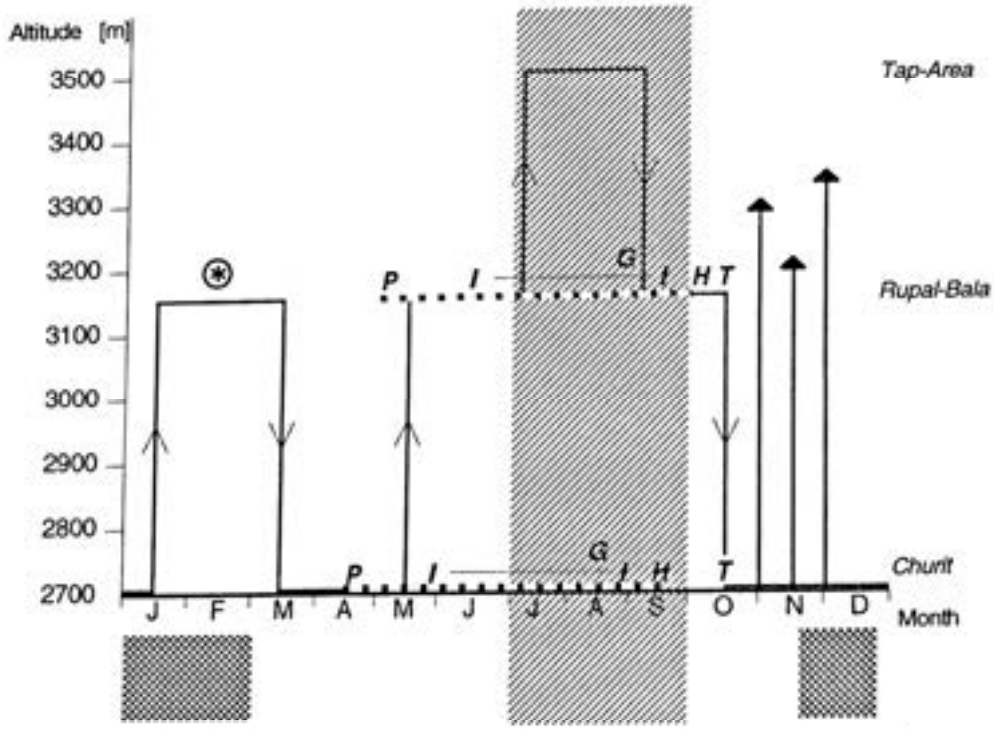
Fig. 8.2 Altitudinal Zonation of Vegetation and Land Use around Nanga Parbat



The altitudinal amplitude of high pasturing in village Churit is approximately 800 metres between this permanent settlement and the highest stage (Fig. 8.3). For neighbouring villages, this amplitude may reach up to more than 1000 metres. During the course of daily grazing, even higher areas up to approximately 4500 metres are utilized.

As mentioned earlier, crop residues and wild hay form the major fodder source for livestock during winter. One characteristic adaptation to the frequent scarcity of fodder supplies in winter is the return to summer settlements between January and March (Fig. 8.3). Families mostly stay here for six to eight weeks and feed stocks of hay and straw to their animals. It is considered less problematic to guide animals over glaciers in winter, than to transport large amounts of fodder downstream to the permanent settlements. Recently, fewer families return to these *Nirrils* in winter. They exchange fodder stocks with other families between the villages and the *Nirrils*. Another exceptional case in this context is the high pasture settlement of Latobo (3600 m) in the upper Rupal valley, where some shepherds overwinter and bring approximately 200–50 robust sheep and goats for daily grazing on the snow-free pastures on the southern exposure. The usage of this high pasture throughout the year reduces the pressure upon the fodder stores in the permanent settlements and helps to cope with the meagre fodder supplies in winter.

Fig. 8.3 Stages of Land Use in Rupal Valley: The Example of Churit



The analysis of the development of livestock reveals that animal husbandry and pasture economy are still of high importance within the agro-pastoral system of Rupal. In the period from 1970/71 to 1992, the number of livestock per capita has risen significantly in all villages of the Rupal valley, and it may be concluded that due to the population growth, the total number of livestock has at least doubled in the same time (Clemens & Nüsser 1994; Pilardeaux 1995: 97 for Astor).

Case Study Raikot

On the northern declivity of Nanga Parbat, the Raikot valley stretches from the junction with the Indus valley at 1179 metres to approximately 3900 metres on a distance of approximately 18 kilometres, directing exactly from south to north. The dominant cultivated crop is maize up to approximately 2500 metres. In the neighbouring Buldar valley, maize reaches its highest limit at 2910 metres. Additionally, in the summer settlements of the Raikot valley, wheat and barley are cultivated up to 3300 metres. Owing to the proximity to the area of double cropping in the colline stage of the Indus valley, the majority of households in the Raikot valley also cultivate land there. The double cropping of winter wheat and maize ensures the people's food supplies together with higher amounts of crop residues as winter fodder.

The stage-wise land use of high pasturing in the Raikot covers an amplitude of approximately 1200 metres from village Tato to the highest grazing settlements. In winter, most of the families descend with their animals to the Indus valley at an altitude of approximately 1150 metres. The total pastoral amplitude sums up to approximately 2350 metres.

In the Raikot valley as well as in the Gor region on the opposite side of the Indus River, animal husbandry is possible in the framework of all-year-round pasturing (Schweinfurth 1957: 72; Troll 1973: 47). The access to snow-free winter pastures in the colline stage of the Indus valley allows a reduction in stall-feeding for cattle and sheep only. As the insufficient hay production does not allow the stall-feeding of all animals, the large goat herds are pastured by paid shepherds on the scarce vegetation of the Indus valley.

On the slopes of the Gor side, oak forests (*Quercus baloot*) offer a valuable fodder source in winter.[1] The sustainable utilization of these winter fodder resources is assured by traditional laws, such as the prohibition of pruning or forest pasturing before the 15th of November, as well as the division of the oak belt between the different villages within the community of Gor.

Concluding, it can be stated that on the northern declivity of Nanga Parbat, the number of goats per capita are significantly higher compared to the situation in the Rupal valley (approx. twenty-five to forty per house against ten to twelve in the Rupal). Yak crossbreeds (*Zomo/Zoai*) are not kept here because of their particular sensitivity to higher average temperatures.

Conclusions

The limiting factors of climatic and biogeographical conditions, such as the duration of snow cover on different pastures and the dry conditions in the valley bottoms of the colline stage, determine the potentials and limitations of animal husbandry as well as the necessity of pastoral migrations from the ecological point of view. The distinct spatial distribution of pasture resources, as well as the necessities of crop cultivation, dictate the seasonal and vertical pattern of utilization. As these two valleys have different ecological conditions due to

their altitudinal position, individual mobility patterns of animal husbandry can be identified. To varying degrees, both valleys experience fodder shortages during the long winter season. Therefore, different strategies to cope with this main problem of livestock rearing have been developed.

Until now, the intensity of agro-pastoral utilization does not show any severe pressure upon the high pastures. Within the course of the authors' fieldwork, no pasture degradation of significant degree has been found around Nanga Parbat. With regard to the carrying capacity, even a slight increase in livestock numbers seems to be possible, provided by improved fodder supplies in winter (Clemens & Nüsser 1995).

Legal and Socio-economic Framework of Pasture Utilization

Pastoral Territoriality around Nanga Parbat

To understand the entire system of agro-pastoralism, it is necessary to add some remarks on the historical background of utilization rights and recent socio-economic developments. This human-ecological system cannot be fully understood by solely analysing ecological problems (Herbers & Stöber 1995: 94).

According to historical records, the villages in the settled area of Gilgit Wazarat, including all villages of Astor, were granted rights of pasture and forest utilization in the beginning of the twentieth century. These cadastral surveys (settlement) were carried out by the State of Jammu and Kashmir in accordance with the general practice in British India (Lawrence 1875: 400–25; Younghusband 1911: 186–92; Singh 1917: 23–26). These rights of access are still in effect today and also determine the villages' actual pastoral economy. For Astor Tehsil, village-wise files of territorial aspects of resource utilization include the names of different pastures, their boundaries and size, together with specifications of the natural setting (Ghas Charay 1917)[2]. Even today, these files serve as a basis for settling conflicts between villages at the court.

The situation of pastoral rights is completely different in the unsettled area of the Indus valley below the junction with the Astor River. The valleys of the northern declivity of Nanga Parbat belong to the community of Gor (nowadays Goharabad, part of the Chilas subdivision), which is situated on the opposite bank of the Indus River. All villages of this area share combined rights of pasture utilization. In practice however, they confine their pastoral migration to the adjoining slopes and valley sections, near to their settlements.

The main ridge of Nanga Parbat, between the Mazeno Pass (5366 m) in the west and Hattu Pir (3127 m) in the east, represents a distinct cultural geographical line of separation[3] between the village-wise territoriality in the Astor valley and the combined rights of resource utilization in the former, segmentary Shinaka republics of Gor and Chilas (General Staff India 1928: 142–43).

In Astor, the pastures are village commons and located in the proximity of the individual villages (mostly on adjoining slopes and valley sections). In general, the areas of grazing rights are confined by natural boundaries like ridges or drainage lines. In some exceptional cases, villages are allowed to use additional areas. The village of Doian in the lower Astor valley has additional grazing rights in the adjoining terraces of the Indus valley (Huko Das) and on the slopes between the Indus and Astor valleys with the localities of Hattu Pir and Buyar. Some villages enjoy additional grazing rights on the opposite riverbanks. The example

of Chongra reveals another exception: besides their rights in the Rama valley, the villagers of Chongra also enjoy grazing rights in the upper Harchu valley, behind the ridge over the Shate Shayn Pass (3894 m). The villages in the Rupal valley share equal utilization rights in the summer pastures of the upper sections of the Rupal and the Chichi valley. A detailed account of the overlaying rights of pastoral utilization between individual villages south of Nanga Parbat is given by Clemens and Nüsser (1994, 1995).

Dimensions of Socio-Economic Change

The access to the national communication network via the KKH, after its completion in 1978, has increased opportunities for off-farm employment and seasonal migration significantly. The Rupal and Raikot valleys have been connected by jeep roads since the late 1980s. Frequent services of jeeps allow young men to earn some money as day labourers in Gilgit or Chilas or to pass the winter in the industry or service sector of the cities downcountry. Simultaneously, the number of tourists has increased with the improved road access (figs 8.3 and 8.4; Kreutzmann 1989: for Hunza; Grötzbach 1993). The men take the opportunity to earn money as high altitude porters or as mountain guides for trekking tourists and expeditions. This is especially true for the Raikot valley and Fairy Meadows, with their easy access from the KKH. Therefore, more and more families also spend the summer in the permanent villages. Here schools and small bazaars are also accessible. In such cases, the men from the winter village manage to irrigate the fields of the summer settlements, which are in a convenient proximity. Goat and sheep herds would then be brought to the pastures by a relative in return for an agreed share of milk products or by paid shepherds in the case of Raikot.

As opposed to Hunza, parts of Baltistan, or Kaghan (Kreutzmann, 1989a, 1989b; Grötzbach 1989, 1993), this very recent development did not change the agro-pastoral economy around Nanga Parbat to a high degree. Only a few marginal pastures have been abundant in the Astor region (Pilardeaux 1995: 97, 103f). Unlike their counterparts in Hunza, farmers of the Rupal and Raikot valleys need not stall-feed their lactating animals all year round. The shortage of workforce, due to migration and non-agrarian income opportunities, has not yet forced any change in the production systems of animal husbandry and mixed mountain agriculture. Labour intensive activities will continue to be carried out within the village community. As in Hunza, women are starting to take over more activities which were traditionally done by men. In spite of non-agrarian influences, animal husbandry and pastoral migration will continue to have a central function within the valleys' economies. The high pastures, however, serve new and external functions. Additionally to their pastoral resource, they now also offer recreational functions for Pakistani and foreign tourists.

Final Conclusions

The principal distribution of vegetation together with the dominant patterns of resource utilization and external influences are shown in the model of Fig. 8.5. Although animal husbandry pressurizes the carrying capacity due to the increased number of livestock, the ecological balance remains stable. The agro-pastoral economy has a sustainable potential under the current socio-economic conditions. In a medium- to long-term perspective, however, an increase in off-farm employment might reduce the male labour force to a high degree.

Possibly, the proximity to markets in Chilas and Gilgit, or to military garrisons, may develop some monetary incentives for animal husbandry in the near future.

Fig. 8.4 Stages of Land Use in Raikot Valley: The Example of Tato

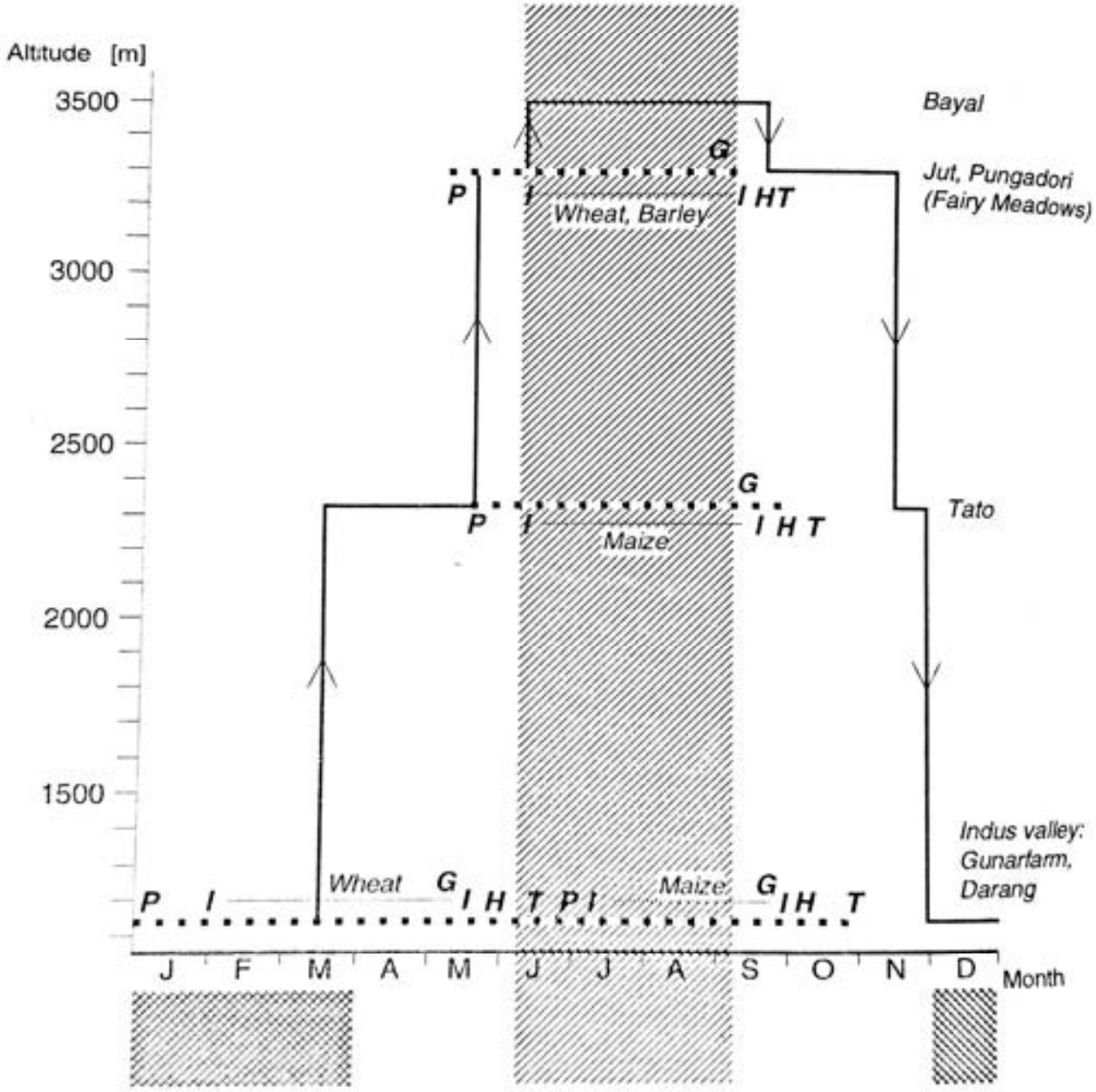
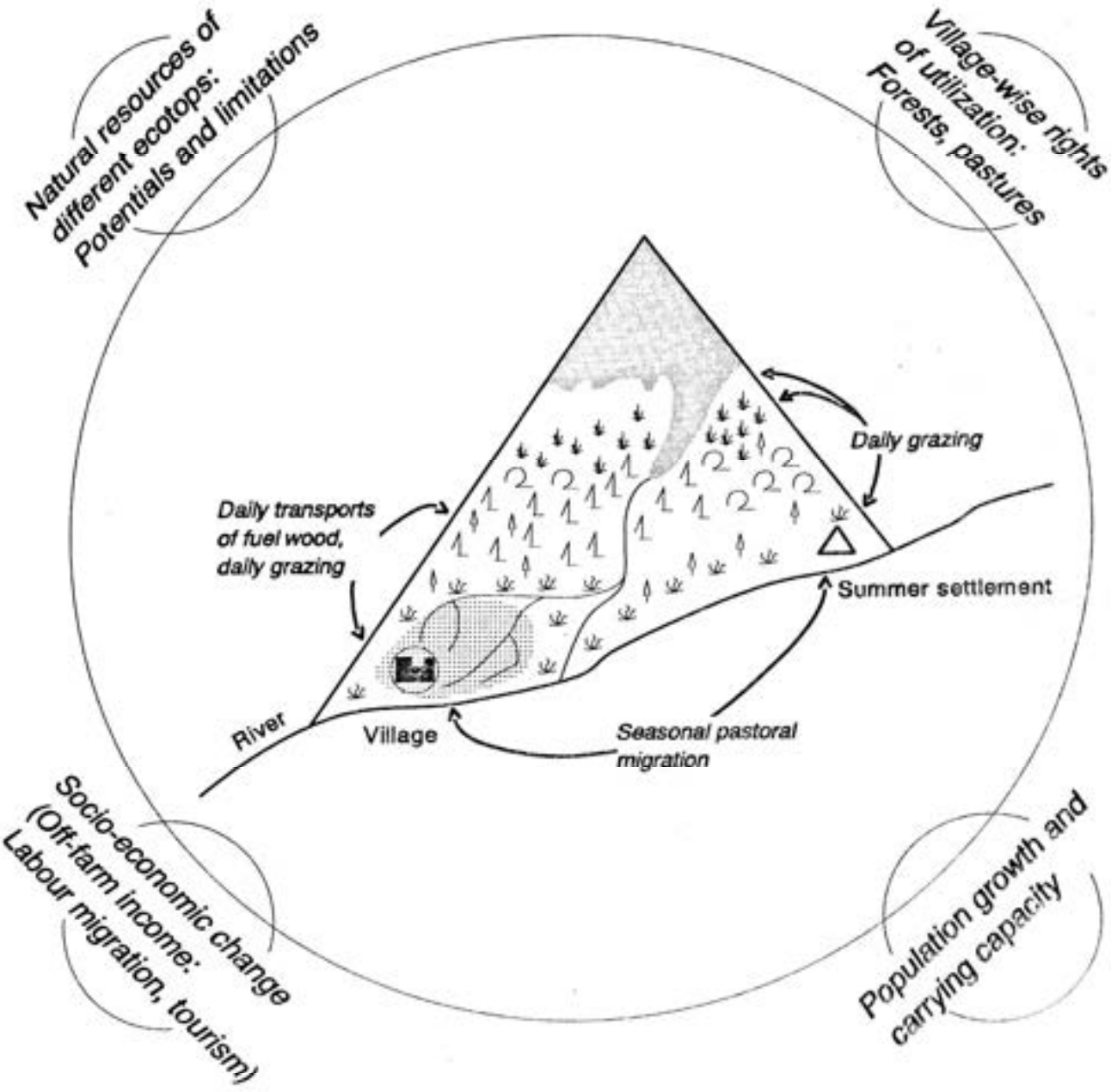


Fig 8.5 Human-Ecological System of Nanga Parbat (NW Himalayas)



Glacier

Irrigated fields

Permanent settlement

Seasonal settlement *(Nirril)*

Drainage pattern

Irrigation channels

Vegetation

1 Coniferous forest on north facing slopes *(Pinus wallichiana, Picea smithiana, Abies pindrow)*

2 Birch forest and willow dwarf scrub on north facing slopes *(Betula utilis, Salix karelinii)*

Juniper forest and scrub on south facing slopes *(Juniperus excelsa, J. turkestanica)*

Artemisia spp. dwarf scrub on south facing slopes *(A. brevifolia, A. santolinifolia)*

Alpine mats on all exposures *(Kobresia capillifolia, Carex* spp. with alpine forbs)

Draft : J. Clemens, M. Nüsser 1995
Graphics : M. Nüsser

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NOTES

1. The utilization of *Quercus baloot* as winter fodder is also described by Haserodt (1989: 126) and (Snoy 1993: 66f).
2. These documents are dated according to *samvat*-chronology, which refers to the era of Raja Vikramaditya (Singh 1917: 133; Kreutzmann 1989: 24). The *samvat*-year 1973–74 corresponds with 1917 AD.
3. Even today, Nanga Parbat's main ridge forms the administrative boundary between the subdivision of Chilas and Astor Addition District (until 1993 a subdivision), both a part of Diamir District.

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9

A GEOGRAPHIC PERSPECTIVE ON LAND RESOURCES AND LAND USE OF MALAKAND DIVISION

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Introduction

Malakand is an administrative division of the North-West Frontier Province of Pakistan. It consists of the districts of Swat, Dir, and Chitral. All these districts were princely states of the same names till 1969, when these were merged with settled areas of Pakistan. This division is very important from the historical, political, and strategic point of view. Buddhist monuments are found in many areas especially in Swat and Chitral. Alexander along with his army passed through Swat, Bajour, and Buner in 326 BC and crossed the Panjkora and Swat rivers. During the fifth century AD the Chinese traveller Fa-hsien visited Swat he gave its name as Swad). The area also came under the influence of various Muslim rulers of India (Habib 1904).

Ever since 1849, when the British took over the administration of the settled districts of the North-West Frontier Province, the prime concern of the government was to devise an effective means of maintaining the security of this area (Habib 1904). The princely states were important because of their situation at the extremity of the territory over which the Government of India exerted its influence. It had been tl policy of the government to control the external affairs of this area in a direction friendly to its own interests, to secure an effective guardianship over the northern passes, and to keep watch over what went on beyond these passes. With these objectives in view Major Biddulph was sent in 1877 to enter into relations with the rulers of these states (Aziz-ud-Din, 1897).

After independence, the Malakand area became more important due to the special position of the Northern Areas and Kashmir and also due to its proximity to Afghanistan and the former Soviet republics, now known as the Central Asian Muslim states (Fig. 9.1)

Table 9.1 Human Beings–Land Ratio/Per Head Area in Acres (1980)

	Geographic Area	*Reported Area*	*Cultivated Area*	*Net Sown*	*Current Fallow*	*Cultiv-able Waste*	*Uncultivable and Forest Area*
Malakand Division	3.235	0.286	0.236	0.23	0.006	0.02	0.03
NWFP	1.664	0.371	0.237	0.218	0.019	0.063	0.071
Pakistan	2.33	0.56	0.466	0.445	0.025	0.06	0.034

Source: Government of NWFP, development statistics, 1981.

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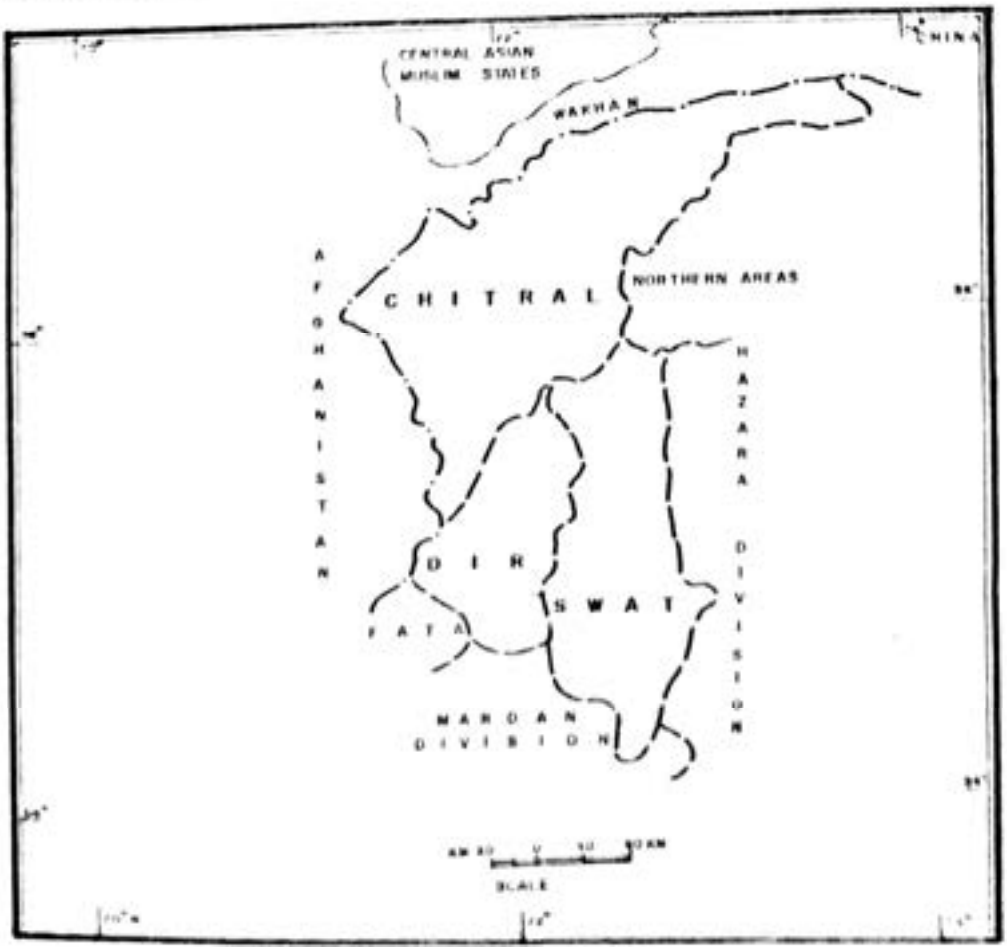
The present circumstances in Afghanistan and Central Asia have made this area politically and strategically more sensitive and it has become imperative to undertake a well-planned policy for the utilization of resources for the socio-economic development of this area.

Natural Setting

Malakand Division lies between 34 degrees, 10 minutes, and 36 degrees, 50 minutes north and 71 degrees, 10 minutes and 73 degrees, 50 minutes east. It is a strategically located area. It adjoins Afghanistan in the north and west, the Federally Administered Tribal Areas (FATA) in the southwest, Mardan and Hazara divisions in the south and east, and the Northern Areas in the northeast. It is very close to the Central Asian Muslim states and is not far from Kashmir (Fig. 9.1).

Malakand Division is a part of the well-known northwestern Himalayan region which is physiographically the most formidable and inaccessible of all areas of the frontier province. The most impressive feature of the region is the towering Hindu Kush Range, which merges with Afghanistan's Wakhan Corridor known as the 'roof of the world corridor.' Lesser ranges extend southward from the Hindu Kush and divide several river valleys formed by Chitral, Swat, and Panjkora rivers and their tributaries. The division may broadly be called the drainage basin of the Chitral, Panjkora, and Swat rivers and their rapid-running turbulent affluents. It is one of the most lofty tracts on the surface of the globe. Tirich Mir, the highest peak, is 7690 metres above sea level (the elevation of Mont Blanc, the highest peak in Europe is 4808 m).

Fig. 9.1: Location of Malakand Division



The whole division is formed by a complex system of high mountains and narrow valleys. It opens towards the south, where the lowest elevation is 452 metres (Mian 1986).

Climatically, the area may be broadly called a sub-tropical continental high land zone. It is characterized by cold, snowy winters on higher elevations and is very hot in summer in the lowlands, warm in the uplands, and cool on higher elevations. Climatic data available from the meteorological stations located in the division does not present the true picture because there must be considerable variation due to spatial relief variations. However, according to the meteorological observatories at Mingora (Swat), Dir, and Chitral, annual rainfall is 469.4 millimetres, 1566 millimetres, and 717.2 millimetres, respectively. Temperatures in the valleys may become higher than 35.3 degrees Celsius in summer. Below freezing winter temperature is common over the higher elevations.

The most important characteristic of climate of this area with respect to agriculture is the variability of precipitation. Total rainfall in January 1964 in Chitral was 74.2 millimetres, while it was only 1.3 millimetres in January 1966. In 1968, precipitation during July was zero while it was 20.6 millimetres in July 1978. With precipitation dependability so low, agriculture operates under great risks even in those areas where annual rainfall is high. Soils found in valley bottoms and river terraces are derived from alluvial and glacial deposits. These are generally fertile if water is available and proportion of gravel is not high.

Cultural Environment

Total geographical area of Malakand Division according to the survey of Pakistan is 28,920 square kilometres (7146132 acres). It is the largest division of the frontier province and occupies 38.8 per cent area of the province. Area-wise, Malakand Division is larger than many countries of the world. Its area is more than 2.8 times that of Lebanon and 11.2 times that of Luxembourg.

According to the last population census (1981), the population of Malakand Division is 2,208,970, about 20 per cent of the population of the frontier province. Population density is 76 persons per square kilometre. Human beings–land ratio for different land types is shown in Table 9.1. It has also been compared with the province as well as with the country. As is obvious from the table, per head geographic area is very high in Malakand Division.

Other cultural factors that are important for land use have been shown in Table 9.2. The changes between 1972 and 1990 have also been shown so that the future trends can be seen. Irrigation is a very important factor. In fact, where irrigation water is available, all the cultivable land is cultivated, so land-use intensity as well as cropping intensity is high. Irrigation is also the primary requirement for investment in modern inputs.

Table 9.2 Cultural Factors (Area in Acres)

Year	*Irrigated Area*	*% of Cultivated Area*	*Owner-Cultivated Area*	*% of Farm Area*	*Not Fragmented Area*	*% of Farm Area*	*% of Farm Area under Medium-Size Farms (5–25)*
1972	208,109	38.1	464375	73.4	N	A	38.1
1980	206,571	42.4	470999	74.4	102622	16.2	41.5
1990	286,187	45.3	823693	80.5	172488	16.8	44.9

Source: Government of NWFP, Development Statistics, 1981.

Continuous increase in the proportion of irrigated area shows that irrigation water is available. If it is properly used and wastage is reduced it would greatly help in proper utilization of agricultural resources. Wastage of valuable irrigation water is a very unfortunate fact in our country. The wastage of irrigation water is as high as 40 per cent (Alizai 1994). Relief and soil conditions as well as unlined canals and distributaries show that the wastage might be higher in Malakand Division.

Whoever owns the land exerts a lot of influence on land use. If the cultivator is the owner he or she would work hard, take proper care of the land, and also invest in modern inputs, because he or she would be fully rewarded. But if the cultivator is not the owner he or she gets only a share of the production and is not sure when the landowner will take back the land, so his or her interest is limited. In the Indian Punjab when the land was handed over to the actual tillers, the yield almost doubled. The proportion of owner-cultivated area is increasing but still 20 per cent of the farm area is not owned by the cultivator (Table 9.2).

The size of the farm under the control of a family is an important aspect of land occupancy. It exerts a strong influence on decision about land use. What the proper size of a farm for an area should be is a complicated socio-economic question that needs detailed study. The size of a farm larger as well as smaller than an economic holding is not favourable for proper utilization of land. In the absence of proper information, it may only be mentioned that medium-size farms between five and twenty-five acres are more favourable for proper land use. The table shows that such farms are increasing but still only 44.9 per cent of the farms are of this size.

Fragmentation means the land of a farmer is divided into more than one fragment/parcel, in such a way that each fragment is entirely surrounded by the land of other farmers. Under such situations the resources of the former are inefficiently utilized. Wastage of irrigation water increases. Chances of theft also increase. The result is reduction in the profit. It has been estimated that the expenses of cultivation increase by 5.3 per cent for every 50 metres of distance between plots, from 20 to 25 per cent for transportation of manure and from 15 to 32 per cent for the transportation of crops. Cultivation of high value crops is discouraged. When the distance between the fragments and size of the fragments reaches such a stage that cultivation becomes uneconomical, the land may be left uncultivated. The situation in the study area is shown in Table 9.2. Only 16.8 per cent of farms are not fragmented. There is no appreciable improvement with time. The number of fragments might be more than ten. The size in certain cases is unbelievably small and distances between the fragments are very long on very difficult terrain.

Economy

Malakand Division is an under-developed area of Pakistan. Owing to absence of proper infrastructure, difficult terrain, unfavourable weather conditions, and its districts' status as princely states, for long time, little attention was given to development before as well as after independence. One of the indicators of under-development is the employment structure. According to the last population census, 77.2 per cent of the employed labour force is engaged in agriculture and other primary occupations in this division as compared to 61.5 per cent for the frontier province and 51.4 per cent for the country. The proportion for Chitral District is 79.7 per cent. This is a very important indicator of under-development.

Agriculture is the predominant economic activity of the people. This is obvious from all the literature available about this area as well as from field observations. It has a very long tradition in Malakand Division. According to a German botanist, an indigenous wheat plant

found in Chitral is one of the oldest types in the world. This shows that agriculture has always been the major occupation of the people. In spite of very high dependability on land, agriculture is still practised according to traditional methods. Modern inputs have reached only limited areas (Mian 1986). People put in real hard work in bringing water for irrigation from long distances where possible under very unfavourable conditions. Steep slopes are terraced and rich crops including fruits and vegetables are produced in valleys and also on slopes. If water is available, real hard work is put in to cultivate even uncultivable land.

Land Resources and Land Use

Land is the basic natural resource. Human beings' attachment to land and concern for it has persisted into the modern industrial, scientific, and space ages. According to the Holy Quran, 'on Earth will be your dwelling place and your means of livelihood for a time' (II: 36). Land as a resource has a special position. It is a renewable resource in the ecological sense because the same piece of land can be cultivated for an indefinite time if appropriately husbanded. But in the sense of space it is finite. Over a given time period, if space is used, it is inevitably used up like a non-renewable resource. So land does not fit into the conventional classification of natural resources. The importance of land further increases when it is considered as the resource of land space. Increasing economic importance of recreation and tourism has made land an ambient resource. This aspect is particularly important for the study area because it has some of the most scenic areas.

Because of the importance of land it is now not considered as property but rather is viewed in the sense of stewardship. According to Lester Brown, 'we have not inherited the earth from our fathers; we are borrowing it from our children.' Probably Hazrat Umar Farooq had the same conception when he refused to distribute conquered land among the soldiers (*mujahideen*), saying that it was for the future generations.

If considered only as an agricultural resource, land has been the base for civilizations. Secrets of development today also lie in proper utilization of agricultural resources. This is obvious from the importance being given to agriculture in the world. In a highly developed country like Holland, with very limited and scarce land, the share of agricultural exports in the balance of payments position is equalled only by the export of natural gas. Use of science and technology has wrought miracles in agriculture. Less than four per cent of the American labour force is feeding all Americans at the lowest per capita expenditure and also exporting huge quantities of agricultural products. Countries with extremely unfavourable conditions like Saudi Arabia and Israel have become exporters of many agricultural products.

With these facts in view the situation regarding land resources and land use in Malakand has been analysed with the help of tables, diagrams, and maps, in a temporal and spatial context. The accuracy and reliability of a geographic study depends upon the unit area used and accuracy of data. The smaller the unit area is, the more reliable the result will be. So the *tehsil* has been used as a unit area for the first time. It was not possible to go beyond the *tehsil* level. As shown in Fig. 9.2 the division consists of nine *tehsils*. Detailed data for the year 1992 was collected from *tehsil* and district headquarters. For temporal analysis the data collected by the Pakistan Agricultural Census Organization has been used. The extremely discouraging and unfortunate fact discovered during this study is the nonreliability of the data. In fact, this has made the study one of only of academic interest. Table 9.3 has been prepared by collecting data from all possible sources. The purpose was to get accurate data for the study. But unfortunately the findings are very discouraging. As is obvious from the

table, there are drastic differences in the data of the total reported area of the study area supplied by different organizations as well as by the same organization in various years.

Table 9.3 Reliability of Land Use Data—Resource Consciousness Total Reported/Farm Area

Source	Agri.	Census	Organ.	Agri. Department	Extention	Bureau of Statistics	District Statistics Officers
Year	1972	1980	1990	1980	1989	1991	1992
Unit	Unknown	Acres	Acres	Acres	Hectares	Hectares	Hectares
Chitral District	80,842	74,132	111,169	74,165	98,671	98,671	98,670
Dir District	255,101	151,695	443,830	152,235	269,206	269,206	269,206
Swat District	269,795	406,855	468,117	409,511	816,088	816,088	816,401
Malakand Division	632,738	632,680	1,023,116	635,914	1,183,965 2,925,577 (Acres)	1,183,965 2,925,577 (Acres)	1,184,277 2,926,348 (Acres)
Comparison	100	100	162	105	462	462	470
Geographic area		28,920 sq. km/ 714,632 acres					
% of geographic area	8.8	8.8	14.3	8.9	40.9	40.9	40.9

For instance, according to the Agricultural Census Organization, total farm area of Malakand Division in 1990 was 1,023,116 acres, while according to the Agriculture Extension Department, it was 2,925,577 acres, i.e., 286 per cent more. Similarly, according to the Agricultural Census Organization, a prestigious organization established only for the collection of agricultural data, farm area of the division in 1980 and 1990 was 632,680 acres and 1,023,116 acres respectively. The data for 1990 is 62 per cent higher than that of 1980. No reason has been given in the publications of these departments for the disparities. The same table also shows that in 1972 and 1980 our knowledge about the land use of the study area was limited to only 8.8 per cent of the total geographic area and increased to 40.9 per cent in 1992. Still we do not know anything, and there is no record of 59.1 per cent of our land. This is in spite of the fact that agriculture is the backbone of our economy. In contrast, those countries where agriculture is a minor part of the economy are giving special importance to agriculture and making proper use of their land resources. For instance in Japan, the present development plan has been specifically made for agricultural development. This unfortunate situation shows on the one hand our national unconsciousness regarding our most important resource and on the other hand reflects the poor credibility of the concerned departments and organizations.

The data used in this study for spatial analysis was collected from district headquarters from the official records of district statistical officers in all the three districts. This was considered to be comparatively reliable because it was supplied with proper signatures and is also comparable with the records of the Bureau of Statistics. For temporal comparison the data of the Agricultural Census Organization has been used.

Land-use classification has been shown in Table 9.4 and Fig. 9.3. The typology is based on the record of the Revenue Department. Its reliability is also questionable because the purpose of the Revenue Department is only to collect land revenue. Fig. 9.3 presents a visual comparison between total reported area of various years as well as major land-use types. The table also shows sub-types. It is obvious that the situation does not show any appreciable improvement. In many cases

deterioration has taken place. Cultivated area has been reduced from 82.5 per cent of farm area in 1980 to 62.2 per cent in 1990. According to more reliable data, it was only 25.3 per cent in 1992. The situation is strangely discouraging in case of current fallow and cultivable area. The land under these types is exactly similar; the only difference is in the time period for which the land was left unsown. In characteristics, this land is exactly similar to the sown land. The land classified as current fallow is cultivated land that is not sown either because of deficiency or non-availability of fertilizer/manure or irrigation water during the cropping season. If this land is not sown for more than one cropping season, in revenue records, the same land is classified as cultivable. It is not sown because of cultural reasons. It is unfortunate that in spite of very high dependency on agriculture, valuable agricultural land is not being sown. The proportion of this land as compared to sown area has increased from 10.9 per cent in 1980 to 20.4 per cent in 1992. Land classified as uncultivable has also increased from 10.5 per cent in 1980 to 72.6 per cent of total farm area in 1992. Field experience shows that if the cultural abstracts are removed a considerable part of this land can also be cultivated. In certain cases land less attractive than this type is being cultivated.

Table 9.4 Land Use 1972–92 (Acres)

Year	*Total Farm Area*	*Cultivated Area*	*% of Farm Area*	*Net Sown Area*	*% of Cultivated Area*	*Current Fallow*	*Cultivable area*
1	2	3	4	5	6	7	8
1972	632,738	490,332	77.4	-	-	-	32,802
1980	632,680	522,166	82.5	510,050	97.6	12,116	43,538
1990	1,023,116	639,891	62.2	628,331	98.3	15,560	117,739
1992	2,926,348	741,181	25.3	664,822	89.1	76,358	59,348

9 *Current Fallow & Cultivable Area*	10 *% of Net Sown*	11 *Uncultivable & Forest Area*	12 *% of Farm Area*	13 *Land-Use Intensity*	14 *Cropping Intensity*	15 *Year*
-	-	109,605	17.3	94	146	1970
55,654	10.9	66,976	10.5	92	163	1980
129,299	20.6	265,490	25.9	84.3	157	1990
135,707	20.4	2,125,368	72.6	92	150	1992

Source: Revenue Department, NWFP, Peshawar

Spatial Distribution of Current Fallow and Cultivable Land

This land needs urgent and special attention. Just the removal of some cultural obstacles already discussed can allow valuable crops to be cultivated on this land. Owing to deficiency of financial resources in the private as well as public sector, priorities have to be fixed for maximum return. In fact planning means fixing the priorities. This land deserves top priority. Overall, the proportion of this land in the division is 20.4 per cent of the net sown area (Table 9.4). As is obvious from the table, the acreage as well as proportion of this type of land has doubled from 1980 to 1990 and it further increased in 1992. The trend shows that it is increasing with time.

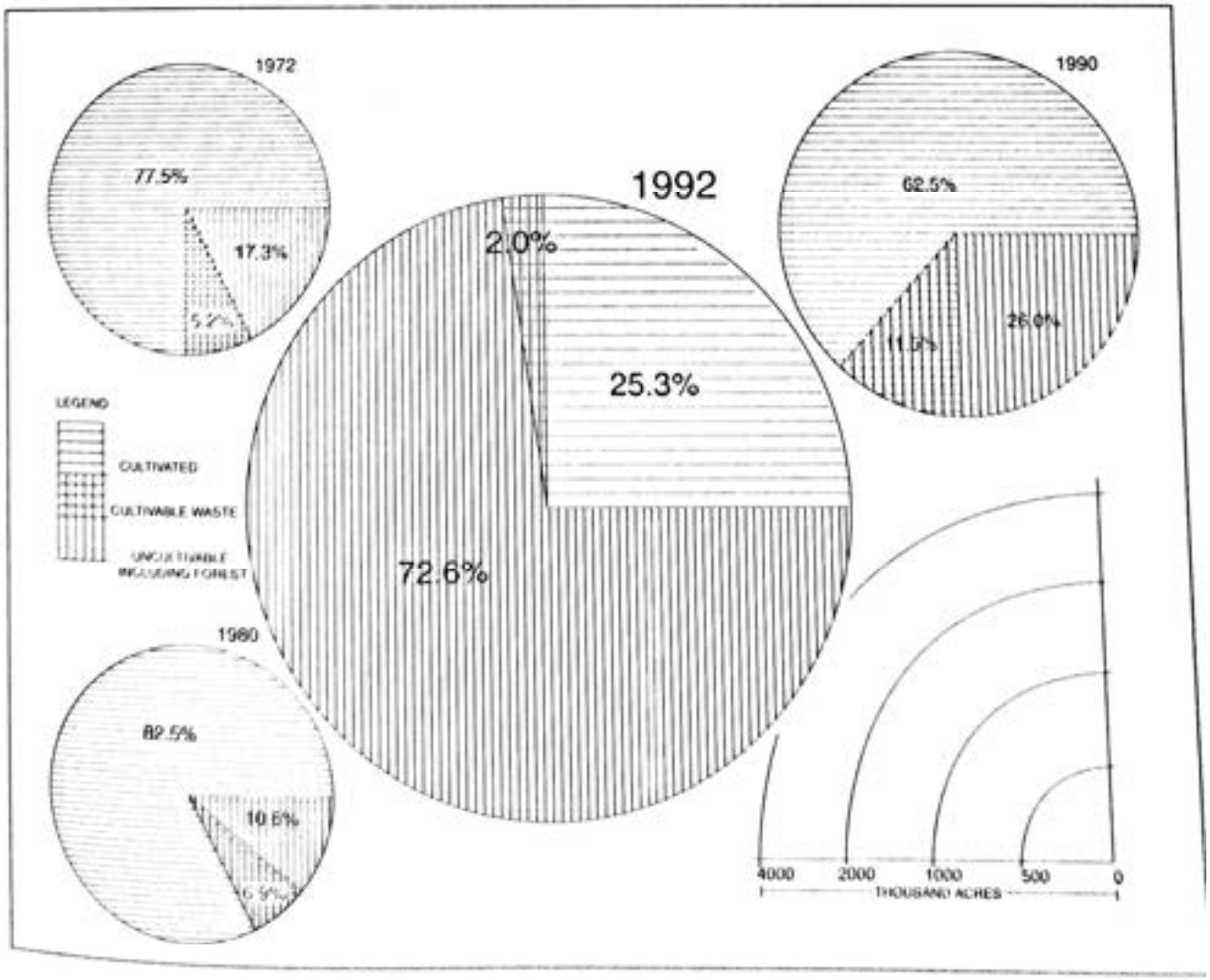
Spatial distribution has been shown on the map (Fig. 9.3). Proportion of cultivable and current fallow land is above forty per cent of net sown land in Mastuj and Dir. Actually, it is

40.5 per cent in Mastuj and 42.4 per cent in Dir. The distribution in other *tehsils* may be seen in the map. The map would provide guidance for fixing priorities for the proper use of valuable agricultural land. The factors which are responsible for the wastage of agricultural resources have been discussed but these are generalized. Which factor or factors are actually effective in which area might be found by further detailed investigation on the *mouza* or even farm level. Such maps may also be made on *mouza* level to provide practical guidance for proper utilization of valuable agricultural land in the study area as well in other areas.

Suggestions

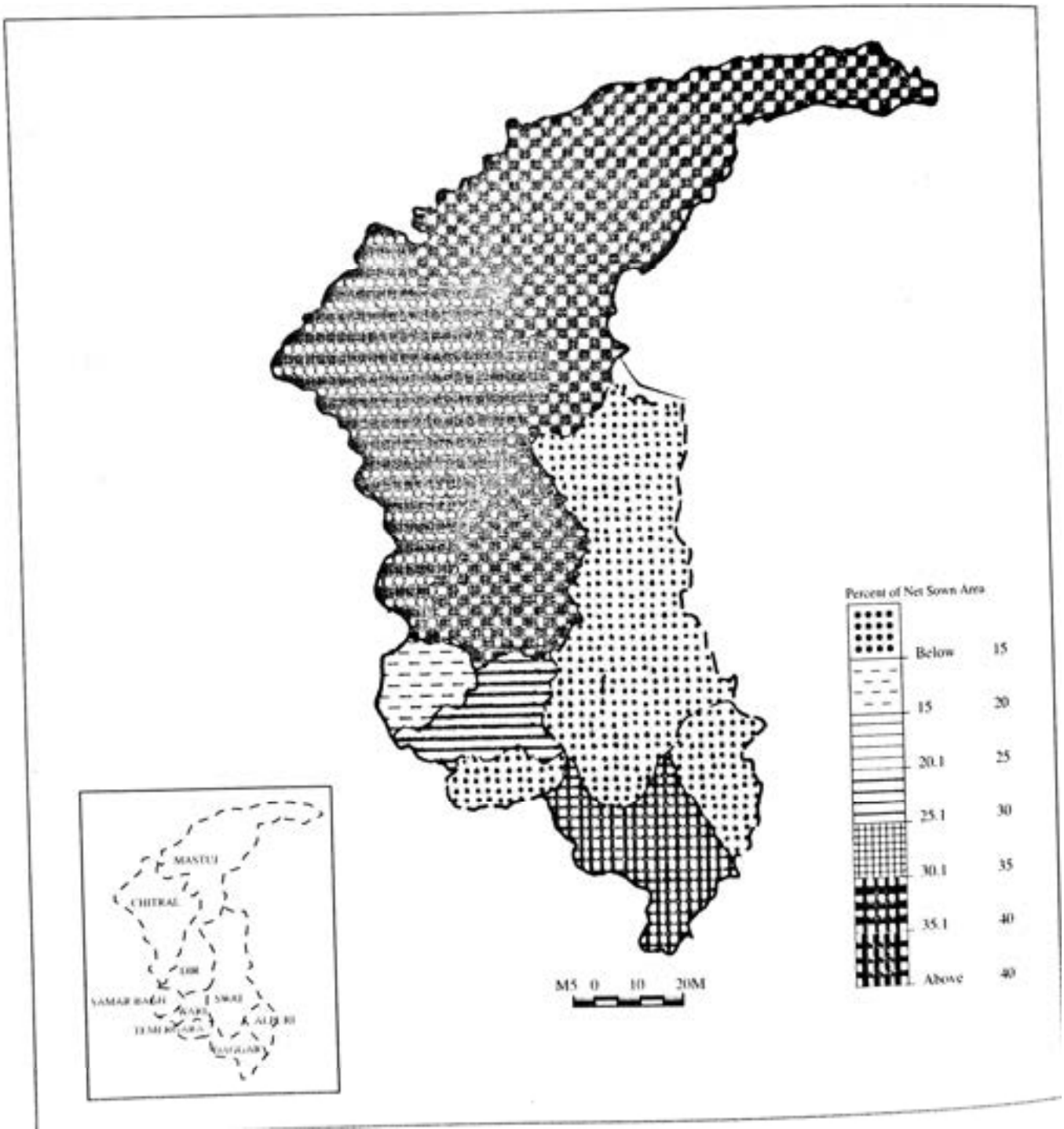
As is obvious from the study, Malakand Division is rich in land resources but is very poor economically. Resources are not being properly utilized; rather, they are being wasted. First of all a complete survey must be carried out by a team of experts from the departments of soil survey, agriculture, animal husbandry, geography, revenue and tourism. Detailed, large-scale maps of the land should be prepared, and accurate data must be made available. Existing land use should be studied and specific recommendations regarding proper use of land should be made after detailed study of the natural and cultural factors that influence land use in different areas.

Fig 9.2 Land Use (1972–92)



Another very important recommendation for this area is encouragement of part-time economic activities like fish farming, poultry farming, bee keeping, and dairy farming on modern lines. Agriculture is a part-time activity and the farmers have sufficient time for other occupations. If proper financial and technical help is extended to them, they can increase their income. Thus they would be able to invest in agriculture to further increase their incomes. The land resources would be properly utilized, the trend of emigration would also be reduced, and many other related problems would be solved. Tourism is becoming very important. As far as possible the local people should be encouraged and involved in this industry. The role of the government should be limited to providing financial and technical assistance and a peaceful environment. If these steps are sincerely taken, land resources would be properly utilized and a revolution would take place in the socio-economic condition of the people.

Fig. 9.3 Cultivable Waste and Current Fallow (1991–92)



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10

THE IMPACT OF THE KKH ON LAND USE IN THE NORTHERN AREAS

*Parveen Daud Kamal**

Introduction

The Northern Areas remained inaccessible for centuries from the surrounding areas. They were for the first time connected with the rest of the country by an all weather road, the Karakoram Highway (KKH), in the 1970s. The highway has been a very important catalyst of far-reaching changes in the economy and society. Since the construction of the highway, the pace of development has accelerated. The region has been opened up for trade and commerce with the Indus Plain, and also with Xinjiang, China. New employment opportunities have been provided. The region has been opened for tourism. The highway has also opened the area to mechanization of farming, chemical fertilizers, and insecticides, and the introduction of new crops, crop varieties, fruits, and vegetables.

This study is aimed at assessing the impact of the KKH on land use in the newly opened-up region. For this purpose, eight villages have been selected (Fig. 10.1). They have been divided into two groups:

A. Villages along the KKH

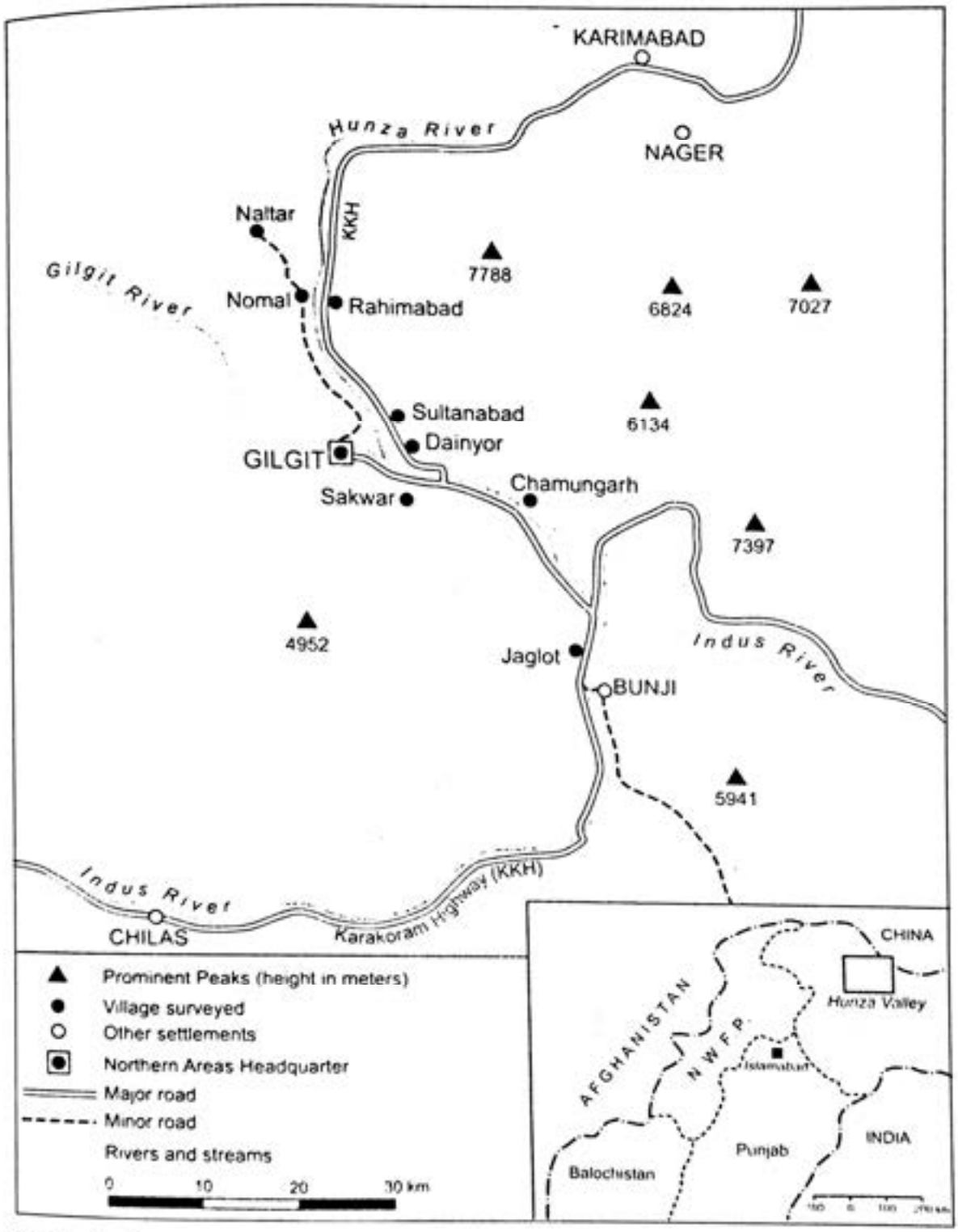
1. Jaglot
2. Dainyor
3. Sultanabad
4. Rahimabad

B. Villages off the KKH

1. Chamungarh
2. Sakwar
3. Nomal
4. Naltar

These villages are situated in Gilgit Agency, which until 1947 was administered by a British political agent stationed in Gilgit. It should be mentioned that in the Northern Areas cadastral surveys and revenue records of the villages were kept within Gilgit Agency only. Ideally, one would have selected sample villages all along the KKH but the lack of revenue data restricted the choice of human settlements.

Fig. 10.1 Northern Areas—Selected Villages Studied



Methodology

Primary information regarding socio-economic conditions was obtained with the help of a questionnaire. It carried questions regarding population, housing, education, trade, transport, and land use.

Secondary data about land use was obtained from the *tehsildar* and settlement officer in Gilgit. For some villages, data was available from the 1940s, as well as some from the 1960s. (Fortunately, records from 1968 to 1983 were available for all villages.) As the KKH was constructed in 1973, a comparison of the data could be made for pre- and post-KKH periods.

The data collected include the following:

a. Total area of the village
b. Cultivated area
c. Types of cultivated area
d. Area net sown
e. Type of crops grown during *rabi* and *kharif* (crop sown before the monsoon to ripen in autumn) seasons
f. Fallow land
g. Cultivable waste
h. Area not available for cultivation

Additional secondary data was obtained from the conservator of forests, Directorate of Agriculture, Food and Agriculture Organization (FAO) officers, and the Aga Khan Rural Support Programme (AKRSP) head office, Gilgit.

Field trips were carried out to all villages surveyed. Interviews and discussions were held with the village notables and farmers. Information collected from various agencies was checked in the field. A note was also made of the site of each village, types of soil, and irrigation system.

Description of Villages

Villages along the KKH.

Jaglot

Jaglot (elevation 4000 m), a village of 2609 people, with 330 households, is situated 50 kilometres south of Gilgit, on the KKH. It consists of two parts. The old village, along with farmhouses, and a small shopping centre, is sited on a river terrace, while the new extension is on the lower terrace, along the KKH, with an army camp, a shopping centre, a bus stand, and a number of restaurants.

Jaglot is an important nodal point, wherefrom roads lead to Skardu and Astor. Besides, it is the principal depot for military and civil supplies of the surrounding area. Before the KKH was built, it was connected with Chilas and Gilgit by a jeepable track. Its total area is 212.5 hectares, out of which 77.9 per cent (165.1 ha) is cultivated. Cultivation depends on canal irrigation from Sai Nallah. Nearly 65 per cent of the labour is employed in farming. The non-farm workers (17 %) are employed in the village, the the rest (18 %) work as migrant workers.

There are 140 shops, and ten restaurants. The village is connected with Gilgit and Rawalpindi by bus and wagon service. There are five jeeps, fifteen small Suzuki pickups, and eight private cars in the village. There are also twenty tractors and the same number of thrashers. About 90 per cent of the ploughing is done by tractors. The livestock population consists of 1800 cattle, 3600 goats and sheep, five buffalos, and a single horse.

Maize is the major *kharif* crop, accounting for 63 per cent (188 acres) of the net sown area, followed by fodder (81 acres). Pulses (8.1 acres) and rice (2 acres) are also grown. Fodder (133 acres) and wheat (126 acres) are sown on 64 per cent and 43 per cent of the *rabi* area. Fruit and barley account for only minor acreage.

Dainyor

Dainyor, a large-size settlement (population 6174) is situated on an alluvial fan on the left bank of the Hunza River. The KKH passes through the centre of the village. Gilgit is 12 kilometres by the KKH and 8 kilometres by an alternate road that crosses the Hunza River by a suspension bridge. This road was the only means of communication with Gilgit before the construction of the KKH.

Dainyor constitutes one of the largest green patches of the Hunza valley. The total area is considerably large, i.e., 916.1 hectares; 60 per cent of it is cultivated, and 6 per cent is cultivable waste. Irrigation is carried out by a canal taken out of Dainyor Nallah. Because of its lower elevation, double cropping is carried out.

Maize is the principal *kharif* crop, accounting for 67 per cent (467 acres) of the net sown area. Pulses are grown on 18 per cent of the area. Wheat is grown on 85 per cent (746 acres) of the *rabi* area. Barley acreage (8 acres) is insignificant. But fodder and fruit are important.

Farming has attained a very rapid and high degree of mechanization. There are fifty tractors and an equal number of thrashers. Nearly all the ploughing and thrashing work has been mechanized. A total of 96 per cent of the labour force is employed on farms, and 2.7 per cent in the village, on off-farm jobs, while 1.3 per cent are migrant workers.

The village has 100 Suzuki pickups, 150 jeeps and six wagons. Transport to Gilgit and to the lowlands, as well as to Hunza, is efficient.

There are more than 100 shops, a petrol pump, an Frontier Works Organization (FWO) workshop, and an establishment of the Pakistan Broadcasting Station.

Sultanabad

Sultanabad, previously called Gujar Dass, is a settlement comprising of 1347 people, (170 households) on the KKH. It was founded by Gujars from Naltar who came to settle here in 1922. In 1932, people from Gilgit as well as Hunza also purchased lands and settled here. The Gujars form 30 per cent of the population. They practise transhumance. In spring, they, along with their herds of cattle, goat, and sheep, move to Naltar, where they own land and pasture. After harvesting summer crops, they return to Sultanabad in October.

The total area is 487 acres, out of which 60 per cent (293 acres) is cultivated. Nearly a third (153 acres), is cultivable waste. Farming is based on canal irrigation from Dainyor Nallah. In view of very low rainfall, dry farming is not practised.

Land is sown both in *rabi* and *kharif* seasons. Wheat (172 acres) is the major *rabi* crop, maize (86 acres), fodder (21 acres), and pulses are important *kharif* crops.

There are six tractors, which are rented at Rs 150 per hour. There are also an equal number of thrashers. Both ploughing and thrashing are entirely mechanized. Gilgit is only 10 kilometres away by the KKH. Buses and wagons ply the road nearly the whole day. The residents also own twenty-five Suzuki pickups and twenty jeeps, which carry passengers and goods up and down Hunza valley.

The village has a relatively large number of livestock. This includes 3000 cattle, 5000 goats and sheep, twenty-five donkeys, and twenty horses. The bulk of the animals are moved up to summer pasture in the Naltar valley. Butter, *ghee*, and some other milk products are produced, and mostly consumed locally, the surplus being sold in Gilgit. The goat's hair and sheep's wool are used for making *chogas*, sweaters, and other woollen garments. This cottage industry has suffered a serious setback due to the cheaper factory-made woollen products that are now available. Most of the goat's hair and sheep's wool are now sold in Gilgit.

Rahimabad

Rahimabad, previously called Matun Das, is 38 kilometres from Gilgit on the KKH. A Burushaski speaking village of 1241 people (172 households), it lies on an alluvial fan and a river terrace. The total area is 242.9 hectares; 40 per cent of it (97.5 ha) is cultivated, while 11 per cent (267 ha) is cultivable waste. Dry farming is not possible, and every bit of the cultivated land has to be irrigated. The land is double-cropped. Wheat is grown on 71 per cent (12 acres) of the *rabi* net sown area, followed by fruit (25 acres), and fodder (17 acres). Maize is grown on 76 per cent (118 acres) of the *kharif* net sown area. In addition to fodder and vegetables (11.7 acres each), pulses (10 acres) are also grown. Ninety per cent of the workers are employed on their own farms, while 10 per cent are engaged in off-farm activities. There are three tractors and three thrashers. The entire ploughing and thrashing is mechanized. The use of chemical fertilizer is becoming popular and common. There is regular traffic to and from the village up and down the valley. Besides the vehicles from outside, five Suzuki pickups and seven jeeps belonging to the village ply the KKH.

The livestock is conspicuous by the absence of donkeys and horses, and the relatively large number of cattle (2000) and sheep and goats (3500). The livestock is taken in summers up to the Alpine pastures.

Villages off the KKH

Chamungarh

Chamungarh is situated on an alluvial fan on the left bank of the Gilgit River, 28 kilometres southeast of Gilgit. As the KKH follows the right bank of the river, it was not connected with it until the construction of a suspension bridge across the river in 1988.

This village of 1290 people and 150 households is inhabited by Kohistanis, that settled here at the end of the nineteenth century. It is rather a small-sized village, with a total area of 34.2 hectares; nearly half of it (i.e., 69.6 ha) is cultivated. Farming depends entirely on irrigation from Batkor Gah, but water supply is extremely limited, and very erratic in some parts of the year. Above the village are the remains of an abandoned settlement named Dala Das, which was a flourishing village till its canal irrigation system was disrupted due to changes in the discharge of the Batkor Gah.

The village has a couple of shops, a middle school, and a daily wagon service to Gilgit. Maize is grown over 77 per cent (703 acres) and fodder over 26 per cent (188 acres) of the *kharif* net sown area. Wheat dominates *rabi* crops, accounting for 72 per cent of the net sown area. Fodder and fruit are of minor importance.

Sakwar

Sakwar lies on the apex of a huge fan that stretches from the southern Karakoram mountains as far as the Gilgit River. A small-size settlement of 965 people (123 households), it is 3 kilometres south of the KKH, and connected to it by a jeepable track. This is the nearest to Gilgit of the eight villages (9 km) studied during the survey. The total area is 576 hectares, out of which 25 per cent or 147 hectares, is cultivated and 19 per cent (110 ha) cultivable waste. The entire farming is based on irrigation from Sakwar Nallah, which depends on the melt-water from glaciers. It is susceptable to variation in discharge.

In winter and early spring, water discharge is very low, and restricts farming. A total of 98 per cent of the working force is employed on the farm. The village possesses eight tractors and thrashers. Ploughing and thrashing have been entirely mechanized. The use of chemical fertilizers is common.

Kharif is dominated by maize (116 acres) and pulses (26 acres). The two account for 82 per cent of the total net sown area. Wheat accounts for 63 per cent (109 acres) of the *rabi* sown area. Fodder comes next in importance, followed by fruit and vegetables.

The livestock population consists of 200 cattle, 450 goats and sheep, and ten donkeys. There are no horses. There is a wagon which plies between the village and Gilgit, and a jeep for the transport of goods. Surplus fruit and vegetables are sold in the Gilgit market.

Nomal

Nomal was a village of considerable importance on the old Hunza valley jeepable road, before the construction of the KKH. It is not connected to the KKH directly, as it is on the right side of the Hunza River, and the highway follows its left side. The village is connected to Gilgit by a 20 kilometre long jeepable road on which jeeps, wagons, and buses ply.

Nomal is a large-size village of 3603 people, belonging to a Burushaski speaking community of Shias. It is the last village of the British Gilgit Agency along the Hunza River. Nomal is situated on a number of alluvial fans and river terraces. Cultivation has also been attempted on the flood plain of the Hunza River, but without much success. The total area is 228 hectares; 38 per cent (88.5 ha) of it is cultivated. Orchards (4 ha) are an important part of land use. It is a double-cropped village. Besides wheat (213 acres) and maize 237 acres), rice (6.3 acres) is also cultivated. Nomal cherries are famous throughout the Northern Areas for their taste and form an important cash crop.

The non-farm workers constitute 8.3 per cent of the total labour force. The rest are employed by farms. The village has a small shopping area, with thirty-five shops. There are secondary schools for boys and girls, a dispensary, and a post office. The village is supplied with power, from a hydel station on the Naltar River.

Mechanization of agriculture has made rapid progress. There are six tractors and an equal number of thrashers. All ploughing and thrashing is mechanized, sparing a lot of labour for off-farm jobs. It has also resulted in the dislocation of ploughing and thrashing animals.

The village possesses ten jeeps and three buses, which ply the Gilgit route. The livestock consists of 1500 cattle, 1000 sheep and goats, eight horses, and nearly 400 donkeys. The dependence on livestock is on the decline; therefore, they are losing their importance.

Naltar

Naltar, situated at a height of 10,000 feet, is connected to Gilgit by a 35 kilometre long jeepable road via Nomal. Its population of 730 is entirely composed of Gujars. Nearly half of the people migrate to Sultanabad in winter. Naltar is characterized by a long winter season with snow and frost. It has a growing period of 190 days that prohibits farming in winter. It is a single-cropped area. Out of the total geographic area of 182.2 hectares, 30 per cent is cultivated. Wheat (161 acres) and maize (23 acres) are the dominant summer crops while seed potato is assuming considerable importance. Land is profusely treated with farmyard manure and also by chemical fertilizers. The village possesses only one tractor, but tractors are hired from Nomal and nearby villages. About 50 per cent of ploughing and thrashing is mechanized.

The village possesses wide expanses of Alpine pastures. Dairy farming is an important component of the economy. In all, there are 2500 cattle, 5500 goats and sheep, and 130 yaks. Dairy products are consumed locally and also sold outside. Road transport is maintained by a fleet of seven jeeps throughout the year. With a cool and bracing climate in summer, a rich pine and spruce forest and Alpine pasture, Naltar offers abundant potential for tourism development.

4. Impact of the KKH on Land Use

The KKH has brought a number of changes in land use. Some of the significant changes will now be examined.

Cultivated Area

The cultivated area in the villages along and off the KKH shows no significant changes after the construction of the highway. Only Sultanabad has shown an increase of 39 acres and that too as a result of the construction of a new canal.

It brings out the fact that cultivated land in the area is very limited. Mechanics of bringing additional land under cultivation are few, unless irrigation facilities can be provided. In most cases, existing irrigation facilities can be improved only. In the villages along the KKH, cultivated land has shown a slight drop, because the highway has been constructed through and on the cultivated land. In the case of Dainyor, an FWO workshop, shops, a petrol pump, a flour mill, and the Gilgit Broadcasting Station have been built on the cultivated land, contributing to a loss of considerable cultivated area.

Net Sown Area

Rabi

The net sown area has generally increased in the villages along the KKH. The increase is small in the case of Jaglot, but very pronounced in Sultanabad and Rahimabad. This is a response to the application of chemical fertilizer, and the introduction of dwarf varieties of wheat. The slight decrease in Dainyor may be due to a rapid decrease in the barley acreage.

In the off-KKH villages, the net sown area with the exception of Chamungarh has dropped. This is perhaps due to a decrease in the barley acreage. Chamungarh shows a slight increase, which may be due to the replacement of barley by wheat and the use of chemical fertilizers, easily available from the Gilgit market only 7 kilometres away.

Kharif

The *kharif* net sown area in the case of villages along the KKH shows a slight rise. This is a result of an increase in maize acreage, which obviously has been achieved because of the increasing use of chemical fertilizers and the availability of marketing facilities.

In the off-KKH villages, the net sown area has shown a fall after the construction of the KKH, due to the fact that the cultivation of pulses has been generally reduced.

Cropping Pattern

Among the *rabi* crops, wheat (Fig. 10.2) has shown considerable increase in all villages along the KKH. Among these the greatest increase has been recorded in Sultanabad. This is partly because in these villages barley has been completely replaced by wheat. Chemical fertilizers are used to bring relatively infertile land under wheat. In three villages off the KKH wheat acreage has dropped. Barley (Fig. 10.3) has suffered a drastic reduction. It has been completely eliminated in two villages, Sultanabad and Sakwar, and drastically reduced in all others. This is in response to the introduction of the dwarf varieties of wheat, which mature as quickly as barley, but yield more grains as well as the fact that it is not economical to use chemical fertilizer on barley. There is also a change in food habits from barley to wheat.

Fig. 10.2 Change in Wheat Acreage

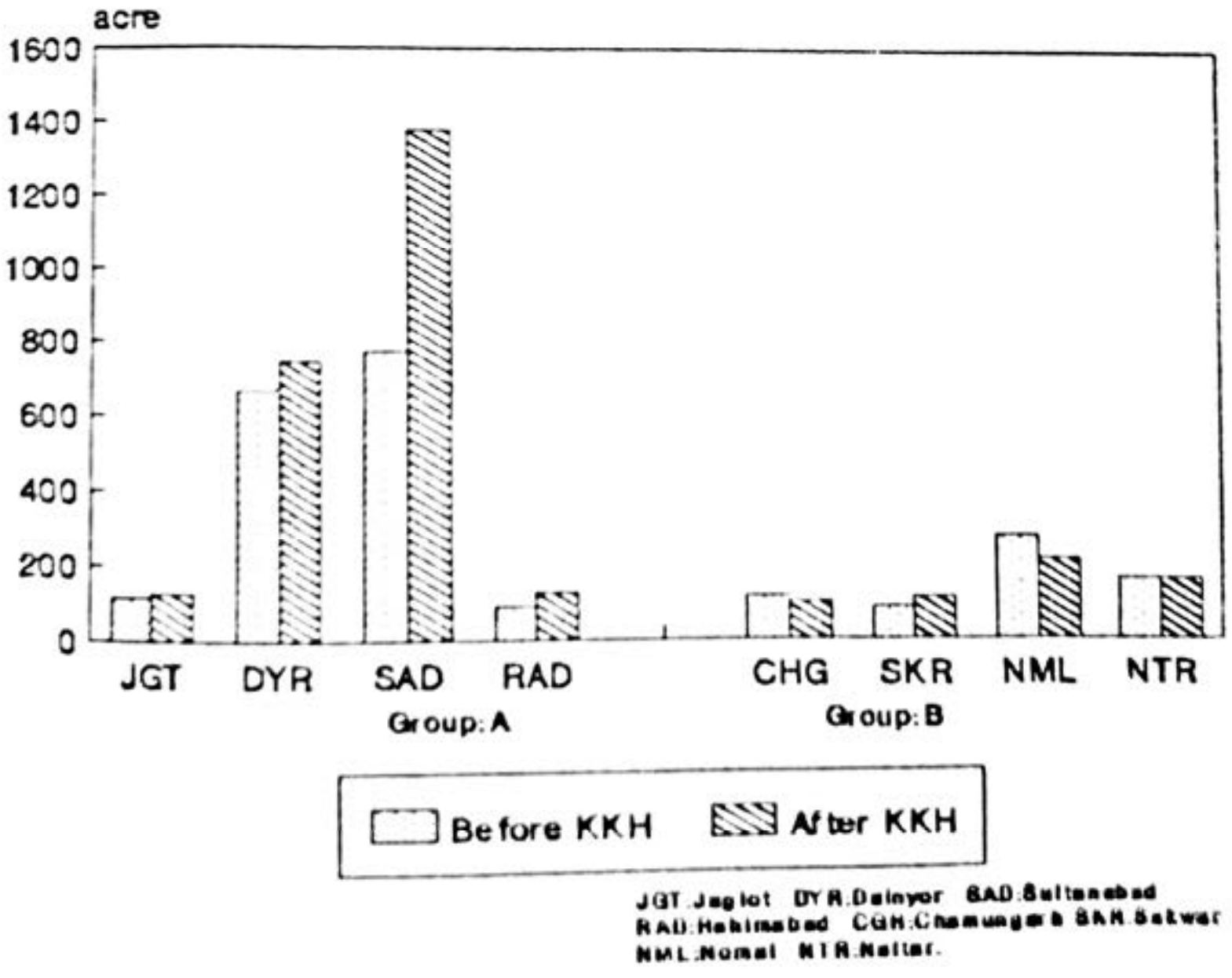
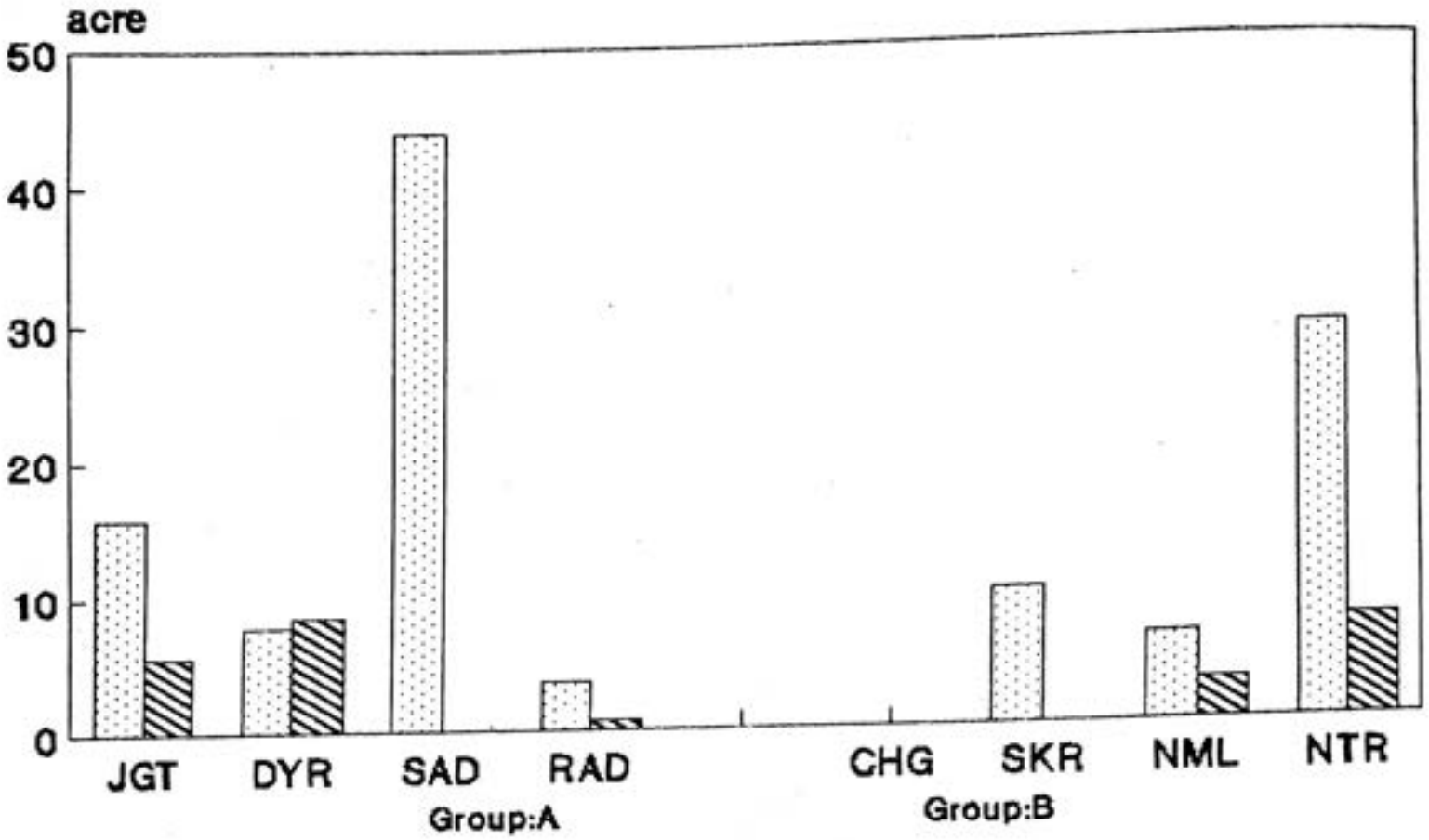


Fig. 10.3 Change in Barley Acreage



Among *kharif* crops, maize (Fig. 10.4) acreage has increased in the villages on the KKH, but slightly decreased in the villages away from the KKH. The former is due to a switchover from pulses and rice to maize. In the latter case, the decrease is due to the following factors: firstly, pulses are still grown as important *kharif* crops, and secondly, there is now a shift from maize to fruit orchards. There is also emphasis on a more judicious use of water.

Rice (Fig. 10.5) has experienced drastic reduction in the two categories of villages. Rice is a labour intensive and water demanding crop. As cheap and good quality rice from Punjab is now easily available in the local market, emphasis on rice has sharply declined. It has been completely eliminated from two villages, Dainyor and Sultanabad. Jaglot and Nomal have recorded a marked fall in rice acreage. Nomal, however, has been able to retain some acreage due to its reputation for producing high quality rice.

Fig. 10.4 Change in Maize Acreage

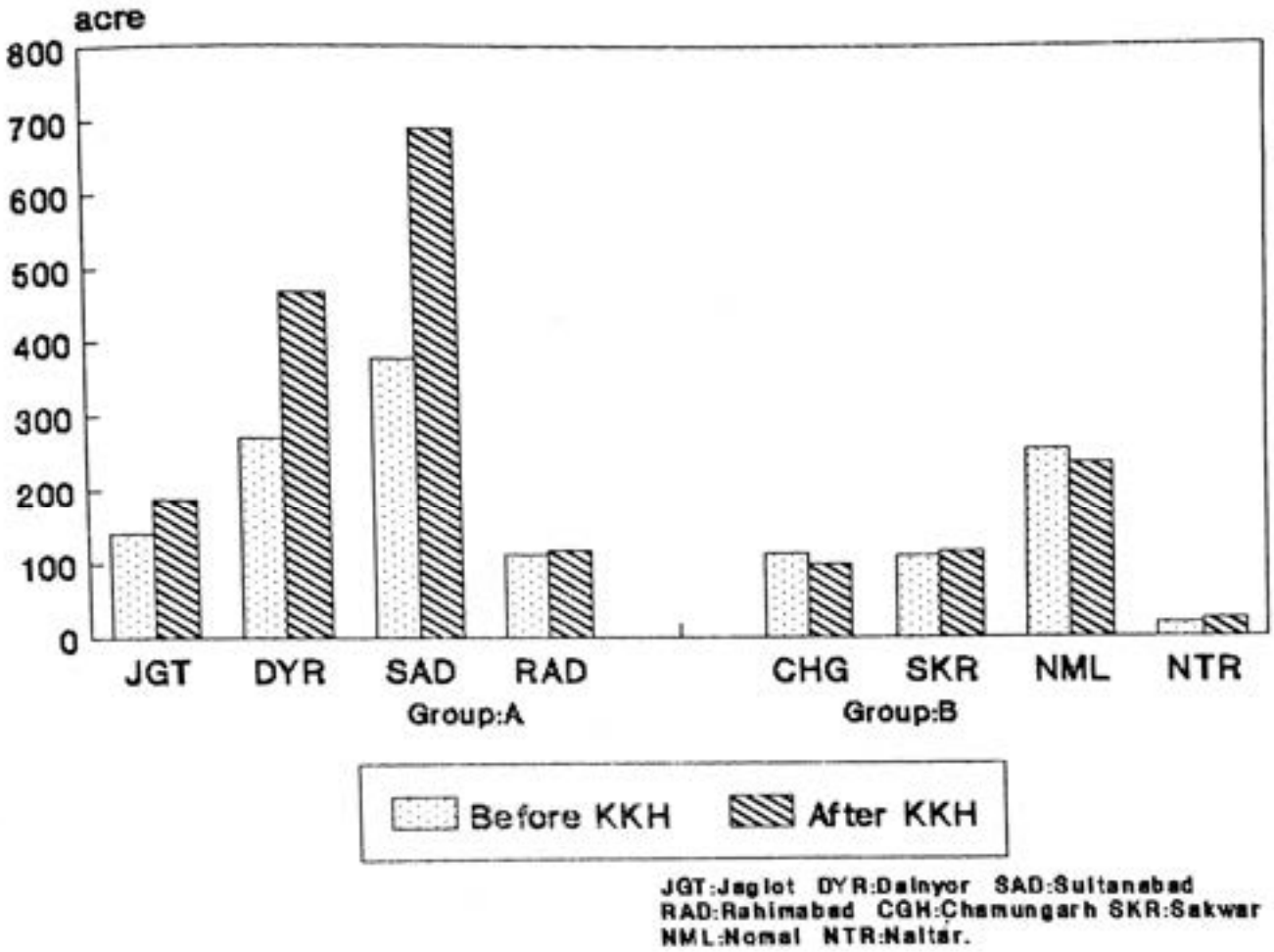
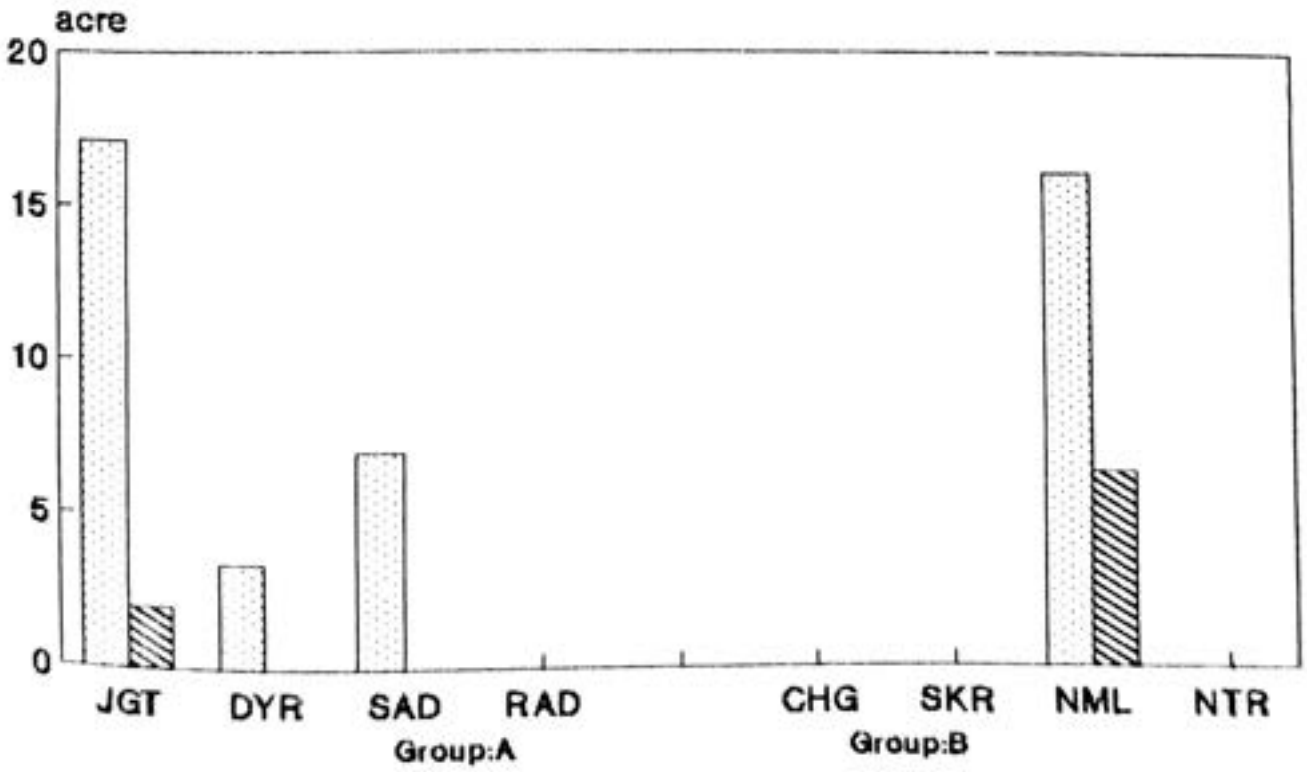
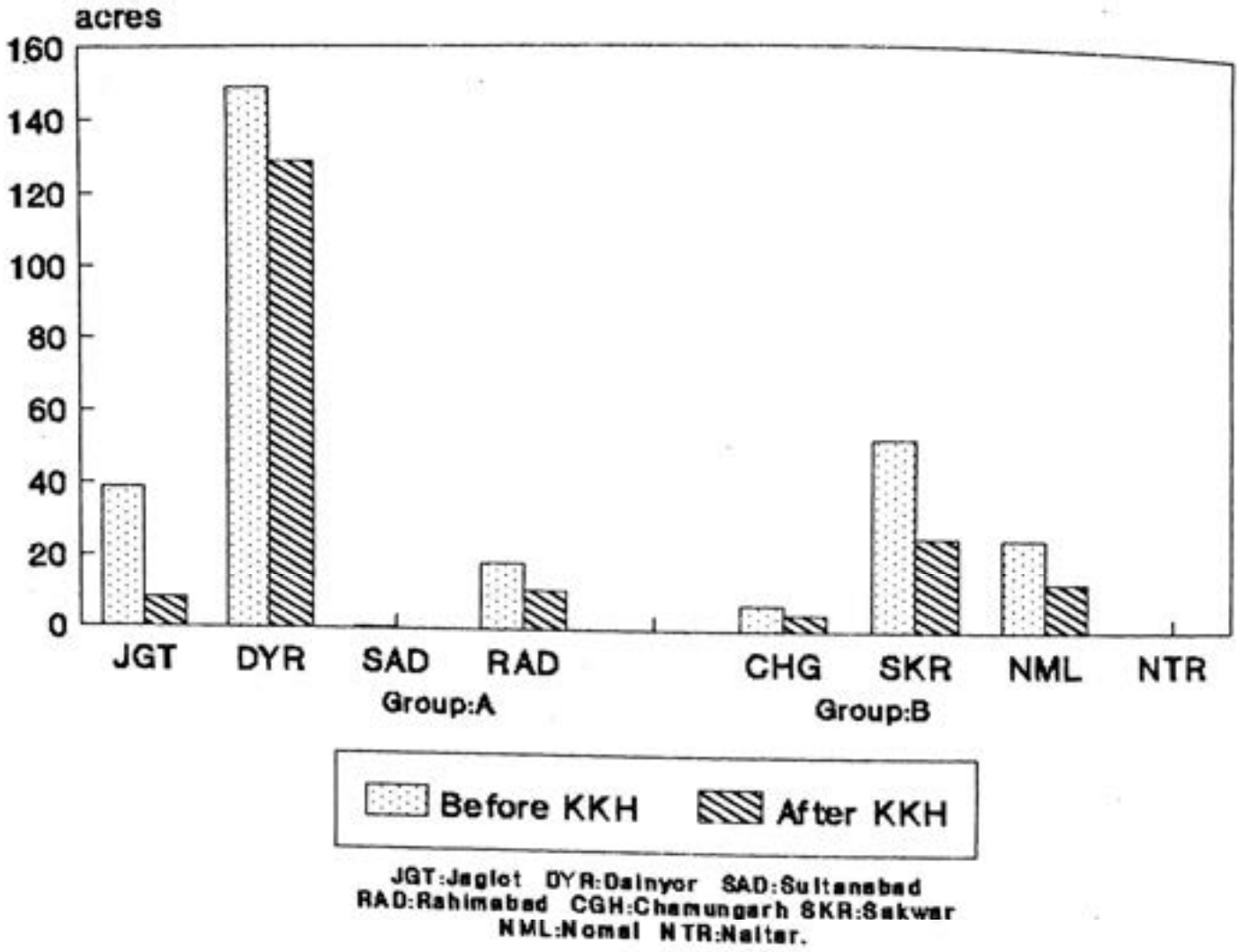


Fig. 10.5 Change in Rice Acreage



Pulses (Fig. 10.6) have also recorded a decline in all villages. They used to be grown on infertile soils which are now heavily manured by chemical fertilizers. The income from the competing crops, like maize, fodder, and vegetables, is far higher than that from pulses. So there has been a shift from pulses to maize and other crops. Another factor is that pulses from Punjab are available cheaply. There is also a change in food habits; therefore, a gradual shift has taken place from pulses to vegetables.

Fig. 10.6 Change in Pulses Acreage



Vegetables have recorded a sharp rise in all villages, but more particularly in villages along the KKH because they are easily transported to Gilgit and other markets.

Changes in the *kharif* vegetable acreage (Fig. 10.7) are not very significant. Rahimabad, along the highway, and Nomal and Naltar, away from the highway, have shown a slight fall in the acreage, while Jaglot shows no change. Dainyor and Sakwar, both adjacent to Gilgit, have shown a slight increase in the vegetable acreage.

Fig. 10.7 Change in Vegetables Acreage

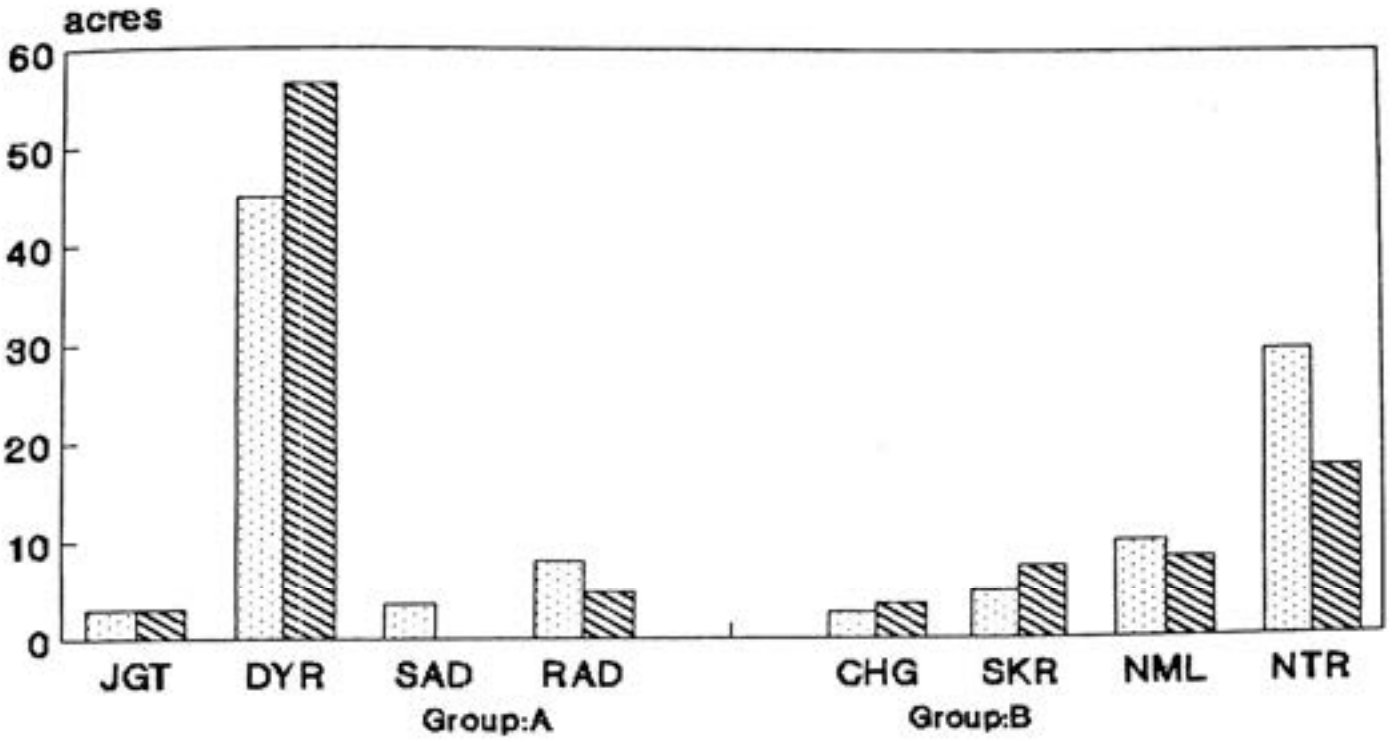
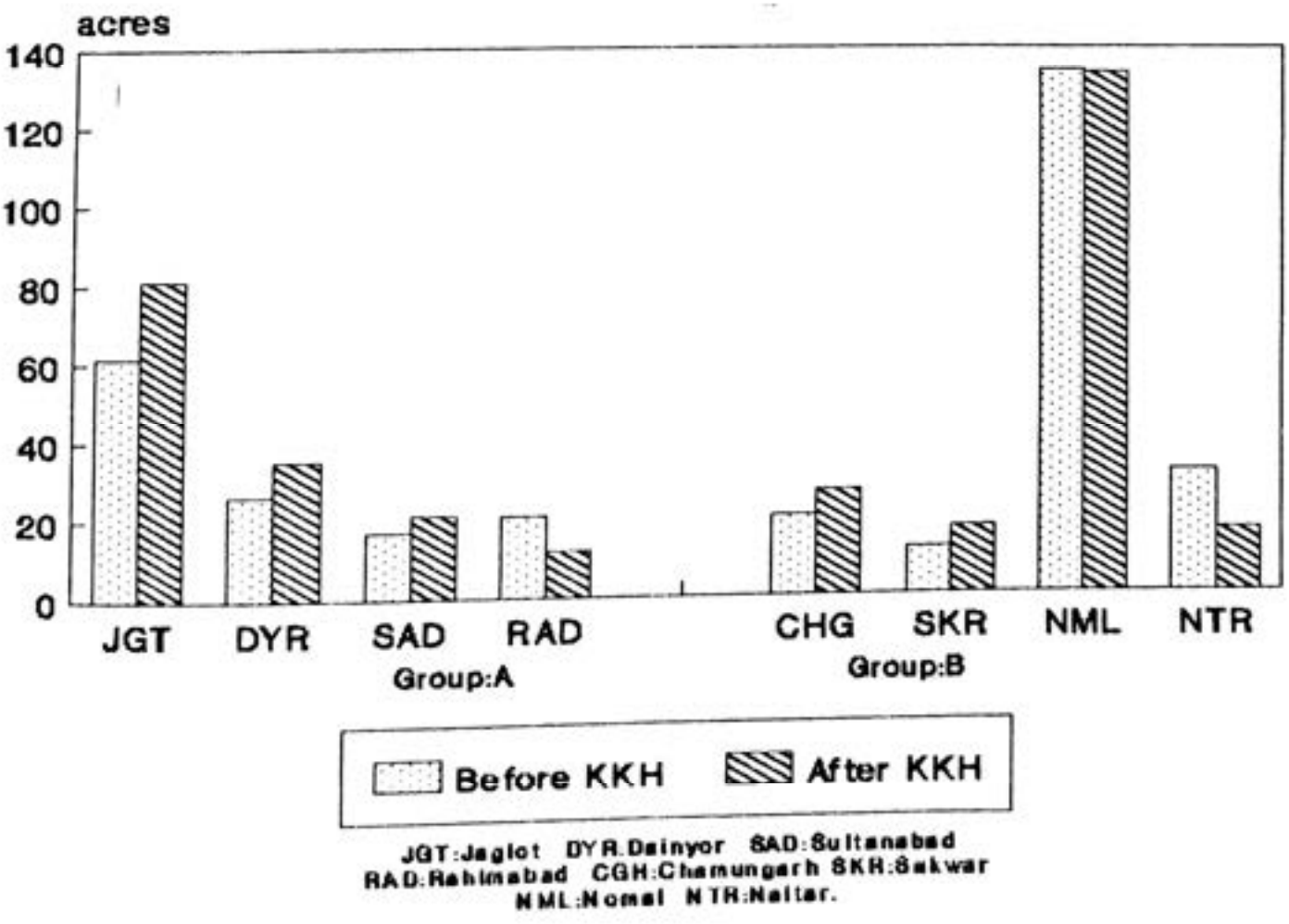
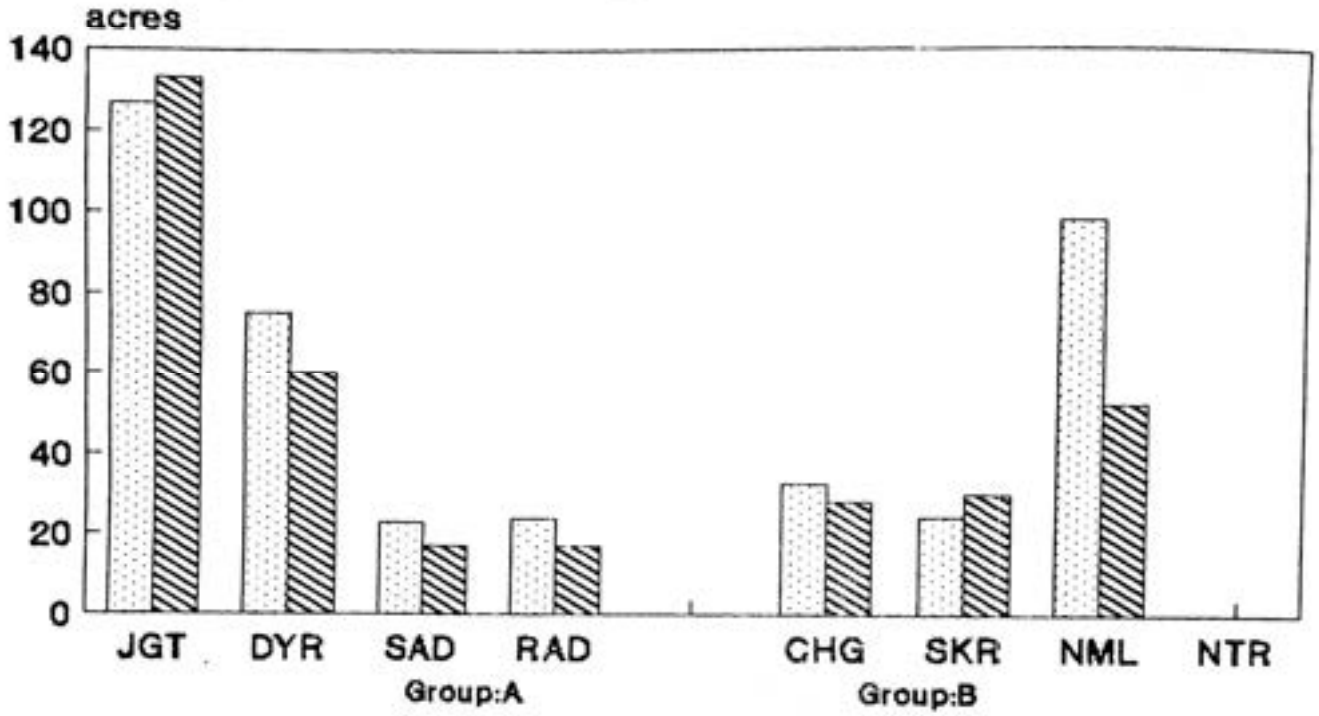


Fig. 10.8 Change in Fodder (*Kharif*) Acreage



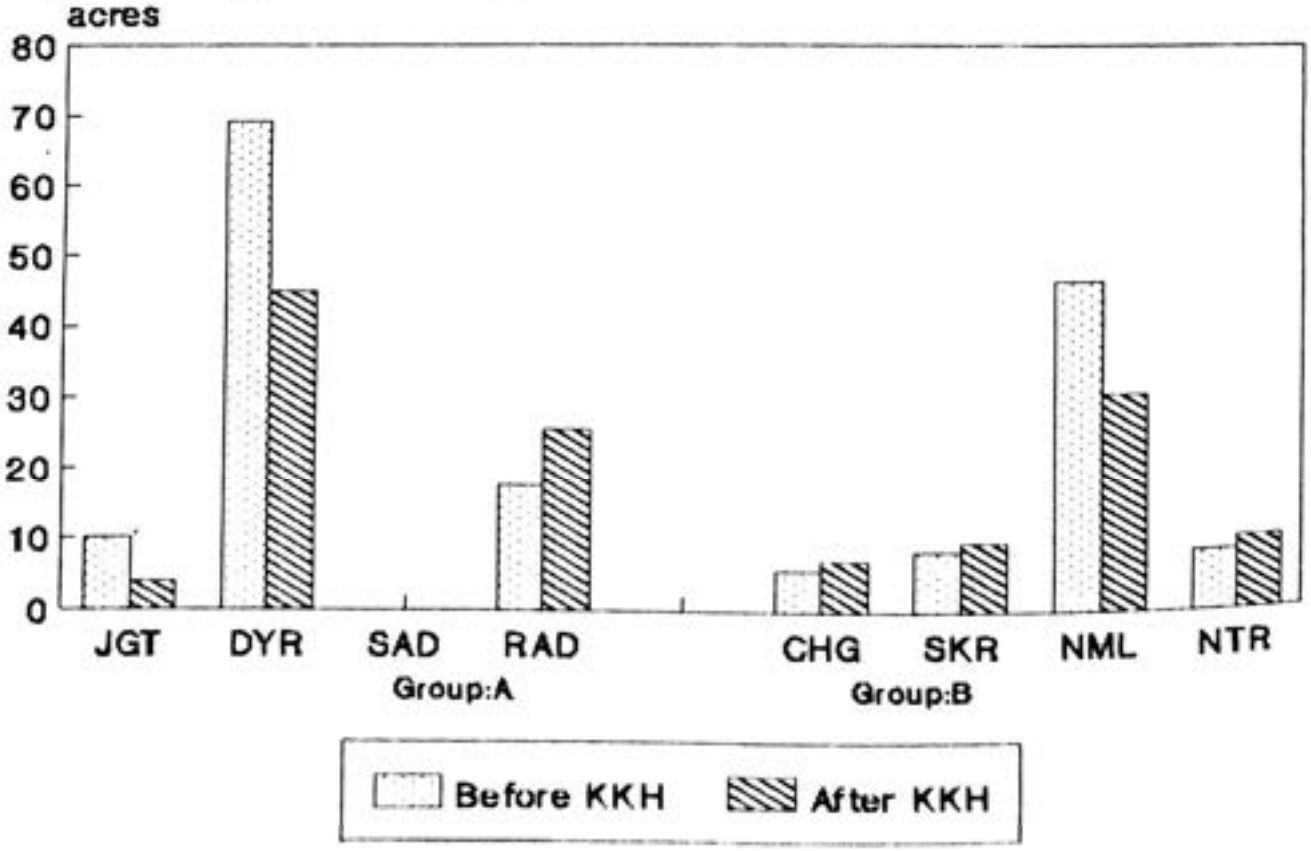
Fodder (*kharif*) (Fig 10.8) has shown a general increase in Group A villages, and some changes in Group B. Fodder (*rabi*) (Fig 10.9) has shown an overall decline in villages both along and off the highway because it has shifted to the *kharif* season.

Fig. 10.9 Change in Fodder (*Rabi*) Acreage



Fruit (*rabi*) (Fig. 10.10) has diminished in Group A villages, because land is now given to wheat. In Group B, only Nomal has shown a slight decline in fruit acreage; all others have shown some increase.

Fig. 10.10 Change in Fruit Acreage



Vegetables (*rabi*) in the villages along the highway have increased in response to urban needs. Sakwar, close to Gilgit, has recorded a slight increase. All other villages show a decrease. Naltar is a single-cropped area and has no *rabi* vegetables.

Chemical Fertilizers

The use of chemical fertilizers were not known in the region before the KKH. With the exception of Naltar, nearly 100 per cent of farmers in every village now use chemical fertilizers. Urea and nitrophos are commonly used, while in one village, Dainyor, nitrate is also used. The price of a bag varies from 200 to 250 rupees. In 1992, Dainyor alone consumed 2800 bags of fertilizer. It is used for a number of crops, but wheat is the most favoured one.

Mechanization

Before the KKH, farming in the Northern Areas was manual and oxen were used for ploughing and thrashing. Since 1973, when the first tractor arrived in Dainyor, it has increasingly been used for ploughing and thrashing. Nearly 100 per cent of the farmers use it for farming. The total number of tractors in the eight villages is ninety-eight. The largest number, that is fifty, are in Dainyor. Mechanization has had the following impacts:

a. Animals used for ploughing and thrashing have been reduced in number.
b. Farm labour previously used for ploughing and thrashing is now available for off-farm employment.
c. Productivity of land has increased.
d. The size of fields has been enlarged for the economic use of tractors.
e. As a result of the off-farm income, cultivated waste and fallow land has been brought under the plough, resulting in an increase in the net sown area.

New Crops and Crop Varieties

A number of new crops, fruits, and vegetables have been introduced. They include seed potato, introduced by Integrated Regional Development Programme (IRDP) in the 1980s and occupying a large *kharif* acreage. The potatoes are consumed locally as food and also sold to traders from the NWFP and Punjab. They bring about Rs 200 to Rs 300 per bag, and have great economic potential.

Vegetables

A number of vegetables have been introduced by the IRDP and FAO since 1982. These include: peas, which give two crops a year, raddish, asparagus, broccoli, brussel sprouts, red and yellow onion, and capsicum (sweet pepper). These are slowly gaining popularity among farmers.

Peas mat for instance, are planted in March and are ready in July. They yields an income of Rs 5000 per *kanal* (1/8 acres).

Fruit

A number of fruit varieties have been introduced by the IRDP. They include Red Delicious and Golden Delicious varieties of apples, introduced in 1982–83. Recently Stark Delicious has also been introduced. Two varieties of cherries were introduced in 1983. They have now almost replaced the local varieties. These include Napoleon (red) and Early River (black). Recently, two new varieties, Being and Talariam, have been introduced.

Improved varieties of pears and peaches have been introduced. Also, seedless grapes have been brought in from Quetta. Two new varieties of strawberry—Red Gauntlet and Gorilla, were introduced in 1982. Likewise, red currants and gooseberries have been introduced since 1982–83.

Market Availability

1. The KKH has opened the area for tourism, business, and commerce to the Indus Basin. Rice, wheat, and pulses can be transported to the Northern Areas from Punjab. Dried fruit, and in some cases, even fresh fruit is brought down to the NWFP and Punjab.
2. A number of markets are now available for the consumption of farm products. These include Gilgit, Jaglot, Aliabad, Rahimabad, and Sost. These centres, in addition to the garrision population, are also visited by Pakistani and foreign tourists. Tourists hotels, which mostly consume locally produced fruits and vegetables, have sprung up along the KKH.

Use of Insecticides

1. The use of insecticide was popularized by various agencies after the KKH came into being. The farmers' response has been very good. The insecticides have been sold on subsidized rates; yet, owing to the low return to the farmers, their use has not been as popular as that of chemical fertilizers.

Tenure System

In the Northern Areas, nearly every household has a piece of cultivated land. Until recently, land was cultivated jointly by the family. The owners were the tillers. With the opening of off-farm job opportunities, land is now being leased. In some cases, farm workers are now being employed on wages.

Conclusion

The study brings to light a number of significant changes in land use in the Northern Areas consequent upon the construction of the KKH. It shows quite clearly that the villages situated on the KKH have benefited more because of their advantageous situation compared to those which lie off the main highway. One can easily assume that the KKH is going to play a vital

role in effecting changes in the socio-economic and political patterns of the region in th years to come.

Acknowledgements

The author gratefully acknowledges that the study was sponsored by the German Research Council, under the Pak-Germany research programme 'Culture Area Karakorum—1989 and 1995.' She is also indebted to Professor Dr M. Said and Mr Nasir Jamal of the Department of Geography, University of Peshawar, for their cooperation, without which the study would not have been possible. The support, help, and hospitality of the public and private agencies, interview partners, and friends in the areas surveyed are also placed on record to express the gratitude of the author.

11

SUSTAINABILITY INDIGENOUS KNOWLEDGE SYSTEM—TRADITIONAL LAND USES IN THE NORTHERN AREAS OF PAKISTAN AS AN EXAMPLE

*Eckart Ehlers**

Introduction

Discussions about global environmental change and preservation of the earth's natural and cultural diversity have reached a point where new concepts and strategies include the renaissance of experiences from the past. While this obvious contradiction can surely not be labelled as a programme for modernization at large, it is equally obvious that at least certain local or regional experiences are worth rediscovery. This holds true also for aspects of agriculture and pastoralism in remote and ecologically fragile areas. Both terms—sustainability and indigenous knowledge systems—are well-suited for understanding the fact that the high mountain areas of Northern Pakistan have maintained a rural population over centuries. In spite of extreme natural hazards and an overall harsh environment, local populations have developed cultural and social practices that have enabled them to make a 'creative adjustment' and survive.

It is the intention of the following deliberations to discuss concepts of sustainability and of indigenous knowledge systems in regard to traditional land-use patterns in the Northern Areas of Pakistan. Before doing so, however, a few preliminary remarks in regard to both concepts may be appropriate.

Sustainability and Indigenous Knowledge Systems

Since the publication of the Brundtland Report on *Our Common Future* (1987) the discussion on sustainability has experienced what one might call an inflationary development: 'Enduring development is development which meets the needs of the present without taking the risk that future generations will not be able to meet their needs' (Brundtland Report 1987). This by now almost classic definition has occasioned overt false labelling, encouraged by the almost universal use and applicability of the term (Vosti et al. 1991, especially Ruttan in the latter!), but it has also revealed new aspects and ways of interpreting the reality of development theory and practice. The fact that indicators for sustainability have been developed for almost all purposes is both intriguing and confusing (cf. Moldan & Billharz 1997). This statement applies without reservation also to geographic issues.

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There can be no dispute that we need ecologically oriented ways of thinking and patterns of action, and that these should proceed not from a local or regional but from a global perspective. The progressive condensation, as well as integration, of time and space and human beings' tightening bondage to the environment, call for new future and future-oriented concepts of environmental conservation and development work. This not only means reducing the demands and environmental consumption associated with the highly complex systems of the industrialized countries (Dietz et al. 1992) but also addresses the regions and societies of the so-called third world.

One should not forget amid all these considerations that the term 'environment' is also currently subject to rationalization, that is coming to be used in the sense of an object or thing. As history has taught us time and again, this is the doing of our own Western and 'capitalistic' society with its specifically European and/or American system of values and norms. Nature and the environment are increasingly being understood and interpreted as an economic 'commodity', that is, subject to the principle of supply and demand and to be treated accordingly. Environmental economy—environmental damage—environmental management: this and other vocabulary reflect the new 'soberness' typical of environmental discussions centring on sustainability.

This sort of conception of the environment is highly questionable, as can be seen from the countless failures of large-scale Western-style development projects in African, Asian, and Latin American countries. Thus, the conceptual shift in the development discussion from recuperative to sustainable development has almost itself drawn attention to traditional systems of land use and led to a deepened analysis of indigenous, ecologically well-adapted farming methods, for example in agriculture and animal husbandry. The fact that many of today's 'problem regions' were for centuries or even millennia in more or less permanent use without loss of productivity gives us food for thought. This reorientation is incidentally paralleled in Western societies by the return to traditional forms of land use and soil management.

Although not as conspicuous as the term sustainability, traditional and indigenous knowledge systems also seem to be in vogue. Recent years have shown a remarkable revival of interest in these phenomena, land-use practices being a major component of this revival. Publications like those of Brokensha et al. (1980) or those of Warren et al. (1995) reveal the development aspects of indigenous knowledge systems and their importance for sustainable land use and land management. The UNESCO's *World Culture Report* (1998), its first ever, is probably the most convincing testimony to this growing interest.

A very general definition of 'indigenous knowledge' reads as follows: '...The local knowledge that is unique to a given culture or society contrasts with the international knowledge system which is generated through the global network of universities and research institutes. Indigenous knowledge is important as it forms the information base for a society which facilitates communication and decision-making' (Warren et al. 1995: XV). While this general definition may not be very helpful in our specific context, it is undisputed, however, that indigenous knowledge systems go far beyond the traditional local land-use systems as such—be they well-adapted or not! Indigenous knowledge systems pertain to:

- indigenous decision making processes,
- indigenous (social) organizations and institutions, and
- indigenous technical knowledge.

Thus, they constitute a wide range of accumulated and inherited wisdom that constitutes an indispensable part of traditional adaptation to and successful coping with harsh and marginal environments. This holds true for the Northern Areas of Pakistan.

Sustainability, Indigenous Knowledge Systems, and the Problem of Marginal Areas

Before we go into a somewhat detailed presentation of one or two concrete examples from the remote areas of Northern Pakistan, it may be appropriate to reflect on the specific character of both marginal and peripheral regions in which sustainability and indigenous knowledge systems seem to play a very specific and prominent role. Marginal and peripheral regions, by their very nature and location, tend to be those where innovations arrive later and where traditions survive longer and more profoundly than elsewhere.

The conditions prevailing in marginal regions and on the fringes of the oecumene are altogether different from those in core regions of social and economic development. Here, we find populations which are still wholly or at least partly dissociated from the conditions of the world market and for the most part live on subsistence farming or other forms of economy. In predominantly rural areas, there are next to no resource potentials beside crop farming and animal husbandry which could offer an additional source of income. Here, often within very confined spaces, the traditional temporal and spatial organization principles which have proven their worth in subsistence farming still play the same decisive role they have in the past: the finely adjusted incorporation and utilization of all the available, spatially often remote, resources through the course of the year into one household economy is becoming more and more a vital necessity for the populations concerned, especially for fast-growing populations. Their way of organizing spatially differentiated resources and their temporally differentiated use of these resources, both of which are governed by rationales specific to their cultural sphere as well as by economic constraints, ensure their subsistence at a 'low' level of material wealth.

As discussed in more detail in earlier publications (Ehlers 1996, 1997b), traditional societies with prevailing subsistence farming, a high growth rate, and lack of non-agrarian resources basically have only three directions in which to develop:

- Population growth and declining standard of living
- Stagnation in both population and standard of living
- Population decline and growing standard of living

Without our going into further details of these interrelationships, it should be self-evident that a careful and sustainable management of marginal and peripheral regions is not only in the interest of their inhabitants, but also their specific fore- and hinterlands, with which they interact ecologically and economically. Strategies in coping with obvious discrepancies between population growth and a definite limitation in the carrying capacity of a certain region include:

- intensified use of cropping resources,
- organization changes in land use through the optimization of spatial and temporal resources,
- tapping of new economic potentials and the concomitant ecological degradation of their natural basis,
- emigration, and
- import of new and/or non-agrarian economic activities.

It goes without saying that constraints and problems resulting from the obvious discrepancy between a rapidly increasing population and equally rapidly decreasing resource potential become especially apparent in both marginal and peripheral areas. Some of the physical, ecological, and socio-economic handicaps of such regions have been compiled in Fig. 11.1.

Fig. 11.1 Physical, Ecological, and Socio-economic Handicaps

Physical and Ecological Factors (Selection)	*Socio-economic Factors (Selection)*
Location	**Tenure and Property**
Isolation	Size of farming enterprises
Distance from markets	Law of inheritance
Accessibility	Field patterns/fragmentation of fields
Environment	**Work Force**
Topography/relief	Education
Climate	Income from extra-agricultural sources
—Precipitation	Family help
—Temperature	Hired labour
—Radiation budget	
Vegetation	**Capital**
Soil	Mechanization
Water and other factors	Work animals and equipment
	Credit system
	Rural infrastructure
	Technical Know-how
	Traditional/modern systems of knowledge
	Innovative potentials and other factors
	Proximity to Markets/Distance from Markets and Other Factors

Source: E. Ehlers 1994

It is the purpose of the following examples to demonstrate those close relationships and interactions between environment and society by taking examples from the Karakoram mountains in the Northern Areas of Pakistan. By doing so, the presentation of two case studies serves not only as a contribution to a better understanding of the regional geography of this fragile and marginal environment, but also as an example of the remarkable human adaptation to and coping with it. As such, both examples will help us also to understand better the close relationships between sustainability, regional development, and marginal locations (Kuhnen 1992). Finally, they will hopefully serve to recognize not only the ecological value of 'traditional' land use systems, but also and equally the 'rationale' behind local belief systems and perceptions of environments.

The Karakoram Mountains/Northern Pakistan: Land Use Systems and Their Sustainability

Both geographical and anthropological research within the framework of the Pakistan-German Research Project on the Culture Area Karakorum (CAK) have revealed a great number of new and remarkable insights into the natural and societal features of this area. Without our going into the details of this context, it may suffice to refer to studies on climate (Weiers 1995) as well as to analyses of specific aspects of the human geography of this region (Kreutzmann 1996; Herbers 1998). Important and comprehensive English compilations of this research are contained in the collections of Stellrecht (1997), Stellrecht and Winiger (1997), and Stellrecht and Bohle (1998). These last-mentioned editions are indispensable preconditions for a better understanding also of the following lines and should be seen in close context with this volume and its contributions at large.

Agricultural Land Use—The Organization of Time and Space

The following deliberations on the close interaction and relationship between nature and society concentrate on one specific example: the Bagrot valley and its rural communities. In line with the aforementioned remarks on problems of marginality and periphery, the Bagrot fulfilled until a few years ago (1994) all characteristics of both economic marginality and geographical periphery. Although located only 30 kilometres from Gilgit, the valley community and the side valley of the so-called 'Little Bagrot' (Grötzbach 1984) have been isolated until quite recently. For many years villages like Sinaker, Datuchi, Farfui, or Bulchi and their inhabitants have been linked to Gilgit and the Karakoram Highway (KKH) by no more than a gravel track passable only for jeeps. Admittedly, the linkup to the local power grid in the late summer of 1994 has done much to modernize living conditions; at the same time, however, the arrival of television has meant a sudden and dramatic confrontation of a traditional society (Snoy 1975) with Western values and norms, the consequences of which have not been analysed so far.

Resources in the way of cultivated area, pastureland, and—of great importance for high crop yields—irrigation water, vary from village to village. In no case, however, are they sufficient to support the steady population growth that has persisted throughout the twentieth century in all settlements of the Bagrot (Table 11.1). Scarcity of resources, especially cultivable land, in conjunction with land division has long reduced the minimum size of farms below subsistence level, even assuming very humble standards. Although the available statistics do not permit accurate figures, it is probable that the average values determined for Gilgit District as a whole are also representative of the Bagrot (Table 11.2). The same holds true for the rural social structure: the great majority of farms are owner-occupied. Common forms of management include amalgamations of family farms, joint management of self-owned or of leased land, and combined cropping and grassland farming in family or neighbourhood communities. Here again no data are available for the Bagrot and its villages alone, but those given in Table 11.3 should be representative also for our case study.

Table 11.1 Population Growth and Development of Households in the Bagrot (1928–91)

Village/	1928[a]		1972[b]		1981[c]		1991[d]	
Locality	**H***	**P***	**H**	**P**	**H**	**P**	**H**	**P**
Bulchi	44	390	109	741	114	920	126	1120
Datuchi	22	185	61	419	67	543	82	656
Sinaker	34	410	61	419	65	544	70	560
Chira	30	206						
Farfui	49	358	195	1265	205	1538	248	2046
Hope	25	190						
Teisot	45	354	116	686	126	541		
Bilchar	37	288	68	345	55		3	
Hamaren						306	25	176
Jalalabad			189	1134			554	4432
Oshikandas			245	1715			370	3160
Total	286	2181						
Gilgit/subdivision			4721	33050				

*H = households; *P = people

Sources:

a. General Staff India, Military Report and Gazetter of the Gilgit Agency and the Independent Territories of Tangir and Darel (Simla, 1928), p. 139.

b. Government of Pakistan, District Census Report of Gilgit. (Islamabad, 1975), pp. 52, 54.

c. Government of Pakistan, 1981 District Census Report of Gilgit. (Islamabad, 1984), p. 50.

d. Compiled according to data supplied by Monika Schneid, Aga Khan Health Services (1990), and Aga Khan Rural Support Programme (1991). This table in its present form has been compiled by Dr Kreutzmann.

. 11.2 Bagrot Valley and Settlements

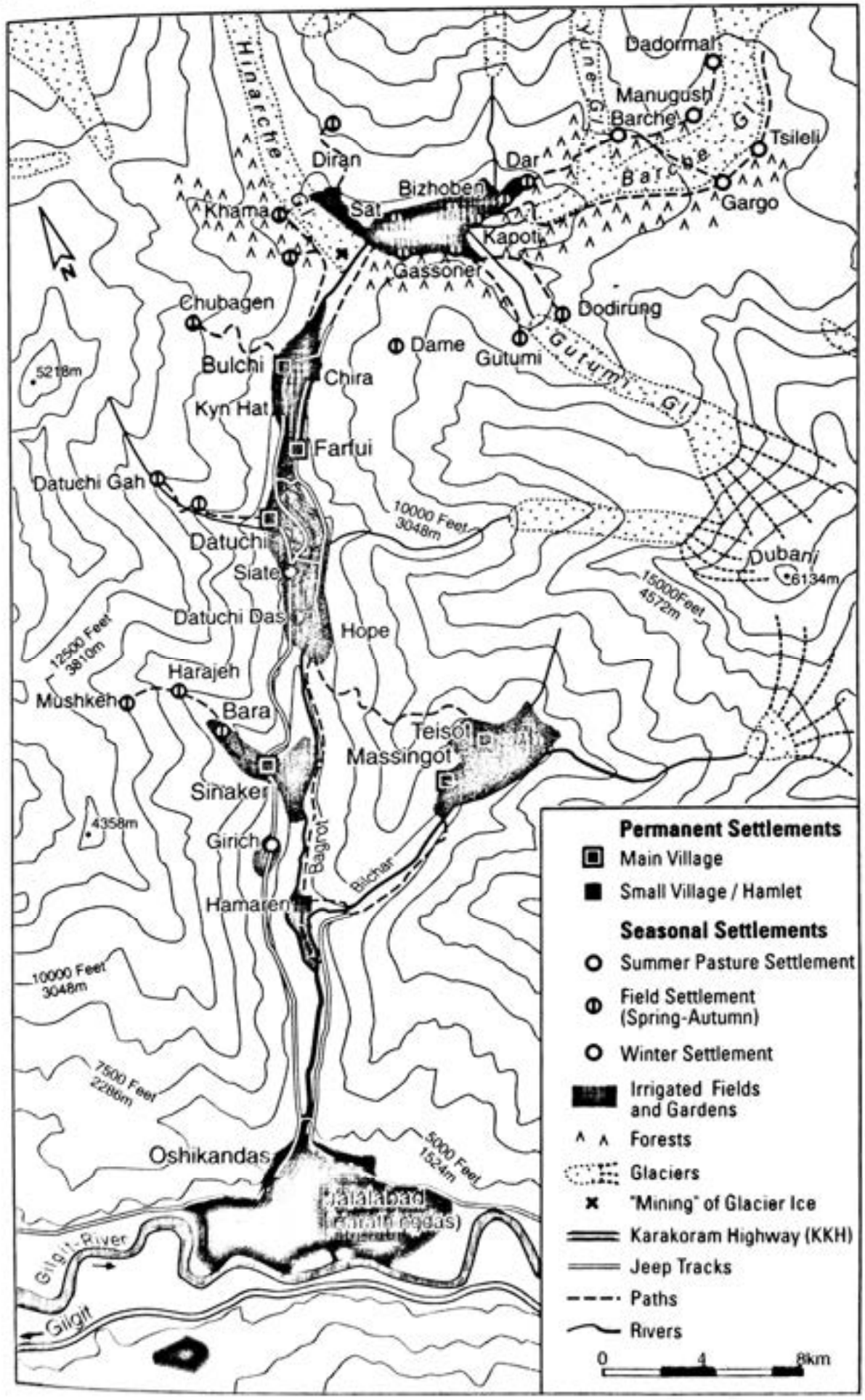


Table 11.2 Land Use in Gilgit District (in Ha)

Type of Use	*Total Area (Ha)*	*Percentage of Total Area (%)*
Farmland	20,392	70
Orchards	3,874	14
Crop farming	16,518	56
Fallow land	8,492	30
Cultivable	6,474	22
Not cultivable	2,018	8
Total area	28,884	100

Source: Northern Area Census of Agriculture, 1980; here quoted from Aga Khan Rural Support Programme, 22nd Progress Report, Gilgit 1988.

Table 11.3 Land Tenure in Gilgit District

	Farms (%)	*Area (%)*	*Area/Farm (%)*
Property	95	94	1.21
Lease (mixed form)	4	5	1.14
Property and lease (mixed form)	1	1	0.93

Source: Northern Area Census of Agriculture, 1980; here quoted from Aga Khan Rural Support Programme, 22nd Progress Report, Gilgit 1988.

Tables 11.1 to 11.3 give a good idea of the problems resulting from the population's rapid growth on the one hand and its limited agricultural resources on the other. As in many, perhaps even most mountain regions of the earth, scarcity and marginality compels the inhabitants of the Bagrot to seek supplementary forms of farm and off-farm income. Therefore, the inhabitants of the Bagrot—like those of other valleys in the Karakoram—have developed various adaptation mechanisms to cope with the growing discrepancy between population growth and agricultural production and productivity. These include the development of summer villages at elevated, climatically less favourable sites, the utilization of complementary highland pastures for seasonal mountain grazing, the introduction of new crops like potatoes, and the transition from single to double cropping in the vicinity of the home settlements using fast growing spring crops.

As already indicated, traditional settlement and rural economy of the Bagrot are organized in such a way that both vertically and horizontally there are altogether three levels of agricultural and pastoral activities:

- ❒ The permanently used valley bottom with its villages and open fields
- ❒ The periodically used area of the summer villages with its arable land and pastures
- ❒ The periodically used high pastures

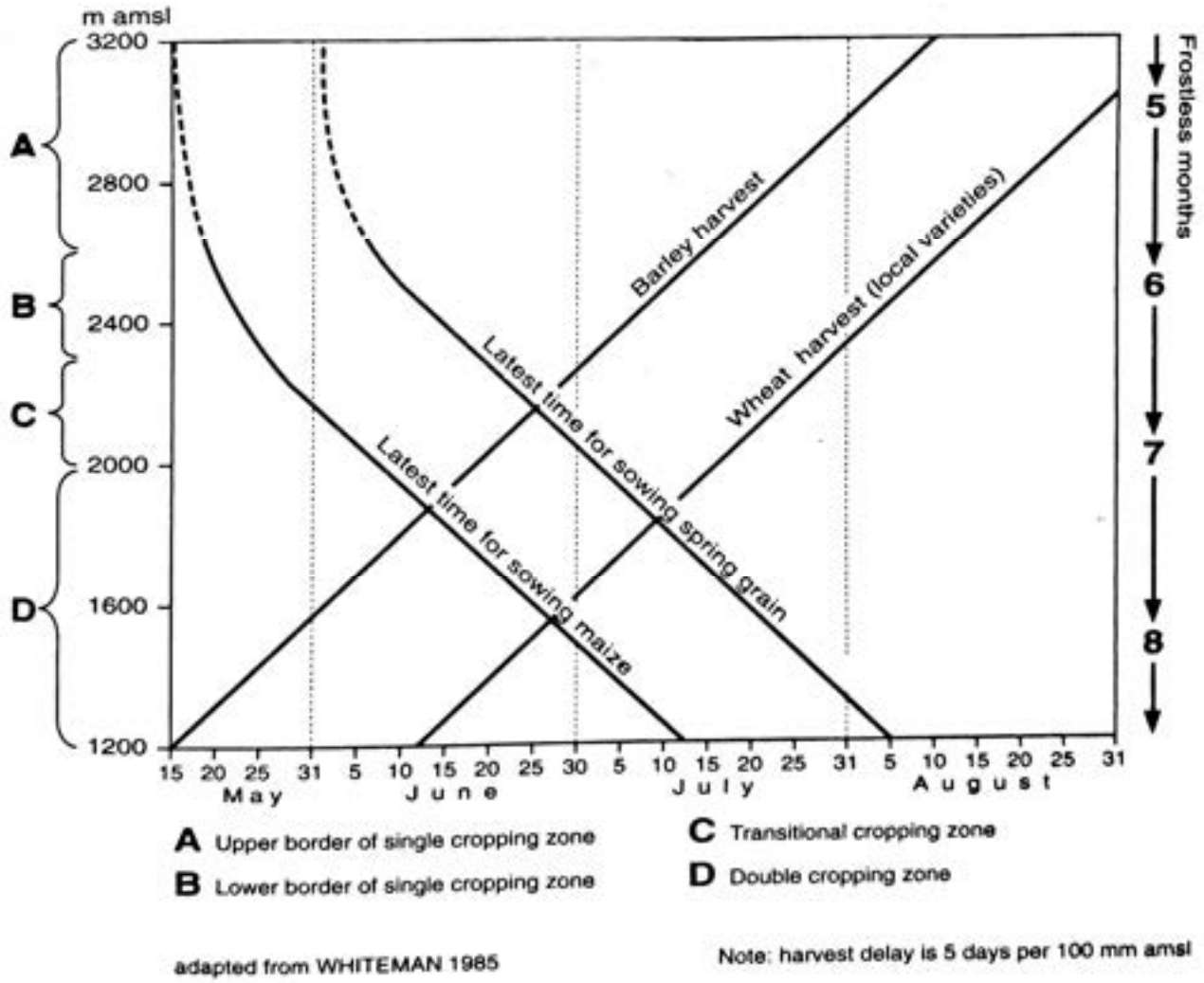
None of these three segments alone is sufficient to support the livelihood of the valley population. While this may have been the case in the past, when the overall population of the Bagrot was low, nowadays agriculture and pastoralism is only part of a broader economy in connection with non-agricultural activities.

The material basis of traditional crop and grassland farming in the Bagrot, as well as in other valleys of the Karakoram, is provided by the terrace fields lining the river, which are cultivated exclusively by irrigation, and the lower slopes close to the settlements. The

agricultural utilization of the valley bottom is extremely intensive and characterized by the following features:

- Development of all areas that can be irrigated and utilized at reasonable cost through fine division into small lots managed by owners or tenants
- Forms of collective land use based on irrigation, communal fieldwork and harvesting, and in the case of double cropping, succession of different crops
- Wherever possible, doubling of the harvested area by the use of fast-growing varieties that allow two harvests a year
- Cultivation of traditional crops for farm and family requirements; these may be substitute by cash crops such as seed potato or different kinds of vegetable
- Clear division of land into an 'infield' area, which is reserved above all for intensive farming, and at a greater distance from the villages, an 'outfield' area, which is preferably used for multiple hay harvesting and fruit culture (apricots, apples, nuts, etc.)

Fig. 11.3 Single and Double Cropping Areas in Gilgit

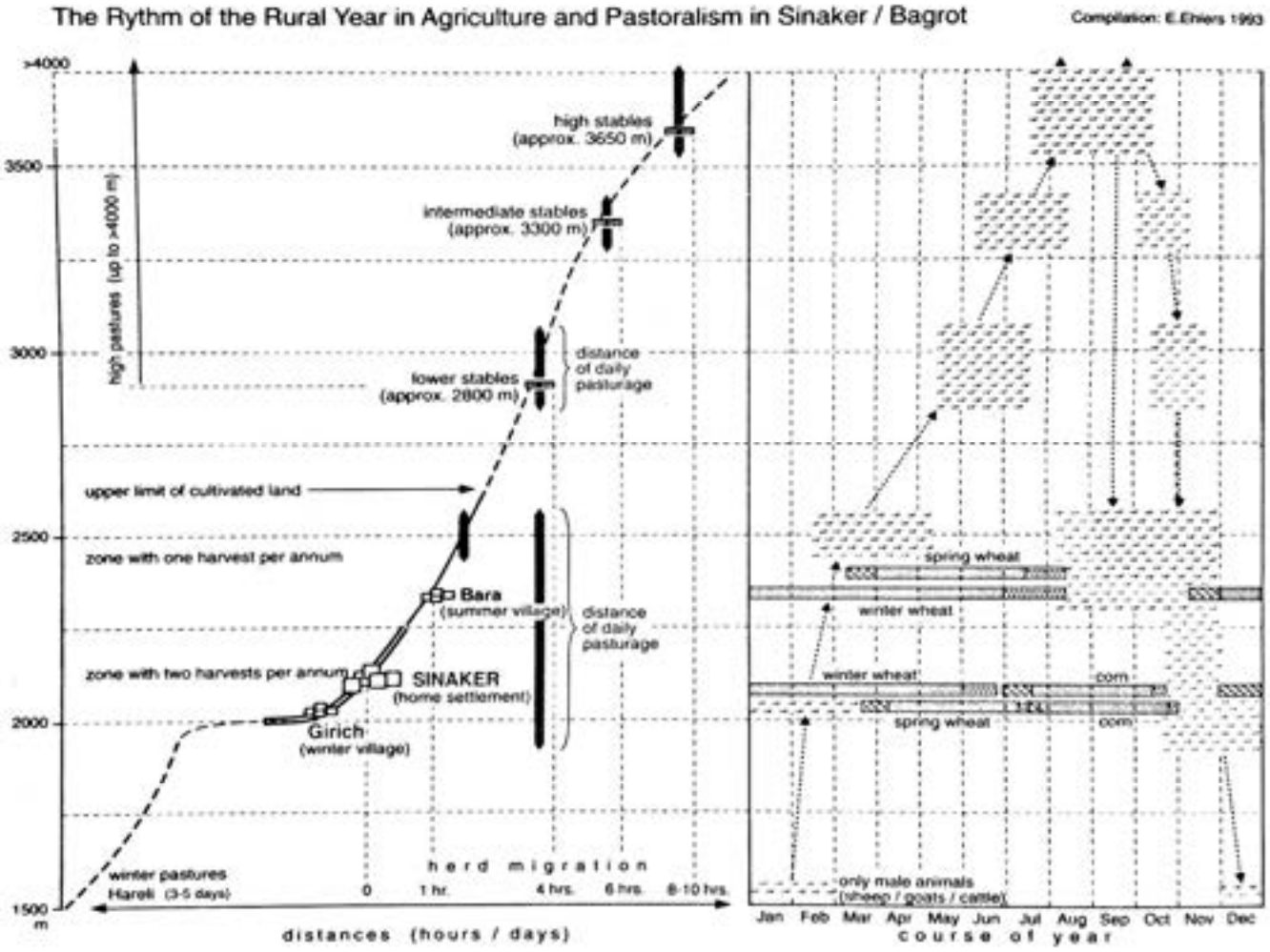


The transition to double cropping becomes more difficult the higher the fields and settlements are situated (Fig. 11.3). Whereas Sinaker, which is located in the valley bottom at an altitude of 2070 to 2140 metres, still clearly lies in the double cropping zone, the fields of Datuchi and Farfui, which are no more than about 150 to 200 metres higher, usually allow for

only one harvest a year. Individual farmers in Datuchi do attempt, often unsuccessfully, to bring maize to maturity as a cash crop. The fact that a difference in altitude of one hundred metres can be decisive can be seen from the land surrounding the former winter village, Datuchi Das, where almost all fields bear a cash crop.

Not only in the Bagrot but in almost all valley communities of the Karakoram mountains seasonally used field settlements are a basic element of rural settlement and subsistence patterns. Field settlements may be summer villages or winter settlements. In both cases the field settlement may be located anywhere between the immediate vicinity of the home settlement and a few hours' walk away (Fig. 11.4).

Fig. 11.4 The Rhythm of the Rural Year in Agriculture in Sinaker (Bagrot)



Sinaker, for example, has two complementary settlements, Girich and Bara (Fig. 11.4), the former of which is meanwhile partly inhabited all year round. The former winter village of Datuchi Das has been used in a like manner for some time now. The field settlements, which are completely devoid of infrastructure, are used by individual family members mostly not more than just for a few days during the spring cultivation and harvest time, but also serve as temporary living and sleeping places when the fields are irrigated during the summer.

The land around the field settlements is typically used in monoculture. With the exception of the southward facing settlement of Bara/Sinaker at a moderate 2280 metre altitude, where both spring and winter wheat are sown and harvested, field settlements are characterized by the almost exclusive cultivation of spring wheat. The crop is sown late April/early May and harvested in late September/early October, after which the harvested fields serve the herds

returning from the high pastures as a stubble pasture and are partly used for several weeks as a kind of intermediate pasture in spring.

The example presented here (for more detailed analysis of the Bagrot Snoy 1975 cf. Grötzbach 1984; Ehlers 1996) is by no means unique within the overall framework of Northern Pakistan. Similar land uses have been reported from the Nanga Parbat region (Clemens and Nüsser 1994), from the Yasin valley (Herbers and Stöber 1995) and especially from Hunza (Kreutzmann 1989). They reflect 'creative adjustment' to not only harsh physical environments, but also to constantly increasing socio-economic constraints. The advantages of traditional land use in regard to the montane environment still need to be examined in more detail.

Pastoralism—Mythological Aspects of Sustainability

As indicated earlier, high pastures are an indispensable part of the rural economy. Although firmly embedded in the overall economic system of most rural households, the spatial and temporal organization of pastoralism is distinctly different from the agricultural year, although rationally and positively incorporated into the overall rural production system. While our specific example, Sinaker (cf. Fig. 11.4) is an exception to the overall rule in that respect (that due to its location in the lower Bagrot, Sinaker peasants only have limited high pasture areas, and, moreover, lack a passageway to the meadowland at the heads of the Bagrot valley and its tributaries), the overall principle of their spatial and temporal inclusion into the agricultural year of the home settlement becomes, nevertheless, clear.

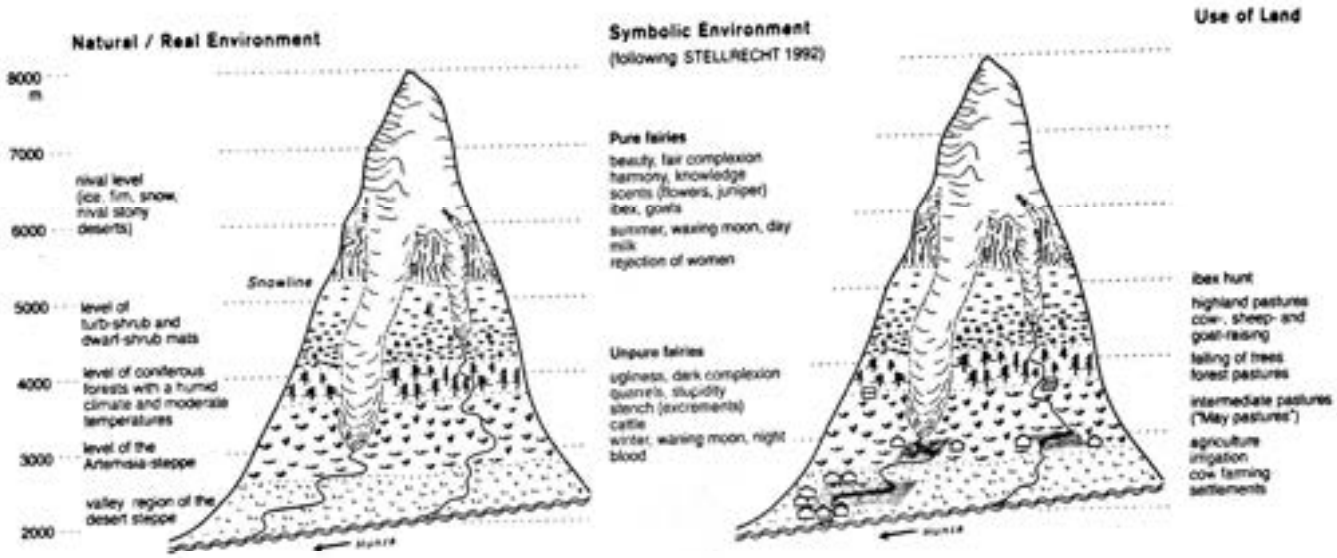
The high pastures are mainly grazed in the time from June to September, the drive cycle of the herds being prolonged by the trek there and back and stops at intermediate relays. As already indicated, the utilization of the high pastures, too, is subject to temporal and spatial differentiation. In this way, adverse ecological effects through overgrazing are kept at a minimum or avoided altogether. This comparatively gentle exploitation of the food supply is made possible above all by the temporally and spatially differentiated utilization of the high pastures and temporary stays in nearby stables. This results in a well-adapted use of the available grazing potential (Clemens & Nüsser 1994) and a more or less intact condition of the high pastures.

Unlike Sinaker, the remaining villages and their affiliated satellite colonies are amply provided with pastures. In recent times, some of this land has even been used below its full capacity. The high pastures, which reach up to more than 4000 metres in altitude, may be grazed in temporally and spatially defined sequences of several weeks' duration each, or they may be frequented during the daily pasturage starting from the main grazing area. Bulchi and Farfui (and their offspring Hope and Chira) are endowed with particularly ample pastures, many of which are only used partially or not at all in some years.

While it is unquestioned that the indicated use of the high pastures as part of the overall rural economy makes sense, it is equally obvious that the regions of the high pastures are connected with specific connotations, values, and perceptions by the rural inhabitants of the valleys, which, to a certain extent, reflect and/or explain their specific forms of animal husbandry. In a recent article, Stellrecht (1992) has published a diagram in which the real and the symbolic environments of the Karakoram, specifically the Hunza region, are juxtaposed. Fig. 11.5 is a revised and somewhat more detailed reproduction of this model. It shows very clearly the existence of ideas of purity and impurity, of clean fairies in the higher parts of the vertical order versus impurity in the valley bottoms and beneath. This symbolism is connected with a wide range of contrasting features and connotations such as beauty, harmony, knowledge

and wisdom, cleanliness, and fragrance and aroma here; ugliness, conflict, stupidity, stench and quarrel there. Vegetational as well as faunistic differences add to the contrast between 'high' and 'low' between the seasonally used high pastures and the permanently settled valley bottoms (cf. Fig. 11.5), giving an overall positive image and perception of the higher sections of the montane system, including the high pastures. Valleys and their economic activities are definitely less favourably perceived in the overall context of this concept of verticality.

Fig. 11.5 Natural Environments, Symbolic References to the Environment, and Land Use



Without overstretching the indicatedrelationship between natural environments and their cultural interpretation, it should be noted that categories like 'pure' and 'impure' and their attachment to the vertical zonation of the montane environment are obviously common classifications of more than only local importance. Referring to extensive literature on this specific aspect of cultural norms and values, the British anthropologist Parkes (1987) has described similar perceptions from the Kalasha world in the neighbouring Hindu Kush. Arguing from a comparable economic background for the Kalasha (Parkes 1987: 639), he refers to a basic dichotomy which is characterized (p. 640) by 'exclusive domains' as shown in Table 11.4.

Table 11.4 Dichotomies of Exclusive Domains

Mountains	Valley
Pastoral	Agricultural
Male	Female
Pure	Impure
Divine	Demonic

Source: Parkes 1987, p. 640.

In line with these basic antagonisms and referring to comparable observations in the Karakoram by Jettmar, Snoy, and others, Parkes (1987: 649) argues as follows:

> ...The underlying opposition between these two sets of categories clearly concerns male and female spheres of association, corresponding with the distinct sexual division of agro-pastoral labour in Kalasha society. This opposition is especially embodied in the topographical contrast between

mountain and valley and the highest mountain peaks and pastures (*son*) being considered the special abode of gods and pure *suci* spirits. The natural vegetation of the mountains is also intrinsically connected with the sacred. Most important is the juniper tree (*Juniperus excelsa*) which grows as the highest evergreen forest around the pastures and provides the main source of fuel in the herding camps.

In contrast, the valleys and their economic activities are interpreted as follows:

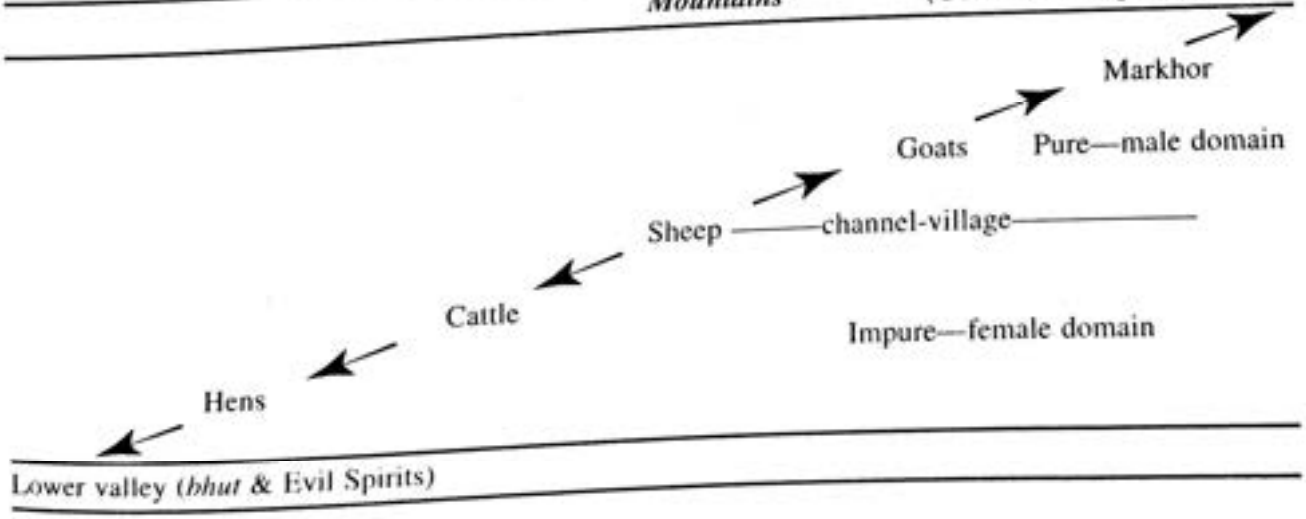
> The lower cultivated regions of the valleys, lying beneath the main water channels, are the true antithesis of the mountain domain: those are delegated to women and agriculture, including Kalasha villages. Especially impure are the lowermost parts of the valleys [...], and thence the entire foreign world outside. Two vegetables, onions and garlic, are felt to be emblematic of this foreign world and are considered to be highly polluting like hens and eggs. The gods and *suci* spirits of the mountains are thought to be as repelled by the stench of onions and garlic as they are attracted by the fragrance of juniper smoke. (Parkes 1987: 650)

Table 11.5 Pure and Impure Categories in Kalasha Ritual Thought

	Pure (ōmješta)	*Impure (prāghata)*
I	Mountains & Pastures	Lower Valleys
	Juniper	Onions & Garlic
	Holm Oak	*Rhoŋ Diestuff*
II	Markhor Goats	Cattle (Sheep)
	Honeybees	Hens & Eggs
III	Altars	*Bashali* House
	Goat Stables	Graveyard
IV	Men	Women

Source: Parkes 1987.

Fig. 11.6 Kalasha Animal Values and Relative Altitude



Source: Parkes 1987.

Parkes' research on livestock symbolism and pastoral ideology among the Kafirs (cf. Table 11.5 and Fig. 11.6) is an almost perfect analogy to popular belief systems in many parts of the Karakoram. Although these traditional connotations and interpretations of the natural environments are losing their historic symbolisms and values, it is unquestioned that their

practical consequences remain a powerful fact in the people's daily lives. Could it not also be that these symbolisms are either an outcome of traditional environmental knowledge systems, giving logical arguments and reasoning to the well-adapted, sustainable use of the fragile mountain environments, or, vice versa, are an ex-post-ideology giving meaning to the specific forms of land use?

Environmental Knowledge and Consciousness as a Developmental Potential

The Karakoram mountains illustrate that mountains and mountain ecosystems cannot be comprehended in rational terms alone. Vertical classifications—geographers would say strata or layers—constitute more than just climatic and vegetational levels. Anthropologists have emphasized that real environments have a corresponding symbolic environment.

It is against this background that traditional land-use patterns are not only responses to ecological parameters. On the contrary, land uses also reflect ritual belief systems as well as social norms and societal values. Or, to put it in a positive way, rituals and societal values determine land-use patterns and their sustainability.

During the last few years, debates on sustainability and the long-term effectiveness of development policies and practical development measures has increased the tendency to look to traditional systems of knowledge and their significance as potential ways of promoting careful and sustained development in countries of the third world (Honerla & Schröder 1995). In a recent article, Nakashima (1998) has elaborated on the cultural context of resource management and argued that the following approaches to culture-environment issues have proven to be especially fruitful:

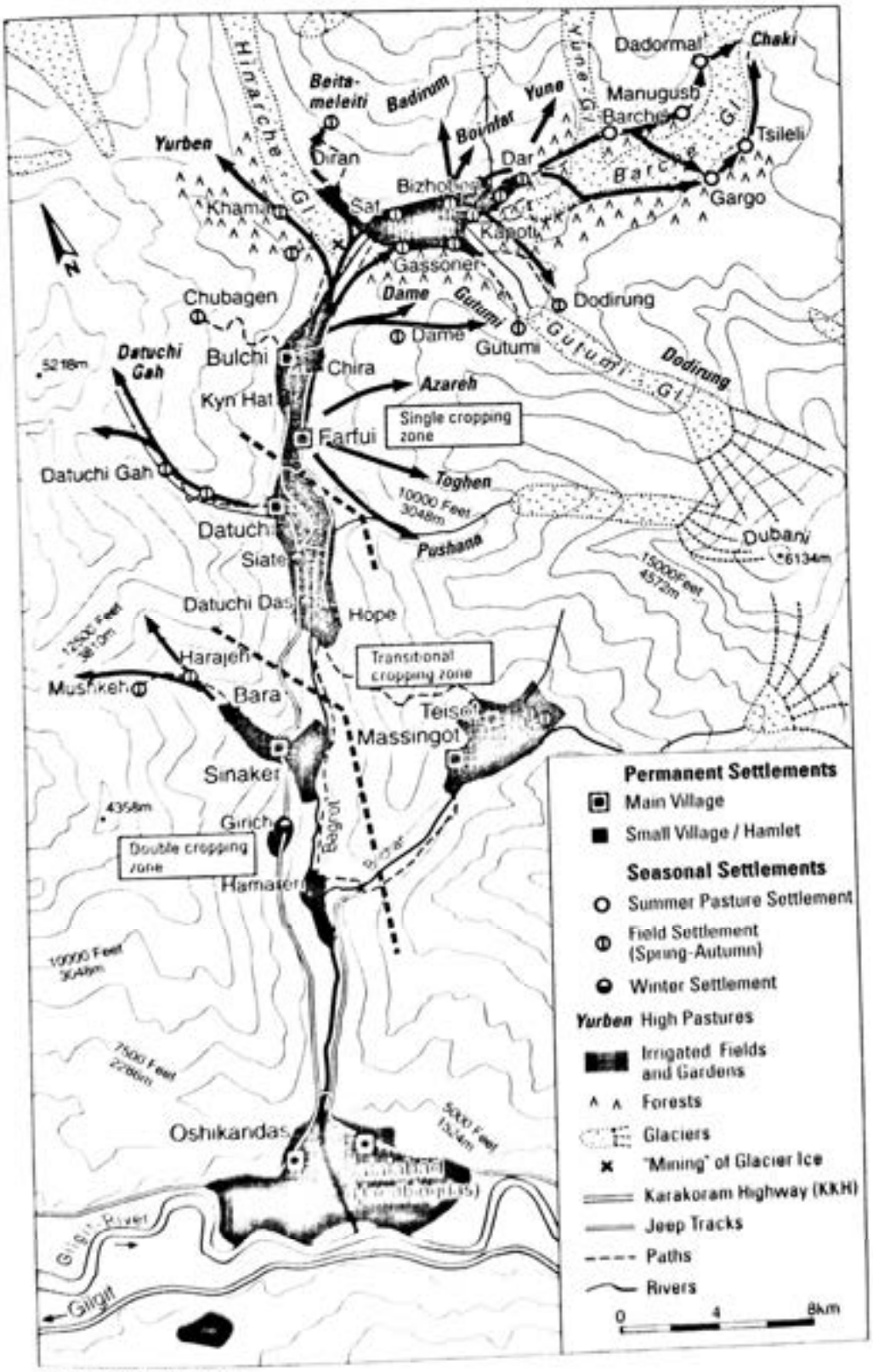
- ❒ Systems of knowledge of the natural environment
- ❒ Technological systems for resource use and management
- ❒ Spatial organization and land-use patterns
- ❒ Common property management systems
- ❒ Social organization of resource use and access
- ❒ World view and spiritual systems influencing human-nature relationships

As regards high mountain regions, researchers have gained insight primarily into the autochthonous environmental knowledge of the mountain dwellers of Nepal and the adaptation strategies for the utilization of land and the organization of space which they derive from such knowledge (Müller-Böker 1991; Pohle 1992). As regards the Karakoram mountains, the studies carried out by Clemens and Nüsser (1994), Ehlers (1995), Herbers and Stöber (1995), Kreutzmann (1989, 1996), and Saunders (1983) contain numerous references to traditional modes of land use without particularly emphasizing their implications for development strategies.

While returning to the criteria for economic marginality listed at the beginning of this article (Fig. 11.1), the cases looked at here, that is, land-use patterns in the Karakoram mountains, pose the question as to the possibility of utilizing traditional systems of knowledge and agriculture of the mountain farmers as development strategies. There is no doubt that in both cases treated here, the locations as well as the limited capacity of the natural environs are handicaps which cannot be changed decisively by technical progress or by scientific know-how. Besides, it becomes very obvious that not only have the ecological adaptations to the fragile montane ecosystem been achieved admirably in the past, but so also has the political structuralization of the valley economy. Fig. 11.7 reveals details of a clear and

ecologically feasible differentiation of the competing villages in the Bagrot valley. Each village and/or community has its own complementary summer and/or winter settlements, as well as high pastures, water sources and resources, specific access to forest stands.

Fig. 11.7 The Spatial and Temporal Organization of Agriculture and Animal Husbandry in the Bagrot Valley

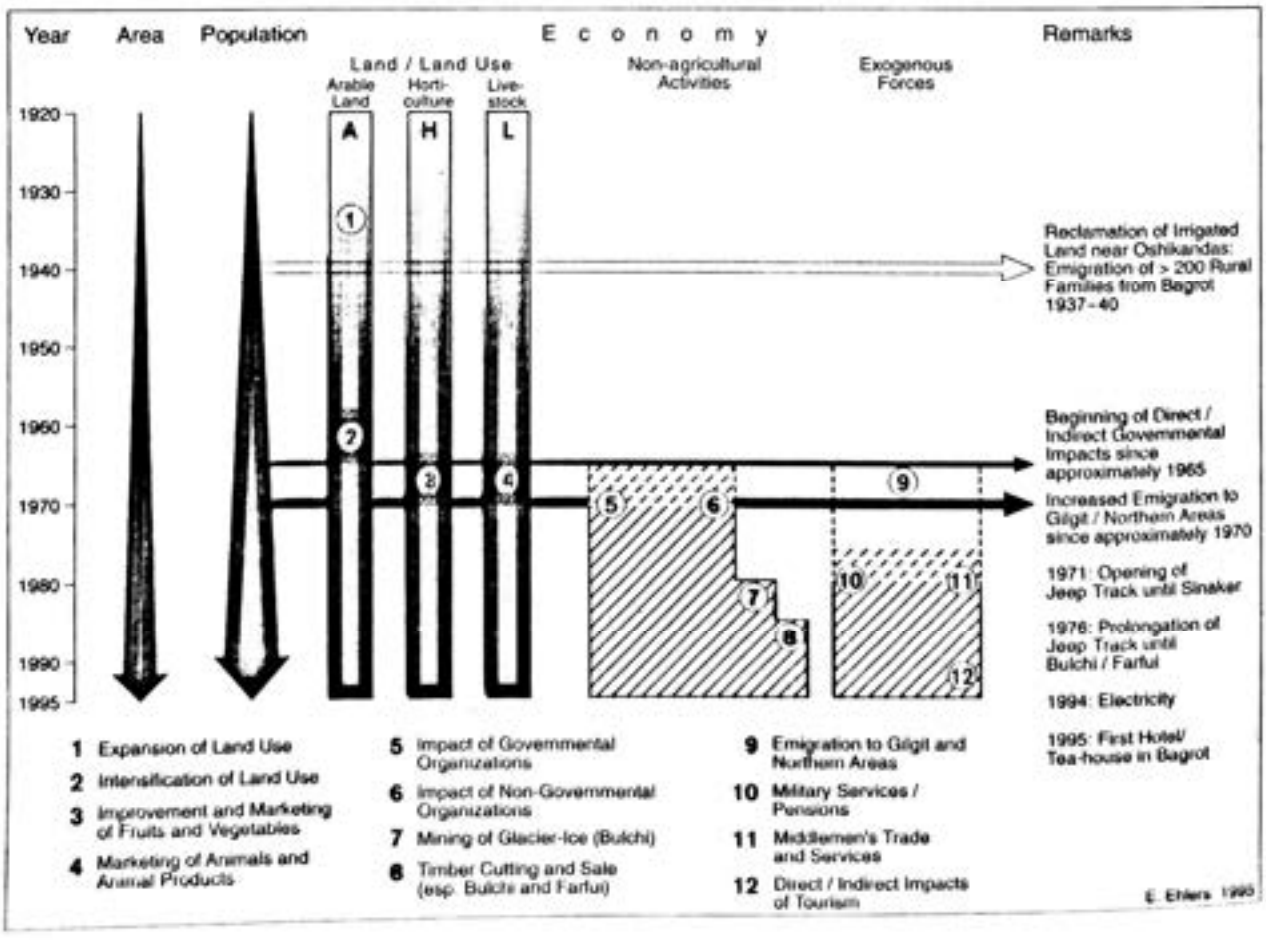


Source Grötzbach 1984
Names Schmied 1995
Data Ehlers 1995

Independent of these analyses, it is obvious that the agrarian carrying capacity of the Bagrot valley—like that of many other valleys—is limited. Neither the mountain pastures nor the arable land of the high mountain valleys can be expanded appreciably or utilized more intensively. However, the question of sustainability versus modernization of agriculture in the fragile ecosystem of the highlands of the Karakoram mountains is difficult to answer. The physical and ecological barriers and limitations of the region can hardly be overcome. Even though it has been possible in part to improve the yield of plants, a long-term adaptation of agriculture and pasture farming to the growing population is only conceivable to a limited degree. The socio-economic conditions are what primarily stand in the way of the preservation or restoration of sustained and long-term effective patterns of land use.

The small-farm structures of agricultural enterprises and the nature of the terrain, which is often extremely disadvantageous, have led to the development of new and more intensive forms of land use as well as the exploitation of non-agrarian sources of income, starting around 1940 and increasing since about 1960. The diagram illustrating the population growth and the agrarian and total economic carrying capacity of the Bagrot valley (Fig. 11.8), shows clearly, however, that the limits of the total economic capacity of this valley as well as of the other valleys has been reached. The selling of glacier ice (Grötzbach 1984) and, more importantly, the deforestation of previously intact mountain forests by external forces as well as the initiation of international tourism, which is not only questionable from a politico-cultural perspective, but also in economic and ecological terms, are expressions of the trespassing of Bagrot's economic carrying capacity.

Fig. 11.8 Population Growth and Carrying Capacity in the Bagrot Valley in the Twentieth Century: A Comprehensive Survey



In view of this situation, sustained long-term agriculture and pasture farming, which in the past made it possible for the population of the Karakoram mountains to survive, seems to be the only economically as well as ecologically sensible perspective for the future. The most important measures which must be taken are:

- the stabilization of present standards of agriculture and pasture farming;
- the protection of natural ecosystems, which has to be ensured by the government in the interest of the country as a whole.

The first measure means the protection of existent agricultural and pasture farming enterprises and the preservation of the mountain farmers' traditional systems of knowledge. It includes a return to and intensification of the ecologically acceptable forms of employment for a fast-growing population in and outside of the mountain valleys.

The second measure concerns the implementation of a series of measures to be taken for the protection of the environment in the whole region of the Karakoram mountains. In the view of the ecological control function of tropical and sub-tropical high mountain regions for the arid and semi-arid lowlands surrounding them (cf., for example, Messerli et al. 1993), it is necessary for the government to stop the catastrophic destruction of the forests through deforestation of the mountain forests immediately. Government-funded conservation measures, which include extensive afforestation as well as other forms of conservation against erosion and floods, can present at the same time a useful source of employment for large portions of the population of the Karakoram mountains, which would have a long-term positive effect on the welfare of Pakistan as a whole. The fact that a return to traditional environmental knowledge and consciousness can be combined with the national and economic interests of Pakistan as a whole is an additional argument in favour of such measures.

Concluding Remarks

In the introduction of this article, it was pointed out that the experience gained by the case studies presented here can be transferable to other situations in time and space. For instance, a large number of parallels can be drawn by comparing agriculture and pasture farming in Europe in the past and present (Allan, 1994 Ehlers 1997a). Not only the spatial and periodic forms of organizing vertical land use, but also the division of farming enterprises into agricultural and stock farming components, the settlement patterns, and social structures of mountain farmers and mountain farming societies in the Alpine regions in the eighteenth and nineteenth centuries show diverse parallels to the problems of high mountain farmers in Asia in the present. More importantly, however, the rediscovery of traditional forms of land use and knowledge systems contains a wealth of potential for a better and sustainable management of fragile montane environments that should be used for a better future of both nature and its inhabitants. It is, therefore, legitimate to compare high mountain regions and societies not only in a cross-cultural perspective, but also in regard to their historical developments here and there. From a geographical perspective, such comparisons not only unfold new aspects of a 'comparative geography of high mountain regions,' but at the same time—and perhaps to a greater extent—offer a geographic contribution to the problem of sustained development in high mountain regions of the third world.

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