

Country Pasture/Forage Resource Profiles

KYRGYZSTAN



by

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1. INTRODUCTION

1.1 Geographical location

Kyrgyzstan is a small, mountainous, landlocked country in the heart of Central Asia lying between 39° and 43° N and 69° and 80° E, covering 198 000 km², with a mixed ethnic population of under 4 500 000. (According to the World Factbook the July 2006 estimate was 5 213 898 and the population growth rate about 1.32%.) The country is bounded to the north by Kazakhstan, to the south by China and Tajikistan and to the west by Uzbekistan, and is almost entirely mountainous with only 7% of the land area suitable for arable agriculture. Together with Tajikistan, it is among the poorest of the former Soviet Union republics.

The main group, the Kyrgyz, make up about 55% of the population. They are a nominally Moslem people with a long tradition as nomad herdsmen and horsemen, speaking a Turkic tongue. Their traditional life-style and ancestral origin in the Altai and the basin of the Yenisei was not dissimilar to that of the Mongols as dwellers in round tents of grey-brown felt draped and bound over a flexible wooden framework (*yurta* in Russian and *boz ooyi*, i.e. 'grey house', in Kyrgyz). The *boz ooyi* together with the high crowned white felt hat *ak kalpak*, the heroic saga of the Manas cycle and fermented mare's milk *koumiss* are the proud symbols of their nation. This is a life-style for which the country is ideally suited, but for the majority it is now greatly changed. The influence of 70 years as part of the USSR was profound. The legacy of these times remains and ten years of independence have brought more uncertainty than economic benefit to the rural population.

Under the Soviet Union emphasis was placed on stock-rearing of fine-wool sheep. Together with water, the natural pastures and grazing-lands of the Tien Shan mountains comprise the Republic's most valuable natural resources.

The capital Bishkek (former Frunze), population about 900 000, is situated at between 700 and 850 m at the immediate foot of the northern Tien Shan ranges [Tien Shan – The Celestial Mountains – Chinese: Ala Tau – the Speckled Mountains-Kyrgyz] and commanding the fertile Chu river valley at the southern most edge of the great Kazakh steppe. Administratively the country is divided into seven provinces or *oblast* (Chui; Talas; Issyk-kul; Naryn; Osh; Jalalabad and Badken) that in turn are divided into 45 districts or *rayon*.



Map of Kyrgyzstan

1.2 Historical perspective

When Kyrgyzstan gained independence in 1991 it opted to be a democratic republic. Attitudes are, however, still influenced by the Soviet experience, as well as by the clan structure of Kyrgyz society which now dominates political as well as administrative life.

The area comprising modern Kyrgyzstan was brought under Russian control in the 1860s and in 1865 incorporated into the Czarist provinces of Ferghana and Semireche. This opened up the region to European settlement in an area previously inhabited mainly by nomadic tribes. The whole region was much contested after the Bolshevik revolution of 1917, but Russian control was regained in the 1920s. *Kirgizia* (as it was called) was declared a Soviet Socialist Republic in 1936. This gave the present Republic a political identity which it had not possessed historically. To provide *Kirgizia* with a minimum of productive crop land, a fringe of territory was added to the republic in the 1930s, in the rich Ferghana valley, incorporating the historic towns of Osh and Jalalabad and a mainly Uzbek population with ancient traditions of settled irrigated agriculture.

Enforced settlement and collectivization in the 1930s dealt a blow to the independent tribal, nomadic life-style of the Kyrgyz, from which it has not recovered. However, after the Second World War, their pastoral skills and traditions as herdsmen were successfully harnessed by the USSR to raise sheep and cattle. Traditional stock-rearing was based on transhumance [the seasonal use by domestic livestock and their herders, using different areas of the mountain pastures roughly along zones of altitude], using hardy local breeds. At that time the herds and flocks were more or less in equilibrium with their environment and the pastoral system stable. Under the Soviet Union the emphasis was placed on specialising in fine-wool sheep, less hardy than the local land races. Stock numbers were deliberately increased, supported by imported feed and a complex of other services. Excessive stocking led to the serious deterioration of the pastures and range lands, coupled with some loss of hardiness in favoured breeds. After independence, with the privatization and division of the sheep flocks, coinciding with the collapse of the wool market and with imported feed no longer available or affordable, sheep numbers have declined precipitously. This has also coincided with a serious decline in the custom and practice of transhumance herding, with the result that, though the remoter pastures are presently under-stocked, the more accessible pastures now tend to be over stocked and seriously degraded.

This situation is very different from that experienced in Mongolia where mobile grazing systems, using hardy indigenous breeds with little or no supplementary feed was and has never ceased to be the general practice. In sharp contrast to Kyrgyzstan, stock numbers in Mongolia, including sheep and yaks, and in particular cashmere goats, have consistently risen since the end of collectivised herding.

The ethnic mixture of the Republic's population was further complicated during and after the Second World War by the settlement of many minority groups as well as Russian administrators and technicians from elsewhere in the USSR, giving the Republic the multi-ethnic character that is still its dominant social characteristic. Many of these settlers came from a rural background and were established in *sovkhoz* and *kolkhoz* (state and collective farms hereafter referred to, for brevity, as *collectives*) on much of the best agricultural land. The Kyrgyz were employed mainly as herdsmen, but living much more controlled lives as part of a centralised production programme.

1.3 The immediate consequences of *perestroika* and independence

After the *perestroika* years, in the late 1980s, the Kyrgyz Supreme Soviet voted for independence from the USSR in August 1991 and later in May 1993 for the economic and political reforms proposed by the present president, Askar Akaev. Despite the ambitious programme of political, economic, land and agrarian reforms set in train at that time, and still in progress, the predominantly rural economy has not taken off as was hoped. Much has reverted to subsistence agriculture, operating largely through a non-cash system of barter.

All but a few of the intensive livestock production units ceased to operate within two years of independence. The collapse of a captive Soviet market and a declining international market for wool, coinciding with the division and privatisation of the state owned flocks that started in the mid 1980s, has led to a dramatic reduction in the numbers of sheep from an estimated 14 500 000 head in 1990/91 (including both state and privately owned animals) to possibly less than 3 000 000 at present. The numbers of other stock (cattle, goats and horses but not yaks) has remained stable and may even have

increased, but production is now predominantly for subsistence. The country's need to feed itself has led to a considerable expansion of the area under wheat, largely at the expense of land previously growing fodder, mainly lucerne (*Medicago sativa*) and sainfoin (*Onobrychis viciifolia*), and barley. All these factors have had and are having a profound influence on the production systems and pastoral resources of the Republic.

1.4 Demography

The Kyrgyz, the politically dominant group, make up roughly 55% of a population of about 4 500 000. This proportion is increasing with the steady emigration of other groups, particularly those of European descent. The country remains multi-ethnic in character including: Russians, Ukrainians, Uzbeks, Germans, Tartars, Turks, Dungans (Chinese Moslems), Kazakhs, Uigurs, Tajiks, Koreans and smaller groups from the Caucasus and elsewhere. All these peoples keep livestock of some kind in addition to their arable farming. Many rural Kyrgyz now live as settled farmers but are still considered to be primarily herdsman with most of the mountain grazing and pasture lands being under Kyrgyz management. Over 60% of the population live in the rural areas, but there is a steady drift to the cities of Bishkek and Osh, particularly from poor, mainly Kyrgyz-populated highland districts. More Kyrgyz are now urban dwellers than ever before.

1.5 Agriculture and crop production

In Kyrgyzstan 109 000 km² are designated as agricultural land in the broadest sense, of which only 14 000 km², 7% of the total land mass, are suitable for arable farming. Of this between 7 320 and 8 372 km² are designated as being available for irrigated crop production. The lower figure is almost certainly closer to reality, as possibly as much as 1 000 km² of land (both rainfed and irrigated) has fallen out of cultivation in recent years, much of it permanently. This is particularly true of Chui, Issyk-kul and Naryn *oblasts* due to the break down of irrigation and drainage systems, lack of essential inputs, machinery and financial resources and in some places due to emigration, especially those of European descent. There is much greater population pressure on the land in the Ferghana *oblasts* and consequently less abandoned arable land. The total area of crops is estimated at about 12 200 km² of which 7 300 km² (59%) are irrigated and 4 900 (41%) are rainfed. Little of the abandoned land currently has any significant value as pasturage and much of it has tended to revert to reed beds, or noxious, spiny weeds and scrub.

The main crops (see Tables 2 and 3) are wheat, barley, maize (for grain and silage), potatoes, melons, oilseed crops, vegetables of many kinds and fodder, mainly lucerne on the better irrigated land and sainfoin on the less well irrigated hill slopes. Sugar beet is an important cash crop in Chui *oblast*; cotton and tobacco in the southern 'Ferghana' *oblasts*. Since independence the need for local self sufficiency has given wheat production an importance it never had in Soviet times when the Republic was, to a great extent, fed from elsewhere.

Driven by local demand and the experience of the shortages that followed independence, the wheat area has increased greatly since the early 1990s. According to official data a total of 193 582 ha of wheat were grown in 1990; in 1999 the official figure was 482 717 ha (both irrigated and rainfed). This increase in area has taken place even as yields have fallen. The greatest increase has been at the expense of other irrigated arable crops, much of it replacing planted fodder crops (mainly lucerne and sainfoin) and barley, which previously helped sustain an intensive livestock industry. This concentration on wheat production has been at the expense of good agronomic practice and rotations. The area sown to wheat is currently showing signs of having stabilized and even to have contracted somewhat in favour of crops such as oil seeds. (For crop/area trends 1990 to 1999 see Tables 1 and 2.) The total area of planted fodder crops, which are mainly accounted for by lucerne and sainfoin are recorded as having decreased from about 432 400 ha in 1990 to 231 500 ha in 1999. The balance being largely replaced by wheat.

The area sown to barley in 1990 is recorded as having been 266 399 ha, which by 1999 had fallen to 101 961 ha. Oil seed crops on the other hand have shown a remarkable increase from a total of 7 801 in 1990, mainly on irrigated land, to a total of 68 488 ha in 1999 almost equally split between irrigated crops of sunflower and (to a lesser extent) rape and mainly rainfed crops of safflower. Also,

Table 1. Comparative cropped areas '000 hectares 1990 to 1999

	90	91	92	93	94	95	96	97	98	99	1990/99
Wheat	194.0	193.0	248.0	342.0	333.0	364.0	452.0	562.0	489.0	457.0	+263.0
Arley	266.0	290.0	264.0	245.0	207.0	151.0	108.0	81.0	75.0	106.0	(160.0)
Maize grain	65.7	62.3	54.7	46.0	36.6	34.9	45.6	37.1	46.0	58.1	(7.6)
Maize silage	89.6	No data	No data	69	No data	No data	No data	No data	No data	20.6	(69.0)
Rice	Est.1.5	No data	No data	2.0	3.0	4.5	5.4	5.9	4.6	5.0	+3.5
Cotton	29.7	25.9	21.5	20.3	26.5	33.2	31.8	24.8	31.5	34.6	+4.9
Tobacco	19.1	19.9	20.8	22.4	18.9	8.5	8.7	12.1	12.7	12.2	(6.9)
Sugar beet	0.1	0.2	6.3	11.7	9.9	13.5	14.3	11.6	21.5	26.3	+26.2
Oil	7.8	0.0	0.0	0.0	30.5	58.1	70.6	56.7	56.2	68.5	+60.7
Potatoes	25.2	22.5	27.2	26.2	34.2	43.7	49.2	56.1	56.1	64.0	+38.8
Vegetables	20.6	19.5	22.2	14.7	22.4	32.2	32.8	36.0	38.4	46.9	+26.3
Melons	4.6	No data	No data	No data	2.6	3.8	5.2	3.1	3.7	4.4	(0.2)
Sown fodder (Incl lucerne & sainfoin)	432.4	419.8	387.1	355.40	234.7	310.1	273.1	228.0	214.8	231.6	(200.8)
Total	1 156.3	Incompl	Incompl	Incompl	Incompl	Incompl	Incompl	Incompl	Incompl	1 135.2	(21.1)

Note: Official statistics are still being gathered according to methods little changed since the Soviet era.

Source: Goskomstat

reflecting the increasingly subsistence and peasant nature of Kyrgyz agriculture, the area cultivated for growing domestic survival crops has increased substantially; potatoes from 25 200 ha in 1990 to 64 000 ha in 1999, and vegetable crops from 20 600 in 1990 to 46 900 in 1999. This also reflects a growing small-farmer cash market for these crops in the towns and cities. Commercial, as opposed to back garden, vegetable production is often in the hands of certain ethnic groups; Uzbeks in the South, in the Ferghana *oblasts*; Dungans and Koreans in Chui. Cabbages (for the Siberian market) are grown in Issyk-kul and potatoes in

Table 2. Comparison between crop areas 1989, 1996 and 1997 between Northern and Southern Zones

Crop	North 1989	North 1996	North 1997	South 1989	South 1996	South 1997
Grain (wheat/barley)	218.2	283.2	337.9	35.5	111.1	127.4
Maize (silage & grain)	31.0	22.5	16.9	26.0	20.3	20.6
Rice	Nil	Nil	Nil	1.0	1.8	1.9
Cotton	Nil	Nil	Nil	27.0	31.8	25.0
Tobacco	2.2	0.2	0.9	17.7	8.5	11.5
Potatoes	7.4	32.4	43.2	3.8	8.0	10.0
Vegetables	11.8	25.0	20.9	5.4	13.0	13.9
Melons & gourds	2.5	3.4	1.9	2.0	8.6	8.5
Oil seed crop	5.2	21.5	14.6	Nil	8.1	7.8
Fodder (sown)	339.1	239.4	162.8	110.8	43.5	35.6
Orchards/Gardens	122.6	112.4	140.9	95.8	72.1	64.7
Total	740.0	740.0	740.0	325.0	325.0	325.0

North = Chui, Issyk-kul, Talas and Naryn oblasts. South = Osh, Jalalabad, Badken oblasts, in 1 000 hectares.

Source: Mott MacDonald NIRAP Report 1999

Issyk-kul, Naryn and other highland areas of Osh and Talas and almost everywhere as an important kitchen garden, domestic, survival crop. Sugar beet production, which is almost exclusively confined to the Chui *oblast*, and to a limited extent in Talas *oblast*, has increased over the last ten years, from a point where it had almost ceased in the mid 1980s due to serious nematode infestation, the result of poor rotation. In 1990 the area sown to sugar beet is recorded as being only 103 ha, while in 1999 it was 28 895 ha. The main incentive has been the highly lucrative local market for vodka. Though farmers who grow sugar beet may also have access to beet pulp for animal feed this does not appear to be well organized since the collapse of the state farming system. Previously the collectives which grew sugar beet often also kept herds of milking cows or managed beef fattening units.

The past ten years has seen an overall decrease in maize production and a change in proportion between grain and silage production. In 1990 a total of 155 261 ha of land is recorded as having been planted to maize, of which 65 664 (42.3%) was for grain, and 89 597 ha (57.7%) was for silage. The data for 1999 show a reduced total of 81 560 ha planted in maize (a reduction of 73 701 ha) of which 61 009 ha (74.8%) was for grain, and 20 551 ha (25.2%) for silage.

All the main deciduous, temperate fruits grow well in Kyrgyzstan and the Tien Shan is a significant geographical centre of origin for many. The commercial orchards and vineyards of the previous collectives tend now to be poorly managed but every rural household has a few fruit trees and berry bushes in their gardens and *dacha*, which are of great importance to household economies.

Table 3. Yields of major crops (kg/ha) 1990 to 1998

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Wheat	2 490	2 240	2 550	2 460	1 700	1 830	2 220	2 370	2 460
Barley	2 220	1 920	2 210	2 030	1 390	1 300	1 670	1 880	2 160
Maize	6 180	5 850	5 130	4 520	3 530	3 740	4 320	4 590	4 920
Rice	1 710	1 420	1 470	960	1 300	1 550	1 750	1 930	2 200
Cotton	2 730	2 450	2 450	2 420	2 020	2 240	2 310	2 510	2 460
Sugar Beet	16 850	15 570	21 330	18 820	11 620	12 310	15 210	18 070	19 970
Tobacco	2 160	2 160	2 080	2 190	1 920	2 080	2 110	2 130	2 240
Oil Seed	1 320	1 030	780	490	470	460	530	690	790
Potatoes	13 600	13 700	12 400	10 800	9 000	9 900	11 400	12 100	13 100
Watermelon	1 960	1 800	1 540	1 400	1 150	1 030	1 130	1 320	1 430
Hay	5 820	5 310	5 310	5 130	4 280	4 260	4 530	4 910	5 400
Forage	22 930	2 040	2 190	20 000	16 390	13 930	15 080	17 460	19 600

Note: Official statistics are still being gathered according to methods little changed since the Soviet era.

Source: Goskomstat

1.6 Agricultural inputs and yields (see Table 3)

Crops yields are low and have fallen considerably since independence due to a combination of causes, among which are lack of cash in the rural economy as well as the unavailability and expense of fertiliser, herbicide and good seed. Most agricultural machinery, equipment and processing plant (seed cleaners etc.) are now ageing and in increasingly poor condition having not been replaced since before the break up of the Soviet Union and since the division of the state and collective farms, are not now always easily available to the new class of small farmer. Average wheat yields, which in the early 1990s were still quoted at between 3.5 and 4 tonnes per hectare on irrigated land, have fallen to an average of 2.0 tonnes and even less per hectare, nearer to the previous average for rainfed wheat.

1.7 Agricultural commodity prices (see Table 4 and Table 5)

Since 1993 the prices of most agricultural commodities have risen in real terms, in particular that of meat. (Table 4.0). The significant exception is wool which has consistently fallen following the international trend. In Kyrgyzstan the general quality of wool has also deteriorated considerably since the privatisation and breakup of the state flocks. Though some cash marketing occurs, in particular for cotton and tobacco and through local bazaars for vegetables, fruits, meat and dairy products, most agricultural trade and exchange is by barter, although commodities are exchanged at a nominal cash value. Commonly, diesel, fertiliser and other inputs, if available, are procured in exchange for grain, or crops such as potatoes and onions. Sugar beet growers are generally paid by the factories in bags of sugar rather than cash. Even the settlement of international debts is carried out through barter and Kyrgyzstan regularly pays its gas bills to Uzbekistan in grain. The present system of agricultural taxation tends to encourage the perpetuation of barter.

As one example, from many, it is reported that in 1995 forty bales of hay might be bartered for two head of cattle (age and sex is not stated). Another report from 1995 quotes that in Ak-suu rayon in Issyk-kul a sheep could be bought for 3 to 4 bottles of vodka (i.e. 1.5–2 litres) or for 10 litres of petrol (76 octane) and a kilogram of mutton was 15–20 Som.

In July 2000, in Chui Oblast in the summer pastures jayloo of the Suisamy valley, a bale of hay (standard oblong bales) costs 25 Som (0.5 USD). A medium-sized cow costs 8 000 Som (USD 160) and a sheep 2 000 Som (USD 40) live

Table 4. National average: agricultural commodity prices 1993 to 1999 (expressed in USD/kg)

Year	Wheat	Potatoes	Mutton	Beef	IMF PPI
	USD	USD	USD	USD	K.Som / \$
1993					
1994	0.07	0.09	0.96	0.69	10.8
1995	0.13	0.32	1.47	1.00	10.8
1996	0.16	0.12	3.39	2.82	12.8
1997	0.13	0.18	2.30	2.09	17.4
1998	0.11	0.09	2.09	1.74	20.8
1999	0.14	0.08	1.33	1.09	37

Table 5. Average meat prices Bishkek and Osh 1995 to 2000 (Kyrgyz Som/USD equivalent/kg)

	1995	1996	1997	1998	1999	2000 (1st 6 months)
BISHKEK						
Beef	1.28	2.03	2.25	2.25	1.33	1.37
Mutton	1.53	2.11	2.46	3.00	1.56	1.79
OSH						
Beef	1.02	1.64	1.82	1.54	0.99	1.08
Mutton	1.39	2.19	2.37	2.00	1.27	1.43

weight. A litre of vodka costs 120 Som (USD 2.4/litre, depending on brand). In the capital, Bishkek, a kilogram of best quality mutton currently costs 100 Som/kg (USD 2.0) and a litre of petrol (76 octane) 15 Som (USD 0.33). Wheat prices (in real terms) which were low in 1994 at approximately 0.6 Som/kg (0.07 USD) in 1999 had risen to 2.21 Som/kg (0.14 USD). Mutton prices, though very low in the early 1990s, rose steeply after 1994 from 14.88 Som/kg (USD 1.47) to a peak of 32.91 Som (USD 3.39), but levelled out to between USD 2.0 and 2.30 in 1997/98, falling back in 1999 to an average of USD 1.6 in the capital Bishkek. In the first half of 2000, better quality mutton has been selling for about USD 2.0 in Bishkek, though the average is still about USD 1.6 to 1.7/kg.

1.8 Land and agrarian reform and policy

Since 1993 the government policy on land and agrarian reform has aimed at the privatisation of land and the breakup of the collectives. This is well advanced and by the end of 1999, with the issue of about 511 000 land certificates, is almost complete. The remnant of the state institute, research, seed and breeding farms are also (in the year 2000) being broken up and privatised. Some 25% of agricultural land has been retained as part of a 'State Land Fund', available for leasehold, subject to auction. State herds and flocks were among the first items to be divided and privatised starting as early as the mid 1980s. In the interests of equity, regardless of experience or skill in agriculture and livestock husbandry, both land and livestock have been divided between all the members of the old collectives young and old, men and women. The land has been parcelled out in very small units, generally in fractions of a hectare, leaving the new land holders to work out their farming systems as best they can as individual farmers or as partners and/or shareholders in smaller or larger agricultural units or peasant farms- *krestianski xezaystva*. Distribution of the old farms' assets in terms of buildings, plant and machinery have posed a greater problem in terms of the equity of division. There are many different variants but the result is that many small holders find difficulty in getting access to machinery, or remain dependant on the rump of the old farm management that have retained control of these assets. In some instances members of the old collectives have elected to retain the old farm management structure and the assets intact, as shareholders in Agricultural Cooperatives. Initially agricultural land was parcelled out as ninety nine year leaseholds but in 1998 this was changed to freehold, subject to a moratorium of five years on the free sale of agricultural land. At the present time strong moves are afoot to lift the moratorium as soon as possible. This is likely to occur in the very near future although many issues remain unresolved and opinions are divided as to the wisdom of this move.

Land previously or currently sown to fodder crops, is classed as agricultural and subject to privatisation. Most natural pasture and hay meadows are still under state ownership although individual communities representing the members of previous collectives have rights of usage. Some 'new' private farmers have acquired title to old livestock units including pasture and meadow land, usually on the fringes of the old farms. The question of the future usage of grazing lands is under review and a new system of lease-holding is being developed.

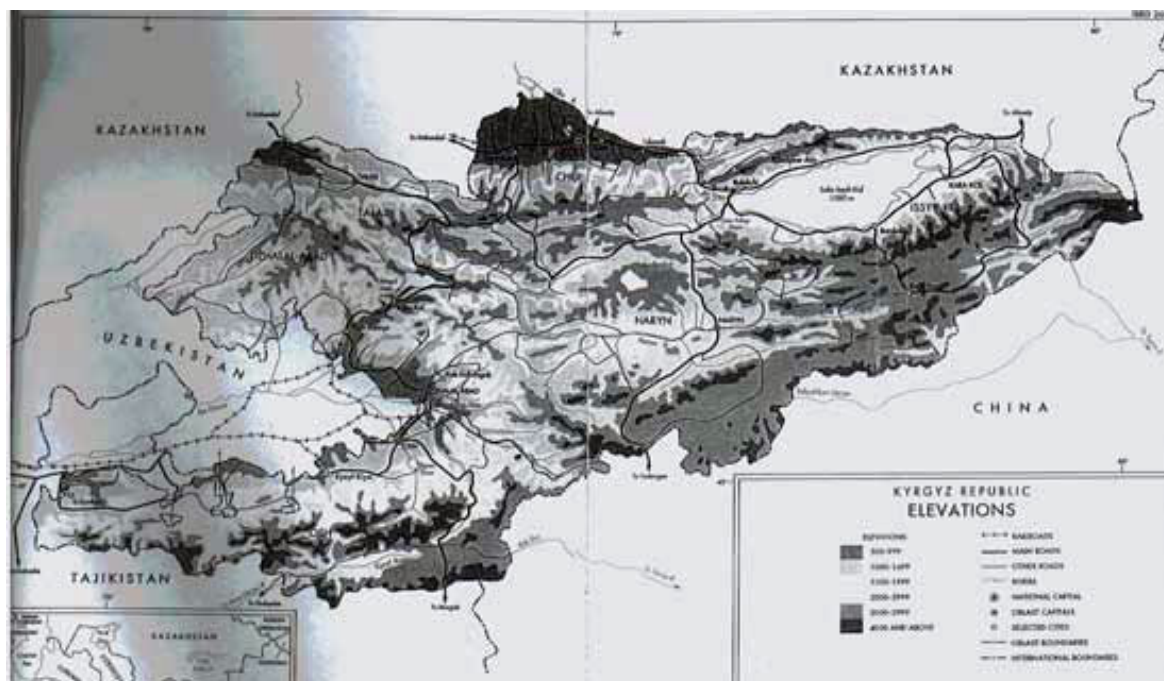
2. SOILS AND TOPOGRAPHY

2.1 Soils

Only the irrigable soils of high potential have been studied in detail. According to FAO/UNESCO classification the soils of the Ferghana valley in the south are Calcic Xerosols; those of the Chui valley are Calcic Gleysols and those of Naryn Oblast in the central highlands are Humic Cambisols. In the mountain tracts Lithosols and outcrops of rock debris occur while the plateau-like surfaces are characterised by Yermosols, especially Takyric Yermosols; plateaux may be covered with loess-like loams.

2.2 Topography

Kyrgyzstan is dominated by the Tien Shan mountains that lie in a series of dramatic parallel ranges running west to east of which the greater part are within the Republic and which divide the country into



three main zones. Ninety-four percent of the Republic is above 1 000 m, with an average altitude of 2 750 m and more than 40% over 3 000 m of which three-quarters are under permanent snow and ice. The highest peaks rise to over 7 400 m in a knot of mountains on the eastern border with China.

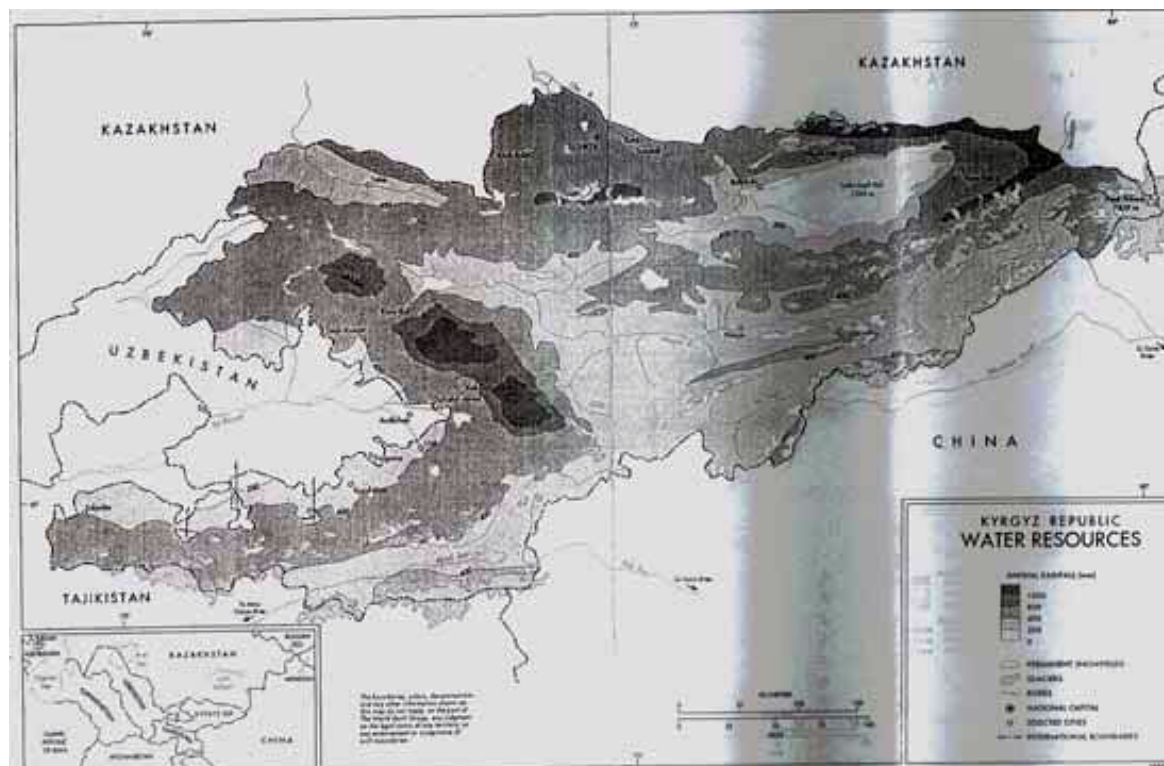
The Northern zone includes the Talas and Chu river valleys that mark the southern edge of the great Kazakh steppe, which stretches for hundreds of km to the north. It includes the upland tectonic basin, at 1 600 m, which cradles the lake of Issyk-kul (the warm lake). Almost 700 m deep, 170 km long and 70 km wide (at its widest) Issyk-kul is the second largest alpine lake in the world (after lake Titicaca in Peru/Bolivia), large enough to create its own local weather patterns.

The Southern zone is marked by a fringe of rich agricultural lowlands in the Ferghana valley centred on the towns of Osh and Jalalabad, held in a scissors grip of mountains between the Pamir Alay in the south, and the western Tien Shan and Ferghana ranges to the North and East.

The Central zone – the main body of the country comprises a vast alpine area of rugged mountain ranges, glaciers, snow fields, high river valleys, upland steppe and alpine and sub-alpine pastures and meadows.

2.3 Water resources

Together with the grazing lands, water resources comprise the most valuable natural assets of the Republic. The Tien Shan highlands are the source of some of the most significant river systems watering the surrounding steppes and deserts of Central Asia. The Naryn and the Kara Darya; their tributaries and many other streams and rivers, rising in the central Tien Shan, the Ferghana and Alay ranges, form the main head waters of the Syr Darya (the *Jaxartes*) and have supported irrigated agriculture in the Ferghana valley since ancient times. The Kyzyl Su (Surkh Ab) rising in the mountains of the Pamir Alay flows into the rich Garm valley in Tajikistan and onwards to form an important tributary of the Amu Darya (the *Oxus*). Before they were excessively canalised under the Soviet Union, both river systems drained freely into the now much diminished Aral Sea. The Chu river also rising in the central Tien Shan, together with its numerous tributary streams, flows north into the Kazakh steppe, as does the Talas river. The Kara Su rising among the glaciers and perpetual snows of the eastern Tien Shan and the Ak Say flowing out of the Chatyr Kol (lake) on the Chinese frontier drain south into the Tarim Basin of western China. These river systems were extensively developed in Soviet times both for hydroelectricity and irrigation.



3. CLIMATE AND AGRO-ECOLOGICAL ZONES

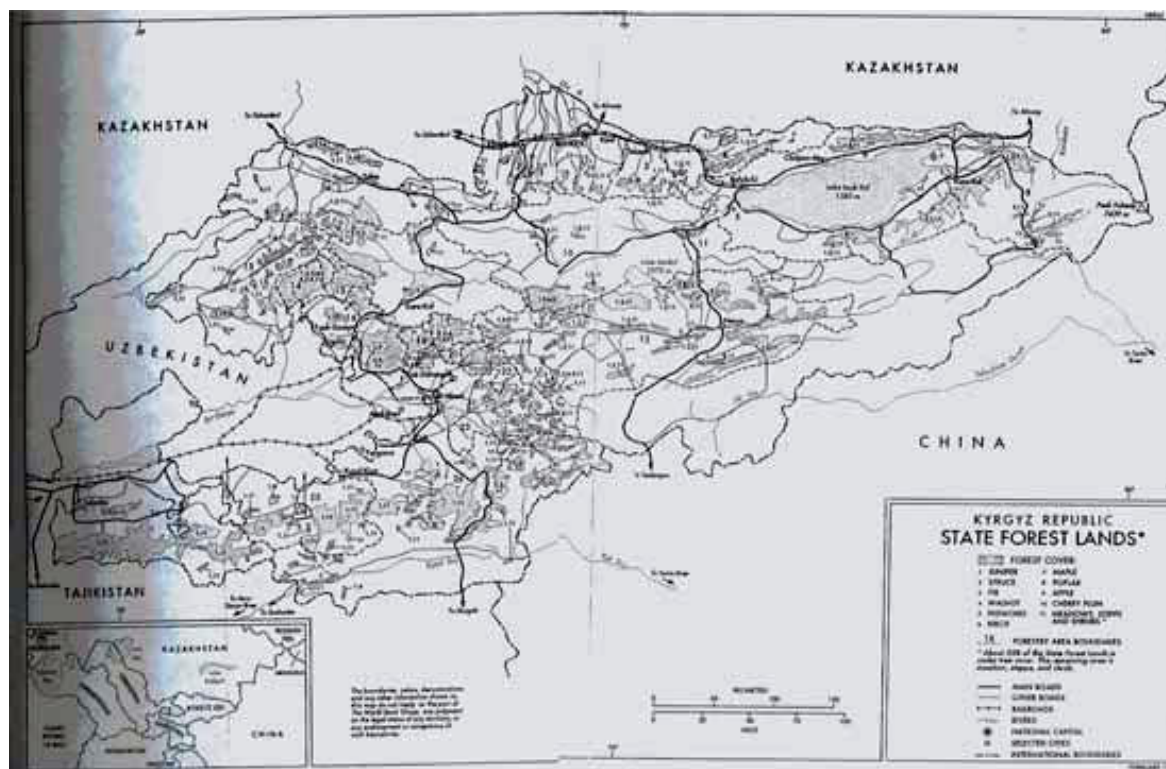
3.1 Climate

The climate is continental, with cold winters and hot summers, but with great local variations depending on altitude, aspect and the lie of the mountain ranges. In July, average temperatures at lower elevations are generally round about 27 °C but can exceed 40 °C, while at the same time at 3 000 m. temperatures may not exceed 10 °C. In winter, frost occurs in all regions. Precipitation is highest in the high mountains, falling mainly as snow, with a maximum of 1 000 mm along the fringe of the Ferghana valley. However, some highland valleys remain almost free of snow even in the hardest winters due to their position in relation to the surrounding ranges and provide wintering grounds for livestock at higher elevations than might be expected. In the Talas valley in the north-west, precipitation varies from 250 mm to 500 mm. In Issyk-kul there is a considerable difference between the western end of the lake which only receives an average of 200 mm and the eastern end which can receives up to 600 mm a year. Rain and snow occur mainly in the autumn and winter but sometimes well into the spring, until late May or even early June. Summers are generally dry but storms of heavy rain, hail and even snow occur, even in mid-summer and even at lower altitudes.

Evaporation in key irrigated areas can vary between 1 200 mm and 1 600 mm, far exceeding average precipitation. Due to the current rate of evaporation lake Issyk-kul has no outlet, despite the many small rivers and streams flowing into it, though in past ages it once had an outflow into the Chu river. The level of the lake is known to have been subject to considerable fluctuations.

3.2 Vegetation

The vegetation in Kyrgyzstan is classified vertically into three belts. The first and the lowest of these lies below 1 500 m and was historically dominated by grass steppe, with marshes and reed-beds along rivers such as the Chu. Much of this, particularly where irrigation has been developed and the land drained, is now under settled agriculture, except in areas which are too arid or the gradient too steep. In the south-west on the fringes of Ferghana where there is higher precipitation along the mountain slopes relic ancient fruit and nut forests occur.



The second belt between 1 500 and 3 000 m is mainly open mountain grasslands and scrub, with some broadleaf and conifer forest, depending on the location and configuration of the mountain ranges and valleys up to a tree line that never exceeds 3 000 m.

The third and highest belt above 3 000 m comprises alpine grassland and sub-alpine meadows, intercalated with permanent snow-fields, glaciers and rocks.

Forests: Forest cover including dense shrub-land is estimated at 8 430 km², of which 1 016 km² are plantations. This is 4.2% of the country or less than 8% of the manageable land area. Most of the forests are between 1 200 and 2 400 m. Jalalabad Oblast has the greatest forest cover (9.0%) followed by Osh (5.1%), Talas (3.6%), Issyk-kul (2.7%), Naryn (2.2%) and Chui (2.1%). Natural forests contain 120 woody species. On the northern ranges the most significant are: spruce (*Picea schrenkiana*), several junipers (*Juniperus* spp), rowan (*Sorbus tianschanica*) and birch (*Betula* spp), with bushy scrub of Barberry (*Berberis* spp), Wild Rose (*Rosa* spp), Buckthorn (*Hippophae rhamnoides*), *Caragana* spp and others. In the western Tien Shan, in the drier more protected areas, pistachio (*Pistaciavera*), is a significant species with stands of wild almond (*Prunus amygdalus*). In the wetter areas, particularly on the southern slopes overlooking Ferghana some of the most significant relic forests of walnut (*Juglans regia*), left in the world are found and of various wild fruit tree species (*Malus*, *Pyrus* and *Prunus* spp), as well as other hard woods such as Maple (*Acer turkestanica*). In the last thirty years it is estimated that forest cover has been reduced by at least 50%. Historically it was undoubtedly much greater. Much timber was felled during the Second World War and centuries of grazing have taken their toll. Forest lands are still controlled by the state through the Forest Department and at the local level through *leskhoz* which are responsible for the protection and management of the areas under their control. They operate as production units, including the sale and processing of timber, replanting and nurseries and the exploitation of other non-wood forest products such as nuts, wild fruits and edible fungi. The *leskhoz* incorporate the local populations and their livestock as well as grazing land and pasture within their boundaries.

3.3 Ecosystem diversity

The diversity of the ecosystems of the main Tien Shan range is naturally high due to the many micro climates and landscape types, with elevations varying from 400 to 7 439 m and habitats including desert

and open steppe, high grass lands, broadleaf and coniferous forest, alpine ecosystems and a variety of aquatic habitats, wet-lands, perennial and intermittent streams, rivers, fresh and saline lakes, including lake Issyk-kul. The western Tien Shan has the broadest range of ecosystems (22 out of 24 classes); followed by the Inner Tien Shan (18 classes out of 24); the Alay and the Northern Tien Shan (16 classes) and the Issyk-kul Basin and the Central Tien Shan regions (12 classes each). As a result species diversity is also naturally high, with well over 500 species of vertebrates, including 83 mammals, 368 reptiles, 745 fishes along with 2 000 species of fungi, at least 3 000 species of insect and over 4 500 species of higher plants. Many species are endemic either to Kyrgyzstan or to Central Asia. Kyrgyzstan boasts a greater diversity than its neighbours. However, for many years now the environment has been subjected to severe human pressure and about 10 % of the mammal and avian species are listed as endangered. The official 'Red Data Book' published in 1985 list the following: 65 plants, 13 mammals -including some world renowned species such as the snow leopard (*Panthera uncia*) and Marco Polo's sheep (*Ovis ammon polii*), 33 birds, three reptiles, two fishes and 18 insect species. This is certainly an under estimate. A network of protected areas does officially exist. This includes 5 *zapovedniki* (strictly preserved areas), two national parks and 70 *zakazniki* (other protected areas). These cover a total area of 558 700 ha or 2.7% of the total country. Many of these areas are too small to maintain viable populations of plants or wild life within their boundaries and despite considerable international interest in the area, there is a lack of funds to provide adequate of management and control.

4. RUMINANT LIVESTOCK PRODUCTION SYSTEMS

4.1 Historical background

Before collectivization, traditional livestock management practices were based on transhumance and hardy land races. Under the Soviet system most livestock belonged to the State, as the property of collectives: individual herders might own up to ten sheep, a cow, a horse and a goat or two. Livestock production developed in two directions. Intensive production for meat and milk was based on home-grown fodder and grain in the form of lucerne, maize (grain and silage) and barley, supplemented by cheap concentrate feed from elsewhere in the USSR. Extensive sheep herding was based on transhumant grazing with a strong emphasis on fine wool production but heavily supported with supplementary feed and services, of all kinds including winter housing.

Starting in the 1940s and increasing steadily over the next thirty years, *Kirgizia* became a wool farm for the USSR and a number of highly specialised fine and semi fine-wool breeds such as the Kyrgyz Fine Fleece *Tonkorunnaya* and the Tien Shan Semi-fine Fleece *Tien Shanskaya*, were developed based on the Merino, the Lincoln and others crossed with native breeds.

In Kyrgyzstan seven distinct breeds of sheep are recognized [see box] Though broadly adapted to the local conditions the new breeds were more dependent on winter housing and supplementary winter feed than the traditional ones. During this time the dominant characteristic of the original indigenous fat-tail and-fat-rump, coarse wool sheep was changed to merino type fine wool breeds. None the less a number of the indigenous breeds such as the Kyrgyz Coarse Wool Fat-tail and the *Hissar (sic Gissar)* Fat-rump were retained and even 'improved' though in reduced numbers. Mutton from the indigenous types is generally preferred by the local Asiatic population. The skills of the Kyrgyz as herdsmen and shepherds with their pastoral and transhumance traditions were used by the Soviet Union in this development under central control and planning and maintained with heavy state support.

Under the traditional nomadic tribal systems droughts severe snow storms and other natural phenomena occurring every four to five years resulted in regular heavy losses of stock which also helped to maintain the natural balance on the pastures, as did their customs of seasonal pasture use. The emphasis on fine wool production led to a sustained effort to increase flock numbers through increasing fodder production, supplemented by imported concentrate feed in the winter. Additional support was provided by the development of a network of access roads, watering points, winter housing, transport and a full range of social and cultural support services for the herding communities, even on the most distant high

BOX

Sheep breeds include: (1) The *Tonkorunnaya* Kyrgyz Fine Fleece based on the native coarse wool / fat tail improved by crossing with fine fleeced rams including the Caucasian merino, the Siberian Rambouillet, the Wuerttemberger and the Precos and later further up graded with imports of Australian merino and others. Approved as a breed in 1956. This is the most favoured wool breed. Said to have dual purpose wool / meat potential, but mutton in fact less favoured than the indigenous fat tail/rump types. Kyrgyz Fine-wool once made up 90% of the Kyrgyz sheep flock, but are now optimistically stated as 45%/46% of the national flock, or about 1 759 000 head. (2) The Tien Shanskaya semi fine wool. Breeding based on the Russian Precoc up graded by crossing with Lincoln rams now estimated at about 180 000 head. (3) The Alaiskaya- semi coarse wool based on the native Alai breed improved by crossing with, Russian Precoc and Saraja. Grubosherstnaya, a generally black/ dark woolled, fat tail, originally used as the native base for the creation of the fine and semi fine wool breeds. Established approved as a distinct breed in 1973. (4) The Australian Merino, from importations in 1971 and 1989 and more recently in 1998 with 290 rams and 400 ewes imported under the World Bank funded Sheep Development Project (SDP) for breed improvement. (5) Kyrgyz Coarse Wool Fat-Tail, was the main hardy indigenous breed of the Tien Shan at the beginning of the XX th C, and one of the base breeds used for the breed 'improvements' described above. Brown grey coarse woolled breed to which the national sheep flock is generally reverting in type, as much by default as by intention. (6) The Hissar (Gissar), a black dark woolled fat rumped breed, and one of the largest (breeding rams averaging 120 to 140 kg liveweight and adult ewes 75 to 80 kg) originating from Tajikistan / Uzbekistan (viz the ancient district of Hissar - rus Gissar), currently much in favour for breeding back for indigenous characteristics, hardiness, rapid growth and meat quality which much favoured locally. Officially numbered at about 800 000 head. (7) The Edilbayev. The indigenous fat-tail sheep of the Kazakh steppe. Greyish / brown coarse wool second only in size and meat quality to the Hissar. (Rams 115 to 120 kg and ewes 80 kg lwt.) Currently popular as an 'improver ' in Chui, Talas and Naryn. All breeds have low fecundity usually producing only one lamb, but fertility good (90%). Lambs can reach slaughter weight in the first season of growth 30–35 kg LW. Fat tail / rump breeds generally superior milkers to fine and semi fine wool types.

summer pastures. This had the desired effect of reducing losses and increasing production, but by the 1970s and 1980s only 50% of feed requirements were being met from the grazing land.

By the early 1960s permanent over-stocking had been established as the normal state of affairs at almost all locations in the seasonal grazing cycle, exceeding the natural carrying capacity of the mountains by between two and two and a half times. In 1913 it is estimated (though opinions on this differ somewhat), the area of

modern Kyrgyzstan carried about 2 800 000 head of sheep. By 1989 this had increased to an official figure of 10 500 000 sheep. If the number of privately owned animals is added the true figure was probably between 14 000 000 and 15 000 000 head of sheep alone. This came to an abrupt end when Kyrgyzstan became independent. Since 1991 sheep numbers, though not of other types of ruminant stock (except yaks) or horses, have declined dramatically to its present official figure of 3 300 000, although by some estimates it may be closer to 2 500 000. (see Table 6)

Table 6. Stock numbers 1990 to 1999 ('000 head)

Year	Sheep	Goats	Cattle	Yaks	Horses	Sheep equivalent	Increase/decrease
1990	9 544.40	428.10	506.10	57.20	312.60	14 536.17	
1991	9 106.60	418.30	518.60	55.30	320.50	14 188.90	-347.27
1992	8 361.70	379.80	514.70	53.60	313.00	13 034.06	-1 154.90
1993	6 972.60	349.70	511.20	50.20	322.00	11 990.89	-1 043.17
1994	4 783.00	293.40	480.90	40.70	299.00	9 390.38	-2 600.51
1995	3 899.30	375.50	470.90	33.10	308.10	8 506.68	-883.70
1996	3 322.20	393.90	459.90	22.60	314.10	8 476.15	-30.53
1997	3 333.50	471.40	473.50	17.90	325.40	7 895.03	-581.12
1998	3 308.50	502.10	492.20	16.70	335.20	7 906.33	+ 11.30
1999	3 263.80	542.70	511.50	16.90	349.80	8 215.67	+ 309.34

Note: Official stock figures are taken in January, before the main spring birthing.

Previously official stock numbers reflected the 'state owned' herds and flocks, without the individually owned animals so that the figures for the years 1990 /92 were almost certainly higher than recorded here, especially in respect of sheep.

Source: Kyrgyzstan GoskomStat

For details of some of the challenges facing sheep herders up to 1995 see the on-line ODI Pastoral Development Network paper *The Kyrgyz sheep herders at a crossroads*.

FAOSTAT data for the years 2000–2005 (see Table 7) confirms the steady decline in sheep numbers while goat and horse numbers have increased. Data for cattle show increases but as numbers are well above the 1990–1999 Kyrgyzstan GoskomStat figures (and the Yak population cannot account for the difference) the cattle data needs further scrutiny.

Table 7. Stock numbers 2000-2005 (,000 head)

Year	Sheep	Goats	Cattle	Horses
2000	3 263.83	542.71	932.27	349.80
2001	3 197.76	601.43	947.02	353.90
2002	3 104.46	639.76	969.55	354.40
2003	3 104.13	661.30	988.02	360.70
2004	3 030.00	647.30	1 003.40	361.14
2005	2 883.92	769.55	1 003.40	361.14
2006	2 965.22	808.40	1 034.89	361.14

FAOSTAT 2006

4.2 The collapse of a system

Comparatively few collectives have kept their management structures and scale of operations intact. Those that have, have generally done so under the guise of becoming Agricultural Cooperatives. Starting in the early 1990s most large intensive livestock units, whether dairy units, beef feed lots, or poultry ceased to operate as the supply of imported feed was cut off. Only a few dairy units still remain with yarded herds (usually of black and white breeds) under zero grazing. Large commercial sheep flocks are now the exception, the present norm being family ownership of small numbers of sheep under subsistence conditions. Some of the farms that have managed to retain large flocks of sheep are now, however, leading the way in terms of breeding policies and programmes that reflect the new economic circumstances.

Each collective had specialist technical staff. The division and privatisation of these units has left the new peasant farmers without technical support, including veterinary care and breeding management although efforts are being made to develop an effective agricultural extension and advisory service with donor assistance in the form of the Rural Advisory and Development Service (RADS). A start has been made to encourage farmer-based breeding, production and marketing groups, with the formation of the Kyrgyz Sheep Breeders Association (KSBA). The Government currently lacks funds to provide any effective state services and a private veterinary service has been very slow to develop. For most of the past ten years there have been few funds to support the Republic's Scientific and Industrial Union for Fodder and Pastures (RSIU), or its successor The State Institute for Land Conservation and Management *Gyprozem* or the Research activities of the National Pasture and Fodder Institute (NPFII).

The construction and maintenance of access roads and watering points, machinery for cultivation, silage and hay making, pasture rehabilitation and running cultural centres, which in the past provided various facilities for herdsmen and their families when taking their flocks to the remoter summer pastures are no longer funded. Much of the rural infrastructure developed in the 1970s and 1980s, particularly in the high mountains, has collapsed or is rapidly disintegrating from neglect and lack of funds for maintenance. Since 1992 there has been a lack of basic agricultural inputs. Farm machinery is now often unavailable to the generality of small peasant farmers, or is in increasingly poor repair. In the poorer, more mountainous areas, haymaking has increasingly reverted to traditional methods, using the scythe, the rake and the pitch-fork.

4.3 Reasons for the rapid decline in sheep numbers

The previous emphasis on fine wool production has proved unsustainable, with international wool prices in long term decline and the quality of Kyrgyz wool deteriorating still faster.

Advantage has still to be taken of local manufacturing capacity though this remains an option, albeit comparatively limited. Once state support and a guaranteed market in the USSR ceased to be a reality, wool production quickly lost its position as the mainstay of the Kyrgyz agricultural economy. The flocks which were distributed to members of the collectives included large numbers of wethers and old ewes, which were the first to be eaten or sold. However, a feature of the last ten years has also been the large numbers of breeding ewes and even younger females that have been slaughtered. Cash has been in short supply, the meat market good and the wool market moribund. It has been difficult for families to feed animals through the winter and there is a shortage of good winter pastures near to the settlements. Herding small numbers of sheep is costly and inefficient and most of the summer pastures are very

far from settlements. Community shepherding has not developed to any significant extent. Where previously whole communities with their collectives' flocks, but well supported by the State, would spend three to four months in the summer on the *jayloo*, comparatively few families are now prepared to do so unsupported.

4.4 Herding habits and grazing pressure

As the sheep population has declined the pressure on the more distant summer pastures has lifted. In addition there is now little or no inter-state movement of stock from Kazakhstan and Uzbekistan to summer in the Kyrgyz highlands as national frontiers consolidate and political relations between the Republics deteriorate. Previously 3 000 km² of summer pasture in Osh Oblast alone was leased to herders from Uzbekistan. Now the Kyrgyz-Uzbek border is virtually closed due to deteriorating interstate relations, and from fear of political insurgents operating through Kyrgyz territory. While pressure on the more distant summer pastures has lifted, pressure on the winter as well as those traditional spring and autumn pastures within easy distance of settlements is very severe, indeed often greater than before. This reflects the present preference for a sedentary life over that of migratory herdsmen by the vast majority of the rural population, including the previously nomadic Kyrgyz.

Privatization of state-owned sheep started in the mid-1980s. Between 1985 and 1993 collectives' sheep flocks were reduced from 8 700 000 head to 4 200 000 head, while at the same time privately owned stock increased from 1 500 000 to 4 600 000 head. This immediately increased the year-round grazing pressure on the pastures closest to settlements as private herders ceased to move their animals to the distant summer pastures in the higher ranges.

4.5 Changes in livestock preference

The altered socio-economic conditions has brought about a change in livestock preference, away from sheep to cattle and horses. Cattle numbers, particularly of the hardy improved native type of brown *Ala Tau*, ('improved' with a dash of Brown Swiss and Jersey blood), have remained stable and probably increased as sheep numbers have fallen. Intensively managed dairy herds have been replaced by family house-cows as part of the tendency towards subsistence agriculture. These are generally herded communally though seldom grazing very far from the settlements. Owning a cow or two with their followers is common to all rural families regardless of ethnic background, thus the total number of cattle has remained stable since independence. Milk, if in surplus to family requirements, is often sold fresh in the local towns and settlements, or processed in some form or other. Several internationally funded projects supporting rural dairy processing plants and cheese factories have been established in recent years based on family cow ownership. The potential for developing a dairy and beef industry in the country based on the family cow and community herding remains considerable, even though at present milk yields tend to be low (1 500 to 2 000 kg pa), with alternate year calving. Shortage of winter feed makes off-season milking difficult to sustain and also means that bull calves are now generally slaughtered at between 3 to 4 months, though some are bought at this age by graziers, if available, and grown out on summer pastures to be slaughtered in the autumn at eight or nine months. [The *Ala Tau* now make up about 85% of the cattle in Kyrgyzstan. A native type graded up with infusions of Brown Swiss and Jersey blood from importations dating back to the 1930s. The *Aleatinsky*, which make up about 10% of the cattle in the Republic, are black and white graded up from Friesian/Holstein imports. Some unimproved native cattle still exist in remoter districts].

Goat numbers have remained stable or may have increased for the same reason (according to FAO data there has been a significant increase), as a source of domestic milk and fibre (angora and cashmere). There is little local tradition of milking ewes, and the Kyrgyz traditionally make little or no cheese or yoghurt, favouring *koumiss* or fermented mare's milk. Ewe-milking was discouraged in Soviet times and the fine wool breeds are poor milkers compared to the indigenous fat-tail sheep. This does not apply so much to other ethnic groups in particular the Uzbeks, Uigurs, Turks, Kurds, Tartars and the other Caucasian groups, who do make yoghurt and cheese to some extent, mainly using cow milk but also goat and sheep milk.

The potential for yak raising is referred to in many reports and yak meat is highly regarded but the number of yaks has decreased, from an estimated 57 700 in 1990 to just under 17 000 head in 1999 after

the privatisation and division of the collective herds. Yaks are much more environmentally specific than other stock being confined to the higher and more inhospitable mountain valleys where few people, even the Kyrgyz, are now prepared to live for twelve months of the year.

Interest in horses has increased and horse numbers continue to rise. Horses are valued by the Kyrgyz as a source of meat, milk, transport and sport (long distance racing and *olak tartu*, - a team game similar to the Afghan *buz keshi*, played with a dead goat or calf), but not for ploughing or cultivation, though for raking hay. Horse numbers may be higher than the official figures. The low cost of herding and feeding horses and the popularity of horse meat and *koumiss* make them an attractive proposition for many, particularly rural Kyrgyz. The Soviet restriction on the private ownership of horses no longer applies and there is traditional prestige in horse ownership in Kyrgyz culture, even among urban families. Horses play an important part in many Kyrgyz domestic 'events'. In particular, funerals demand the slaughter of horses, an ancient tradition of the nomad horsemen of the steppe, (viz. the frozen graves of Pazyryk in the Altay Autonomous Republic in Siberia: circa 600 BC).

4.6 Sheep breeding trends and sheep breeding policy

With the collapse of the fine wool market and the high price of meat, farmers are changing from Kyrgyz fine-fleece and other fine/semi-fine-fleece type of sheep to traditional fat-tail and fat-rump, coarse, coloured wool types, which survive on poorer pastures and lower quality fodder and produce a preferred quality of mutton. The return to the indigenous type of sheep is occurring by default rather than as part of any deliberate breeding policy and the result is an untidy mess of mongrel sheep. There are notable exceptions, however, where directors of former collectives have retained management control over sizeable flocks and some semblance of the old management structure. Some forward thinking farm directors are deliberately breeding their ewes to fat-tail/fat-rump rams using breeds such as the Hissar. Some pure bred fine, white wool flocks remain and have their passionate advocates. In 1998 several hundred pure bred Merinos, ewes and rams, were imported from Australia, under a World Bank Project, to 'improve local stock'. This met with considerable, vocal local criticism and its long term results and benefits have still to be assessed.

The national breeding policy is hotly debated between traditionalists who wish to retain a programme based on fine wool breeds and those who wish to ignore wool quality and concentrate on meat production and a return to fat-tail/fat-rump types. In the centre are those who recommend a compromise between the two lines of thought and as far as possible wish to combine meat and wool quality in any breeding policy, based on a quite sophisticated system of cross breeding, which though it appears to have merit in theory may prove rather more difficult to implement in practice, under present conditions. In reality the implementation of any national breeding policy will be extremely difficult, with the effective collapse of the state breeding farms for want of funds, and an infinity of small private flocks. Market forces will probably dictate its direction, regardless of the arguments of academics.

4.7 Herding customs

Collective, traditional responsibility for managing and herding livestock was taken away from the Kyrgyz clans and the 'khans' during the 1930s and 40s. The legacy of this remains today. Though the communal herding of house cows and their followers by village herdsman is generally customary in most rural villages, regardless of ethnic origin of the community, the case with sheep herding is generally different. The actual herdsman are often ethnic Kyrgyz. When they were privatized the state-owned sheep flocks were broken into innumerable lots, a few head to each family, and since then the practice

Table 8. Number of sheep breeding cooperatives and farms

Oblast	Farmers' sheep flocks	Numbers of sheep	Including sheep of breeds:			
			Kyrgyz fine fleeced	Tienshan semi-fine fleeced	Alay semi-coarse fleeced	Coarse fleeced sheep
Jalal-Abad	51	54 944	54 944	-	-	-
Issyk-Kul	10	44 431	44 431	-	-	-
Naryn	30	14 548	9 754	4 794	-	-
Osh	21	23 091	21 856	-	360	875
Talas	73	40 428	40 312	-	116	-
Chui	18	12 176	11 856	-	-	320
Total	203	189 618	183 153	4 794	476	1 195

Note: In 2000 all remaining breeding farms are being broken up and privatized under L&AR
Source: MAWR data for 1997

of community shepherding has not developed to any extent even among the Kyrgyz. This has been an important factor in the rapid decline of sheep numbers and the demise of transhumance management.

There are dangers that the local oblast and rayon administrations *akimyat* and the local 'Village Governments' *ayil okmutu*, (which are an arm of local administration rather than elected community representative bodies) may take more of the management of seasonal grazing lands into their own hands and out of the hands of the local stock owners and herdsman. Much will depend on how the new laws relating to the leasing of pastures and grazing-lands which are currently under review in Parliament, are drafted.

4.8 The future of sheep herding

Reports in 1995 confidently predicted that the decline in sheep numbers after 1991 was the result of a wave of 'panic sales' that would soon be reversed in response to rising meat prices and a combination of local and export demand. This has not occurred, yet, though it may still happen, particularly if encouraged by new laws relating to renting grazing land. The possibility certainly exists that private entrepreneurs, with access to capital and foreign markets, may in future seize the opportunity to become large scale graziers and take long term leases on sizeable tracts of rangeland in the Tien Shan. As yet, however, there is little evidence of this happening. It remains a possibility, if the new legal framework being developed favours this development, in which case there might be some danger of the rural communities losing their traditional grazing rights. There is some evidence, however, that sheep numbers have bottomed out at between 2 500 000 and 3 500 000 head, but at that level there are hardly enough animals of breeding age to satisfy the local demand, let alone exports.

There is little or no surplus cash in the rural economy and poor rural families, even among the traditionally meat / mutton eating Kyrgyz, increasingly survive on diets in which meat has become a luxury. The domestic urban market for meat is limited and an export market, to the Central Asian Republics or to more distant wealthier markets such as the Arab States and Iran, has yet to develop.

5. THE PASTURE RESOURCE

The pasture area, estimated at some 89 000 km² (see Table 9), consists of 39 000 km² of summer pasture (above 2 500 m.), 27 000 km² of spring-autumn pastures (between 1 500 and 2 500 m) and 23 000 km² of winter pastures. The summer jayloo, spring jaztoo and autumn guzdo pastures consist principally of perennial grasses and Cyperaceae, which are reasonably resilient under heavy grazing. The winter pastures – kyshtoo/kishlak [In varying forms these basically 'turkic' terms are used over a very wide geographical area from Central Asia, through Afghanistan, Iran, the Caucasus, Anatolia to the Balkans. viz. Summer quarters/pastures Kyrgyz: 'jayloo'- Afghanistan/Iran: 'yeilagh /-yaylagh', Turkey 'yayla'. Winter quarters/pastures. Kyrgyz. 'kishtoo', Uzbek/Tajik 'kishlak' (also a village, i.e. a winter settlement) / Afghanistan / Iran: 'qeshlaq'; Turkey 'kishla'. and with other local variations in pronunciation.], generally closer to the settlements, are mainly crop residues and aftermaths, or perennial browse and shrubs, which are more prone to being lost if consistently and heavily grazed; though hardy, drought tolerant and cold resistant they are being replaced by woody weeds and unpalatable plants. There are supporting areas of sown, generally irrigated, fodder mainly lucerne and sainfoin and hay meadows, which may also be irrigated. In Soviet times these amounted to about 6 000 km² of which 4 000 km² were sown and 2 000 hay meadow. Since 1991 the area of irrigated fodder has declined, to a present estimate of 555 km² of lucerne and sainfoin mainly due to the expanded area of wheat.

Pasture productivity declined steadily since the 1960s and by 1993 was reported to be about 300 kg/ha of dry matter, due to overstocking and poor grazing management. Productivity of the summer pastures declined from 640 kg/ha

Table 9. Pasture resources in the Kyrgyz Republic

Type of pasture	km ²	%
Summer pastures, from 2500 to 3500 m asl	38 890	19.4
Spring-autumn pastures – 1500-2500 m asl	26 970	13.5
Winter pastures	22 850	11.4
Total pastures area to total territory of KR	88 710	44.3
Arable land	16 000	8
Forests	12 000	6
Total area of Kyrgyzstan approx.	200 000	100

to 410 kg/ha and the spring and autumn pastures from 470 kg/ha to 270 kg/ha over the thirty years preceding 1993. The productivity of winter pastures decreased even more dramatically from 300 kg/ha to less than 100 kg/ha and encroachment of woody and unpalatable weeds affected about 50 000 km², over 5 400 km² had their value as grazing reduced to almost nothing.

5.1 Carrying capacity of the grazing lands

The maximum carrying capacity of Kyrgyzstan's grazing-land is estimated at 7 000 000 sheep equivalents. This includes all ruminant stock (cattle; yaks; sheep and goats) and horses (The accepted ratio is: one horse = 6 sheep: one cow or yak = 5 sheep; one goat = 0.7 sheep). Official estimates of sheep equivalents is about 8 216 000. Though sheep numbers are significantly reduced the number of 'sheep equivalent' is not when cattle and horses using the pastures and the abandonment of the outlying grazing is taken into account. Previously large numbers of cattle were managed under intensive conditions, and fewer grazed on natural pasture.

The reduction of sheep numbers from 14 500 000 in the late 1980s to 3 000 000 or less should have resulted in a general and gradual improvement of all the pastures. But there has been no policy to bring stock numbers into line with the carrying capacity of the land. The mountain summer pastures, now hardly grazed at all, are under utilised, while the winter and the traditional spring and autumn pastures are hard grazed out of season all the year round.

The number of cattle and horses has been maintained and may have increased. In particular, more cattle are at pasture than previously as they belong to small farmers rather than intensive units. The numbers of grazing horses is probably more than statistics indicate, as ownership is not well recorded. So stock numbers, in 'sheep units' are still higher than the carrying capacity of the grazing, and are excessive on pastures within easy walking distance of settlements. Many traditional winter, spring and autumn pastures carry twice the number of animals and for many more months of the year than they should. Almost nowhere is controlled grazing management being practised and the privatisation of herds and flocks has only increased this problem.

5.2 Seasonal pastures

Seasonal pastures in the Tien Shan are not based on altitude alone as many other factors influence where and when livestock were traditionally grazed throughout the year, but the description provided below is generally applicable.

- Summer pastures: The summer pastures *jayloo* in the Tien Shan include all grazing above 2 500 m and are classified as state lands traditionally leased out to herders by their village governments and subject to grazing regulations. The area grazed between June and September is much less than the official figures due to a number of factors among which are: topography, lack of water, stony surfaces and screes and inaccessibility. The area traditionally used was always less than the official one so estimates of carrying capacity based on official figures are theoretical.
- For instance Naryn *oblast*, in the central Tien Shan has officially 10 720 km² of summer pasture, but the five main traditional *jayloo*: Solton Sarai, Son Kul, Aksai, Arpa, Oruk Tam and Kum Bel between them total 3 110 km² or 29% of the official total. Resource mapping has classified 7 250 km² of the area as being either stony, or infested with shrubs and unpalatable or poisonous species, leaving little useful unused reserve. Historically, most of the area would have been grazed occasionally, but now even the better summer pastures carry comparatively few stock.
- Summer pastures are mainly grassland on gentle rolling mountain slopes, typically with 60-100% cover of 5–15 cm grasses such as *Festuca valesiaca*, with sedges, *Carex* and *Cyperus* spp. (about 30%) and broad-leaved perennial herbs with some legumes. At higher altitudes herbaceous legumes are rarer than lower down and often absent. Other species, including eidelweis (*Leontopodium ochroleucum* Bauverd), (which has similar romantic connotations as in alpine Europe). (10%). Low, prostrate plants such as *Potentilla* and *Alchemilla* invade and sometimes dominate heavily grazed areas at higher altitudes, whereas *Artemisia* spp. replace fescue under heavy grazing in the transitional zones and on lower slopes.
- There is a marked contrast in the height and density of the grass between north-facing slopes, which are much more lush and south facing slopes which have a much thinner cover, the effect of

differences in insolation. Differences in aspect must be taken into account when and if the summer pastures are sub-divided into grazing lots for leasing. Steep slopes of difficult access often show above-average cover. Though excessively stocked in Soviet times, particularly latterly in the 1970s and 1980s, most of the, traditional *jayloo* are now showing the beneficial effects of several years of light and sometimes negligible grazing by livestock. This under-utilisation of the summer pastures is often in stark contrast to the heavy stocking and continuous use of the more accessible pastures, which currently get little or no seasonal relief.

- Transhumance to and from the *jayloo* takes from one to six days by foot or on horseback with the grazing flocks and may cover 200 km. Previously many stock were taken by lorry along with herders' families and their gear, (leading to the decline of the Bactrian camel which formerly performed this role). Few herders can afford lorries and will not travel on foot, or spend the summer on the high pastures without support services.
- The collectivized system continued to use the seasonal pastures, following older Kyrgyz traditions of transhumance, but under state control, management and support, through the structures of the collectives not by community or tribal decision and management. The end of state and collective management has left the majority of the now mainly settled private stock owners and herdsmen with little idea of how to organise themselves to manage their pastures on a group basis.
- Spring-autumn pastures: These are generally on the foot hills below 2 500 m, typically with a sparse open cover of fescues and *Artemisia*. The latter dominates on the drier slopes and under heavy grazing. Herbaceous legumes are commoner than higher up and make an important contribution to the quality of the grazing: *Medicago*, *Trifolium*, *Astragalus*, *Onobrychis*, *Anthyllis* and *Hedysarum* spp, there are also sub-shrubs such as *Thymus* and *Origanum*. Grazing conditions are often very similar to those in semi-arid mountain tracts of Afghanistan; Iran Turkey and the Middle East. There is clear evidence that many transition pastures have had a long history of heavy grazing. Ground cover seldom exceeds 40% in the conditions prevailing in the Tien Shan; equivalent areas in Ferghana and on some of the northern foothills overlooking the Chu valley are better than elsewhere, to the point of being mown for hay, with meadows rich in legumes as described above. Heavy stocking has led to local dominance of unpalatable plants such as *Ranunculus alberti*, *Inula* spp, and others on damper hillsides and meadows of the northern foothills, and species such as *Verbascum* spp, generally on drier slopes. The spiny shrub *Caragana*, generally present in gullies, tends to 'explode' onto degraded slopes where it forms impenetrable thickets.
- Winter pastures: The definition of a winter pasture *kishtoo* need not correspond to altitude, landscape features or vegetation type but they are usually close to permanent settlements, in areas of light or negligible snow fall where stock can be easily housed, at least at night. Snow cover is no longer the defining factor it was, if stock can be housed at night and stall fed, as is now customary. The Kara-Kujur valley in the north of Naryn *Oblast* is counted as a traditional winter pasture; it lies at 2 700 m, produces abundant hay, is relatively free of snow and has plentiful water. Livestock including sheep and yaks were historically wintered even in the Ak Say valley, in Naryn *oblast*, which though over 2 500 m is generally comparatively free of snow. Its remoteness, difficulty of access and proximity to the Chinese frontier, means that it is now little used by domestic livestock even in the summer, making it a haven for wild life including herds of wild sheep (*Ovis ammon*) and ibex, (*Caprus sibirica*). In Osh and the Northern oblasts winter pastures are generally below 1 100 m. but foothills in places such as Nawkat and Kara-Su *rayons* in Osh tend to be well covered with annual and perennial grasses and herbs, elsewhere the lower traditional wintering grounds are generally semi arid steppe, with *Artemisia* and *Stipa* spp. predominating.
- Many ancient, traditional wintering grounds of the Kyrgyz and Kazakhs, particularly in the lower Chu and Talas valleys and in the Issyk-kul basin were colonized in the late nineteenth and early twentieth centuries by European and other agricultural settlers. Expansion of irrigation had the same effect in Ferghana. There are still a few old Kyrgyz men and women who can recall, or at least recall their parents telling them of how they returned from their *jayloo* in the autumn to their traditional wintering grounds only to find them occupied by Russian, Ukrainian and German (from the Volga region) pioneer farmers, claiming exclusive use of the land. Settlement intensified in the 1930s and 40s when irrigation systems were developed to support the new *sovkhoz* and *kolkhoz*.

Throughout, winter grazing consists of a mixture of natural grazing, aftermaths and stubble and weeds on the abandoned crop land.

- Because of the breakdown in seasonal grazing management, lack of mechanisation, shortage of man-power and a rapid decline in sheep numbers, large tracts of intermediate altitude pasture and hay meadow at some distance from settlements, particularly along the northern slopes of the Tien Shan overlooking the valley of the Chu river and in the South along the foot-hills over-looking Ferghana, are no longer grazed or mown. Increasingly in the late summer and early autumn, these areas are being burnt, deliberately or accidentally, but generally uncontrolled. Though forbidden by law grass fires are now a regular feature of the Kyrgyz autumn, sometimes covering many square miles of mountain and foot hill and resulting in a widespread grey pall that lasts for many days if the weather is still.

5.3 Livestock feeding in winter

Livestock feeding in winter is particularly difficult. In Soviet times imported feed amounted to 1 600 000 tonnes; by 1993 it had dropped to 700 000 tonnes and by 1999 to virtually nothing. It is estimated that grain shortfalls are at least 50%, hay 30% and silage 40%. Spring, summer and autumn grazing deficiencies, though less severe, are due to the continuous rather than seasonal, use of pastures, which has and continues to lead to their deterioration, while neglecting the herbage on the distant summer pastures due to the abandoning of transhumance.

5.4 Erosion

Erosion affects over 445 000 km², about half the total pasture area. Soil compaction due to high stocking densities has led to accelerated erosion on the steeper slopes and aeolian erosion on the lower and drier ones. The cultivation of pasture land on steep slopes has in places led to accelerated run-off and gullying. Land slips originating along the lines created by stock paths on steep slopes are visible, especially in the 'loess' foot hills that fringe of the Ferghana valley. Many stock routes have suffered serious degradation, are often seriously eroded and still show the effects of earlier years of excessive use.

6. OPPORTUNITIES FOR IMPROVEMENT OF PASTURE RESOURCES

6.1 Rotational grazing

Rotational grazing was recommended and supposedly implemented during collective times by the National Pasture and Fodder Institute (NPMI) on the summer pastures. Something similar is now required for the over-stocked and overutilized spring and autumn pastures. A return to transhumance, whereby stock use the various parts of the grazing lands at different seasons would be best. The social constraints that obviate this and have led to the demise of traditional practice must be recognised as a reality, until and unless a new corporate or community approach to stock management can be developed, whereby only the community herdsmen and their families move and special allowance is made for this, so as to make it worth their while.

A five year cycle of four years use followed by a year's rest and the division of communal pastures into five blocks, is commonly proposed. In view of the terrain as well as new herd and flock composition under private ownership and the poorly developed sense of community herd and flock management, this is likely to be difficult if not impractical to implement in practice.

The problem with general recommendations of this kind is that the grazing lands of a community are not homogeneous and consist of a mixture of north and south facing slopes, rocks, screes, thorny scrub, marsh and reed beds, as well as good grazing and hay meadows. It is not usually possible to divide common grazing land into five equal parts. Herdsmen will not agree or adhere to such a simplistic approach. In some cases the pastures are so badly degraded that a rest period of longer than one year will

be required to restore them to reasonable condition. Rest and rotation sounds plausible, but the details of how a block of common or even individually managed grazing is to be divided and managed and how many and what type of stock it should carry can only be worked out on a case-by-case basis. This is a new concept to those brought up in the old Soviet system, where rules were set out in text book style with little regard for local variants, nor account taken of local experience or encouragement given to local decision making, particularly on a community basis.

Practical details must be worked out jointly by all concerned, most importantly with the active involvement and participation of the livestock owners and herdsmen whose local knowledge and expertise must be taken into full account. Decisions of this nature should not be left entirely to the representatives of the *rayon* agricultural administration and the village governments, (both arms of government), or even only to 'knowledgeable' experts from either or both the NPFI; or the State Institute for Land Conservation and Management (SILCM -*Gyprozem*). The newly formed Rural Agricultural Advisory Service (RADS), may have a role to play but still lacks the necessary experience. The situation must be constantly reviewed at least every second year, noting the condition of the grazing in relation to stock numbers and rest and recovery periods. The sub-division of a grazing block must be based on shepherding experience and common sense. Grazing units must be well defined by geographical features in the absence of any possibility of fencing.

6.2 Reseeding

Reseeding will only be effective (supposing the technical skills are available) once the management faults which have caused the degradation have been rectified. This means that all the issues relating to grazing rights should be solved and controls for stocking-rates put in place before a programme for seeding is instituted. In the present circumstances, with the exception of well controlled experimental areas, a widespread programme for reseeding depleted pastures is unlikely to be either affordable or practical. The Republican Scientific and Industrial Pasture Unit (RSIPU) had almost twenty years experience of re-seeding pastures with *Agropyron (Elymus / Leymus) cristatum* and *Kochia prostrata*. Both are frost and drought tolerant and being perennial are well suited for winter pasture. Lack of funds has stopped this programme but 30 000 ha had been re-seeded and improved in the Republic up to 1993, including a 1 500 ha plot re-seeded with *Kochia* in the late 1980s along the Haidarkan - Badken road (Badken *oblast*, Ferghana valley), which is reported as being well established. *Kochia* is reported to contain 0.3-0.8 FU Kg DM and can reach a height of one metre. It is especially valued for winter grazing, with an ecotype from Samarkand in Uzbekistan being considered more palatable than the indigenous Kyrgyz material. Any reseeding programme should concentrate initially on these two proven forages. Such a programme would only be possible if supported by international funding.

The summer pastures are mostly in good condition and do not require reseeding. Many spring-autumn pastures are too steep or too rocky to make it practicable. However, there may be some justification for re-seeding with tested land races and cultivars of various forages in selected areas of spring, autumn and winter grazing, if conditions are suitable and precipitation sufficient, on a trial basis. Present lack of funds is unlikely to permit anything more general than this and even then almost certainly only with international assistance.

Various reports have recommended reseeding with a wide range of forages and other plants (including some which are toxic!), but these recommendations have not been based on local field testing. *Psathyrostachys (Hordeum) junceus* and *Hordeum turkestanicum* are both native dual purpose sheep and cattle species thought to have a potential, as well as *Elymus dasystachys*. In Ferghana *Bothriochloa ischaemum* has been identified as a potentially useful grass for the foothills, with *Phleum pratense* and *Alopecurus pratense* for hay production in moister areas. At present no seed is readily available in Kyrgyzstan, so a programme of seed production would have to be instituted with all the inputs and technical skills which that implies.

It is frequently proposed to re-seed the now increasingly extensive areas of abandoned arable land with the objective of re-establishing pastures. *Cynodon dactylon* has been proposed for re-vegetating such land. In some places it is already a widespread and serious weed of arable land. It is easily propagated vegetatively, but should only be tested where the land is unlikely to be reclaimed for cropping in the future.

6.3 Weed control in pastures

Weed infestation is largely brought about by faults in grazing management; correction of these faults is a prerequisite to any control programme. Research on weed control in pastures by NPFI in the 1980s showed that productivity could be raised from 0.8 to 1.6 TDM/ha. The cost effectiveness of such techniques would need to be re-calculated at current rates. Up until 1991 over 1 000 ha of weeds were cleared annually in Osh *oblast* alone. Weeds in the summer pastures are most serious where stocking rates had been particularly heavy. On deep fertile soils common weeds include *Salvia*, *Alchemilla*, *Rumex*, *Myosotis* and *Plantago* and in places of previous heavy stock concentrations may be up to almost 100% of the cover.

Grassy summer pastures often contain in addition to grasses (*Gramineae*) up to 60% sedges *Carex* and *Cyperus*. These are not weeds but an important part of the natural pastures and are actively grazed. Burdock (*Actium* spp.) and cocklebur (*Xanthium* spp.) are increasingly invading abandoned arable land, particularly in Chui, Naryn and Issyk-kul *oblasts*. Both have burrs which contaminate fleeces and increase the difficulty of marketing Kyrgyz wool. Much low lying land, in particular along the lower Chu river, and in other places in Ferghana (viz. in Susak *rayon* in Jalalabad *oblast*), is tending to revert to reed beds (*Phragmites australis*), as drainage systems deteriorate for want of maintenance.

On the hill pastures, the worst weed infestations are in areas particularly favoured by shepherds and where there have been concentrations of livestock for a long time. A rest period of at least two years may be necessary to allow the excess nitrogen to be leached out of the soil, combined with slashing the weeds back before they seed. Widespread mechanical or chemical weed control or eradication programmes in the country's present economic circumstances are difficult to imagine.

On poor rocky soils in the mountains and in mountain gullies the leguminous shrub - *Caragana* (*Caragana kirghisorum* and *Caragana pleiophylla*) is generally present and vigorously invades denuded slopes. The control of *Caragana* has received much attention from visiting experts because it now dominates hundreds of thousands of potentially good mountain pasture land, particularly in Issyk-kul *oblast*. Control will not be easy. Resting is no solution, nor is burning likely to be effective, it may activate the germination of *Caragana* seed. Slashing by hand or mechanically and treating the stumps with herbicide has been suggested, combined with reseeding with appropriate deep rooted woody species such as *Artemisia*, *Kochia* and *Salsola* and native and introduced grasses such as *Agropyron desertorum*, *Agropyron cristatum*, *Elymus jinceus*, *Pipthatherum (Oryzopsis) hymenoides* and *Pipthatherum holciformis*. However, it is doubtful if either funds, manpower or appropriate machinery will be available to implement such a programme, at present, unless from international sources, with so many other serious agricultural issues to be dealt with. *Caragana* may have an initial nitrogen fixing and beneficial effect, but it forms impenetrable thorny thickets. Though providing some browse for goats, and in the past for Bactrian camels (now rare in Kyrgyzstan), *Caragana* is of little benefit for sheep and cattle. It does have some use in stabilising eroded slopes, though observation shows that where pasture degradation is severe and there is little other natural herbage, lines of erosion still develop between the bushes. None the less the flowers have some value to bee keepers, and the thickets also provide excellent cover and refuge for game [For instance the Siberian Roe-deer (*Capreolus [capreolus] siberica*), the Tolay hare (*Lepus tolai*), the Chukar and Grey partridge (*Alectoris chukor & Perdix perdix*) and the Turkestan pheasant (*Phasianus [colchicus] principalis*)] and other wild life. In the future it might even have a use as fuel wood as it already has in western China.

6.4 Irrigation of natural pastures and hay meadows

The conditions in the high valleys in the Tien Shan, with plentiful melting snow and ice, make irrigation of natural pastures and meadows an interesting proposition. Research in Naryn in the mid 1980s, established that two to five irrigations over 600 to 800m³/ ha each between May and September increased dry matter yield from mountain pastures from 200 – 500 kg to 1 500 – 2 500 kg/ha. If fertilizer was added this could be raised between 2 400 and 4 000 kg/ha. The growing season was extended by between 20 and 40 days with a marked increase in nutritive value.

There are problems and limitations. In Naryn *oblast* where the potential for this development is greatest, the area of Alpine pasture suitable for irrigation is generously estimated at 1 500 km² or 14% of the total. The potential is more restricted elsewhere. This experimental work, completed now fifteen and more years ago has not been followed up. With the summer pastures so under-utilised at present, with funds for development

work in such short supply and with so many other more pressing needs in the agricultural sector, the irrigation of alpine pastures is unlikely to be given priority. The potential is there whenever the need and the funds are available. Priority should be given to hay meadows, both natural and sown where maximum return can be expected. Schemes should be kept simple, with the minimum of fixed structural work and individual areas kept comparatively small at between 0.5 and 20 ha so as to be more easily managed.

6.5 Fertilization

The NSIU carried out extensive top dressing experiments on the natural pastures, mainly in the alpine and sub-alpine areas at around 3 000 m, using both tractors and aeroplanes. In Naryn *oblast* alone approximately 1 200 km² were so treated between 1975 and 1982. Applications ranging from N30, P30, K0 to N90, P60, K40 were applied both annually and periodically every 2 to 3 years. Herbage yields increased by 50% to 90% in the first year, but dropped to 10 to 15% two years after application. At present there is insufficient fertiliser and cash to buy it in the rural economy for the main arable crops, let alone for pastures. In any case experience from elsewhere indicates that upland pastures, adapted to a nutrient poor environment do not provide the same level of economic response to fertiliser as cultivated crops. Fertilizer is likely to remain restricted to sown hay meadows and fodder crops and even that is unlikely or at best to be severely limited.

6.6 Perennial sown hay meadows

Several reports have recommended sown meadows, of a mixture of tall perennial grasses such as: *Dactylis*, *Bromus inermis*, and *Lolium perenne*, on arable land no longer used for crops. In the 1970s and 1980s the NPFI tested perennial grasses but not surprisingly this met with little acceptance compared to cereals or longer term perennial forages such as lucerne and sainfoin. As much of the abandoned crop land is no longer easily irrigated and is now effectively dependant on natural precipitation any programme based on re-establish pastures will need to take this into account when selecting the species for re-establishing pastures.

6.7 Fodder trees and shrubs

A history of heavy grazing and cutting for timber and fuel means that the Tien Shan are remarkably devoid of trees and shrubs, though the relics of older coniferous and deciduous forest cover and thorny scrub, (which is increasing in places as previously described), remain, though mainly on slopes too steep for grazing. Poplars and aspens (*Populus* spp) and willows (*Salix* spp) mark the watercourses in the lower warmer valleys and together with Siberian Elm (*Ulmus pumila*) were widely planted along roadside verges in Soviet times, now under increasing threat from the axes of villagers seeking winter fuel. *Tamarix* spp occur in many lower lying warmer areas. There is, however, no local tradition of lopping for fodder. If there once was it was discouraged in Soviet times. Additional fodder from trees and shrubs is hardly necessary in upland areas. Grazing lands in the semi-arid belt from about 400 to 2 000 metres are composed of dwarf shrubby plants including *Salsola*, *Haloxylon*, *Artemisia* and *Atriplex* spp. Some experimental seeding with *Kochia* took place in Osh and Badken in the 1980s with promising results. In the southern Oblasts, in the Ferghana valley, mulberry (*Morus alba*), is commonly planted along road sides and the edge of fields and irrigation channels. Originally, and to some extent still, these were planted to feed silk worms. In many countries mulberry leaves are also stripped and branches lopped as a valuable contribution to the summer forage for sheep and goats retained in the settlements in summer.

7. CULTIVATED FODDER CROPS AND NATURAL HAY MEADOWS

7.1 Cultivated fodders

Two fodders are extensively cultivated in Kyrgyzstan, Lucerne (*Medicago sativa*) and Sainfoin (*Onobrychis viciifolia*). The former is usually planted on the better irrigated land, the latter on the less well irrigated foot slopes and cultivated up-lands.

Table 10. Areas under planted perennial fodder crops (mainly lucerne and sainfoin) 1990 to 1999 ('000 ha)

Seed crop	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	1990/1999
Lucerne	34.8	23.6	11.7	4.3	2.2	2.8	2.5	2.2	2.1	2.8	(32.0)
Sainfoin	10.8	9.3	8.8	5.8	5.2	3.1	1.4	1.3	1.8	2.7	(8.1)
Other fodder	0.6	0.5	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	(0.6)
Total seed	46.2	33.4	20.8	10.5	7.4	5.9	3.9	3.5	3.9	5.5	(40.7)
Peren. hay	207.0	206.0	202.2	195.5	208.1	218.8	215.1	185.5	179.2	199.7	(7.3)
Peren. green fodder & silage	171.6	171.4	159.2	143.7	122.1	74.7	51.6	36.6	29.7	23.4	(148.2)
Peren. sown pasture	7.6	9.0	5.0	5.7	9.3	10.7	2.5	2.4	2.0	2.9	(4.7)
TOTAL	432.4	419.8	387.2	349.7	337.6	310.1	273.1	228.0	214.8	231.5	(200.9)

The collapse of the intensive livestock units in the early 1990s meant that demand for lucerne was greatly reduced. At the same time the Republic's need to feed itself, coupled with diminishing yields meant that wheat acreage expanded rapidly through the mid-1990s to its present level of about 460 000 ha. Much of the increase in wheat has been at the expense of planted fodder crops which has decreased from about 432 400 ha in 1990 to its present estimated level of about 231 500 ha in 1999. Within this overall decrease the greatest change has occurred in the areas of fodder managed for seed, which have fallen from 46 200 in 1990 to 5 500 in 1999, and for green forage and silage which has decreased from 171 600 in 1990 to 23 400 in 1999. At the same time the area managed for hay has not altered very significantly being recorded as 207 000 in 1990 and 199 700 in 1999. Though official statistics may be open to question, these trends certainly accord with general observation and also mark the general collapse of the intensive meat and milk industry based on yarded cattle dependant on silage and carried green fodder (see Table 10).

Lucerne: Lucerne is, and will remain, the main fodder crop in the Republic. It has a very ancient history in this region. One theory even maintains that lucerne may have been first deliberately cultivated in the Ferghana valley in ancient times. It is reported to have been fed to the great 'blood sweating' [thought to have been the effects of a parasite causing *Equine Parafilariosis*] war horses bred by the ancient kings of Ferghana, and much sought after by successive Chinese emperors. In Kyrgyzstan lucerne gives three to five cuts a year over four or five years under irrigation in the Ferghana provinces; with minimum irrigation in upper Naryn it gives one or two cuts. Four to five years is the optimum, older fields become heavily infested with weeds such as *Picris* and *Cuscuta*. It is desirable to rotate lucerne with other crops.

In the latter years of the Soviet Union several new cultivars had been developed on the NPFI farm in Skulk *rayon*, Chui *oblast* outside Bishkek, among them TOKMOKSKAYA, UZGHENSKAYA and BEREKE. The latter has shown particular promise in the colder higher altitude regions. These cultivars are reported to be capable of producing yields of 20 T/ha and 300 kg/ha of seed, being an increase of 20% and 30% respectively over the older cultivars. Almost no further original work has been carried out by NPFI since independence. Very limited quantities of seed of these varieties and only negligible quantities of seed are currently being produced by NPFI. Average yields of 10 T/ha of hay and no more than 200 kg/ha of seed are now normal. Grazing of autumn aftermaths is common, especially in highland provinces such as Naryn.

Sainfoin: This is the second fodder crop of Kyrgyzstan. Only one cultivar YSSIK-KULSKI is used; there is no commercial seed production and seed is only available in experimental quantities at the present time. This crop suits the drier, mainly rainfed, hills and sloping land up to about 2 000 m. Two, rarely three, cuts per year are possible with yields of up to (but now seldom) 20 T/ha. There is less risk of bloat when feeding green sainfoin than when feeding green lucerne. Sainfoin is palatable, fast growing and competes well with weeds. It does not respond as well to supplementary irrigation as lucerne, but is none the less quite demanding of soil moisture. It is short lived, seldom being very productive after three years. Demand for seed is presently met from on-farm production. Sainfoin is extensively grown in the low rolling foothills at the eastern end of Issyk-kul lake and in the lower altitude tracts of Naryn *oblast*, where it provides an important nitrogen source in rotation with cereals. Early summer rain in these areas in late May and June can make haymaking difficult. It is highly melliferous.

7.2 The potential for alternative short duration pulses for small mixed farms

In Kyrgyzstan and its neighbours, there is no recent tradition or experience of growing leguminous fodder or pulses other than lucerne and sainfoin. This includes the short duration annuals common in all the countries to the south and west of the borders of the Central Asian and Caucasian states which have similar environments, such as Afghanistan, Pakistan, Northern India, the disputed territory of Kashmir, Iran and Turkey. In the highlands of these countries clovers, (*Trifolium* spp including cold-tolerant *T. resupinatum*), vetches (*Vicia* spp), grass pea (*Lathyrus sativus*) and a whole range of field peas (*Pisum sativum*), beans (*Phaseolus vulgaris*), grams (*Vigna radiata* and *V. aconitifolia*), chick peas (*Cicer arietinum*) and lentils (*Lens esculentum*), are traditional and essential parts of all small farmer, mixed production systems, as well as providing an important part of the diet of the population. Similar agricultural traditions almost certainly existed in pre-Soviet, Central Asia, which shared so much in common, (historically, culturally and environmentally) with the countries just mentioned. That these crops are now little known and seldom cultivated in Central Asia almost certainly has much to do with the destruction of small scale peasant farming in the 1930s and 1940s, when it was replaced by large scale, mechanised collective and state farms, which rendered these crops obsolete.

The whole social dynamic as well as the scale of agriculture and land use in Kyrgyzstan is in the process of radical change and in the present circumstances smaller peasant land holdings are likely to be the norm. With crop production systems changing, there is likely to be a place for short duration, nitrogen fixing fodder and pulse crops. Beans (*Phaseolus vulgaris*) are now being grown by small farmers in Talas *oblast*, on contract to Turkish merchants. The stover of pulses is useful as fodder. There is an absence of good, clean, true-to type seed and planting material and to date the national research programme is still not geared up to deal with this. The scope to transfer relevant technology from countries with similar environments, but different histories of social and economic development is very necessary, especially those across the southern and western borders of the ex Soviet Central Asia and Caucasian Republics.

7.3 Barley

Barley is widely grown as a fodder and cereal crop although the acreage has decreased since independence, due to a combination of factors, the collapse of the intensive livestock sector and the urgent need to produce wheat for human food in these remote areas. The barley acreage in highland areas such as Naryn declined in the early and mid 1990s being almost entirely replaced by wheat, which is hardly viable at these altitudes. The incentive was local food security. In the 1970s and 1980s much good pasture and hay land in the high valleys was cultivated to grow barley. This was a serious environmental error, as some of the best valley bottom pasture and hay meadow was cultivated at this time and in consequence is now seriously degraded. There is recent evidence of pasture being ploughed to grow 'survival' crops of barley as well as wheat by small private farmers in the higher valleys, particularly those that have been allotted land outside areas best suited for crops. Barley grown for hay would yield only 750 FU/ha against 2 250 FU/ha for grain, (not counting the straw) and 2 700 FU/ha for lucerne and sainfoin. There is no justification for growing barley hay at the higher altitudes and strong environmental arguments against it. Grain production will always be a more economic proposition in the lower valleys.

7.4 Haymaking

Hay is a very important winter feed; in the absence of concentrates it is all that is available to many livestock owners. Hay comes from two sources; natural meadows, which are traditionally seen as a community resource, and sown and irrigated forage, which is the property of the individual farm or farmer. Cereal straw is saved for fodder. So important is hay-making considered that traditionally movement to the *jayloo* is often delayed until hay-making has been completed. Hay may be used as a medium for barter trade and a paper written in 1995 reports [Reference 'Assistance for Improvement of Private Livestock Sector - EC Tacis Project A&F KYR 9301 September 1995'. AGRER NV. Brussels. Belgium] that 40 bales of hay might be bartered for two head of cattle. Hay meadows are commonly irrigated if they lie conveniently to springs and streams, but even very steep slopes are mown if the growth of grass justifies the effort.

In Soviet times almost all hay, except on very steep land, was mechanically mown and baled. Though no longer operating, one of the main factories manufacturing hay balers in the USSR is in Kyrgyzstan. With privatisation and the present lack of access to machinery currently faced by the peasant farmer, especially in the more mountainous districts, many have reverted to traditional methods. A survey in 1999 [reference unpublished report based on a survey carried out under the auspices of the staff of the Rural Agricultural Advisory Service (RADS) and collated by T.O'Sullivan, GRM Consultant Brisbane, Aus., May 2000] on haymaking carried out across the main altitude zones confirmed a general observation, in mountain and upland districts haymaking has now largely reverted to mowing with a scythe, tedding and windrowing with rakes (sometimes horse drawn) and pitchforks for piling into hay cocks to dry and loose stacking rather than baling. Mechanised haymaking and baling is increasingly confined to the lower valleys and larger farm or field units of sown lucerne, where there is some chance that farmers have managed to retain sufficient appropriate machinery. Natural hay meadows are still looked on as a community resource and haymaking organised very much as a community operation, with individual families having rights to the hay off certain sections of the meadows, known as 'hay-mowings' or *kocba* in Russian.

There is much confusion in the statistics between hay meadows and sown lucerne and sainfoin, but natural meadows are thought to occupy 2 500 km² or 3% of the total natural grazing area in the Republic. Their productivity exceeds ordinary pasture-land by up to 50%, with a feed value of between 0.45 and 0.55 FU/kg DM, producing an average of 1.3 T of hay / ha. In Naryn *oblast*, which comprises the most significant extent of natural upland pasture and meadow land in the central Tien Shan, hay meadows are mainly confined to valley bottoms and riverine terraces, though hay may be made on steeper slopes if justified. The flora of these meadows is dominated by fescue (*Festuca* spp.) and bush grass (*Calamagrostis epigelos*), plus some clovers, (*Trifolium repens* and others), *Lotus* spp, other legumes, as well as *Carex* spp and a variety of herbs. In the Southern *oblasts* of Osh and Jalalabad extensive medium-tall grasslands occur, on the deep soiled loess foothills, overlooking the Ferghana valley, dominated by *Stipa* and *Agropyron* spp.

Even with mechanisation, the quality of hay, both from natural meadows and planted lucerne and sainfoin is of generally low quality, being usually mown when far too mature. Haymaking during the period of optimum growth is often complicated and delayed by rain. In the case of lucerne much leaf is usually lost in the process of handling. There is often considerable contamination with coarse weeds, often up to 40% or more, many of them unpalatable and in the case of hay from the natural meadows sometimes even noxious weeds such as *Asphodel* and *Verbascum* spp.

7.5 Silage

When the many intensive livestock units were functioning silage making was common, mainly associated with production of milk and beef. Typically silage was made in large concrete lined pits, the smaller type being 400 tonnes. The silage, mainly green maize, but also lucerne and grasses, was consolidated with a tractor, covered with polythene sheeting plus a layer of clay, and weighed down with old tractor tyres. Preservative chemicals, mainly 'pyrosulfonitrate' was imported from Kazakhstan, sufficient to treat between 12 000 T. to 17 000 T. per year.

Though some silage is still made, it is much less common than previously. Between 1990 and 1999 official data shows that the area planted for maize silage has fallen from 89 597 ha to 20 551 ha, and for other fodder crop 171 600 ha to 23 400 ha. Very little if any chemical is currently available and little money to pay for it, nor is there any plastic sheeting. Silage making is now almost entirely confined to the few surviving large farm units, which still have yarded milking cows. These large capacity silage pits are ill suited to the small peasant farmer with only a few head of animals. Community silage making is not perceived as an option. Silage quality, even in Soviet times, was not very good, much of it being rank and over-mature.

7.6 Other fodder crops

The fact that sugar beet cultivation has increased and appears to grow well in Chui and Talas *oblasts*, has lead some visiting consultants to suggest that there may be some scope for growing fodder beets for feeding to village milking cows. To date this remains a tentative recommendation. It has already been

noted that sugar beet pulp is at present a rather under-utilised source of livestock feed. In Ferghana, cotton farmers have access to cotton cake.

7.7 Seed production

Kyrgyzstan was a major producer of lucerne and sainfoin seed for the Soviet Union. In the 1980s the Republic was regularly producing almost 5 000 tonnes a year of lucerne and 4 000 tonnes a year of sainfoin seed for both domestic use and export to the rest of the USSR. In 1990 the official figure was a total of 4 982 tonnes of lucerne seed and 3 942 tonnes of sainfoin. By 1999 the official production figure had dropped to 313 tonnes of lucerne and 835 tonnes of sainfoin, almost all of which was used in-country and mainly to satisfy local 'on-farm' requirement or for barter exchange between neighbours. In 1990 official statistics *GoskomStat* record that a total of 34 786 ha of lucerne and 10 861 ha of sainfoin were being managed for seed production. In 1999 official statistics recorded that the area being managed for seed production had been reduced to 2 800 ha for lucerne and 2 700 ha for sainfoin. This could even be an over estimation for current serious commercial seed production. With the collapse of the command economy and shortage of cash in the Republic, few if any of the old state seed farms that produced lucerne seed do so any more on a commercial basis, except in reduced quantities for their own use, or for barter between neighbours. One sizeable specialist lucerne seed cleaning plant in Kara Su *rayon*, Osh *oblast* has converted its entire system to cleaning and processing wheat seed. As an indication of past capacity, four seed farms operated in Uzghen *rayon* Osh *oblast* alone producing 250 T of lucerne seed for export to other Soviet Republics. One farm in Uzghen used to produce between 100 and 150 T with its own specialised combines and equipment. By 1994 this farm produced only 30 T and at the present time no longer produces any lucerne seed at all. The cash sale market for lucerne seed either in-country or for export is negligible, though it continues to be spoken of in official circles as something in which Kyrgyzstan should have both a large local demand and comparative advantages for seed export. Despite this the author of this paper knows of only one seed farm in Chui *oblast* that exported 30 kg of seed to Russia in 1999.

Before any serious attempt to revive an international market for Kyrgyz lucerne seed, or for Kyrgyzstan to begin to compete on the international market, considerable improvements in cleaning techniques, and basic seed quality will be necessary, to avoid serious contamination with seeds of prevalent weeds such as dodder (*Cuscuta epithimum*). No other forage seeds are produced and none imported at the present time while there is little cash available in the rural economy, or farmer demand.

8. RESEARCH AND DEVELOPMENT ORGANIZATIONS AND PERSONNEL

The Republican Scientific and Industrial Union of Fodder and Pastures was created in 1986, in response to the crisis created by thirty years or more of serious over stocking and bad grazing management that had reduced pasture productivity in the Tien Shan ranges from an average of 660 kg DM/h to less than 350 kg DM/ha. Calculations made on the theoretical figure of 88 000 km² of natural pastures had tended to ignore the fact that at least 50 000 km² were un-exploitable for geographical and topographical reasons, or because they lacked watering points.

After the creation of RSIU the situation improved in the short term, as the result of the cultivation and planting with forages of 300 km²; through weed eradication on an additional 1 000 km² and the introduction of rotational grazing schemes designed for each *sovkhos* and *kolkhoz*, including periodic rest periods. This type of controlled management was imposed on one million ha of pastures annually and seems to have helped arrest the degradation, but was begun too late and on the eve of the break up of the USSR. The RSIU supported the creation of many new watering points, the installation of 756 wells, 867 small dams and catchments and 1 389 km of pipelines providing water to 2 000 km² of pasture. By 1989 50 000 km² of hitherto inaccessible grazing land were opened up for exploitation. Less than fifteen years later little of this infrastructure is in working order. The RSIU was set up with the following establishment:

- Six *oblast* level inspection units: Six *oblast* machinery stations, 14 maintenance offices,
- A central office for survey and design: Two experimental seed farms: One National Pasture and Fodder Institute (NPFRI). These were intended to perform the following tasks.
- The NPFRI to establish pasture rotation schemes as requested by the farms; conduct research on improving degraded pastures, weed eradication, re-seeding degraded winter pastures.
- Carry out oblast level inspections of the pasture rotations; the implementation of management techniques; of the construction and operation of watering points etc.
- The establishment on a total of 150 km² of mechanised fodder production stations.
- Self financing machinery stations to assist farms with mechanisation to produce fodder reserves on a contract basis.
- Establishment of an Office to manage survey and design work and the blue prints for the construction of water supply access roads, fences, financing, land tax etc.
- Providing a management board for developing irrigation and watering systems, with mobile mechanised columns; drinking water facilities on the summer pastures.
- Establishment of cultural centres to support herdsmen and their families on summer pastures.

By 1995 the budget for these operations had been cut to 500 000 Som (USD 35 000) and by 1996 they had ceased to operate. NPFRI sub-stations were closed down, construction and maintenance ceased as had any attempt to support 'cultural' centres on the summer pastures.

The NPFRI and its associated experimental seed farm operate a 1 500 ha farm in Sokuluk *rayon* Chui *oblast*, close to Manas-Bishkek airport. The Institute employed 35 scientists and concentrated research on five new cultivars of lucerne (3 crossbred and 2 synthetic), a cold resistant variety of sainfoin and some seed production of grasses such as *Dactylis glomerata*, *Bromus inermis* and *Bromus riparia*. There were sub-stations in Talas, Issyk-kul, Chui and Osh. A phytopathological laboratory is attached to the farm. At the present time with staffing considerably reduced and budgets drastically cut the effectiveness of NPFRI is also seriously limited.

The original duties of the RSIUFP are now split. The Pasture and Fodder Research Institute, its sub-stations and farm, fall under the responsibility of the Agrarian Academy. Responsibility for the monitoring, measurement of production and the development of management systems for using the natural pastures and meadows, including survey and cadastral work, are presently the responsibility of the State Institute for Land Conservation and Management (SILCM - Gyprozem. Gyprozem is currently also responsible for supervising at least one pilot area in Naryn *oblast* for controlled grazing management.

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10. CONTACT

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Mr. J. M. Suttie provided comments.

Arrangements are being made for local revision and up-dating

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