

Country Pasture/Forage Resource Profiles

AFGHANISTAN



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1. INTRODUCTION

Afghanistan has undergone a great deal on unrest and civil war over the past twenty years and millions of refugees were forced to flee to Pakistan and Iran; although many have now returned, many remain outside the country. The present agricultural and pasture situation has to be seen in the context of these events. A UNEP report (UNEP, 2003) provides details on the post-conflict state of the environment, the natural resources of Afghanistan and recommendations on how to improve environmental conditions and policies.

Afghanistan lies between 29° and 38° N and 61° and 75° E. It is completely landlocked and is bounded on the north by Turkmenistan, Uzbekistan and Tajikistan; on the east by China and Pakistan (including the disputed territory of Kashmir), on the south by Pakistan and on the west by Iran (see Figure 1). Access from the north is good; the eastern frontier is blocked by some of the world's highest mountain ranges: the Karakoram and the Pamirs. There are two main roads into Pakistan through the Khojak and Khyber passes; to the west is desert. Massive ranges within the country make internal transport difficult: Almost all the drainage is internal. There are four main rivers: the Amu (Oxus) drains north to the Aral sea; the Kabul river to the Indus through the Khyber; the Helmand and Hari Rud run into the western deserts.

The altitude range is from about 470 m on the SW border with Iran to over 6 000 m in the eastern mountains. The summer snow line varies between 3 000 and 4 600 m – it descends to about 1 800 m in winter.

Afghanistan is essentially semi-arid to desert and most crop production is limited to pockets of irrigable land, with some rain-fed areas in the north and at high-altitudes. Crops cover less than 10% of the total land area; most of the rest is extensive grazing, desert or high mountain and permanent ice. By far the greatest part of the land surface of Afghanistan is extensive grazing land – desert; semi-desert or high or steep mountain; only about 40% is said to be suitable for winter grazing. From satellite imagery it has been estimated that more than 70% is rough grazing (Table 1). Population estimates are given in Table 2.

Crops

Crop production is mainly from irrigated land, except on the Northern Plains where there is just enough precipitation for very extensive cereal cultivation. Most traditional irrigation systems have a sporadic supply – either spate irrigation fed by rain or snow-melt from far off hills or karez systems. (a traditional system of Iranian origin whereby underground springs [usually fed by snow on the mountains] are tapped and channelled, through tunnels, to the fields). Most of the arable land can only be watered for



Figure 1 Map of Afghanistan

Table 1: Afghanistan – Land use (1993) *

	Area (ha)	Percentage
Irrigated agricultural land	3 302 007	5.1
Orchards	94 217	0.1
Intensively irrigated	1 559 654	2.4
Intermittently cropped	1 648 136	2.6
Rainfed agricultural land	4 517 714	7.0
Forest land	1 337 582	2.1
Rangeland	29 176 732	45.2
Barren land	24 067 016	37.3
Marsh land	417 563	0.6
Water bodies	248 187	0.4
Snow-covered area	1 463 101	2.3
Urban area	29 494	0.05
TOTAL LAND AREA	64 559 396	100

* Source: Provincial Landcover Atlas of Islamic State of Afghanistan, FAO/UNDP Project AFG/90/002, 1999.

part of the year. When a limited supply of permanent water is available it is used for home gardens, orchards and other high-value crops near the homestead.

Wheat is the staple crop and national food – mainly winter-sown but spring wheat is grown in the coldest zones; consumption is 220 kg wheat per capita, per annum. Some high-quality rice is grown where conditions are suitable (Kunduz). Maize and barley are used as stock-feed, rarely for humans. Millets (*Panicum miliaceum* and *Setaria italica*) and grass pea (*Lathyrus sativus*) are cultivated in the highest zones. Pulses are mainly grown for export to Pakistan: grams (*Vigna radiata*), chickpea (*Cicer arietinum*) and lentils (*Lens esculenta*). Fodders, mostly clover (*Trifolium resupinatum*) and lucerne, (*Medicago sativa*) are important in most production systems. Tree crops are very important; apricots (*Prunus armenaica*) and mulberry (*Morus alba* and *M. serrata*) for subsistence and sale; pomegranates (*Punica granatum*), grapes (*Vitis vinifera*), orchard crops (apples, plums, peaches pears) and nuts (almonds – *Prunus*), pistachio (*Pistacia vera*), walnuts (*Juglans regia*), and chilgoza (*Pinus gerardii*). Dried fruit, mainly raisins, used to provide about 40% of the agricultural exports. Vegetables are grown everywhere for subsistence, and near towns for sale; melons are a major summer crop.

Livestock

There are two main types of livestock production systems, those of sedentary villagers and the transhumant (Kuchi) systems; Karakul sheep production is a third, specialised, sub-system in the north of the country.

Livestock are integrated into most systems – the transhumant sector has a third of the small ruminants and most of the country's camels. Cattle, sheep and goats are the main stock; camels, asses and horses are important; there are a few yaks and buffalo in particular environments. Cattle are still the main source of farm power and provide subsistence dairy needs. Most small ruminants are kept in mobile production systems with regular movements between summer and winter grazing. In the north there are five million Karakul sheep in a specialised production system. Feed is mainly from grazing and crop residues; fodder is grown to supplement these in most areas. Coarse grain is used as winter-feed and some concentrates are fed. Domestic fowls are found in all settled systems; turkeys, ducks, partridge and geese are also kept.

Dairy products are important in the local diet, especially curd and buttermilk, and are mainly produced at home. Ghee (clarified butter oil), qurut (dried curd) and some cheese are generally prepared and marketed by women. Large numbers of small ruminants, wool, hides and skins are exported to Pakistan. Afghanistan always had an important share in the Astrakhan skin market. In 1996 it was estimated that 450 000 of these skins were produced from Karakul sheep in the northern provinces and marketed from Afghanistan. In addition to sheep wool, cashmere wool fibre of medium fineness is produced by goats in Afghanistan and collected and marketed worldwide through a

Table 2: Population estimates

1979 Government census	13.05 million
1996 Unofficial UN estimate	18–20 million
2006 (July est.) World Factbook	31 056 997

Table 3: Afghanistan – Production of principal crops*

Crop	Gov't Statistics 1976		Estimated 1999	
	Area '000 ha	Productivity kg/ha	Area '000 ha	Productivity kg/ha
Wheat	3 404	1 316	1196	1 660
Barley	320	1 200	180	1 200
Maize	484	1 612	160	1 500
Rice	210	2 071	140	2 000
Cotton	112	1 429	Not available	
Sugarcane	4	15 000	Not available	
Orchards	140	Not available	Not available	
Vegetables	92	7 830	Not available	

* Source: Food Security Through Sustainable Crop Production in Afghanistan, AG:DP/AFG/96/004, Field Document 1, 1999.

Table 4: Afghanistan – Livestock numbers (1000 head)*

Category	1981	1995		2003
	Total	Farmers	Kuchis	Total
Cattle**	3 750	3 495	198	3 693
Sheep	18 900	15 504	6 508	22 012
Goats	2 900	5 458	3 472	8 930
Horses	400	167	200	367
Donkeys	1 300	872	147	1 019
Camels	265	101	176	277
Poultry				12 200

** Includes some buffaloes and yaks

* Source: 1981 data – Central Statistics Office: Afghan Agriculture in Figures (1978); Statistical Year Book 1360 (1983); 1995 data – estimates of the author based on data from the headcount 1995, organized by project AFG/93/004; 2003 data – results of the first livestock census, reported by FAO on 4 December 2003.

few dealers in Herat. Carpets are woven by both settled and nomad families for sale. In addition to local wool, wool for carpet production is also imported from Pakistan and Iran. The Turkmen plains are famous for their horses. Dung is a valuable by-product for soil fertility maintenance or as fuel

2. SOILS AND TOPOGRAPHY

The outstanding physical feature of the country is the Hindu Kush, which forms a barrier between the north and south. About 150 km north of Kabul it spreads out into several ranges with the Baba, the Hesar, the Safed Koh and the Turkestan ranges to the north. Other important ranges include the Koh e Murgh south of the Hari Rud, and the Mazar; there are also high ranges to the east and on the Pakistan border. The Hindu Kush and its subsidiary ranges divide Afghanistan into three distinct geographical areas: the Central Highlands, which contain the Hindu Kush and its ranges, the Northern Plains and the Southwest Plateau.

The Northern Plain is part of the great Central Asian Plain and stretches from Iran to the foothills of the Pamirs. It comprises fertile plains and foothills, which slope gently to the Amu Darya (Oxus). The south-western Plateau, to the south of the Central Highlands is a high plateau with an average altitude of about 1 000 m; most of it is sandy desert and semi-desert. A quarter of the plateau is the Registan desert, which is crossed by the Helmand River and its tributary the Arghandab.

National soil mapping has only been done at a very small scale: detailed work was limited to alluvial valleys – little is known of upland soils, including the rainfed wheat-lands of the north. Much of the hilly land and some of the deserts are rock and gravel. The Central Highlands have desert steppe or meadow-steppe soils. The Northern Plains have extremely rich, fertile loess soils. The Southwest Plateau has infertile desert soils except in places along rivers where alluvium has accumulated. Arable soils are generally of high pH. Nitrogen is the main limiting nutrient in crop production; phosphorus is often lacking; response to potassium is rare.

3. CLIMATE AND AGRO-ECOLOGICAL ZONES

The whole country is arid to semi-arid; precipitation is mainly in winter and falls on the higher ground as snow. Some eastern areas bordering Pakistan are affected by the monsoon, but the monsoon does not reach the SW, and mountains on the Pakistan side shelter the NE. Temperature regimes are greatly modified by altitude – low sites are almost frost-free with very hot summers; the higher areas are arctic in winter.

Table 5: Climatic data for selected stations

Station (Altitude)	Temp Max °C Jan	Temp. Min °C Jan	Temp. Max °C July	Temp. Min °C July	Annual precipita- tion mm
The North					
Faizabad (1 200 m)	6.7	-4.7	33.4	16.0	321
Kunduz (433 m)	7.3	-2.4	33.7	23.1	349
Mazar-I-Sharif (348 m)	9.1	-2.0	33.6	23.3	190
Central Highlands					
Lal (2 800 m)	-3.4	-21.4	23.2	4.2	282
Kabul (1 791 m)	3.3	-7.4	32.2	14.0	276
Ghazni (2 183 m)	1.6	-10.7	30.3	13.9	292
Southwestern Plateau					
Farah (660 m)	13.9	0.2	42.3	24.3	77
Kandahar (1 010 m)	13.2	0.1	40.4	22.7	132
Herat (964 m)	10.4	-2.9	36.4	21.2	241
Eastern Lowlands					
Khost (1 164 m)	13.4	-1.1	33.9	21.9	442
Jalalabad (580 m)	16.0	2.6	39.3	27.1	164

Table 6: Geographic zones

Zone	Precipitation (mm)	Dry months	Frost months
1. Badakshan (without Wakhan)	300 – 800	2 – 6	1 – 9
2. Central and Northern Mountains	200 – 800	2 – 9	0 – 8
3. Eastern and Southern Mountains	100 – 700	2 – 9	0 – 10
4. Wakhan Corridor and Pamir	<100 – 500	2 – 5	5 – 12
5. Turkestan Plains	<100 – 400	5 – 8	0 – 2
6. Western & Southwestern Lowlands	<100 – 300	6 – 12	0 – 3

Agro-ecological zones

The broken relief and wide range of altitude in Afghanistan leads to a great variation in climate within relatively small distances. A simplified version of the eleven geographical zones suggested by Dupree (1980) is shown in Table 6.

The climatic types as listed by Khaurin (1996) are shown in Table 7.

For a biodiversity profile and map of the vegetation of Afghanistan refer to <http://www.icimod.org.sg/focus/biodiversity/afgbio.htm>

Table 7: Climatic types of Afghanistan

Region	Climatic type
1. Extreme North	Continental desert climate
2. South	Sub-tropical desert climate
3. Northwest	Continental semi-arid Mediterranean climate
4. Lower central & Southeast	Warm semi-arid Mediterranean climate
5 North East Central	Continental semi-arid to moist Mediterranean with winter frost
6. Lower Kabul Valley	Dry steppe climate
7. High mountains, centre and NE	Alpine

4. RUMINANT LIVESTOCK PRODUCTION SYSTEMS

Village cattle production

In all regions of Afghanistan cattle are very important for the cultivation of land and for milk production. In 1991, a national average of 82% of farmers (who had any cattle at all) owned an average of four cattle. The proportion of farmers owning their own oxen in the same year was 70%, with 46% of the farmers owning two or more (ASA, 1992).

(There have been marked decreases in livestock numbers in recent years, particularly due to prolonged drought. According to the results of the first-ever livestock census [see report dated 4 December 2003] the number of cattle per family has fallen from 3.7 in 1995 to 1.22 in 2003, while the number of sheep decreased particularly sharply from 21.9 to 2.9 over the same period. The number of families without livestock has increased from 11.4 to 14.4 families per community. The numbers of draught animals have also declined over the past years, in particular numbers of oxen used as a major source of farm power for ploughing, transport and threshing. The Kuchi nomads and other semi-nomadic pastoralists in the provinces of Ghazni, Zabul, Kabul and Kandahar have been particularly hit by the drought, and about 60% of Kuchi households have completely lost their livestock. The major challenge now is to maximize the natural regeneration of herds.)

Oxen are the traditional source of farm power, but tractors are becoming more widely used and are replacing animal draught power. As in other countries of the region with similar agricultural conditions, the intensification of crop production and the easier availability of tractors and fuel will further decrease the importance of cattle for farm power, while at the same time the already important function of cattle for milk production will further increase.

Even the smallest and poorest farmers keep at least one cow to provide their subsistence requirements for dairy products, but many farmers have more than one cow, and this is a common pattern all over the country.

Production for sale and selling of milk and dairy products was common in the Kabul region and in Northern Afghanistan. In the Pasthun areas of eastern and southern Afghanistan the priority for milk production was mainly for home consumption and it was considered shameful to sell fresh dairy products like milk, yoghurt or buttermilk. Any surplus of these products was freely distributed to relatives or other needy people, but butter, cheese and qurut (dried whey) were sold. Recent experiences with the successful introduction of two pilot milk-marketing schemes in Kandahar and Kabul show that many farmers have strong interests to increase milk production from cattle and to sell the products. Even in Kandahar, the taboo of selling milk seems to be less important than it used to be.

There are regional differences in the management of cattle. In the eastern provinces, from Nangarhar in the north to Kandahar in the south, milking cows are usually kept within the compounds, where they are stall-fed and watered. In summer, dry cows, young stock and male cattle are often taken to the hills

for grazing where they are managed on a communal basis, but many of the cows may also never go out for grazing. The situation is different in the northern provinces and the Herat area, where communal grazing of cattle, including cows, is the common practice. In some areas like Nuristan and the Hazarajat in Central Afghanistan cattle herds are moved to high pastures for the production of cheese and butter during summer.

During the summer and spring seasons, fresh lucerne and/or clover (shaftal or berseem) is given to the stall-fed cows several times during the day and in those areas where cows go out for grazing in the evening at the homesteads. Important sources of winter-feeding for cattle all over Afghanistan are cereal straws, hay from grasses or legumes and maize stalks. Other sources of roughage, like leaves in Badakshan or camelthorn (*Alhagi*) in the northern Turkestan plains, have only regional importance. Great efforts are made to collect enough fodder, especially in those areas with a long winter period like Badakshan or the Hazarajat, and large stacks of hay are stored on top of the cattle houses. Very often wheat straw is mixed with legume hay before feeding. Bouy and Dasniere (1994) calculated for villages in Badakshan an average availability of one tonne of straw and 200 kg of legume hay per animal unit (300 kg), which was sufficient for the indoor feeding period of about 110 days. Milking cows and working oxen usually also receive a supplementation with concentrates like cotton seed cake, maize or barley grain during winter.

In communal village herds, cows and bulls are herded together and natural matings from any available bull take place on the pastures. This system provides the greatest chance for the cows to become pregnant but also means there is little selection for performance. The problem of finding breeding bulls for mating arises where farmers keep their cows at the homestead, and where the maintenance of a bull is too expensive for small farmers. Although some owners of bulls charge a fee for mating, this practice is not popular. In the past artificial insemination had been mainly restricted to Government farms but has now been introduced on a limited scale for farmers in the Kabul, Kandahar and Nangarhar Provinces.

During winter and in some areas during the hottest hours of the day during summer, cattle are housed inside. The types of byres in the different regions vary with respect to availability of space and quality of ventilation and lightning. Unhygienic conditions seem to be more a problem of cattle houses in the eastern regions of Afghanistan. Manure is carefully collected and used either as fertilizer or for burning.

Small ruminant production by villagers

About two-thirds of the small ruminants in Afghanistan are owned by villagers, but in general ownership of sheep and goats for this group of people is less common than for cattle. On a national average only 57% of the farmers kept small ruminants in 1991 and by far the largest majority between one and twenty-five animals. Bigger flocks are rare except in the north with the largest average flock sizes in the Faryab and Jowzjan provinces.

The management of small ruminants owned by villagers varies with the region, but shows common characteristics as well. Sheep and goats are usually herded together and both depend on grazing for the largest part of the year. Large owners may employ their own shepherd, or family members take their own sheep and goats out for grazing, but normally the small ruminants of villagers are herded in joint flocks. The great majorities of flocks move out of the hotter lowland areas in the early summer to reach the better grazing areas and cooler weather of the highlands; most flocks will not return to the lowlands before the beginning of autumn. In Badakshan and Nuristan small ruminants are not allowed to remain in the villages or the lowlands until the time of harvest of the crops (Bouy and Dasniere, 1994). Data on body weight changes during the year from Herat show that those flocks, which do not migrate, are in the poorest condition (McArthur, 1980). Important summer grazing areas are in the Ghor and Ghazni provinces and the Dasht-i-Ish and Dasht-i-Shewa pastures in Badakhshan province.

During spring and summer adult animals and young stock are kept in different flocks and the rams are separated from the ewes until the mating season, which starts between October and November. During winter most village small ruminants are housed during the night and during bad weather. Hay, straw, leaves, different local types of roughage and concentrates are given as supplementary feeding during this period. In Nuristan, the most important roughage for goats is leaves from the evergreen oak trees. The actual amount of feed given and the length of the feeding period depends on the region and the weather conditions. A supplementation with concentrates, for example 200–450 grams of maize or barley, for two months is a common practice.

Milking of sheep and goats starts early about two days after birth and continues for about four months. Normally lambs are allowed to suck during the same period twice daily, and great care is taken to ensure that they receive sufficient amounts. The remaining milk is partly consumed fresh, but mainly converted into dairy products. Estimates for daily milk production range from 250–500 grams for sheep from different areas.

Sheep are shorn either once or twice a year and goats only once. The annual greasy wool production of ewes is 0.5–2.0 kg, which is partly traded and partly used for domestic purposes. Especially Turki sheep in the northeast have a high growth rate, but good growth performance during summer grazing has also been found in lambs from Herat (McArthur, 1980). Surplus males, which are not needed for mating, are usually castrated in the first year. Many owners of small flocks slaughter the lambs in the autumn for production of dried mutton, and animals are only sold in case of urgent need for cash. Because of the higher fat content of the meat, sheep are preferred to goats for slaughter. Bigger flock owners in the northern areas sell lambs after weaning, which are then further fattened in small units of 5–10 lambs until autumn, or for the religious holidays.

Sheep are the main species of small ruminants, but in some areas goats make up the majority in the flocks. Goats utilize alternative feed sources and are used to lead the combined flocks. According to information from farmers, goats have higher twinning rates but also higher abortion rates and losses after birth than sheep.

In addition to meat, goats produce milk, hair and wool. They are normally shorn once a year in late spring and the hair is used for making ropes or the black tents of the Kuchis. Some farmers never shear their goats. Many of the goats in Afghanistan produce down fibre that is separated by hand from the hair after shearing, either by the flock owners or by workers employed by the wool dealers. The cashmere fibre is mainly collected in the western and northwestern areas. Brown seems to be the dominant colour of cashmere wool from Afghanistan; all the cashmere wool for sale is marketed through Herat by only a few dealers. Payment is made according to the proportion of hair fibre in the wool and the price per kilogram is determined by the world market for that fibre.

Sheep production with Karakuls

Astrakhan pelt production from Karakul sheep is a highly specialized form of sheep production mainly found in villages in Northern Afghanistan. It started to become an important business after the 1920s when Turkmen refugees from the Central Asian republics of the former Soviet Union fled with their Karakul flocks to Afghanistan. In the 1950s, Afghanistan controlled the major astrakhan markets, but later lost share due to lack of proper marketing and management and breeding of the Karakul flocks. Estimates from 1996 indicated about five million Karakul sheep in the northern provinces, which would mean about one-third of the sheep owned by villagers and thus the same proportion of this breed as before the war. The ability of the Karakul to produce meat and wool under very extreme climatic and ecological conditions has obviously helped it to survive those years when, due to war and lack of demand on the international markets, pelt production was of lesser importance. Problems with security and marketing of pelts may have reduced the number of Karakul sheep since then, but no exact information is available.

Karakul flocks are usually larger than other sheep flocks owned by villagers and many flocks consist of several hundred ewes. The main source of feed is natural pasture in one of the driest parts of the country, using different pastures in different seasons; however, supplementary feeding with hay and concentrates during winter or scarcity periods is practised. For the production of astrakhan pelts Karakul lambs have to be slaughtered before the second day after birth, and owners therefore remain with their flocks during the lambing period to decide whether to rear or to pelt a lamb. The decision whether to slaughter or rear depends on the quality of the pelt and the pelt prices offered by dealers. Depending on these conditions, the proportion of male and surplus female lambs pelted may range from 25% up to 95%. With an increasing demand for meat, Karakul farmers have started to recognize that rearing lambs for mutton can be more profitable than pelting the lambs, but the security situation and the need for cash in spring are still important reasons that favour pelting. It is possible that the available pastures are not sufficient to allow for the raising of large numbers of additional lambs.

Nomadic production systems

Nomadic and semi-nomadic production systems are still an important part of small ruminant production in Afghanistan. The last systematic census of the nomadic population was carried out in the late 1970s. According to the information collected then true nomads, who live in tents the whole year, are concentrated in the western and southern parts of the country between Paktia in the east and Faryab in the north, while semi-nomads who live in houses during winter, are found mainly in the northeast between Jowzjan and Nangarhar. A livestock headcount programme carried out by the FAO Livestock Project AFG/96/007 in 1997/98 counted about 75 500 Kuchi families. However, these data did not include important areas with a Kuchi population like Badghis and Faryab, or any of the other provinces in the north of Afghanistan, so that the true population of nomadic families might be close to 100 000.

Comparison of information from the past and from a recent survey (Barker *et al.*, 1999) shows that the management of nomadic flocks remains very similar, although movement into, and use of the grazing land in the Hazara areas, appears to be rather limited at the moment. Fertility is an important indicator of the success of a production system. Nineteen flocks monitored by the author in the southwest region in 1999 had reasonable lambing percentages averaging 84%, which is in line with information from earlier studies. Supplementary feeding with grain or roughage is practised for two months by about half of the 349 flocks covered by the above-mentioned survey. In addition to animal health problems, the interviewed flock owners mentioned cost and availability of supplementary feeds during winter, as the main constraints. Proper access to veterinary services was one of the main concerns raised by the Kuchis.

Other livestock

The majority of camels are of the one-humped dromedary type, which are mainly kept and used by Kuchis, but also rented out to sedentary farmers. Some Bactrian camels are kept in Badakshan and Wakhan. Water buffaloes have only regional importance around Kabul and Jalalabad and yak are found in the Pamirs of the Wakhan. The yak is used for milk production and castrated males as pack and riding animals.

Animal nutrition

A rough estimate of the dry matter supply to livestock shows the availability of 23.5 million tonnes of roughage for about 7.5 million livestock units (LSU), which means an average available amount of dry matter per LSU per year of about 3.1 tonnes. This amount is equivalent to a daily supply of about 7 kg for cows and 850 grams for small ruminants. In addition, concentrates are available up to the amount of 55 kg per head for cattle and 6.5 kg per small ruminant. Assuming that goats will normally receive only small amounts or no concentrate, the available proportion for sheep can be estimated at 10 kg; this amount is very close to what farmers from different areas report as feeding practice.

Even if the animal numbers are slightly overestimated and not all feed resources fully considered, it becomes very clear that the available amounts of fodder are a limiting factor for production. The feeding problem is thus first of all a matter of quantitative supplies, which is further aggravated by large regional and seasonal differences. Mobility of the livestock is one important strategy to deal with these aspects and fodder production from agricultural land another. From the available information it can be assumed that the present livestock systems already make full use of the opportunities from mobility, and that agricultural by-products are largely utilized. There is therefore good reason to believe that a further substantial increase of feed production has to come from extra production from the arable land, either directly from fodder crops, or through increase in production of other field crops and larger availability of agricultural by-products.

Very little information, other than general statements, is available from Afghanistan about the quality of feeds and their content of essential nutrients. With the common feeding system a deficiency of protein is possible, especially during winter; however the extent is not clear because farmers also include feed with a higher protein content in the ration. For example, many cattle are fed legumes either fresh or as hay and the use of cotton seed cake for sheep is widespread during winter in the northern provinces. Cotton seed cake is traded and is therefore also fed to cattle in those areas where it is not produced.

5. THE PASTURE RESOURCE

By far the greatest part of the land surface of Afghanistan is extensive grazing land – desert, semi-desert or high or steep mountain; only about 40% is said to be suitable for winter grazing. No statistics on grazeable area are available; while desert may provide opportunistic grazing when there is precipitation, bare rock, scree and glaciers do not.

Transhumant (Kuchi) herders, who practise vertical, seasonal migrations between the dry plains and the summer pastures in the mountains, exploit much of the pasture on a season basis. Sedentary communities also use many of these grazing lands and often there is friction between the two systems. Overgrazing is probably mainly caused by the sedentary stock since the Kuchis only graze for a short season (and rested the land under their traditional system) whereas farmers' stock graze every day unless there is snow cover.

Pre-war migration systems are well documented in the literature. Migrations were disrupted by the war, but many have been re-established, although where the Kuchis had used the lands of other ethnic groups as summer pasture, these rights have not been re-established. Under present circumstances it is unlikely that the problems of management of extensive grazing systems by the traditional pastoralists can be addressed. While the Kuchis of Pathan origin are by far the most important, numerically and economically, of the transhumant livestock-raising ethnic groups, they are not alone. In the extreme south there are Baloch and Braoui (of ancient Dravidian origin) and in the northeast yurt dwelling groups with Altaic affinities.

At the height of the disturbance livestock numbers fell drastically as farmers and herders became refugees and some Kuchi stock moved to other countries. According to anecdotal evidence the grazing land (hard grazed for a very long time) recovered rapidly and there was excellent pasture. This situation did not last long – stock numbers in both communities rapidly regained their former levels, through purchase and natural increase, once the refugees returned and now most pastures are as sorely overgrazed as before.

Natural pasture

Afghanistan is at the convergence of several vegetation types, the Mediterranean, the Tibetan, the Himalayan and towards the Pakistan border is influenced by the monsoon. Its great altitudinal range also adds to diversity but, for the vast majority of the grazing lands, low precipitation, with winter incidence, means that the main grazing vegetation type is *Artemisia* steppe. Trees are often taken as sound indicators of ecological zoning; Afghanistan's forests have long been sparse and in recent years they have suffered destruction either from the local populations desperate for firewood, or where there is valuable timber, through uncontrolled logging (often for export) by warlords. In the central mountains below 2 000 m degraded *Pistacia atlantica* (this pistachio has many names; *P. khinjuk* and *P. caboullica* occur frequently in local literature. For simplicity *P. atlantica* – which occurs through North Africa and Western Asia – is retained in this profile) forest is widespread – although often degraded to the extent of an occasional vestige. North of the Hindu Kush, on deep loess hills and plains *Pistacia vera* is common between 600 and 1 600 m with *Amygdalus bucharica* and *Cercis griffithii*. These pistachio forests are a valuable source of high-quality pistachios but have been heavily exploited for firewood. In the east and south between 1 200 and 2 000 m *Quercus baloot* and *Amygdalus kuramica* occur. At low elevations in the east *Acacia modesta* is frequent and, with adequate moisture *Olea cuspidata*. In Paktia towards the Pakistan-Waziristan border the dwarf palm Nannorhops is locally important and is exploited for fibre. Between 2 200 and 2 500 m *Pinus gerardiana* (an important cash crop for piñons 'chilgoza') and *Betula* sp. occur. From 2 500 to 3 100 m there are Deodar (*Cedrus deodara*) forests but large parts have been severely exploited and have been replaced by stable *Artemisia* communities. From 3 100 m to the tree line at about 3 300 m *Picea smithiana* and *Abies webbiana* occur in areas of higher precipitation while *Juniperus* spp are in the drier zones – often heavily used for firewood.

The floristic composition and the state of the grazing lands of Afghanistan are not well documented and little or no up-to-date information is available. Extensive, transhumant livestock production is still the most obvious way of gaining an economic return from most of the country's unirrigated landscape and traditional pastoral systems have restructured themselves to cope with the many political changes and remain vigorous and important – without external assistance.

Whatever the detailed composition of the pastures may be, the overall situation is relatively simple: *Artemisia* steppe is by far the predominant grazing vegetation and there is high-quality pasture in the upper alpine zones, for a short season. There are variations towards Pakistan where there are effects of the monsoon and the great deserts of the west and southwest are allied to the flora of Iran and Balochistan. The mainstay of this vast area is *Artemisia*; the plant of the extensive grazing lands is generally referred to as *A. maritima* as it is in Pakistan; this may merit further investigation since the altitude range of the *Artemisia* steppe is from about 300 to 3 000 m. In neighbouring Turkmenistan and Uzbekistan, *A. herba-alba*, *A. turanica* and *A. maikara* are mentioned. Throughout most of its range *A. maritima* is associated with the viviparous grass *Poa bulbosa*; *Stipa* spp are frequent. There is a very short flush of annuals in spring but these dry off quickly. Other sub-shrubs associated with *Artemisia* include *Acantholimon* (Plumbaginaceae), *Acanthophyllum* (Caryophyllaceae), *Astragalus* spp. (Leguminosae), *Cousinia* (Compositae) and *Ephedra* sp. (Ephedraceae).

In eastern areas close to Pakistan, Laghman, Kunar, Nangarhar and Paktia, where rainfall is adequate, *Cymbopogon*, *Chrysopogon*, *Heteropogon*, *Aristida* and other grasses of the monsoon areas occur; often associated with *Acacia modesta* and *Olea cuspidata*.

In the warmer areas of Mediterranean climate, including Farah and the Northern Plain, the leguminous sub-shrub *Alhagi* is a widespread coloniser on disturbed land and provides useful browse for small stock and camels – around Balkh it is made into hay.

Very few investigations have been carried out to estimate the dry matter production of the grazing land. From different pasture areas in the Herat province McArthur *et al.* (1979) found a dry matter growth of 0.41 to 1.04 tonnes per ha. The crude protein percentages of these pastures varied in the middle of winter from 5 to 20% and the authors concluded that the stocking rates were approaching carrying capacity (0.49 to 1.25 ewe equivalents per ha). The dry matter production from another area in western Afghanistan was estimated by Casimir *et al.* (1980) at 0.5 tonnes per ha, but only 23–32% was consumed by the nomad economy. The crude protein content of the three main species from these pastures was between 12 and 18% in spring. In Khost the dry matter production from different pasture types was estimated by Volk (1972) at 0.5 to 5 tonnes per ha, with the higher production on pastures used by nomads for winter grazing. The average crude protein of plants collected in autumn from these pastures was 11.1%. Results of dry matter production from other areas cited by the same author were 0.5–1.2 tonnes for Khwaja Qachay (Maimana), 0.6–1.0 tonnes for Dashte-Laily and 0.8–1.0 tonnes for Bay-Saqal (Baghlan).

The level of productivity of the pastures varies significantly between areas and from one year to another. Assuming an average dry matter productivity of 700 kg/ha/year and 50% utilization, the total amount of dry matter available from the grassland in Afghanistan can be estimated at about 20 million tonnes. With the composition of crops and yields as in the pre-war period another 3.5 million tonnes of roughage from agricultural by-products, mainly cereal straw, can be utilized for livestock production.

Infertile soil and low rainfall are the reality of natural grazing land throughout the country, but indigenous, transhumant livestock production systems have been developed to obtain a living from the difficult terrain and climate. As in many other countries, there is the problem of controlling the grazing pressure and of solving the conflict of interests between the settled livestock owners (whose main interest is in crops and who never consider the sustainability of the natural grazing) and that of the herding communities. Overgrazing often leads to invasion by spiny and/or unpalatable weeds but this is a management problem associated with mismanagement – not a weed problem *per se*.

Uprooting shrubs, notably *Artemisia*, for fuel is a very serious and widespread problem. This is not just a question of villagers having to find fuel to cook their food, but traders organize uprooting and purchase of shrubs from remote areas to supply urban markets.

Ploughing of sub-marginal land in the hope of getting a quick return from cereals or cumin is widespread where the topography allows the use of tractors. In the Northern Plains and in the Herat region “rainfed” cultivation has recently been pushed far past the limits of reliable rainfall, usually by speculators rather than traditional farmers. This usually produces no crop and leaves bare land. In some parts of the Central Highlands, including Ghazni, there have been attempts to grow wheat or cumin on the “rainfed” *Artemisia* steppe. The crop hardly ever succeeds and if cultivation is by tined implements (Pakistani tillers) there is considerable destruction of the vegetation; if mouldboard or disc ploughs are used then the *Artemisia* is destroyed.

Sown or improved pasture

Sown or improved pasture for grazing is not relevant to Afghan production systems. Almost all agriculture, except the extensive cereal areas of the north, is totally dependent on irrigation. The demarcation between the desert and the sown area is clear and abrupt. The vast majority of the grazing lands are arid to semi-arid at rainfalls so low that “improvement”, even if management structures were available, would be impossible both economically and technically. Since the grazing lands are “open access”, improvement is even less feasible. The Alpine pastures depend on snowmelt; little information is available on their composition and condition but it is likely that climate and the necessity of transhumant flocks to return to the lowlands well before deep snowfall will give them considerable protection. The transition and winter pastures, however, are sure to be overused. Unfortunately there are no social or official structures, which could organize or control pasture improvement. Any improvement in condition of the natural grazing lands would have to come from manipulation of grazing pressure; that implies control both of stock numbers and regulation of when defined areas are grazed – not at all feasible under present conditions.

Sown fodder

Sown fodder from legumes is a very traditional crop throughout the country and is usually grown close to the homestead. The proportion of fodder in the rotation varies; it is probably between 3% and 10% according to local conditions and the farmers’ needs. Fodder from legumes is partly fed fresh and partly made into hay to supplement the crop residues that form the basis of winter (and dry-season) feed. Lucerne (*Medicago sativa*) is the most widespread but can only be grown where there is year-round irrigation. Persian clover or shaftal (*Trifolium resupinatum*) is grown as a winter annual and gives two hay cuts in spring. Excellent landraces of shaftal are available, which are suitable for both low and high areas and which are also used as a vegetable. Vetch (*Vicia* spp.) and grass pea (*Lathyrus sativus*) are grown as rainfed crops in some high altitude areas. Egyptian clover or berseem (*T. alexandrinum*) is grown in some relatively frost-free areas adjoining Pakistan (Khost and around Jalalabad) and has become more popular in recent years due to its higher production. However, berseem, unlike shaftal, is suitable neither for haymaking nor as a vegetable. Around the bigger cities, commercial fodder production is practised for on-farm use and for sale of fodder to the urban dairies and for horses. There are large areas of commercial fodder near Jalalabad and Kandahar.

Summer fodder is little developed although maize thinnings are widely used. Crops are sown very densely and thinned for stock feed, a practice that is very widespread in the Himalaya-Hindu-Kush region through Pakistan and India to Nepal. Recently, multi-cut sorghum hybrids, multi-cut fodder sorghum (*Sorghum bicolor*) and multi-cut fodder millets (*Pennisetum americanum*) have been successfully introduced and tested in the Nangarhar, Kandahar and Farah provinces. The introduction of a relatively cold-tolerant ‘Mott’ cultivar of *Pennisetum purpureum* is also being tested. Wheat and barley are often cut as green feed in times of spring scarcity. Two multi-cut oat varieties, which have proved very successful in Pakistan, have also been successfully introduced in the Kandahar, Farah, Nangarhar and Kabul provinces. In field trials production from oats was significantly higher than from either wheat or barley.

Intercropping of orchards with fodder crops is also common practice in Afghanistan. It is particularly useful during the establishment years of new orchards where cropping with annual field crops could have a deleterious effect on the young trees through disturbance of the superficial root system. Lucerne, being a perennial, is the favoured fodder although clovers could be used. The beneficial effects of a fodder intercrop include: protection of the soil and weed control during the early years when the trees are small; economic returns from interlines before trees come into fruit; biological nitrogen fixation (legumes); assistance to biological pest control (lucerne is an alternative host to some predators of orchard pests). This is important and topical since there is a great deal of orchard re-planting, to replace those which were destroyed or died through lack of irrigation during the war.

The Northern Plains – Turkestan

The northern plains are fairly homogenous climatically and are warm enough in winter for clovers and probably non-dormant lucerne varieties. Dairy production is well developed in the area and hay is also needed for winter feeding of sheep. Fodder production is traditional and well understood and only economic and water restrictions limit its use. The most widespread fodder is lucerne (*Medicago sativa*),

which is of very ancient cultivation in this region. Local and Central Asian varieties of lucerne are grown that are strongly perennial, winter-dormant and, although usually cut, stand up to hard grazing by stray livestock. Shaftal (*Trifolium resupinatum*) is also well known and, near Mazar-e-Sharif, is mainly grown as a winter annual. In Badakshan, shaftal is grown as a summer fodder, after wheat, and is considered a soil improver. The plains around Mazar-e-Sharif and on either side of the main road to Sheberghan have extensive irrigation; water delivery, rather than land availability, is the limiting factor and much of the irrigated land is managed on a fallow system, being cropped in alternate years. The fallow is frequently a near pure stand of a leguminous sub-shrub (*Alhagi* sp., said to be *A. camelorum* but probably correctly *A. pseudalhagi*). These shrubs – about knee-high – are cut in late spring, dried, bundled and stored as winter feed for small stock and camels. Permanent irrigation is reserved for the best land with orchards and around villages. Trees are rare to absent in most areas except those where there is permanent irrigation. In villages and orchard areas mulberry, poplars, Russian olive (*Elaeagnus* sp.) and *Ailanthus* trees are, however, common.

Eastern Lowlands

Winters are mild so non-dormant lucerne varieties and berseem (*Trifolium alexandrinum*) can be grown successfully. Shaftal (*T. resupinatum*) is still very widely used. Around Jalalabad, lucerne is grown as fodder for sale and has a good market. In Khost, climatic conditions for fodder production are similar to those in Nangarhar; maximum temperature exceeds 30 °C during four months and the minimum is below zero for two months. This is still warm enough in winter for the cultivation of berseem (*T. alexandrinum*). Most farms have a small fodder area, usually convenient to the farmstead for winter feeding. Shaftal, which is well known in and well adapted to the area, is most common, with some berseem. Because it probably does not fit into the two-crop pattern of local farming, lucerne is not grown in Khost. Maize thinnings are widely used in summer.

Western and Southwestern Lowlands

These areas are arid and totally dependent on irrigation. The climate is mild enough for winter clovers and non-dormant lucerne varieties. The most important fodder crop is lucerne; its standard of cultivation is good and dodder is very rare, probably indicating good seed quality and field hygiene. American lucerne varieties were introduced in pre-war times and also recently varieties from Iran. In Kandahar, lucerne is very often grown as a cover crop in orchards or vineyards. Lucerne is both fed fresh and conserved as hay to supplement crop residues in winter; in Herat it is grown as a cash crop for seed production.

Central Highlands

Winters are severe; lucerne and shaftal are grown, the choice depending on the availability of summer irrigation. Vetch and lathyrus are occasionally grown. Particularly in the Ghazni area, fodder is very widely grown with lucerne (*Medicago sativa*) and Persian clover or Shaftal (*Trifolium resupinatum*) as the main crops; some vetch may be sown as a summer catch crop. Lucerne is undersown in wheat and stands are maintained for up to ten years; the standard of cultivation is good and varieties seem well adapted. Three to four cuts are taken depending on water availability and much of the crop is made into hay for winter use. Shaftal is sown at two seasons: some is autumn-sown and overwinters (under snow) for use in spring and early summer. A second sowing, as an autumn catch crop, is made into wheat fields at the last irrigation before harvest. Much of the clover is used green, but it is also made into hay and ingenious methods of drying are used to avoid leaf-loss.

Weeds as fodder

Within the irrigated land, on stubble, fallow, bunds and canal banks, there is a lush growth of weeds suitable for stock feed in the warm season. These weeds are cut or uprooted as the case may be and fed to livestock. They furnish a substantial part of the seasonal feed for cattle. In arable land and along drainage lines *Cynodon dactylon* is very common in all but the coldest areas. In warmer zones, *Imperata cylindrica*, *Sorghum halepense*, *Dicanthium annulatum*, *Cenchrus ciliaris* occur on bunds and field edges. Common annual grass weeds include *Alopecurus myosuroides*, *Avena* spp., *Chloris* spp., *Dactyloctenium aegyptium*, *Digitaria* spp., *Echinochloa* spp., *Eleusine* spp., *Lolium* sp., *Phalaris minor*,

and *Setaria* spp.. At high altitudes, truly temperate grasses such as *Dactylis glomerata*, *Lolium perenne* and *Phleum pratense* appear where moisture is available – sometimes as a band a few centimetres wide along irrigation ditches passing through the steppe, often with *Trifolium repens*. Annual leguminous weeds include *Lathyrus* spp. (including *L. aphaca*), *Medicago* spp., *Melilotus* spp., *Trifolium* spp., *Trigonella* spp., and *Vicia* spp.

Crop residues

Crop residues are a major source of feed in sedentary production systems. Straw from wheat and to a lesser extent from barley is the main roughage for winter feeding. Local wheat threshing methods chaff the straw so that it can then be stored and fed easily. Maize, and in some areas rice, are the summer cereals that also produce by-products for winter feeding. Haulms from pulses including grams (*Vigna* spp. “mash”), lentils, peas and groundnuts are used as fodder. Large amounts of maize and barley grain are sold to transhumant herders as animal feed for winter use. Cotton sticks may be grazed or taken to the homestead as feed and firewood. Straw treatment with urea has been demonstrated but in many areas there is a global scarcity of dry matter so treatment that increases feed intake is problematical.

Trees for fodder

In irrigated areas on-farm tree growing is a common practice in the Afghan farming systems. Many trees were destroyed during the war but farmers are re-planting. No trees are specifically grown for fodder but several of the traditional on-farm trees provide livestock feed as a by-product of wood, fruit production and shade. Common trees, which are used for fodder purposes are mulberry (*Morus serrata* and *M. alba*), willow (*Salix* spp.), poplar (*Populus* spp.) and Russian olive (*Elaeagnus* spp.). Farmers continue to plant trees on their farms spontaneously and produce young trees, especially mulberry and poplar, by traditional methods. In the better watered areas on hillsides, oaks (*Quercus* spp.) and olives (*Olea cuspidata*) are lopped for fodder and browsed.

Seed supply and production

Most fodder seed in Afghanistan probably comes from on-farm production or farmer-to-farmer exchange but seed of the traditional fodder (clovers and lucerne) is widely available in local markets. The purity of such seed is, at best, mediocre and contamination with weeds and inert material is usually serious. No information is available about the genetic purity or cultivars on sale but they are mostly landraces, which should be adapted to local conditions. The seed supply has been reconstituted after the war without outside assistance. Merchants purchase seed from outside Afghanistan when necessary and it is known that in recent years seed has been imported from Iran, Pakistan and Turkmenistan. Traditionally, Afghanistan produced lucerne seed for export and there is information that this business has started again.

Hay making

Hay making is traditional and common, especially in areas with cold winters. Lucerne, which continues to produce in summer, and shaftal are the main hay crops (berseem is difficult to cure). Hay making is almost entirely manual from mowing to stacking and in some cases tying into small bundles. Storage places vary from sheds to rooftops. In the Balkh/Mazar region the wild leguminous sub-shrub *Alhagi pseudoalhagi*, which grows in almost pure stands over large areas, is made into hay for camels and small ruminants. In the warmer areas groundnut (*Arachis hypogaea*) tops are dried to make good hay; the plants are dug and pods removed while the tops are still green. Local hay-making techniques are well adapted and effective. The forage is mown by sickle, after wilting for some time it is tied into small trusses that are further field-dried, turning occasionally (presumably the early trussing is to reduce leaf-loss); thereafter the trusses may be stacked loosely on bunds for further drying before final storage. Taking the trussed hay to rooftops and similar hot, sunny places may accelerate drying. Some hay is traded to Kuchis.

6. OPPORTUNITIES FOR IMPROVEMENT OF FODDER RESOURCES

The production of fodder from agricultural land was a traditional part of the pre-war farming systems in Afghanistan and with traditional methods and local seeds farmers have now resumed production. Effort are presently being made by the FAO Project "Livestock Development for Food Security in Afghanistan" to collect information about the availability of different varieties, their performance and about farmer agronomic practices in different areas. At the same time field demonstrations and on-farm trials are carried out with selected crops and selected varieties from neighbouring Pakistan and abroad.

Suitable land and water will always be limiting factors for agricultural production in Afghanistan and the promotion of fodder crops will be in competition with other field crops. The individual farmer makes the final decision about the scale of fodder crop production, but it is also critical that the importance of fodder crops for the development of livestock production is duly considered in the formulation of development programmes for field crops. At the moment, all interventions should be designed to increase yield per unit area, especially in irrigated tracts. This could be achieved by the use of better varieties of existing crops, improved husbandry, strategic use of fertilizers where profitable and, after testing, by an introduction of a wider range of fodder. This strategy has been successful and popular in parts of Pakistan. For example, FAO work in the Northern Areas of Pakistan has been highly successful both in developing adapted fodder technology for smallholders and in transferring it to farmers (see Dost, M. World Animal Review 1996 and refer to the Pakistan Country Forage Profile).

Emphasis should be put on leguminous fodder crops for several reasons:

- they supply high quality feed suitable for supplementing the rough grazing and coarse roughage, which form the basis of the livestock's diet;
- they are traditional throughout Afghanistan and, therefore, farmers are familiar with their cultivation;
- they are a fertility-building break in the rotation;
- shaftal and lucerne can be conserved as high quality hay for times when green feed is scarce

The first priority is yield improvement of traditional fodder crops since they are already widely grown and yield and utilization improvement can begin as soon as technologies and better cultivars are proven in the field. The testing of new varieties of lucerne, shaftal and berseem is now being carried out with several hundred farmers in the Kandahar, Farah, Nangarhar and Kabul provinces. More detailed investigations of the new varieties are carried out on experimental fields in Kandahar and Jalalabad. Seeds and experiences gained by the fodder work in Pakistan are utilized and adapted to the local conditions in Afghanistan.

In addition to good quality seed other ways of improving the yield of existing fodder crops include: proper seedbed preparation and land-levelling; use of appropriate fertilizer, mainly phosphorus; sowing at the optimum date; harvesting at the correct stage and time to maximize yield of high-quality feed; mowing lucerne at the correct height (5–10 cm) and using sharp sickles to increase longevity of the crop. Mixed cultivation of legumes and cereals is a very common practice among farmers, which seems to protect the legumes during early growth from damages. Experiments are now being carried out to compare these local practices with the cultivation of single crops.

In the higher areas of Central Afghanistan and in the Kabul area, vetch (*Vicia sativa*) and fodder beets (*Beta vulgaris*) are cultivated. Tests with new varieties of fodder beet and with the autumn sown Hungarian vetch (*Vicia pannonica*) have recently started at the farmers' level.

The second priority is testing and demonstration of fodder crops that do well under similar conditions and production systems in neighbouring countries. Introduction of broad-leaved multi-cut oats (*Avena sativa*) has shown very promising results, especially in the Nangarhar and Farah provinces. First experiences with multi-cut fodder sorghum and fodder millet varieties and with Hybrid sorghum (*Sorghum x sudanense*) are also encouraging enough to justify a continuation of the programme on a larger scale.

The third priority is the testing of other likely fodder crops, including trees and shrubs; this is medium- to long-term work, which will yield results for extension in later phases. However, possibilities for tree planting on farms are limited; they can only be grown where there is year-round water and much of the arable land has only an assured irrigation supply in winter. Sites for planting are scarce and often

a fruit tree can be grown in places that would be suitable for fodder. Tree planting on “communal” (i.e. waste) land does not seem to be a viable option but linear planting in villages may be developed if supported and undertaken by communities. Afghanistan is outside the zone where leguminous fodder trees are well adapted; *Robinia* could be grown in some of the moister areas but such sites could grow fruit! Most of the adapted, and widely used, fodder-producing trees are non-leguminous; Moraceae, including *Morus* and *Ficus*, and Salicaceae, including *Populus* and *Salix*, are probably the most important families. In the context of Afghan agriculture tree fodder presents some problems over and above the scarcity of sites, their reduction of crop yield through shade and root-spread and their high demand for water. Most on-farm trees grown in Afghanistan are deciduous and produce leaf at a season when fodder is less of a problem. Serious study of fodder trees and shrubs would be costly and long term; since herbaceous fodder crops of high quality are already traditional, it seems logical to concentrate on these initially and, insofar as ligneous species are concerned, encourage the use of on-farm trees that may supply fodder as a by-product. Some trees can thrive on saline soil and use poor-quality water; e.g. *Prosopis juliflora* in the warmer areas.

Where to intensify fodder production?

Fodder is at least as costly to produce as other field crops. It should, therefore, be encouraged where it is likely to be profitable, not merely because there is a feed deficit. For subsistence livestock production (e.g. milk for family use) improved cultivars could improve production if farmers are willing to purchase them. However, the main fodder improvement thrust should be where a sound economic return is expected. Likely situations are:

- farms, which produce milk for sale, especially in peri-urban areas but also where cheese or ghee are sold;
- around and within house compounds where there is subsistence milk production. Some green legumes produced under these conditions will also be necessary for poultry;
- for livestock used for transport and, perhaps seasonally, for draught.
- where it is necessary to provide strategic supplies of feed, fresh or dried, to assure survival of weak dairy or other productive stock through the difficult season;
- for sale either green (usually near large towns) or as hay.

Seed production

In the past Afghanistan produced a large amount of seed for export, especially lucerne seed. The natural conditions are favourable and there is the chance that lucerne seed production for export will again become an attractive business.

7. RESEARCH AND DEVELOPMENT ORGANIZATIONS AND PERSONNEL

The pasture and fodder related institutions of Afghanistan were dispersed during the troubles and no national specialist is available. Natural grazing is the responsibility of the Forest Department whereas grazing livestock and sown fodder are under Animal Production.

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- Useful Website: www.aims.org.af/

9. CONTACTS

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