



Review of the literature on Pastoral Economics and Marketing:

Afghanistan, India, Iran, Iraq, Israel, Jordan, Pakistan, Palestine, Syria, and Turkey

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Summary

The present report is part of a global study on the Economics of Pastoralism commissioned by The World Conservation Union (IUCN), contributing to the three year UNDP-GEF project World Initiative on Sustainable Pastoralism (WISP). The IUCN global study aims at supporting and advancing a current change in attitude towards pastoralism, so that appropriate policies, legal mechanisms and support systems are established to allow for the self-evolution of pastoralists towards sustainable livelihoods.

The objective of the present regional study is to collate and document information on economic valuation of pastoralism in Afghanistan, India, Iran, Iraq, Israel, Jordan, Pakistan, Palestine, Syria, and Turkey. It also identifies gaps where primary research on markets and economic valuation needs to be conducted. The study is aimed at demonstrating the usefulness and effectiveness of economic valuation as a tool for decision making and producing economic arguments for use in advocating better policies.

In the countries under review, except for India and Turkey, drylands occupy half or more of the countries' total area. Pastoralists are a minority, with the exception of Afghanistan. They contribute between 4 and 18% of the GDP, and cover the national dairy and meat demand to a considerable extent, sometimes up to one third, although dairy and poultry farming have taken over a part of the national markets. With the globalization and the depression of meat and wool prices, exports from the pastoralist sector have become difficult. Even specialties like Pashmina goat wool are produced in Australia, and also the Near East Awassi sheep breed is produced in Australia and marketed in the Gulf states. There may be, however, new market niches like camel milk products, or medicinal plants for human and animal health. Tourism is a well established market as well, of which pastoralists usually benefit the least although it is often the main attraction.

For several decades, policies have not been supportive to pastoralism in the region. Based on carrying capacities calculated on the basis of North American concepts of rangeland management, stocking rates were found too high, and that was considered as the major reason for overgrazing. In several areas, pastoralists were pushed to sedentarise. Crop cultivation, especially irrigation, was promoted in many dryland areas, but mismanagement often lead to land degradation. Large pasture areas were lost, and migration routes cut off. Worst of all, most pastoral land tenure systems were profoundly altered and ceased to be the basis of efficient pasture management. Conservation policies in many countries, especially in India, added to the pressure on pastoralism. In India, half of the camel population was lost during the past decade, while the camel is considered a perfect resource to make use of drylands, nowadays including tourism. The number of goats seems to have increased in several countries, as goats are very relevant for poor populations. National conflicts in Iraq and Afghanistan, and internal conflicts like in Turkey and Israel/Palestine were a major problem for pastoralism.

Data on pastoralism, apart from ethnographic studies, are hard to come by. Knowledge gaps are usually far larger than available knowledge. Official statistics as well as most research organisations generally under represent pastoralists and often ignore their production systems. There are hardly any systematic assessments, with, to some extent, the exception of Afghanistan, where several development organisations explored post-war opportunities (World Bank, USAID, Cordaid, INWENT). Some very important issues, like the role of the camel, are not dealt with, e.g. in the recent Pakistan Economic Survey – while FAO recently issued a press release on the potential of camel milk.

Other good practices of economic valuation could be identified:

- FAO has published detailed studies of pasture management in most countries of the region, and recently added a valuable publication on transhumance in temperate Asia.
- FAO has included extensive data on productivity of local breeds in its Domestic Animals Database (DAD-IS).
- IFAD undertook a project to develop Pashmina wool in Northern India with respective studies.

- Both FAO and IFAD made useful contributions with data from the Badia steppe in Syria and Jordan, in which Blench's work plays a major role. Projects to conserve the Badia steppe in cooperation with the Bedu pastoralists were implemented.
- A number of researchers have recognized the values of pastoralist production systems and came up with data within their expertise and their work possibilities. This is especially true for India (League for Pastoral Peoples and Endogenous Livestock Development, Lokhit Pashu Palak Sansthan, ANTHRA, camel and sheep research institutes, Agrawal, Saberwal, and others).

Introduction

Pastoralism is an ancient way to use dryland areas, well adapted to the challenges of maintaining productive and sustainable livelihoods. Pastoralists, both nomadic and transhumant, are a large and significant minority in the region. Because their cultures and land management systems are poorly understood, they are subject to myths and misconceptions.

Many of the misconceptions relate to economics. It is widely believed that productivity of pastoralist systems is low, and that sedentary livestock raising is more productive. Breeds of pastoralists are thought to lag behind Northern breeds suiting the industrialized livestock production.

Land degradation is a widespread fact of which the culprits are often thought to be pastoralists. Range sciences usually undertake calculations of areas, fodder availability and feed requirements, with resulting too high stocking rates. Economic data on the ground, however, are hard to come by. Few economic valuation studies have been carried out on pastoral production systems. In addition, the state of the art findings have not been communicated effectively to government actors and development agencies.

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The League for Pastoral Peoples and Endogenous Livestock Development is a civil society organisation promoting the cause of pastoralism. Founded in 1992 according to German law, its activities mainly cover capacity development, consulting, and advocacy. To that end, it issues publications, organizes workshops and conferences, and contributes to publications and events of third parties, especially the United Nations, development organisations, and the scientific community.

Economic arguments

Drylands: A resource for pastoral livestock production

The share of drylands in total land areas is around half in Afghanistan (45%), Pakistan (60%), Iraq (63%), and Syria (55%). In Iran and Jordan up to 90% of the country is arid. Semi-arid areas cover large parts of India, Pakistan, Iraq, Afghanistan, Turkey and Syria. Detailed descriptions are available on locations, sizes, precipitation, vegetation, and other features. Also, rather detailed descriptions of pastoral and transhumant mobility as well as integration of livestock and crop production are available for all dryland areas, mostly from FAO.

Accuracy of dryland areas is sometimes disputed. Rangelands cover around 45% of the total land area in Afghanistan, according to the FAO land cover map. However, large areas which are considered 'barren land' or 'waste land' are also used for grazing, particularly in the winter season. The total grazeable area therefore is much larger, estimated at 70-85% of the total

land area, according to a USAID study. Similarly, India classifies much of its surface as wasteland, which indeed is used for grazing. Alternative uses of the wastelands may put pastoralism under more pressure.

Most drylands have, with exception of pastoralism, limited economic use. However there are some competing industries which need to be taken into consideration. In Iran, for example, in addition to forage production, mining, fuel wood, industrial use of rangeland products e.g. medicinal plants and recreation are other benefits of the rangelands (FAO).

Development of irrigated crop production has often proven to be unsustainable. Soils became degraded by salinization. Fossil water resources were exhausted. Pastoralism has been sustainable for many centuries, even though it might have changed previous vegetation. Problems of overgrazing have occurred since a few decades that need to be well understood and solved.

Drought is a normal feature of drylands. For example, thirteen drought years during the past two decades, occurred in Iran. Drought has many negative effects on the environment and the rangeland is no exception. Based on a report by the UN, the total losses of crop and livestock due to drought in year 2001 in the agriculture and livestock sector is estimated at 2.6 billion US\$. It was estimated that 75 million heads of livestock were being affected and 900 million US\$ of damage was being inflicted. The striking drought of 1999-2000 caused a 41% reduction in the total forage of the rangelands, equal to 4.4 million tons (FAO Iran).

The Kuchi nomads and other semi-nomadic pastoralists in the provinces of Ghazni, Zabul, Kabul and Kandahar have been particularly hit by the drought of the first years of this Millennium, and about 60 percent of Kuchi households had completely lost their livestock. (FAO Afghanistan).

Severe droughts, however, are exceptions. The "common" drought can be tackled. While crops may not grow or wilt away easily, the breeds developed in arid and semi-arid regions survive droughts for a longer time.

Main pastoralists' livelihood patterns

In the face of variable rainfall, mobility is an ecological and economic necessity. Pastoralists make use of the scarce dryland vegetation and follow seasonal forage availability, which mainly depends on precipitation and temperature. Both nomadic and transhumant systems are practised in order to locate the best pastures and grasslands resources.

Transhumance is defined as "a type of pastoralism in which pastoralists regularly graze their herds in two or more geographically separated grazing orbits within a year" (FAO 1992). This animal husbandry system takes advantage of the temporal and spatial variability associated with typically altering rainy and dry seasons.

Typically, flocks move out of the hotter lowland areas in spring to reach the better grazing areas and cooler weather of the highlands, e.g. in the Himalayan mountains of India, Pakistan and Afghanistan. Similarly, herds are shifted between mountains and lowlands in Iraq, Iran, and Turkey. In autumn, they move back to the lowland villages to avoid the cold winter of the highlands. During winter, the herds are fed on stubbles from harvested fields, or browse along water channels and roads. Often they are fed on crop residues, hay, silage, agro-industrial by-products, or feed concentrates. In India, forests, and their associated grasslands and fodder trees, are another major source of grazing and fodder collection.

In arid regions, complexity, variability, and uncertainty characterize the grazing systems of the nomads. Therefore, management practices are not simple. In desert rangelands, pastoral people respond quickly to available opportunities and challenges. They follow rains to make use of the subsequent vegetation.

The desert pastoral communities of the Thal, Cholistan, Kohistan, and Tharparker desert areas in Pakistan leave their villages in early winter in search of better grazing and migrate into irrigated areas. In the early monsoon season, when forage is abundant during July to November, they return to their villages and leave their animals to graze.

Herds move to Al-Badia desert of Jordan and Syria at the onset of autumn rains when drinking water becomes available for livestock. When the water supply dries up in late spring, the herds move back to rainfed areas where drinking water, stubbles, crop residues, fallow

and mountain grazing are available. Trucks are nowadays used to provide water and feed to the herds, or to move whole herds to pastures, resulting in overexploitation of pastures where formerly the scarcity of water limited the grazing and allowed the vegetation to recover.

Generally, nomadic pastoralism has declined. Camels that were mostly associated with nomads, have sharply declined in numbers. Semi-sedentary systems are widespread. Irrigated crop production has often limited grazing lands, like in Rajasthan, India, or in Syria's and Jordan's Badia desert. Among the Bedouin of the Near East, economic diversification has become so extreme that, in many cases, dependence on sheep production is more symbolic than actual. Lancaster (1981) and Abu-Rabia (1994) describe how the Jordanian and Negev Bedouin have increasingly taken up a variety of seasonal and permanent employment outside the pastoral sector and are investing in permanent housing, thereby maintaining and perhaps even cementing their social structure while effectively discarding herding (cited after FAO (2001) Pastoralism in the New Millennium). In Afghanistan, income derived from livestock production is often supplemented by other income sources, like harvesting, casual labour but also through the purchase of agricultural land. In recent years, an increased diversification of household income and a move towards a more semi-migratory lifestyle has taken place (de Weijer).

Sheep and goats are the basis of most pastoralist systems, although the Gujars in Pakistan and India migrate with buffalo and cattle. In India, other pastoralists like the Todas graze them e.g. in forest areas. Camels are important in the deserts of Rajasthan (India), Balochistan (Pakistan) and Afghanistan as well as the Badia desert of Syria and Jordan. Yak occur in a few very high places in Afghanistan, Pakistan and Ladakh in India, but are not as important as they are in the Eastern Himalaya.

Total livestock numbers have, however, increased in most regions –both arid and semi-arid– over the past several decades, especially sheep and goats. Many areas are overgrazed on the one hand. On the other hand, feed sources like crop residues, sown pastures or feed concentrates were developed, and natural grazing in some areas is reduced to one fourth of the total feed requirements, like FAO shows in the table below.

Contribution of different sources of fodder production in Iran, in 1999 (FAO)

Source of fodder	Production (1,000 tons TDN)	Contribution %
Fodder plants	4,155	17.5
Crop residues	7,322	30.8
Agro-industrial by-products	6,394	26.9
Range forage	5,885	24.8
Total		100

Minority populations and their invisible half

Pastoralists are a significant minority in the countries under review, except in Afghanistan, where Kuchis are part of the Pashtun majority. Statistics do usually not properly reflect them. The reasons are probably their being mobile and difficult to enumerate, but also their often low social status. Also, definitions are not clear: Should transhumant pastoralists be included, or are we counting only “true” nomads? Resource conflicts like grazing rights in protected areas in India seem to often lead to under representation. Where the policy is to relocate communities, smaller numbers may make the problem look smaller. Political conflicts often add an interest in downplaying actual numbers, like the Bedouins in Israel, the Kurds in Turkey, or the Kashmir conflict between India and Pakistan. Refugee problems like in Afghanistan, or disruptions by war like in Iraq seems to make enumeration impossible, at least for the period of unrest.

In general, it seems to be easier to access livestock numbers than numbers of their keepers. Two facts may lead to the conclusion that the total number of pastoralists must have increased significantly:

- Nomads usually keep much larger herds than sedentary or transhumant livestock keepers. With more sedentary systems, the average number of animals per household has decreased. If the total number of livestock were constant, the number of livestock keeping households should have multiplied.
- As total livestock numbers have increased significantly in most areas over the past decades, the total number of livestock keeping households may have increased accordingly.

Of course, statistics of livestock and people need to be analysed more carefully, and e.g. non-pastoral livestock production systems like peri-urban dairy systems subtracted from calculations.

For example in the Kaghan Valley in Pakistan, in 1901, the total population of the then Tahsil Mansehra was 18 396, of which Gujars were 9 200. By 1981, the population had increased to 154 602 (Muhammad Rafique Sardar (2003) :Agro-Pastoral Production Systems Of High Altitude Pastures, Upper Kaghan Valley, NWFP, Pakistan, in: FAO Transhumant Grazing Systems in Temperate Asia).

Some studies are available that shed a light on the economic status of pastoralists. This is especially true of the pastoralists of the Badia steppe in Jordan and Syria. IFAD and FAO carried out project baseline surveys around a decade ago.

In the Syrian steppe, al Badia, there are between 900,000 and 1,5 million people. The number of nomadic herders is estimated to have decreased to 10,000 persons, while the rest being transhumant herders, who take the sheep for grazing for 7-8 months a year (FAO (2003): Syrian Agriculture at the crossroads). Jordan statistics indicate that the population of the Badia is around 185 000 who live in 170 communities. There are 25,594 households, 12,242 (or 48 percent) of which own livestock. The prevailing grazing system in the Badia is semi-nomadic grazing. Only 2 percent of livestock raisers are full-time nomads, the rest are semi-nomadic and live in houses, although their stocks move according to the availability of forage.

A survey by IFAD (1995) in the Jordanian steppe revealed that 54.5 percent of the holdings employ shepherds, 97.7 percent of whom are paid in cash; the other 2.3 percent are paid in kind (partnerships or grants). Jordanians represented 23.7 percent of the shepherds and employees. Similarly, an FAO survey conducted near Palmyra, Syria, in 1998 found that 61 % used tents; 15 % houses; and 24 % both. 80 % owned a truck, tractor or car.

FAO in its 2003 publication on "Transhumant Grazing Systems in Temperate Asia" presents detailed studies including socioeconomics of pastoralists of the Kaghan Valley and the Malakand Division in Pakistan, and the Gaddis in Himachal Pradesh, India. Nomadic graziers drive all the livestock to higher altitude. Same is the case with the household members. Since they do not have permanent hutments in winter grazing areas so all the members had to move with livestock. On the contrary the sedentary graziers have their houses in lower parts of Kaghan valley. 1-2 dairy animals are kept at home to meet the milk needs of the remaining household members. Similarly, sick and elderly people do not move upwards with livestock. Further the male members of the household move between their summer huts and permanent huts/homes back in villages/town in lower valley parts to take care of remaining members and stock.

Arun Agrawal presents a 1998 study on the economics of collective migration of the Raika in Rajasthan, India, showing that the group can move in a more efficient, and more secure way.

Women pastoralists: The invisible half

The contribution of pastoralist women in livestock production has not received the attention it deserves and women as a source of information on livestock production, have been ignored. They not only remain the 'hidden hands' of production but also a neglected source of indigenous knowledge (Sangeeta Rangnekar: Women Pastoralists, Indigenous Knowledge And Livestock Production In Northern Gujarat). Much ethnoveterinary knowledge among women pastoralists was also recorded in Afghanistan (Diana Davis IK Monitor 3, 1996).

Similar facts are reported in detail from the Raika in India by Ellen Geerlings (Geerlings, Ellen, 2001. Sheep husbandry and ethnoveterinary knowledge of Raika sheep pastoralists in Rajasthan, India. MSc thesis, Wageningen University, Netherlands).

Women's work is crucial to a Kuchi family's survival. There is a clear gender division of labor, with men being responsible for livestock and sales away from the tent, women being responsible for household work and sales around the tent, and children being responsible for young stock. However, there is not a clear division of assets, or rights of access to profits from sales (Christine Jost (2004): Men, Women, Children And Livestock. A Livelihoods Analysis of the Afghan Registan Kuchi Focused on Gender and Animal Health, Cordaid, The Netherlands).

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 (FAO Iran).

In Iran, according to FAO, more than 86% of the milking, 42% of the feeding watering and health care is done by women (FAO National Sectoral Report on Women, 1994).

In the northern areas of Pakistan and in the Chitral alpine pastures, women commonly look after the herds and spend the summer in alpine areas. Men maintain additional supplies by travelling back and forth. The winter season is spent around permanent settlements in lowlands (FAO Pakistan).

Exports from pastoralism: Globalization challenges

The largest share of pastoral products is for local marketing and consumption. There was successful exporting mainly before globalization and Free Trade Agreements. Even specialty products like Pashmina goat wool are nowadays produced in Australia.

In pre-war Afghanistan, the share of livestock products in export is estimated at 35%. Large numbers of small ruminants, wool and hides and skins were 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 to the world markets through a few dealers in Herat. (FAO Afghanistan)

World Bank reports that in pre-war years, livestock and livestock products (handicrafts; rugs, carpets) contributed 16% and 8-10% to the Gross Domestic Product of Afghanistan. Livestock products were about 14% of total exports with carpets and rugs accounting for a further 9%, with a total value of \$US 65 million per year. This is exclusive of unrecorded live sheep exports to Iran, which were estimated at an additional \$US 33 million per year. This would lead to 34.6% of total exports stemming from livestock and livestock products (de Weijer).

In Syria, around half a million sheep were exported to the Gulf States annually. As the Gulf States markets in live sheep have a preference for Awassi breed, Syria allowed export only of male animals in an attempt to protect Syria's competitive advantage. However, during the 90s, Australia developed an Awassi sheep industry and conquered the Gulf market.

World markets for meat and wool are, at present, depressed; this is clearly felt even in remote herding areas. Wool in particular is affected, and most of that produced by herding systems is short, rather coarse and dirty; it cannot compete with imports from Oceania. In Afghanistan, mechanized wool-washing facilities have ceased to function; now traditional hand-knotted carpets are being made from Oceanic wool imported via Pakistan - although local wool may be used for the carpet web (FAO Transhumant Grazing Systems in Temperate Asia).

Table 1: Drylands, pastoralists, and their contribution to the national economy¹

	Share of livestock in GDP	Share of livestock in agricultural GDP	Livestock exports	Share of livestock in agricultural exports	Dryland area	Share of Drylands/ total area	Number of pastoralists	Share of pastora-lists
Afghanistan	16-18% ²		35% ³		29 M ha	45%	2.5 million kuchi	7% to 10%
India	7%	20%			12.4 M ha pasture/ grassland; 64 M ha wastelands	3.9% pasture/ grassland; 20% wastelands		
Iran	6%				90 M ha	90%	0,8-1,5 m ⁴ 3m families, among which 180,000 nomadic	2%
Iraq		30%			43 M ha	63%		
Israel							200.000	
Jordan	4%				8 M ha	90 %	88.500 ⁵	7%
Pakistan	11%	47% ⁶	8,5% ⁷		45.2 M ha	60%	30-35 million depend on livestock ⁸	
Palestine							20.000 ⁹	
Syria¹⁰		30%		15%	10 M ha	55 %	150,000families	X/18 mio
Turkey	4,5%	25%			1,2 M ha	16%		

¹ Figures are cited from various FAO publications, unless otherwise specified.

² World Bank, before war

³ pre war

⁴ CENESTA

⁵ Laith Roussan (n.d.) Executive Summary – Jordan: Community and household-level impacts of institutional options for managing and improving rangeland in the low rainfall areas of Jordan, Jordan University for Science and Technology. Paper co-authored with Faisal Awawdeh, Emad Karableh, Samia Akroush, Khaleal Abu Soui, Nadira Al-Jouhari, Enass Ghraibeh and Tidiane Ngaido

⁶ Pakistan Economic Survey 2004/5.

⁷ PakTribune March 02, 2006

⁸ PID, 2006

⁹ <http://www.arij.org/bedouin/index.htm>

¹⁰ ILRI

Effects of globalization may be thorough, where pastoralists produce for markets, whether domestic or export. In Mexico, sheep breeds disappeared with the conclusion of the NAFTA, by which cheap Australian wool entered the Mexican market. Subsistence sheep breeders, however, were not affected (Raul Perezgrovas in Livestock diversity. Keepers' rights, shared benefits and pro-poor policies. Documentation of a workshop with NGOs, herders, scientists, and FAO. Organised by the League for Pastoral Peoples and German NGO Forum on Environment and Development, in cooperation with CENESTA/CEESP, held during World Food Summit - Five Years Later, Rome 2002)

There may be, however, new global market niches like camel milk products (FAO press release of 18 April 2006). With regard to medicinal plants for human and animal health, markets should be explored; However, currently there is a "green gold" rush of some Northern industries to secure traditional knowledge, and pastoralists may lose out.

Tourism is a well established global market as well, of which pastoralists usually benefit the least although their culture is often the main attraction of a tourist destination. Folklore, traditional knowledge and Genetic Resources have become issues dealt with by the World Intellectual Property Organisation.

Pastoralists' contribution to GDP and the livestock sector

The economic activities of pastoralists are only partially captured by economic statistics. The informal sector is generally underrepresented. A large part of animal products, like milk, meat, wool, are for the family's own consumption and usually not recorded. Sales of live animals and animal products are only partly recorded. Some animal products, though extremely important to the local economy, are almost completely overlooked by statisticians, like manure, draught power, or medicines made from animal products. In spite of such omissions, production data carry weight in the statistics.

Pakistan's livestock sector produces almost half of the agricultural GDP. In Pakistan, 28 billion litres of milk per year are produced, translating into a value higher than that of wheat and cotton combined. This country is the world's fifth largest milk producer, but does not cover its domestic needs. It is not clear whether these figures include subsistence production.

Table 2: Livestock Products in Pakistan (2004/5), in thousand tons

Milk	29472.0
Beef	1115.0
Mutton	740.0
Poultry Meat	416.0
Wool	40.2
Hair	21.5
Bones	365.1
Fats	136.3
Blood	46.4
Eggs Million No's.	8529
Hides	8.6
Skins	42.6

Source: Pakistan Economic Survey 2004/5

For the countries under report, the contribution of the livestock sector to the Gross Domestic Product is estimated between 4 and 13%. Afghanistan, before war, had its livestock sector contribution as high as 16-18% of GDP (Ulfat-un-Nabi Khan and Muzaffar Iqbal (n.d.): Role and the Size of Livestock Sector in Afghanistan. A Study Commissioned by The World Bank, Islamabad)

It can't be easily concluded that most of this is contributed by pastoral and transhumant production. Data on the number of animals in the various production systems, and resulting

milk and meat output are not readily available. Cattle and buffalo are nowadays often kept in periurban or urban systems without grazing. But in Pakistan and India, the Gujars migrate with buffalo and cattle, and there is much grazing in the forests and so-called wastelands.

The number of sheep and goats, as well as camels, usually provide an indication on the size of pastoral production systems, whether transhumant or mobile.

Table 3: Livestock numbers¹¹

	Camels	Goats million	Sheep million	Cattle million	Buffalo million
Afghanistan	180,000	7,3	8,8	3,7	
India	900,000	115	51	205	84
Iran	146,000	26	53,9	9	0,5
Iraq	10,000	1,1	6,3	1.5	0,98
Israel		0,11	0,36	0,35	
Jordan	18,000	0,63	1,6	0,64	
Pakistan¹²	800,000	56,7	24.9	24.2	26.3
Palestine					
Syria¹³	7,000-12,000	1	15	0,9	0,25
Turkey		7	27	10.4	0,14

There have been significant changes in livestock numbers in many countries of the region. In general, the numbers of goat and sheep have increased over the past century, while camels are clearly on the decline. A modern sector of dairy cattle and poultry has been promoted during the past decades, in order to cater to increasing urban milk and meat demand. The pastoralist production systems are often considered backward, not productive and not worth or possible to develop – especially with a view to already degraded lands.

In Turkey, for example, the number of ruminant animals were increasing before the 1980s but have decreased since. Given the Turkish dietary preferences, sheep have relatively high value and increased in number from 34.5 million head in 1960 to 46 million head in 1980 but declined to 27 million head in 2003. The number of goats declined during the same period from 24 million to 7 million because of grazing restrictions in forests and government policies encouraging herd reduction. The use of tractors probably has caused the decline in number of oxen. Cattle, which have risen in value as farmers strive to meet the growing urban demand for milk and meat, increased in number from 12.4 million head in 1960 to 15 million in 1980, but decreased to 10.4 million head in 2003. In contrast to the red meat sector, the numbers of poultry and beehives have steadily increased during the same period. Poultry products are gaining importance and account for a major share of animal products in human diets in Turkey as in many other countries. By 2000, Turkey had 264.5 million head of poultry, almost four times higher than the number in 1990. C Akbay and I Boz (2005) Turkey's livestock sector: Production, consumption and policies).

In Syria, sheep provide 55% of the total meat production. The number of sheep doubled during the 1980s but came to a halt as rangelands were overgrazed. Available rangeland per sheep decreased from 7,9 ha in 1961 to 2,6 ha in 1993 (FAO 2003). Efforts were made to develop the dairy and poultry sectors.

¹¹ Figures are cited from various FAO publications, unless otherwise specified.

¹² Pakistan Economic Survey 2004-5

¹³ ILRI

Goats: The cattle of the poor

Livestock policy of the Indian Government in the 1970s aimed to restrict the goat population to 40 million and increase the number of sheep to 70 million by 2000 A.D.. Goats were considered to contribute to land degradation with their sharp cloven hooves and their thorough browsing habits. While the ecological impact of goats was disputed among scientists, in India, the population of goats rose to 115 million in 1992, whereas the population of sheep remained at 51 million, reflecting the socioeconomic relevance and wide adaptability of goats.

Goats constitute an important productive asset of the country that generates a flow of income and employment throughout the year, especially for the landless, marginal, and small landholders. These constitute about 85% of all households, but occupy only one-third of the total land in India. On the other hand, the distribution of livestock wealth, including sheep and goats is more equitable. These households maintain about 71% of the small ruminant

population largely on common lands and harvested fields. Thus, they can be profitably raised with low investment in extensive and semi-intensive systems.

Table 4: Contribution of goats to the Indian economy, 1994

Product	Quantity (thousand t)	Value (million Rs)
Meat	470	27 360
Milk	2 200	11 000
Pashmina	0.04	20
By-products		3 650
Manure	18 790	1 879
Blood	46	46
Skin		3 283
Total		47 283

Shalander Kumar and K .P., (2001). Goats in India: Status and Technological Possibilities for Improvement. Proceedings of the Workshop on Documentation, Adoption, and Impact of Livestock Technologies in India, ICRISAT-Patancheru, India, 18–19 January 2001. Edited by Pratap S Birthal and P Parthasarathy Rao).

Camels on the decline

Camel numbers declined in all relevant countries. The Asian camel population decreased between 1994 and 2004 from 4.5 million to 3.5 million, or by 21%. The development in Asia contrasts with that in Africa, where the camel population grew from 13.2 to 15.4 million, or by 16 %, during the same time period (FAO data cited after Ilse Köhler-Rollefson League for Pastoral Peoples Camels on rapid decline in Asia. German NGO Forum, Bonn, June 2005).

In the Syrian Badia Steppe, camels have radically reduced in number due to competition from trucks in transportation and also to a low return compared with sheep. The total number is around 12,000 raised by Bedouins, largely for cultural reasons. The FAO /GCP/SYR/003/ITA wild life project is contributing to stabilizing camel numbers by providing the camel cooperative grazing access to the wild life reserve near Palmyra.

India has seen by far the most rapid decrease of the camel population during the last ten years, amounting to nearly 40%. Field surveys by Lokhit Pashu-Palak Sansthan (LPPS), a non-government organization in India, revealed a 50% decline between 1995 and 2004 in selected parts of Rajasthan. Prime culprits for this development are irrigation agriculture and the establishment of nature reserves. The Indira Gandhi Canal, which runs parallel to the border with Pakistan, has eliminated prime camel-breeding areas, and in the villages that once had the reputation for producing India's best camels, not a single animal is left. The privatization of former common property resources is forcing camel breeders to sell their herds for slaughter; field owners also resort to shooting and other cruel acts to keep camels

away. Only ten years ago, the Raika and other traditionally camel breeding communities adamantly rejected the idea of using camels for meat. This ethic was grounded in Hindu values and was subscribed to by the local Muslims. But it seems to have eroded away almost entirely. Despite massive awareness-raising campaigns by LPPS, appeals by a group of international camel scientists, and a plea by camel breeders themselves, the government appears paralysed in its inability to come up with a remedial action plan, or even acknowledge the issue. At the same time, groundwater levels have dropped and even completely disappeared, so in some locations camels may even make a comeback.

Pakistan's camels are also on the decline, down to 800 000 or less in 2004 from 1.1 million in 1994, equivalent to a decrease of about 29%. Yet in Pakistan, the prospects for camels seem comparatively bright. This may be because there is a heightened demand for these animals in Afghanistan, where the livestock economy collapsed after the war, and the country remains dependent on animal imports. Cheelkand, a minor hamlet in Mirpurkhas district of Sindh Province, is the scene of a thriving weekly camel market from where camels are trucked to the border with Afghanistan and even Iran. In the Tharparkar Desert in the southeast of the country, camels still count for much and are regarded as a symbol of wealth. A good camel costs 40,000 Pakistan Rupees (about 554 Euro). (Saving the Camel and Peoples' Livelihoods Building a Multi-Stakeholder Platform for the Conservation of the Camel in Rajasthan. International Conference, 23-25 November, 2004, Sadri, Rajasthan, India. LPPS, Misereor, FAO, Life Initiative)

Pastoralists produce for the local markets

Some studies point at the subsistence production of pastoralists. For example, in Pakistan's Khagan Valley, market structures for sale of livestock and its products are existing and are known to the graziers but they are consuming almost all the products (milk and ghee) except wool (Muhammad Rafique Sardar (2003) :Agro-Pastoral Production Systems Of High Altitude Pastures, Upper Kaghan Valley, NWFP, Pakistan, in: FAO Transhumant Grazing Systems in Temperate Asia).

However, almost 50% of Pakistan's meat market is supplied by small ruminants which are usually kept in pastoral or agropastoral systems (Nawaz and Khan, 1995, quoted in Jasra, 2000).

An IFAD Survey among some 600 herders in Badia, Jordan 1995 reports:

- 70.3 percent of herders sell dairy products. This increases to 94.9 percent in the northern Badia and decreases to 80.4 percent in the south. Meanwhile, 12.9 percent of breeders' households consume their produce; 83.4 percent of sample members sell wool; the rest use it domestically.
- Sale of animals is the most important income source. Usually small animals, especially males, are sold even under 20 kg. 97 percent of the sample members sell sheep, while 84 percent sell goats
- In the mid and northern Badia, milk is sold to cheese makers; but in the southern Badia, families make Jameed (dried yogurt) and clarified butter for sale..

In Jordan, the total production of red meat in 1996 was estimated to be 21,350 t, meeting 43% of the country's consumption, to which sheep contributed 66%, cattle 23%, goats 9% and camels 1%. The estimated total production of milk in 1996 was 165,100 t, with approximately 65% coming from cows, 23% from ewes and 12% from goats (FAO). Thirty per cent of sheep and goat's milk was processed to produce ghee and dried buttermilk, or jameed, 10% was consumed as fresh milk and 60% was made into white cheese.

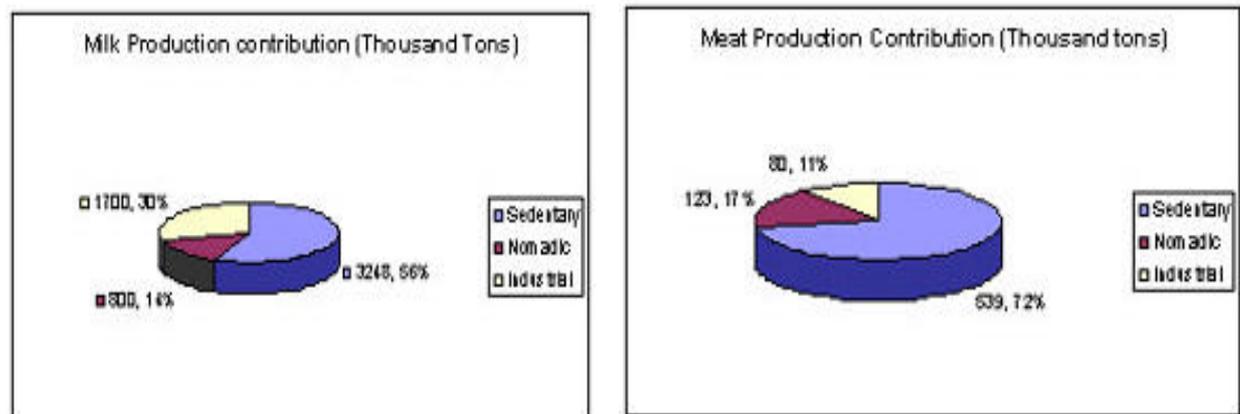
If Jordan is about 50% self-sufficient in milk (ILRI), and 65% of it is from cattle (FAO), it may be concluded that around one fifth of Jordan's marketed milk is produced by pastoralists, with a population at around 7%. The milk which is consumed by the pastoralists themselves, is probably not counted.

The pastoral communities in Syria are important not only because they are almost self-sufficient in terms of daily food but also because they supply the urban areas with a great part of their requirements in animal products. Still, in Syria there is a gap of 25% to 30% between demand and supply of animal products (ILRI).

In Iran, although migrating pastoralists number only about 2% of the entire population (1.3 million pastoralists) according to government figures, they satisfy about one quarter of the country's livestock needs (CENESTA).

FAO provides data on the contribution of the different livestock production systems in Iran, according to which nomadic pastoralists contribute 14 % of milk and 17% of meat production. This includes transhumant systems. Sedentary systems which account for 56% of milk and 72% of meat production are typically mixed cropping and livestock systems, that usually hire a herdsman to look after livestock grazing in vicinity of the villages during summer.

Figure 1 – Production of milk and meat by the different systems in Iran (FAO)



Marketing and infrastructure

Marketing is on the one hand considered as a major problem that pastoralists, both transhumant and mobile, face. On the other hand, there is much evidence that local markets are well provided with pastoral products (see preceding chapter). The marketing issues have not systematically been studied and represent a key knowledge gap.

From a Workshop on Rangeland Management and Pastoralism in Arid Lands in 2002 it is reported that in some countries, dumping of live animals or meat from Australia and New Zealand causes problems to local production (Mohammad Taghi Farvar (2002): Workshop on Rangeland Management and Pastoralism in Arid Lands, CENESTA/CEESP, Iran).

In West Asia and North Africa, demand for small ruminant products (WANA) is expected to grow due to increased affluence and population growth. The poor in marginal areas of the region whose livelihoods depend on livestock production, however, may lose their market share due to low productivity and poor marketing infrastructure (Aden Aw-Hassan, Farouk Shomo, and Luis Iñiguez (2003): Helping Small Enterprises Capture the Livestock Products Market in West Asia and North Africa. ICARDA, Caravan 22).

In Iran, in some places cooperatives and companies go to the pastoralists to collect their surplus production. Sedentary pastoralists have fewer problems in selling their products and buying their requirements where mobile pastoralists often have to go to towns to buy their needs during their seasonal migration (FAO).

In Afghanistan, farmers are mainly at the mercy of middlemen for selling their animals, hides and skins and poultry. In some cases, however, processing of milk at the farm into cheese, yogurt, curd, butter and ghee, allows value addition and through direct marketing farmers get around middlemen. The Pamir Reconstruction Bureau has initiated collection and its distribution in the Kabul area (World Bank).

A recent study on opportunities to rebuild Afghanistan concludes that there are sizeable domestic, regional and international markets for processed products from Afghanistan agriculture. Its results may apply to pastoralist systems in other countries as well:

- There is a need to determine opportunities and constraints in adding value to and marketing of meat and other livestock products, for instance wool, karakul, cashmere, handicrafts (rugs, carpets), hides and skins, and milk products.
- Opportunities for improving the traditional technologies for milk processing, wool spinning, and cashmere harvesting need to be determined, and mechanisms through which international quality standards can be met, and production can be increased.
- Potential markets (regional, national or international) need to be determined, as well as the mechanisms that need to be put in place to access these markets.
- An economic assessment of the economic profitability of lamb fattening is required, including the type and level of investment required to reach international hygiene and sanitation standards. Focus should initially be on import substitution, with a vision of potentially reaching the export market in the future.

(Eberhard Halbach and Wais Ahmad: Paper 9: Prioritizing Investments For Initiating Rural Development: The Case Of Rebuilding Afghanistan. Strategies for Development and Food Security in Mountainous Areas of Central Asia. International Workshop Dushanbe, Tajikistan June 6-10, 2005).

The Raika in Rajasthan, India, “depend on middlemen to market live animals and wool. Demand for slaughter animals is high, and Muslim agents regularly visit the Raika homesteads looking for animals to buy. In the wool market, the middlemen are also from the Raika community. While there is some grumbling about the high margins obtained by these people, it is difficult to operate without them, since the sheep breeders are generally much too occupied with herding to take these matters into their own hands. ...However the fact that India imports huge amounts of carpet wool from countries such as Australia and Canada (whose farmers actively lobby their governments for higher import quota to India), suggests that pressurizing the Indian government for changing its import policies might yield some positive results (Lokhit Pashu-Palak Sansthan (2005): Sheep pastoralism in Rajasthan. Still a viable option? Workshop report compiled by Chakrawarti Singh and Ilse Köhler-Rollefson).

Roads can have a development effect also on pastoralists. The opening of the Karakoram highway in Pakistan has had a noticeable effect on both the agriculture and the animal husbandry of the area. The road link permitted easy transport of cereals from the plains, sometimes subsidized; this has led to an increase in fodder cultivation for winter feed. Improved fodder technology has been taken up by the population. Introduction of improved lucerne (*Medicago sativa*) cultivars to replace old, winter-dormant landraces was especially successful. In recent years there have been many inputs to development in the area, as well as intensive improvements in education. Now many youths have received education, and are no longer interested in herding. The present situation has been studied in detail and is described by Ehlers and Kreutzman (2000); the local population is now making less use of high pastures although there is some anecdotal evidence that other groups may be taking an interest in them (FAO Transhumant Grazing Systems in Temperate Asia).

Income and expenditure: How pastoralists make a livelihood

Systematic studies on pastoralist household economics are rare, and certainly not easy to carry out. However, some data may illustrate the best practices.

The Gaddi in Himachal Pradesh, India

In Himachal Pradesh, India, herders sell 40 percent of their sheep and 70 percent of their goats every year. Gaddis are very reluctant to reveal their income, but a fair estimate would be the following:

- A 100-animal herder selling 50 animals @ Rs 500 (US\$ 10.86)/animal/year (average) would have a total income of Rs 25 000 (US\$543.47) annually.
- A 350-animal herder selling 100 animals @ Rs 500 (US\$ 10.86)/animal/ year (average) would have a total income of Rs 50 000 (US\$ 1 086.95) annually.
- A 1000-animal herder selling 300 animals @ Rs 500 (US\$ 10.86)/animal/ year (average) would have a total income of Rs 150 000 (US\$ 3 260.86) annually.

Sale of goat milk is considered unethical by Gaddis; goat milk is never sold, it may be given to acquaintances. The only use of this milk is consumption by the graziers and making cheese for their own use.

Expenditure is only Rs 1.00 (US\$ 0.02) per sheep and Rs 1.25 (US\$ 0.02) per goat as grazing fee. Ten percent of animals are lost due to wildlife or accidents. Besides grazing, the only supplement provided to the animals is salt (at 3 kg/100 animals), which is fed once a week by spreading it over the rocks at stopovers (FAO: Transhumant Grazing Systems in Temperate Asia).

The Raika shepherds in Rajasthan, India

Income: In a study on the Raika shepherds in India, the highest returns are from the sale of sheep - 56% of the total revenues. This is nearly half as much again as returns from wool sales. However, the fluctuations in returns from animal sales (Rs. 420 to Rs. 21,020; 25 Rs were worth 1 USD at the time of the field study) are much higher than in the case of wool sales (Rs. 1,705 to Rs. 11,880). Most flock leaders earned between Rs. 600 and 900 by selling the droppings of their sheep (when divided among the individual families whose animals make up a flock, the amount may be smaller). These earnings scarcely rival the revenues from wool or animal sales, and constitute, instead, a supplementary income. Yet, families that earn less than Rs. 5,000 in an average year can by no means scoff at Rs. 600; indeed, in some cases, the amount is as much as 25% of the final profit.

Grazing expenses: The most important requirement for the survival of the migrating enterprise -- grazing for the sheep - is available free for the most part. But shepherds incur unavoidable expenses on supplemental feed for the sheep, medicines, shearing, labor, and sometimes, grazing. In rare instances, raikas are forced to transport their sheep by trucks to areas where fodder can be found. Fodder is not available uniformly abundantly through the migration cycle. In the winter months, especially, the raikas must supplement natural fodder with different kinds of purchased feed. Supplementary feed is also bought for pregnant sheep. In addition, the shepherds may incur grazing expenses in two other situations. Those camps that migrate around the year pay grazing fees to the forest department during the monsoon months. Almost all private fields are planted, and the fodder available in the common grazing lands in villages is insufficient even for village animals. Grazing fees vary between states. In Rajasthan they were Re. 0.50 per sheep; in Madhya Pradesh fees were raised tenfold in 1989 to Rs. 10.00 per sheep. Grazing expenses also arise in Haryana and Uttar Pradesh - the winter destinations for migrating shepherds. The rent for crop stubble in the fields ranges between Rs. 50 and Rs. 100 a month for one thousand sheep. The browse in double cropped irrigated fields constitutes a new adaptive niche for the raikas. The current situation has reversed earlier exchanges between farmers and shepherds. Prior to the arrival of irrigation and the increasing shortage of fallow fields for the shepherds' flocks, it were the farmers who paid the shepherds for the manure from the sheep. The reversal of monetary flows reflects the changing reality of the asymmetrical relationships between the farmers and the shepherds, driven in part by the efforts of the Indian state to promote irrigated agriculture. With increasing use of irrigation, chemical fertilizers, and pesticides, the importance of sheep manure as an agricultural input has declined.

Labour cost: Seven of the thirteen Raika shepherd flocks studied employed labour during the migration cycle. The salary of the hired hand depends on age, skill, the closeness of the kin relationship with the flock leader, and the number of sheep he brings into the flock. If the shepherd does not bring any sheep, he receives between Rs. 2,000 and 3,500 as salary, daily food, and a change of clothing for the migration cycle. Food is provided also to those shepherds who bring sheep into the flock. But if the number of sheep inducted into the migrating flock is more than 100, no salary is paid.

(Profits on the move: The economics of collective migration among the Raika shepherds in India, by Arun Agarwal, in: Human Organization, Winter 1998)

Feed expenses

Glatzer calculated that in Afghanistan, 18% of the income is used on the purchase of supplementary feed in 'normal years', and pastoralists in Nangarhar and Laghman spend between 300 and 2000 Afg (US\$ 6 to 50) on supplementary feed per animal per winter season (FAO).

Feed expenses are certainly becoming the critical factor in pastoralist systems. Blench reported from Jordan, that with the availability of subsidized feeds, "the buying of feeds has become the single most important household expenditure. Every individual livestock producer interviewed in a survey of 400 households spent some money on feeds. Feeds are purchased in bulk by the government and sold according to allocations denoted by the 1991 livestock census (Blench, 1995).

Size of herds: A wealth indicator?

In Pakistan, livestock keepers on average tend 2-3 cattle/buffalo and 5-6 sheep/goat per household and derive 30-40% of their income from livestock (Pakistan Economic Survey 2004-2005).

In Pakistan's Upper Kaghan Valley, NWFP, the average herd size of nomadic Bakarwals was 149 head. Of this total 108 (72%) were goats, rest 40 (27%) were sheep and 1 (0.8%) was equine. On the other hand sedentary transhumance graziers keep buffaloes, cattle, goats, sheep and even equine. This group, on the average, keeps about 12 livestock head. Out of this total 5 (42%) were goats, 5 (42%) cattle, 1(8%) buffalo and 1 (8%) equine. This group interestingly had no sheep stock. (Muhammad Rafique Sardar (2003) :Agro-Pastoral Production Systems Of High Altitude Pastures, Upper Kaghan Valley, NWFP, Pakistan, in: FAO Transhumant Grazing Systems in Temperate Asia).

In Jordan, herd sizes traditionally were some 150 to 200 animals, since this was all that could be managed by the labour available in a family unit (Blench 1995).

Among the Gaddi in Himachal Pradesh, small flocks are up to 100 animals; Medium Flocks consist of 300-500 animals; while the Large Flocks comprise 1 000-1 500 animals. The average composition of flocks is the same, with 60 percent sheep and 40 percent goats. Each flock has two or three dogs and large ones have four or five pack ponies. Gaddis owning 250 and more animals are generally considered to be well off (FAO Transhumant Grazing Systems in Temperate Asia).

Collective migration

During migration, herds are often joined. A study among Raika shepherds in India shows that substantial variations in surplus are present across different sized flocks. The larger flocks produce a surplus of almost Rs. 30 per sheep and Rs. 3,000 per person in contrast to the smaller flocks which earn less than Rs. 2 per sheep and Rs. 100 per person. It also seems that once flock size begins to approach five to six hundred sheep, shepherds either divide their flock into two, or sell enough sheep to reduce flock size. More than 600 sheep in a flock increase diseconomies of scale (those related to the sheep a given number of shepherds can manage during grazing) to the point where existing flock size becomes unattractive. (Profits on the move: The economics of collective migration among the Raika shepherds in India, by Arun Agarwal, in: Human Organization, Winter 1998)

Livestock products

Dairy products

In Afghanistan, 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 (FAO).

Production for sale and selling of milk and dairy products was common in the Kabul region and in Northern Afghanistan. In the Pashun 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 is a large potential in dairy products. Cheese and other products are currently produced only for local consumption. However, some products, such as yoghurt from Ghazni enjoy a nationwide reputation. Investment in collection, processing and packaging, and a cold

transportation chain are potentially profitable investments, but are logistically challenging (Eberhard Halbach and Wais Ahmad: Paper 9: Prioritizing Investments For Initiating Rural Development: The Case Of Rebuilding Afghanistan. Strategies for Development and Food Security in Mountainous Areas of Central Asia. International Workshop Dushanbe, Tajikistan June 6-10, 2005).

In Syria, the share of sheep milk decreased to 33%, as a result of an increasing cow dairy sector (FAO 2003). Production of yogurt has been rising steadily, reflecting increased demand. Whereas about 59,000 tons of yogurt was produced in the country in 1999, production rose to more than 90,000 tons in 2003 (More Yogurt, Please! Muhi El-Dine Hilali, Luis Iñiguez, and Monika Zaklouta ICARDA Caravan 22, 2005).

The migratory lifestyle of the Jabbans, or cheese makers, in Syria is slowly changing, especially in terms of working places. They are moving from the Khanasser Valley towards the steppe where more dairy sheep are raised. (Malika Abdelali-Martini, Aden Aw-Hassan, and Hisham Salahieh: The Potential of Partnership with the Jabbans of Syria, in: ICARDA Caravan 22)

Sale of goat milk is considered unethical by Gaddis in Himachal Pradesh; goat milk is never sold, it may be given to acquaintances. The only use of this milk is consumption by the graziers and making cheese for their own use. (FAO Transhumant Grazing Systems in Temperate Asia)

Camel milk

In Rajasthan, camel milk is a by-product of camel breeding which is consumed primarily by herdsman (especially on migration) and by their families. There are traditional cultural restrictions on the sale and processing of camel milk, and it is not marketed in the core camel breeding areas, such as Bikaner, Jodhpur and Jaisalmer. But in the late 1990s, there was a large "grey" camel market in the northern tip of Madhya Pradesh (Mandsaur, Jarwa, Ratlam, Indore, Bhopal, and Ujjain) and in parts of southern Rajasthan (Bhilwara, Chittorgarh, Udaipur, Kotah, Nimbahera) which proceeded at tea-stalls, to private households, or under the guise of cow/buffalo milk to dairies.

The production system is extensive – camel herds are usually stationed about 10–15 km from the towns and supported exclusively on natural graze, mostly consisting of tree vegetation. Some of the trees include *Acacia nilotica*, *Prosopis cineraria*, *Capparis decidua*, *Balanites aegyptiaca*, *Zizyphus glabrata*, *Acacia leucophloea* and *Acacia senegal*. The camels are milked twice or thrice per day, usually during the night, because the milk is collected in the early morning. The average daily yield of a lactating camel is around 2 kg, although some owners assert that individual yields can be as high as 6 kg or more. The income generated from milk sales can be substantial, exceeding the returns from selling the young male offspring.

Camels are praised for a very efficient feed conversion rate and according to some calculations require only 1.9 kg of dry matter to produce 1 litre of milk, compared with 9.1 kg in cows (Stiles, 1983, cited from Saving the Camel and Peoples' Livelihoods Building a Multi-Stakeholder Platform for the Conservation of the Camel in Rajasthan. International Conference, 23-25 November, 2004, Sadri, Rajasthan, India. LPPS, Misereor, FAO, Life Initiative).

Several years ago, the Rajasthan High Court declared camel milk as hazardous to human health and sentenced a Raika camel milk vendor to a monetary fine and jail. This decision was appealed to at the Supreme Court through a Public Interest Litigation initiated by the NGO Lokhit Pashu-Palak Sansthan. The plaintiff brought forward evidence about the high esteem for camel milk in other countries, and the Supreme Court decided that camel milk was fit for human consumption. Yet, to this day, camel milk continues to be discriminated against by the Rajasthan Dairy Federation, which does not accept it. At the same time, research by Indian scientists now also supports the therapeutic value of camel milk in the treatment of several diseases, including tuberculosis, jaundice, anaemia. A recent study by the Medical College in Bikaner and the National Research Centre on Camel suggests that camel milk is also useful for the treatment of Type 1 diabetes (Agrawal et al., 2003).

LPPS, Misereor, FAO, Life Initiative (2004): Saving the Camel and Peoples' Livelihoods. Building a Multi-Stakeholder Platform for the Conservation of the Camel in Rajasthan. International Conference, 23-25 November, 2004, Sadri, Rajasthan, India

FAO considers the global market for camel milk at 10 billion USD, with 200 million customers in the Arab world (FAO Press Release 18.04.06).

Meat

In India, goat meat is the most preferred meat, and although its production has been raised significantly, the demand is not met. (Shalander Kumar and K P Pant (2001): Goats in India. Status and Technological Possibilities for Improvement. Proceedings of the Workshop on Documentation, Adoption, and Impact of Livestock Technologies in India, ICRISAT-Patancheru, India, 18–19 January 2001. Edited by Pratap S Birthal and P Parthasarathy Rao)

In Himachal Pradesh, herders sell 40 percent of their sheep and 70 percent of their goats every year. Live beasts are sold at the beginning of upward and downward movements. The mother stock is maintained to the age of 8 years. Lambs and kids aged 3-6 months are sold in the plains or outer hills in March: 3-month-old lambs fetch Rs 350 (US\$ 7.6) while a 6-month-old may fetch Rs 700 (US\$ 15.2). Kids of the same age fetch Rs 250-350 (US\$ 5.43-7.60) more since goat is preferred for meat. At this age the body weight of lambs and kids is 9-12 kg. The second sale is in September, when downward migration starts, by which time lambs and kids are fully grown and weigh between 20 and 22 kg. Traders go up to the sub-alpine and alpine areas to buy the animals. Sheep fetch Rs 650 (US\$ 14.13) each, while goats may fetch Rs 750-850 (US\$ 16.30-18.47). Himachal Pradesh, FAO Transhumant Grazing Systems in Temperate Asia

Sheep wool

World markets for meat and wool are, at present, depressed; this is clearly felt even in remote herding areas. Wool in particular is affected, and most of that produced by herding systems is short, rather coarse and dirty; it cannot compete with imports from Oceania. In Afghanistan, mechanized wool-washing facilities have ceased to function; now traditional hand-knotted carpets are being made from Oceanic wool imported via Pakistan - although local wool may be used for the carpet web. (FAO Transhumant Grazing Systems in Temperate Asia in Temperate Asia)

FAO offers productivity data on many breeds. For example, "the Turkish Imroz sheep breed is shorn twice a year; annual wool production per head is about 1.5 kg to 2 kg. The fleece, which hangs in curled locks 25 cm to 30 cm long is not uniform in quality."

In Himachal Pradesh, sheep are shorn thrice yearly, in January (yield ca. 500 g), April-May (yield ca. 800 g) and September (yield ca. 1 500 g), for a total of 2 800 g per sheep. The wool is sold to traders who know the routes and shearing times and where to buy. Prices are fixed by the government; the rate is Rs 6.5/ kg of mixed wool (2001). Black wool is in high demand but, following sheep improvement programmes, most is white or shades of white. Black sheep, like black wool, fetch higher prices. About 5 percent of the wool is woven domestically. (FAO, Transhumant Grazing Systems in Temperate Asia)

For Aghanistan, production of ewes is 0.5-2.0 kg, which is partly traded and partly used for domestic purposes. (FAO) A recent marketing study in Afghanistan found that some producers of quality carpets try to exclusively use local wool, but the supply of local wool is insufficient to meet demand. Similarly, those quality producers using imported high quality wool would be happy to substitute the foreign wool with local quality production, if more was available. This shortage of local wool is partially related to the reduced number of livestock caused by the extended war period and the drought in some areas that have threatened the traditional extensive grazing and nomad lifestyle in many provinces of the country. There is a lack of appropriate wool scouring facilities in the North East. (Eberhard Halbach and Wais Ahmad (2005): Paper 9: Prioritizing Investments For Initiating Rural Development: The Case Of Rebuilding Afghanistan. Strategies for Development and Food Security in Mountainous Areas of Central Asia. International Workshop Dushanbe, Tajikistan June 6-10, 2005)

Cashmere goat wool

China is the largest producer of raw cashmere and current estimates of production put their annual clip at approximately 10,000 metric tons. Mongolia produces somewhat more than 3,000 tons annually with Iran, Afghanistan, Turkey, Pakistan, India and Central Asian Republics producing significant but lesser amounts. In total the annual world clip is estimated to be in excess of 15,000 but less than 20,000 tons (WOOL Project: Carol Kerven, Serik Aryngaziev, Nurlan Malmakov, Hilary Redden, Aidos Smailov: Cashmere Marketing: A New Income Source for Central Asian Livestock Farmers. In CRSP Research Brief, University of California, April 2005).

In Afghanistan, the cashmere fibre is mainly collected in the western and north western areas. Brown seems to be the dominant colour of cashmere wool; 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. (FAO)

Currently, uncombed cashmere wool is exported from Afghanistan. Consequently, there is some potential for establishing carding operations in Afghanistan. China is the dominant player in the market and its manufacturers appear very efficient. Mongolian competitors have idle capacities as more efficient Chinese firms have gained market share and are buying up raw materials. Cashmere has high marketing potential for Afghanistan. Reports show that cashmere goats are present in the mountainous Wakhan area of Badakshan, but the farmers are not aware of the value of such wool internationally and do not differentiate it from other goat hairs (Eberhard Halbach and Wais Ahmad (2005) Paper 9: Prioritizing Investments For Initiating Rural Development: The Case Of Rebuilding Afghanistan. Strategies for Development and Food Security in Mountainous Areas of Central Asia. International Workshop Dushanbe, Tajikistan June 6-10, 2005).

Between 1999 and 2002, IFAD supported the Pashmina wool production and marketing in India. Major results included, among others:

1. Local efforts to develop cooperatives and negotiate with major industrial players will not be effective without support from higher levels of government. Regular policy support and advocacy will ensure that internal domestic trade is fair and allows for the autonomous operation of collectives.
2. Marketing cooperatives must have the means to handle trans-border trade, especially in products such as cashmere. This cannot occur without effective customs and border operations that are supportive of local production. It also requires policies that support international trade in cashmere, which currently do not exist in India. Illegal trade across the Chinese border will continue to hamper cooperative marketing efforts, as Kashmiri traders may seek cheaper fibre in Tibet. Coordination with military and border customs officials is needed to halt this illegal trade.
3. The success of programmes to improve genetic traits will be directly linked to the perceived economic benefit of the raising of animals with the genetically selected trait. Selection for white hair has proven to lead to higher prices.

IFAD: Development of Pashmina in Ladakh, Jammu and Kashmir, India

Camel wool

Camel wool is utilized by camel breeders for the manufacture of items to be used in their own household such as rugs, blankets, charpais and saddle girths. Similarly to camel milk, there were earlier certain cultural restrictions on the sale of wool. Because of low wool yields and short fibre, there appears to be only limited potential for commercial use of camel wool.

Dromedaries in India produce about 0.6 m kg of hair, which is used to make carrier bags, floor coverings, blankets, etc. This study explored the potential to make better end-products from this specialty fibre. Processes included sorting by colour (darker fibre is coarser and longer), scouring to remove vegetable matter and dust, blending with various other natural and artificial fibres, carding and spinning. The following products were developed: coat fabric, blankets, rungs, hand-knotted carpets, and hand-made felts. Conclusions include the following. Hair from kids and adult camels should be kept separate, and after proper sorting,

finer and coarser qualities may be mixed together. Sorting is vital to optimize the use of different grades of hair. Finer, brown hair should be used for making blankets and fabric in blends with wool and synthetic fibres. Dark brown hair may be used to make rugs and hand-knotted carpets. Wool is preferred as a blend for these purposes. The coarsest quality, black, hair may be blended with wool to make hand-made felts (V.K. Singh and P.C. Patni Camel hair: Its textile applications. Central Sheep & Wool Research Institute, Avikanagar, Rajasthan 304 501).

Pelts from Karakul sheep

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. (FAO)

In the past, Karakul skins used to be one of the major Afghan export products. During the years 2003 and 2004, this industry has rebounded strongly. With the number of livestock growing again, there is a large potential for the growth of the Karakul skin industry to last. Investment opportunities exist in skin processing and in emerging leather manufacturing. However, the extent of activities is currently low, and skills and expertise to develop these industries are largely lacking. The export performance indicates, however, that the raw products are produced at internationally competitive prices. (Eberhard Halbach and Wais Ahmad Paper 9: Prioritizing Investments For Initiating Rural Development: The Case Of Rebuilding Afghanistan. Strategies for Development and Food Security in Mountainous Areas of Central Asia. International Workshop Dushanbe, Tajikistan June 6-10, 2005)

Camel leather

The skins of camels are especially useful for manufacturing lampshades, toys, drum covers and certain types of containers. They are also used as material for shoes; according to members of the leather working community, there is no tanning facility in Rajasthan and skins have to be transported to south India for this purpose. A regional specialty used to be the kuppa or kuppi, painted vessels for oil, ghee and perfume painted in an intricate pattern. Because of lack of demand this artisan industry has now stopped.

Camel bones

Similar to the bones of other animals, camel bones are processed into fertilizer (bone meal). They are also used as in lieu of ivory for the production of jewellery and ornaments, as well as

for manufacturing inlaid furniture. Logistics are complicated by the fact that the nearest facility for cleaning bones is located in Uttar Pradesh, requiring transport to and fro.

Draught power

In India, in 1996–97, draught animals accounted for 14% of the total power available to the agricultural sector (Table 3). Share of livestock in the total power availability declined sharply from 69% in 1961–62 to 25% in 1981–82. However, its absolute contribution has remained almost unchanged at about 20 million kilowatt. (Pratap S Birthal and P Parthasarathy Rao: Economic Contributions of the Livestock Subsector in India).

In India the camel is traditionally regarded as a draught animal and means of transportation, while its food potential is largely ignored. In the Thar desert, camel carts are still popular and remain a frequent means of transportation. They fulfil this function not only in remote rural areas, but also in the major cities. In Bikaner, Jodhpur and Jaipur, camel-drawn carts are ubiquitous. They move goods of all kinds, especially wood, fodder, gas cylinders, fabrics, bricks, etc. The typical two-wheeled carts are a relatively recent invention dating back to the 1950s.

Ownership of a camel and a cart is a solid source of income, sufficient to support a family. For this reason, development agencies (such as Heifer Project International) and regional banks support loans for the purchase of a camel cart. According to studies by the National Research Centre on Camel, the average daily income from camel carting was Rs 300 and Rs 140 in city and village areas, respectively, versus a daily expenditure of Rs 40/camel/day. The income from camel carting was estimated to be higher in city areas as compared to rural areas because camel keepers in the city area had more opportunities to transport different agricultural commodities and construction materials than those operating in the rural areas.

In the hilly parts of the state (Aravalli range and southern Rajasthan), the camel continues to be used as beast of burden, notably for the transportation of harvested crops, such as chili peppers, chara, etc. It can carry loads weighing 150–300 kg over long distances and 450 kg over short distances. Other chores performed by camels include threshing, lifting of water and powering of oil mills.

The camel is used as riding animals mainly in the Jaisalmer area, where it exerts considerable draw on tourists. This is utilized by the Department of Tourism which organizes a Camel Festival in Bikaner and promotes other camel games, such as racing and polo at various festivals. Finally, the camel also maintains some military significance, being used to patrol the desert border. The Border Security Force keeps 1750 camels for this purpose in Rajasthan and Gujarat (LPPS, Misereor, FAO, Life Initiative (2004): Saving the Camel and Peoples' Livelihoods. Building a Multi-Stakeholder Platform for the Conservation of the Camel in Rajasthan. International Conference, 23-25 November, 2004, Sadri, Rajasthan, India).

Manure and fuel

Dung manure is an important contribution to the rural economy often mentioned but rarely quantified. In India, about half of the total dung produced is used as manure and the rest as domestic fuel. In 1970–71 dung manure accounted for about 43% of the total value of manure and fertilizers used in agriculture. This declined drastically to 23% in 1980–81 and to about 13% during the 1990s. However the absolute value of manure has been increasing steadily (Pratap S Birthal and P Parthasarathy Rao: Economic Contributions of the Livestock Subsector in India).

In Rajasthan, camel dung represents an important fertilizer and plays, or played, a significant role in the relationship between camel breeders and farmers. Although the fertilizing effect of camel dung is not as high as that of goat or sheep dung, it is regarded as better than cow dung. Although its effect is retarded, since it takes longer for camel dung to decompose, it lasts for 3 years. Sedentary camel breeders sell camel dung by the cartload or exchange it for grain. Nomadic camel pastoralists receive compensation in kind from the owners of the land on which their herds stay over night. Even higher fertilizing value is attributed to camel urine.

With increasing use of chemical fertilizers, the importance of sheep manure as an agricultural input has declined (Profits on the move: The economics of collective migration among the Raika shepherds in India, by Arun Agarwal, in: Human Organization, Winter 1998). However, in the meantime, agricultural input subsidies were abolished almost worldwide. The

price of petrol, raw material to produce fertiliser, is soaring. Those two factors may have led to increasing value of dung.

Risk insurance: A modern product with tradition

Not only to pastoralists, but also to other resource-poor livestock keepers, the animals are an insurance against risks, and especially the droughts that so frequently occur in drylands. Crops wilt away easily, while the breeds developed in arid and semi-arid regions survive droughts for a long time.

In Turkey, livestock give increased economic stability to the farm household, acting as a cash buffer (small stock), a capital reserve (large animals) and a hedge against inflation. In a mixed farming system, livestock reduce the risk through diversification of production and income sources and therefore a much greater ability to deal with seasonal crop failures and other natural calamities (C Akbay and I Boz (2005) : Turkey's livestock sector: Production, consumption and policies).

In India, livestock wealth is mainly concentrated among the majority of marginal and small landholders. Although crops and livestock are interdependent to a large extent, the latter constitute an important mechanism for coping with the risks of crop failure. In land-scarce economies livestock provide livelihood support in terms of income and employment generation to the millions of landless and small landholders (FAO). Especially, small ruminants are a good risk insurance.

The goat is one of the most important species of livestock in India. It has short generation interval, high prolificacy, and is easily adaptable to a wide range of climatic conditions. These characteristics give it a greater relevance in the household economy of the poor, particularly in the marginal environments including arid, semi-arid, and mountain regions. In these environments rainfall is erratic and frequency of crop failure is high. The goat is capable of surviving on sparse vegetation and in extreme climates.

Productivity aspects

Land and water productivity

Land and water are needed for all livestock production systems to grow feed. Land can be pasture land, crop land that provides residues on which livestock grazes, crop residues like oilseed cakes that are fed after processing, land sown with fodder crops, or land where crops are grown to produce feed concentrate. Yields of the various feeds need to be compared, and necessary land areas estimated. Data are available mainly with regard to yields of sown fodder crops (FAO); little data is also available on fodder amounts from pastures. However, assessments of land productivity with regard to the different feed sources are not readily available.

Water productivity is a subject on which very little data are available, but very worthwhile to look into in view of sparse water resources especially in dry areas. In Jordan, irrigation uses 73% of all treated waste water, while 22% is used for public supply in towns, 4% for industry and 1% for livestock (ILRI). Such data seem unavailable for other water sources, or most other countries. It is argued that industrial livestock production requires seven times more water than crops for each kilogram produced (Livestock – the thirst makers? In: New agriculturalist on-line, 1 September 2004). Livestock kept by pastoralists possibly uses seven times less water than crops, without polluting water bodies. While the ideas are right, much clearer data are needed.

Productivity per animal

Usually, productivity is related to the breed and to its milk, wool and meat yields. Performance with regard to draught power, dung, resistance to disease, risk insurance drought resistance are not considered, not even the cost of inputs like fodder and medicines. For example, cattle milk yield in India is about 12–15% that in the USA, Canada, and Israel. Meat yield of sheep and goats is about 60% less (Technology Options for Sustainable Livestock Production in India Documentation, Adoption, and Impact of Livestock Technologies in India ICRISAT-Patancheru, India 18–19 January 2001).

The productivity of goats in India is low. The average carcass weight is only 10 kg, lower than the world average of 12 kg. The milk productivity is also low. One of the main causes of low

productivity is lack of adoption of scientific methods of production, and limited commercialisation of goat keeping. Nevertheless, there is considerable potential to raise the productivity of goats and their economic and food security contributions, as India has a large number of important breeds of goat.

Health is Wealth

The literature is abundant with regard to non-availability of veterinary services to pastoralists, but details on economic losses from diseases and parasites seem not to have been assessed. Also, details on traditional treatments are rarely available.

Ethnoveterinary knowledge and practices are described as well as weak and strong points of both conventional and traditional institutions and actors (Geerlings, Ellen. 2001. Sheep husbandry and ethnoveterinary knowledge of Raika sheep pastoralists in Rajasthan, India. MSc thesis, Wageningen University, Netherlands).

The graziers in Upper Khagan Valley, Pakistan, have reported that fever, cold and tuberculosis are some of the common diseases of the transhumant livestock. They treat the sick and weak livestock with some of the antibiotic and antiworms medicines available in the market. Mostly treatments are given during the winter season when livestock are in proximity to cities. The medicinal plants are used as treatment when livestock are in alpine pastures. ((Muhammad Rafique Sardar (2003) :Agro-Pastoral Production Systems Of High Altitude Pastures, Upper Kaghan Valley, NWFP, Pakistan, in: FAO Transhumant Grazing Systems in Temperate Asia).

In Jordan, animal disease is a major cost to livestock owners. Peste des petits ruminants, foot and mouth disease and blue tongue are endemic, causing debility rather than death. Internal parasites, external parasites, including lice and keds, together with nasal bots are significant problems. The effectiveness of government vaccination programmes is low. The imports of live animals and animal by-products from different parts of the world, and mobility of livestock within and across the borders, increase the potential of infection of animals with epizootic diseases. The losses through disease are reduced fertility and prolificacy, reduced growth rates, extended age at first lambing, mortality, and loss of quality of meat and products. (FAO)

Anthra, an organisation of women veterinary scientists working in the field of livestock production and development, has been involved since 1996 in a research project to document and validate local ethno -veterinary and animal management practices carried out by livestock rearing communities in different parts of the states of Andhra Pradesh and Maharashtra in India. Communal knowledge and innovations are an integral part of the day to day healing and management practices of farmers in all areas and over 80% farmers continue to use these because they are easily and quickly available, especially in remote villages. However this knowledge is today being rapidly lost. Farmers, both men and women, have expressed a keen desire to increase their own knowledge of these systems (Nitya Sambamurti Ghotge, Sagari R. Ramdas, S. Ashalata, Nandini P. Mathur, Vivek Gour Broome & M.L. Sanyasi Rao: Social Approach To The Validation Of Traditional Veterinary Remedies - The Anthra Project. In: Tropical Animal Health and Production, Vol 34, Number 2, March. 2002, pp 121-143, Kluwer Academic Publishers in association with the Center for Tropical Veterinary Medicine, University of Edinburgh).

The Raika shepherds in India rely on both indigenous and western medicines, but resort to western treatments -- vaccines, injections, antibiotics, and deworming medicines--mostly when indigenous medicine fails. Government veterinary hospitals are notoriously unreliable: needed medicines are often unavailable, and doctors inattentive to the animals of the shepherds. (Profits on the move: The economics of collective migration among the Raika shepherds in India, by Arun Agarwal, in: Human Organization, Winter 1998)

Proper access to veterinary services was one of the main concerns raised by the Kuchis in Afghanistan (FAO). A medicine against the most important camel disease, trypanosomiasis, is yet to be developed.

Is productivity of pastoralist systems lower than of sedentary systems?

The question reflects a prejudice in the first place. Systems are usually not compared. Above all, sedentary systems are associated with industrial breeds or crossbreeds. Milk and meat production per animal is compared to local breeds, and the results speak against local

breeds. Many livestock scientists deplore the poor milk and meat yields per animal of the local breeds.

For example, “in Turkey, average carcass weight of cattle has increased from 120.5 kg in 1984-86 to 176.7 in 1997-99, an average growth of nearly 3 percent annually. This number is approximately 2 and 1.5 times less than USA (247 kg) and Europe (320), respectively and slightly higher than Africa (133 kg). Average lamb carcass yield has increased from 12.1 kg in 1984 to 14.9 kg in 1998, an average annual increase of 1.6 percent. However, this number is well below the USA (33 kg) and slightly higher than Europe (14 kg). It is commonly accepted that per-cow milk yields in Turkey have also grown since the early 1980s. However, per-cow milk yield in Turkey is still low (1567 kg) and approximately 4.6 times less than USA (7227 kg) and 3.4 times less than Germany (5320). Only 20 percent of cattle, for example, were high yielding variety breeds” (C Akbay and I Boz (2005) Turkey's livestock sector: Production, consumption and policies).

Another author stresses “cattle milk yield in India is about 12–15% that in the USA, Canada, and Israel. Meat yield of sheep and goats is about 60% less (Technology Options for Sustainable Livestock Production in India Documentation, Adoption, and Impact of Livestock Technologies in India ICRISAT-Patancheru, India 18–19 January 2001).

In consequence, many scientists recommended to introduce high yielding breeds or crossbreds in dry areas. As this would not work in pastoralist systems, their recommendations pertain to industrialized production. Often, smallholder farming is also addressed with high-yielding breeds of industrialized countries that produce only under specific optimum conditions. With regard to cattle, Friesians have largely replaced local breeds (Shami and Golani cattle) in Syria and about 20% of cattle in Turkey (FAO).

So far, mostly cattle breeds have been replaced by improved breeds. Sheep and goats do not easily lend themselves to stall keeping, where conditions can be controlled and better adapted to the needs of improved breeds. Also, there are several documented examples where imported breeds of sheep and goats did not live up to the local conditions (Gura in Seedling, GRAIN).

Local breeds are highly valued for their performance under the difficult conditions of pastoralist systems. They have to move long distances on stony and steep ground, overcome huge differences in altitudes and temperatures, withstand weather extremes, poor feeding and often droughts. Each region has its own breeds specialized to the conditions, resulting in a great diversity. A recent survey of camel animal genetic resources identified 27 different camel breeds in Pakistan.

FAO has detailed descriptions of many breeds of the region (DAD-IS database). Some of them are so productive that the global livestock industry adopted the breed, like the Syrian Awassi sheep. Also in Jordan, the main sheep breed is the successful fat-tailed Awassi; 92% of the goats are of the indigenous black Baladi breed and 8% are Shami and crossbreds (ILRI).

Usually, productivity is related to the breed and to its milk, wool and meat yields. Performance with regard to draught power, dung, resistance to disease, risk insurance/ drought resistance are not considered, not even the cost of inputs like fodder and medicines. Fertility (how many offspring as percentage of females) is sometimes assessed, occasionally as a health indicator, but fertility is also an important indicator of the success of a production system. Nineteen flocks monitored in the southwest region of Afghanistan in 1999 had reasonable lambing percentages averaging 84%. Fertility rates for sheep and goats for the years 1996 to 2000 have been determined by FAO:

Species	1996	1997	1998	1999	2000
Sheep	71%	82%	90%	91%	72%
Goats	96%	117%	115%	104%	68%

(FAO Afghanistan)

Pasture management

Rangeland quality

Very detailed information on the vegetation of pastures is available from FAO on all countries under report, except for Israel and Palestine. Several of these studies assess the quality of the pastures, and point at an increasing loss of quality.

In Iran, for example, the condition of the rangelands has deteriorated drastically. The results of a recent census show that the area of good range has come down to 9.3 million hectares, fair to good 37.3 while poor ranges have increased up to 43.4 million hectares (Technical Bureau of Rangeland, 2000, cited from FAO).

Overgrazing has caused the near complete loss of edible species from the Himalayan pastures. Weeds such as *Stipa*, *Sambucus*, *Aconitum*, *Cincifuga*, *Adonis*, and *Sibbaldia* have heavily infested these pastures (FAO). In Pakistan, rangelands are producing only 10 to 15 % of their potential, according to FAO.

Amount of fodder from pastures and grasslands

Some of the FAO studies estimate the amount of fodder available from the pastures. The objective sometimes is to calculate the "carrying capacity", i.e. the number of livestock or livestock units that can be fed from the pastures. This may be then compared with the stocking rate – in order to demonstrate and quantify overgrazing. Other feed sources are usually taken into account.

A methodology to assess forage production and utilization is described in Muhammad Rafique Sardar (2003) :Agro-Pastoral Production Systems Of High Altitude Pastures, Upper Kaghan Valley, NWFP, Pakistan, in: FAO Transhumant Grazing Systems in Temperate Asia)

The livestock population in Pakistan, for example, is supported by feed resources derived mainly from crops, fodder, rangelands and other grazing areas, and from agro-industrial by-products. It is estimated that existing feed resources are deficient by 29 and 33 % for total digestible nutrients (TDN) and crude protein (DP, digestible protein) respectively. The details are summarized in the Table below:

Estimates of available livestock feed and nutrients in Pakistan

Feed	Quantity (M t)	Total Digestible Nutrients (M t)	Digestible Protein (M t)
Green fodder	59.0	8.2	1.1
Dry roughages	48.8	18.2	0.3
Concentrates/agro-industrial by-products	3.2	2.0	0.4
Range/pastures	-	11.2	0.8
% deficiency	-	29	33

Source: Malik, 1988; Akram, 1987 cited from FAO

In Iran, the contribution of different sources of fodder production, in 1999, was as follows (FAO)

Source of fodder	Production (1,000 tons Total Digestible Nutrients)	Contribution %
Fodder plants	4,155	17.5
Crop residues	7,322	30.8
Agro-industrial by- products	6,394	26.9
Range forage	5,885	24.8
Total		100

In Afghanistan, assuming an average dry matter productivity of 700 kg/ha/year and 50 percent utilization, the total amount of dry matter available from the grassland is estimated at about 20 million tons (FAO). In addition, an estimated 3.5 million tonnes of roughage from agricultural by-products is available. A more recent study disputes this estimate: "It seems to imply that 89% of the land area of Afghanistan is used as rangeland, which seems to be on the high side. Using a more realistic percentage of grazeable area of 70%, the dry matter off-take would be 15,8 million tonnes. This figure does not take into account the other forms of supplementary feed, like bread, seed cake, imported feed, maize etc. Glatzer calculated that 18% of the income is used on the purchase of supplementary feed in 'normal years', and the author obtained information from pastoralists in Nangarhar and Laghman that they spend between 300 and 2000 Afg (US\$ 6 to 50) on supplementary feed per animal per winter season. This figure also does not consider the grazing of pastoralists' animals on agricultural fields after harvesting. Therefore the real use of the resource base by the pastoralists can not easily be quantified, and the 'carrying capacity' of the land can not be estimated on the basis of the range land alone; calculations would inevitably lead to the false conclusion of severe overstocking, even at times when livestock numbers are known to be very low." (Frauke de Weijer (2005): Towards A Pastoralist Support Strategy. USAID / RAMP).

Shankar and Gupta (1992) have classified the Indian grazing lands as fragile eco-systems and have ranked them as class IV and V in their land capability classification. The carrying capacity of these areas is 0.20 to 1.47 adult cattle units (ACU)/ha, but the present stocking rates are much higher. In semi-arid areas, the present stocking rates are 1 to 51 ACU/ha against the carrying capacity of 1 ACU/ha (Shankar and Gupta 1992) while in the arid areas, the stocking rates are 1 to 4 ACU/ha against the carrying capacity of 0.2-0.5 ACU/ha (Raheja, 1966) (all cited from FAO).

It is calculated that 31% of the meat production of Iran, 218,000 tons per year, is associated with range. Annual dry matter production of rangeland is estimated at 10,7 million tons (Fazilati and Eraghi, 1984). This equals to 5.9 million tons of TDN per year. Having conversion coefficients of 55%, 43% and 36% for conservation of range forage to TDN it is calculated that 38.5, 30 and 25 millions of animal units could be supported by the rangelands respectively for a grazing period of 8 months (FAO).

On the basis of grazing season, rangelands could be put into two categories: mountainous, uplands characterized by their cool summers; and plains, lowlands characterized by their warm winters. The area of summer grazing rangelands is estimated to be 23 million hectares producing 6.21 million tons equal to 3.415 million tons of usable TDN. Grazing on these rangelands starts from early spring and continues until late summer. It is calculated that 54 million animal units could be grazed on these rangelands for a period of 100 days. Winter and fall grazing rangelands located on lowlands are 67 million hectares and are mostly used in winter. They produce 4.5 million tons of forage or 2.47 million tons of usable TDN.

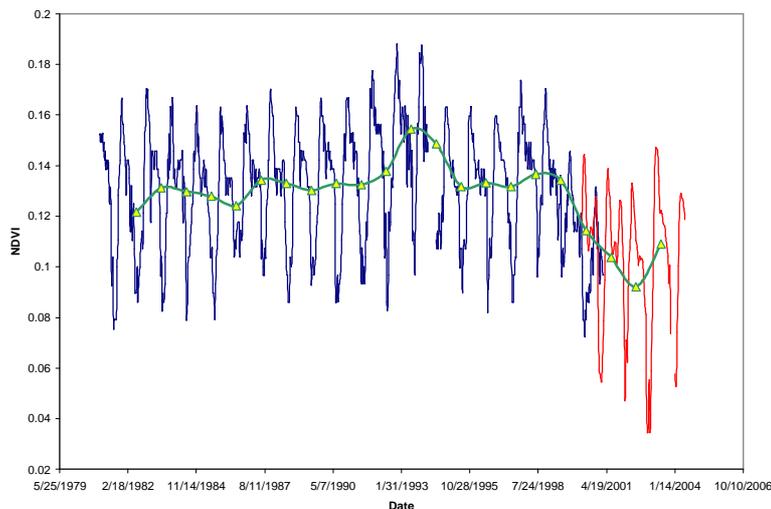
The production figures cited here are just for the normal years from the rainfall point of view and occurrence of drought is a normal feature with 13 drought years during the past two decades. Iran along with some of her neighbours suffered a very prolonged drought. Drought has many negative effects on the environment and the rangeland is no exception. Based on a report by the UN, the total losses of crop and livestock due to drought in year 2001 in the agriculture and livestock sector is estimated at 2.6 billion US\$. It was estimated that 75 million heads of livestock were being affected and 900 million US\$ of damage was being inflicted. The striking drought of 1999-2000 caused a 41% reduction in the total forage of the rangelands, equal to 4.4 million tons (FAO).

In Jordan, the rangelands support about 88 500 people in 12 200 livestock-owning households. In the past, rangelands provided around 70 percent of feed requirements for animal grazing in Jordan, but today it has declined to about 20-30 percent. (Laith Roussan (n.d.) Executive Summary – Jordan: Community and household-level impacts of institutional options for managing and improving rangeland in the low rainfall areas of Jordan (Jordan University for Science and Technology. Paper co-authored with Faisal Awawdeh, Emad Karableh, Samia Akroush, Khaleal Abu Soui, Nadira Al-Jouhari, Enass Ghraibeh and Tidiane Ngaido).

Rangeland overgrazing and recovery

Overgrazed pastures are recorded from most places, with observations on “the near complete loss of edible species. Weeds such as *Stipa*, *Sambucus*, *Aconitum*, *Cincifuga*, *Adonis*, and *Sibbaldia* have heavily infested these pastures”, reports FAO about the Himalayas. “The impact of overgrazing on the vegetation is evident from the excessive uprooting of the green matter (grass and bushes), leading to reduced seeding, reduced regeneration, and the consequent loss of plant production in the next year. Also, there is a change in the floristic composition, a decline in volume and frequency of plants” (FAO Jordan). Many others could be cited, reporting land degradation and erosion in the worst cases.

Frauke de Weijer discusses methodologies to assess overgrazing: “The NDVI (Normalized Difference Vegetation Index) does provide information on the dynamics of general trends in the growing season of a region. The graph below shows seasonal and annual changes in vegetation.



The NDVI can only provide general information on relative vegetation growth and dynamics. Without extensive ground-truthing it can not provide information on the current status of the range lands; in terms of potential rangeland degradation, species composition and palatability, etc.

A range land assessment was conducted by IOM for the provinces of Zabul and Ghazni, through the University of Arizona. Stocking rates were determined for the summer pastures, based upon a number of assumptions. A number of assumptions were made (weight of average sheep and dry matter intake per annum, threshold of production below which the land is not utilized, threshold of steepness of the slope under which the land is not utilized, the number of days the grazing is used, etc). It has proven very difficult to compare these recommended stocking rates with actual or potential livestock numbers, due to difficulties in matching the districts and insufficient knowledge of the actual management patterns. Additional research is required to validate the assumptions, obtain more information on actual pasture use and on the palatability and nutritional value of the different plants. This study also did not focus on on-ground evidence of overgrazing and can therefore not answer questions regarding potential degradation of the pasture.

Only in the Registan, a comprehensive assessment of the status of the water and vegetation conditions was carried out by CADG in cooperation with Cordaid. They conclude that in certain areas the rangeland has been severely degraded, and the seed bank has been depleted. In other areas however, the pasture has returned after a few rains and though it will take more time to fully recover it has the potential to do so, and in other areas the pasture was found to be ‘excellent’.

In other areas of Afghanistan no such assessments have been carried out, and even though many documents seem to state that ‘the range lands are overgrazed and degraded’, there does not seem to be any evidence to support these claims. In fact, due to the conflicts over pasture access certain areas may even been under-grazed. “ (Frauke de Weijer USAID)

On the recovery potential of overgrazed pastures, there is anecdotal evidence: In Afghanistan, “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” (FAO).

De Weijer concludes: “It is of crucial importance to gain a better understanding of the current status of the rangelands, of its potential to recover, and which range management practices can support the recovery. However, to do this at a national level may lead to similar problems in interpreting the results as faced by the IOM study. It may be more effective to conduct such assessments at a more small-scale level.”

The Qashqai and other pastoralists have also developed systems for rehabilitating rangelands and improving vegetation. For instance, they have developed a system of planting seeds of wild plants along the migration route (small bags filled with seeds were carried around the necks of sheep and goats and the seeds would spill out of small holes in the bag as the herds migrated across the mountains), assessing the number of livestock that a rangeland could carry in any given season and adjusting their numbers of livestock accordingly, discussion and agreement on the price to sell livestock, and finally leaving fallow certain areas of grazing lands that were being exhausted. (The role of Qashqai nomadic communities in reducing vulnerability to recurrent drought and sustainable livelihoods development in Iran - case study seeks to understand how local pastoral communities could play in the management of drought in Iran. CENESTA (Centre for Sustainable Development), Iran for the Rural Institutions and Participation Service, FAO, February, 2004).

Water point development and feed subsidies: Well-meant causes of degradation

The development of water points for human and livestock use in arid lands often causes land degradation. Around the water points, bare surfaces are caused by animal trampling. Severely degraded land typically accounts for 5 to 10 percent of the total area. Normally, soil fertility is quite high but normal vegetation patterns are impeded by the impact of hoofs, including soil compaction, and heavy grazing. Water development in arid areas might upset entire ecosystems by changing the relationship between traditional wet and dry season grazing areas, and converting traditional dry season grazing into year-round grazing (FAO (1997): Production Systems Management: Livestock-Environment Interactions. Briefing Notes).

In Jordan, it was generally considered that Bedu herds in the pre-modern era were limited to some 150 to 200 animals, since this was all that could be managed by the labour available in a family unit. “The system of allocating subsidized feeds on a per-head basis has created a major incentive to increase herd sizes, and in the Badia – the rangelands covering most of eastern Jordan – herds of 1 000 to 2 000 sheep are common. The forage resources cannot support herds of this size, and the desert is increasingly used to store animals while sacks of feed are trucked in” (Blench, 1995).

Pasture utilization: Mobile can be more sustainable than sedentary

Very little data is available on how pastoralists actually utilize pastures and grasslands: In Pakistan’s Khagan Valley, “the monthly and seasonal utilization was much higher than recommended 50% utilization for such ranges. The forage utilization was 20, 66, 71 and 69 percent for June, July, August and September, respectively. The highest utilization was recorded for the month of August” (FAO).

Some authors note that sedentary herding causes much greater overgrazing damage than mobile pastoralism: In Afghanistan, “transhumant (Kuchi) herders, who practice seasonal migration 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” (FAO, see also Frauke de Weijer).

However, it has also been noted that moving around livestock by truck has greatly contributed to overgrazing of the Badia steppe in Syria and Jordan. The critical factor is drinking water for

the animals. In the past, when the drinking water reserves had vanished, it was time to leave the Badia. Nowadays, herds remain much longer, since water is also transported with the herds. The vegetation recovery period is considerably reduced.

Communal land tenure is crucial, but no tragedy of unregulated commons

Hardin's (1968) concept of the 'Tragedy of the Commons', argued for private tenure, using grazing as an example, based on the assumption that access to a common resource leads to overexploitation because the livestock owner will view the grazing resource as a free commodity, thus maximising herd size at the expense of other herders. Refuted extensively in the academic literature, his argument fails to recognise common property arrangements, and in reality reflects a situation of open (or unregulated) access, a situation that is the exception rather than the rule. Despite the overwhelming evidence against his argument, the concept of the 'Tragedy of the Commons' still holds strong sway amongst policy-makers throughout the globe, resulting in inappropriate land tenure policies for marginal lands (Camille Richards: Individualising the Commons. Privatisation of Grazing Lands. In: ICIMOD Newsletter 35).

FAO reports that for a long period in the past, Jordan's grazing lands were characterized by effective traditional land tenure systems and grazing rights which were associated with tribal institutions. This protected the resources in these lands and organized their use in a way that assisted in their conservation and continued productivity under the prevailing environmental and social conditions. With the elimination of these systems and rights and declaration of grazing lands as state-owned land, open for everybody, new land uses encroached. Pastoral communities began to plough marginal land at the borders of the Badia to grow cereals in order to confirm property rights, when the survey and registration of lands started in the forties. Settlement of people and building started soon afterwards. Land survey and property registration were resumed in the eighties. Most of the marginal grazing and some deep-desert lands were registered. Estimates indicate that at least 1 500 000 hectares (or 15-20 percent of the traditional grazing land) where the vegetation cover was damaged, were registered to pastoralists. Many of these areas were over-used without consideration to their resource requirements or their productivity. The change in land tenure, also led to a lack of the incentives that encourage pastoralists and Bedouins to maintain and conserve their resources and lands and control their grazing (FAO Jordan)

In Syria, similarly, pastoral communities evolved its code of laws and customs and its organization of groups and subgroups on family relationship. Each group used to maintain grazing rights in its 'DIRAH' or 'MANZEL' as Hema and negotiated when necessary with the other groups for movement of its livestock to areas of more favourable climatic conditions during periods of drought. After the Second World War the national administration mistakenly decided to settle the Bedouins thinking that Al-Badia would sustain dry farming, thus encouraging the sale of rangelands. Also in the meantime, some political parties who were after pastoral votes had pressed the administration to free the pastoral peoples from their sheiks institution. Abolishing the tribal law in 1958, therefore, led to the death of grazing rights (Urf). It can be concluded that the replacement of allocated grazing land tenure by no-man's land tenure (al shi'you'e or open access) has opened the door widely for all range degradation symptoms, including, ploughing, early and overgrazing, uprooting the shrubs and multiple tracks from vehicles. In 1970, legislative act 140 was passed that allowed to stop land ownership in Al-Badia, to fine for ploughing and confiscate equipment, and reallocate the rangelands to sheep fattening cooperatives, completes with grazing rights, demarcation of boundaries and range improvement plan. A network of warehouses for storing feed reserves and fattening centres dot the whole steppe. The programme of cooperatives was assisted internationally by UNDP, FAO, WFP and World Bank. Soon after, however, an administrative change re-established the old policy based on the belief that the shortage of forage in Al-Badia is due to climate change and not to land tenure and so it is thought that the development of pastoral communities can only be through feed and water provision. (FAO Syria)

In Turkey traditionally pasture areas belong to the state and are open for common use. The Pasture Law of 1998 brought a new regime to pasture ownership. According to the Pasture Law, pastures will be assigned to municipalities or village communities once their boundaries are determined and certified. After certification is completed, carrying capacity and duration of grazing will be determined for each area, then the villages will be given the right to graze the

previously determined and certified areas for a given period of time with the set number of animals (FAO Turkey Pasture/Forage Resource Profiles. Alptekin Karagöz January 2003).

In Afghanistan, currently, a land policy review commission has been established, lead by the Ministry of Justice. It is of the highest importance that land tenure insecurity is taken into consideration and measures are identified. Local negotiation processes, such as described above for grazing rights, are probably also the best solution for solving these issues. But they will need to be embedded in a clear legislative framework, which leaves no ambiguity towards these 'residential users' rights'. (Frauke de Weijer)

From ancient times and particularly since the Islamic era, land tenure in Iran was varied and included state ownership, lands for the benefit of the public or charities, and land under customary ownership or control of tribal and nomadic pastoralists. The latter covered the greater part of the arid and semi-arid lands, where pastures were nominally owned by the khan, or tribal chief, who would assign them to tribal groupings against a share of their yearly profits (around 3% of their grazed livestock). Other land was owned by the government (khalisa) or by non tribal people who would rent them for a fee in cash or in kind. (CENESTA)

The joint policies of Agrarian Reform and Nationalisation of Natural Resources as part of the 1963 "White Revolution" of the Shah altered the structure of rural society and its livelihood system in a fundamental way, in particular as they severely weakened or even destroyed customary institutions of natural resource management and mutual aid associations, such as for rangeland and water use and agriculture. These reforms failed, however, to replace these with suitable alternatives and rather set up an expensive and inefficient government bureaucracy. The agrarian reform law limited the amount of land a landowner could keep; the government was authorised to purchase the rest at a specified rate. A huge loophole was introduced by making an exception for "mechanised" farmlands, which led to large tracts of pastures being ploughed up in order to maintain their ownership (CENESTA).

Grazing permits were introduced in order to enable a set of US oriented range management experts to control rangelands. The range management plans, however, failed due to the neglect of socioeconomic matters and the large area involved (FAO). A revision led to grazing permits "issued for 689,000 households for nearly 55 million Animal Units (AU) to be grazed on 56 million hectares of rangelands. On the basis of analysis of recent data, the area of a grazing enterprise is 81 hectares and mean herd size of households is 80 AU. This is at odd with households requirement as it is revealed by the Faculty of Natural Resources of Tehran University. It has been concluded that running a normal life on the basis of extensive grazing animal husbandry needs 530 hectares of land to be grazed by 229 AU for a period of 8 months. According to this calculation grazing usufruct could be granted to 18,000 households. This means that over-population is still one of the most important problems of the rangelands" (FAO).

The Iranian NGO CENESTA collaborated with communities to develop more efficient range management and land tenure approaches. The project includes participatory research on rangeland management models (customary, government/expert-based and new eco-social); capacity building of pastoral communities; promotion of Community Conserved Areas; support for community investment funds (sanduqs) for sustainable livelihoods; and support towards legal and policy reforms.

"The communities who engaged in the project began by identifying and analysing their problems and prospects—in particular regarding migration, livestock and rangelands—and decided that, in order to achieve their agreed objectives, it was necessary to recreate their natural resource management institutions. They then analysed their existing or customary structures in meetings with the community elders and decided to establish some new councils for sustainable livelihoods, each with their own investment fund or sanduq. Modelled on the basis of customary organisations, these councils are composed of representatives of each of the 14 clans of the Kuhi sub-tribe, elected by their constituent oba chiefs (an oba is the smallest unit of pastoralism containing a set of "tentholds" or households). In fact, the councils are rehabilitated versions of the traditional community organisations that had disappeared as a result of decades of social and economic pressures and injustice. The councils have undertaken a number of activities related to livelihoods and wealth generation, environmental issues and legal and policy work" and came up with a series of policy recommendations (Lessons from the experience of Land Reform in Iran—impact of nationalisation of rangelands

on nomadic Pastoralism. Summary of report prepared by Centre for Sustainable Development (CENESTA), ICARRD, Porto Alegre, Brazil, 7-10 March 2006 with the support of UNDP/Dryland Development Centre and FAO Iran).

Increasing herd transport by motor vehicle: Pastoralism may drive too far

In Syria, large trucks are increasingly used to transport e.g. sheep and water around Al Badia. The soil surface breaks, erosion starts, soft sand or mud develops and routes become impassable. Vehicles drive around these areas, so that in some places, areas eroded by vehicles have become one kilometre wide (FAO (2003): Syrian Agriculture at the crossroads).

From Iran it is reported that, because of fragmentation of their migratory routes, pastoralists, like members of the Koochi Sub-tribe, above, are forced to migrate along roads by truck (The role of Qashqai nomadic communities in reducing vulnerability to recurrent drought and sustainable livelihoods development in Iran - case study seeks to understand how local pastoral communities could play in the management of drought in Iran. Prepared by CENESTA (Centre for Sustainable Development), Iran for the Rural Institutions and Participation Service, FAO, February, 2004)

Opportunity costs

How much value is added by pastoralism per unit land/water? It would be helpful to have such an estimate if opportunity costs are to be assessed. So far, alternative uses are described with their economic and ecological implications.

Shrubs for fuel: A root of degradation

In Afghanistan, 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 organise uprooting and purchase of shrubs from remote areas to supply urban markets (FAO). Not taking action against this practice will cut on rangeland availability for pastoralism.

In Syria, shrubs and trees are pulled up for fuel and medicinal use. As they are pulled up by their roots, there is no plant recovery, and erosion is fostered. With the availability of fossil fuels, the practice has been generally decreasing, but increasing population as well as fuel prices may reverse this trend (FAO (2003): Syrian Agriculture at the crossroads).

In Iran, approximately 5.4 million cubic metres of range shrubs are cut-off or uprooted annually to provide fuel for rural people (FAO 2004).

Renewable energy plants – an opportunity at not yet known cost

In the arid and semi-arid regions, particularly on the degraded lands and lands affected by moving sands, *Jatropha curcas* L. has proved to be a promising oil-bearing tree. The seeds of this Euphorbiaceae tree contain more than 30 % oil, which can be used for making bio-diesel. The seed cake produced after oil expulsion is rich in nitrogen (> 5 %), phosphorus (>2.5% P₂O₅) and potassium (1% K₂O) and can be converted into valuable organic manure for improving physical and chemical properties of the soil. The plant propagates freely from seeds as well as from cuttings and can start producing fruits in two to three years after establishment. It is well adapted to the harsh environments of desert margins, and can withstand drought once it is established through supplemental irrigation in the dry areas.

Preliminary studies have shown that it could prove a very promising species for rehabilitating degraded areas and protecting the land from wind erosion when introduced in dry areas within the framework of watershed management. A well established plantation of *J. curcas* could produce on good soil on an average about 5 tons seed/ha/year giving 1500 kg/ha oil and 2500 kg/ha seed cake. However, under marginal conditions a yield of 1.5 tons seed/ha can be expected. The crop is being promoted as a valuable source of bio-fuel produced on degraded drylands in several developing countries.

The government of India has a very ambitious plan for promoting *J. curcas* production on degraded lands and the private sector and the non-governmental organizations are providing technical support to farmers to harness full benefit from this valuable plant (Prof Dr. Mohan C. Saxena, International Center for Agricultural Research in the Dry Areas (ICARDA), *Jatropha*

curcas L., an excellent source of renewable energy in the dry areas. Eighth International Conference on Dry Lands Development 25-28 February 2006, Beijing, China)

Medicinal plants from the Drylands: An opportunity to be tapped

Harvesting medicinal plants in Iran dates back to past centuries. According to current information the amount harvested was some 39,000 tons (valued at 77.7 million US\$) in 1989-1993. Considering the land area of the country, harvested products should be much more. *Ferula gummosa*, a plant widespread over 700,000 hectares, has a juice called galbanum which is used in different industries e.g. medicine. In 1996 and 1998, 15 and 27 tons of galbanum were exported, respectively. The income through the export of galbanum in 1998 alone was some 180,000 US \$. There are lots of range plants with medicinal and industrial value. Nowadays, some companies cultivate such plants. (FAO)

Crop cultivation and irrigation schemes: An opportunity at high cost

In Himachal Pradesh; India, a study found that village areas and forest margins used by villagers as common-property were being converted into private property, thus pushing the mixed use zone for products such as firewood, animal fodder and bedding, further upslope towards the protected forest. (F. Berkes, G.S. Chauhan, I. Davidson-Hunt, K. Davidson-Hunt, C. Duffield, J.S. Gardner, L. Ham, B.W. Pandey, J. Sinclair, R.B. Singh and M. Thakur: A Mountain Watershed Ecosystem in Himachal Pradesh)

Similarly, Nanda Devi Biosphere Reserve, India A Case Study in the Buffer Zone analyzes the impact of loss of grazing area on transhumant pastoralism, the current state of monetary return from livestock rearing, and the output–input ratio in terms of energy currencies in villages inhabited by transhumant pastoralist populations and villages now practicing sedentarized lifestyles. Although small ruminant-dominated animal husbandry is providing monetary benefits to local populations, the system is consuming more resources than it produces in terms of energy currencies. Transhumant Pastoralism in the Nanda Devi Biosphere Reserve, India A Case Study in the Buffer Zone Sunil Nautiyal, K. S. Rao, Rakesh K. Maikhuri, Krishna Gopal Saxena 2003

Dr Amrita Patel, Managing Director of India's National Dairy Development Board (NDDB), stated in her keynote address that 'in the coming decade, it is the goal of NDDB that all livestock be removed from degraded gauchar (common) lands, to convert small producer dairy herds to completely stall-fed enterprises'. These words express the hopes of an environmentally-conscious leader of cooperative dairy development who understands that village common lands in India, needed desperately for rural water catchment and firewood production, are currently unable to sustain the intense grazing pressures to which most are submitted. Unfortunately, in the state of Gujarat, the very heart of Indian dairy cooperative success, there is presently little hope of reducing grazing pressure on commons, regardless of NDDB's efforts to promote composite feeds and zero grazing. Reduced to a fraction of their former area, and depleted of their most palatable vegetation, Gujarat's common lands are utilised by small ruminant pastoralists who can neither afford commercial feeds, nor can aspire to productive dairying. Nonetheless, these pastoralists, and their goats, sheep, and the manure they produce, are vital to the state's agricultural economy. Richard P. Cincotta and Ganesh Pangare Population Growth, Agricultural Change, And Natural Resource Transition: Pastoralism Amidst the Agricultural Economy of Gujarat

Large pasture areas have been converted to cropland in Turkey. According to FAO, there were 440.000 km² of grazing land during the 1920s, while by 1980, rangeland had decreased by half, to 217.000 km², due to mechanization of crop production.

In Afghanistan, 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 (FAO)

Such danger seems not always present, as in the State of Israel First National Report On the Implementation Of the United Nations Convention to Combat Desertification, November 2000: "Grazing pressure in the semiarid regions was reduced as well, and many semiarid rangelands and rain-fed croplands were transformed into irrigated croplands. The sustainability of this agricultural development and its potential to avert salinization risks in the semiarid region have been driven by transportation of high-quality irrigation water from dry subhumid-generated resources. This has been augmented by water conservation measures hinged on the invention and implementation of drip irrigation and fertigation technologies, and by backing of agricultural research and assistance of agricultural extension services. Most dry subhumid areas, as well as many arid and even hyperarid areas have benefited from the agricultural experience gained in the semiarid region and the infrastructure established to support it. By the same token, afforestation practices developed for the dry subhumid areas have gradually "migrated" to semiarid and even arid regions. The discovery of geothermal, brackish fossil groundwater in the Negev and the adaptation of conventional greenhouses to growth houses ("protected agriculture") in dry and hot regions of Israeli drylands, provided Israeli farmers with options of intensive cash-crop agriculture and recently also of aquaculture – practices that are economic on land use and hence of little if any desertification impact."

Similarly, in Jordan during the last two decades, 20 000 ha of the Badia desert have been irrigated, using underground water, to grow vegetables (especially tomatoes, watermelon and potatoes), plus fruit trees and cereals, especially wheat.

The Indian government has been supporting irrigated agriculture by subsidizing power, fertilizer and high-yielding crops. As a result, in the Thar Desert, a tribe of "tubewell nomads" has arisen. Farmers pump up groundwater to grow crops such as mustard and wheat. As irrigation allows the growth of more than one crop, this has reduced the fallow periods on the fields when pastoralists can graze their herds after harvest. Irrigated cropping commonly goes on for a few years – during which farmers may have to deepen their wells with dynamite from time to time – until the groundwater level sinks below the reach of their pumps. Farmers then move on to the next spot, leaving behind barren, salty ground in place of the previous drought-resistant vegetation (Case study: Camels on the way out in Rajasthan Evelyn Mathias, Sept 2005).

The browse in doublecropped irrigated fields constitutes a new adaptive niche for the raikas. The current situation has reversed earlier exchanges between farmers and shepherds. Prior to the arrival of irrigation and the increasing shortage of fallow fields for the shepherds' flocks, it were the farmers who paid the shepherds for the manure from the sheep. The reversal of monetary flows reflects the changing reality of the asymmetrical relationships between the farmers and the shepherds, driven in part by the efforts of the Indian state to promote irrigated agriculture. With increasing use of irrigation, chemical fertilizers, and pesticides, the importance of sheep manure as an agricultural input has declined. (Profits on the move: The economics of collective migration among the Raika shepherds in India, by Arun Agarwal, in: Human Organization, Winter 1998)

Conservation: An opportunity not yet lost

In the early 1990s, the Indian Institute of Public Administration studied grazing in national parks and sanctuaries. Most of them allowed grazing of livestock within their boundaries, and where it is not allowed, it occurred anyway. Many of the protected areas had a density of cattle and of goats higher than the national average, and fodder extraction was common (Shekhar Singh, Indian Institute of Public Administration, in: Victoria Dompka (ed.) Human Population, Biodiversity and Protected Areas: Science and Policy Issues. AAAS 1996 Since the early years of the new Millennium, a strict policy is implemented that excludes foraging and fodder extraction from protected areas.

For centuries, pastoral communities have been grazing their sheep and goat flocks in the vast alpine rangelands of the Great Himalayan National Park in Himachal Pradesh. Despite research that showed little evidence to substantiate excessive overgrazing, the Department of Forests extinguished all use rights within the park. This was done without providing monetary compensation to the 10,000 grazing rights' holders. Instead, alternative forest land was offered, but this can not replace the alpine forage resource that is so vital for sheep wool production and health. Perhaps the case of the Great Himalayan National Park in Himachal Pradesh can serve as a lesson for policy-makers in the process of designing new and

innovative approaches to community-based conservation (Camille Richards, Extinguishing Grazing Rights in Protected Areas: The Case of the Great Himalayan National Park, India. In: Individualising the Commons - Privatisation of Grazing Lands. ICIMOD Newsletter No. 35 Management of Mountain Commons in the Hindu Kush Himalayas).

In Pali district of Rajasthan, where the traditional summer pastures have become part of the Kumbhalgarh Sanctuary and are therefore off-limits to grazing, the Raika camel breeders sold away large numbers of camels and lost their livelihoods (LPPS, Misereor, FAO, Life Initiative (2004): Saving the Camel and Peoples' Livelihoods. Building a Multi-Stakeholder Platform for the Conservation of the Camel in Rajasthan. International Conference, 23-25 November, 2004, Sadri, Rajasthan, India). After much damage on pastoralists' livelihoods was inflicted, legal action is being taken, as an unprecedented step, by several pastoralists groups.

In less densely populated areas, it may be easier to reconcile conservation needs with Pastoralism. Studies in a Snow Leopard sanctuary in Ladakh, India, showed that the three villages lost 7.1% of the total livestock holding to the snow leopard, which translated to an estimated loss of c. US\$ 185 per household per year. This study suggests ways how pastoralists could contribute to snow leopard conservation, and benefit from eco-tourism. It also evaluated the influence of domestic sheep and goat grazing on the habitat use of Tibetan argali (*Ovis ammon hodgsoni*) in a prospective wildlife reserve in Ladakh. (Interactions between argali and livestock, Gya-Miru Wildlife Sanctuary, Ladakh, India. Final Project Report by Tsewang Namgail to The International Snow Leopard Trust January 2004) Similarly, the international workshop on the conservation of the asiatic cheetah held in Mehdishahr, Semnan, Iran: 20-22 January, 2004 elaborated lessons from national and international experiences.

Fire control in afforested areas

In arid countries where afforestation is used to prevent and combat desertification, pastoralism is often thought to foster land degradation. However, in the planted forests of Israel, researchers have found that grazing considerably reduces understory biomass, enhancing fire control. It was, nevertheless, not known how grazing compared with other fire control methods from the point of view of the forest administration. Nor was it known whether animal owners could derive any appreciable benefit from being allowed to have them graze in the forest.

A cost-benefit analysis was conducted in the afforested area of Yatir, in the northern Negev desert of Israel, assessing the profitability of grazing for the Bedouin herders and its usefulness to the Jewish National Fund (JNF), the organization managing the forest. Findings show that the herders' use of the forest pastures reduced their forage costs, especially in times of drought, while the JNF received an inexpensive fire control means. It was also shown that within the framework of the management of the forest rangeland by a parastatal, the JNF, entrusting the handling of that rangeland to a dominant kin group of herders contributed to sustainability. Twelve years of collaboration led the JNF to coopt that kin group, turning it into the forest gatekeeper, to the mutual advantage of both the JNF and the group. This research suggests that, given the technical, economical and political feasibility of pastoralism in afforested areas, arid countries might benefit from integrating herders in their struggle against desertification (Henri Rueff, Integrating Pastoralism in Arid Lands Afforestation: a Cost Benefit Analysis of the Interaction Between foresters and Bedouin herders in Israel).

Conservation incentives

The relationship of upstream and downstream communities in the same watershed has been explored for the use of natural resources especially in the terms of land use pattern such as grazing lands in an ongoing project on "Developing incentive-based mechanisms for watershed protection services and improved livelihoods" in Himachal Pradesh in India. The project is a part of the Implementation phase of the India country study under the international project: "Developing markets for watershed protection services and improved livelihoods" undertaken by Winrock International India, based in New Delhi.