



‘You can’t go home again’

Pastoralism in the new millennium

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SUMMARY

1. Extensive pastoral production takes up some 25% of the world's land area and produces some 10% of the meat used for human consumption, while supporting some 20 million pastoral households. Pastoral production is split between the extensive enclosed systems typical of North America, Australia and parts of South America and the open-access systems in Africa, the Andes, Asia and Siberia which are still largely the province of 'traditional' producers. The breakdown of the command economies of Central Asia has probably increased the numbers of households depending on pastoral production in the last decade of the twentieth century. Although pastoralists, along with foragers with whom they have much in common, represent an almost archetypically vulnerable social group, donor interest in the sector is minimal.
2. The rangelands exploited by pastoralists often cannot be used by conventional agriculture, although as technical advances spread cultivation into remoter regions, pastoralists are forced into increasingly inhospitable terrain. Although spontaneous settlement is quite common on the fringes of the pastoral domain, national governments are often hostile to pastoralists. Many countries have policies of sedentarisation that derive as much from political considerations as a concern for the welfare of those they wish to settle. However, compelling pastoral nomads to settle has a very unsatisfactory history and is unlikely to meet with long-term success.
3. Pastoralists make substantial contributions to the economy of developing countries, both in terms of supporting their own households and in supplying protein, both meat and milk, to villages and towns. The governments of those countries rarely recognise these contributions by a corresponding investment in the pastoral sector. The pastoral economic system is under increasing threat from the globalisation of the trade in livestock products and unpredictable import policies in many countries. Broadly speaking, the trend in this century has been for the terms of trade to increasingly turn against pastoralists.
4. The marginal lands that have previously been the province of pastoralists are increasingly coming into focus as reserves of biodiversity. Their very inaccessibility has permitted the survival of species eliminated in high-density agricultural areas. Consequently, there is pressure on governments to declare large regions protected areas, both because of pressure from the conservation lobby and the potential income from tourism. Uncertainties about pastoral tenure have made it difficult for pastoralists to lodge effective land claims.
5. The future of pastoralism will depend heavily on political decisions made by national governments in countries with extensive grasslands. Enclosed pastures are unlikely to see any significant extension, but conditions for existing pastoralists will become more difficult as both farmers and the conservation lobby expropriates land. Work with pastoralists, and a more sympathetic understanding of their production systems, could act both to protect their lifeways and enhance their capacity to produce protein on otherwise marginal land.

6. Experience to date suggests that technical inputs will only have a very limited impact on overall output. Only a major policy re-orientation will protect and support pastoralism during the next millennium. Elements likely to become important are;
 - a. Production of niche products, either unusual species or breeds, and meat and milk free from contaminants
 - b. Crop-livestock integration, the effective use of pastoral outputs in mixed farming, particularly the extension of work animals
 - c. Co-conservation, the development of interlocking strategies to link conservation of wild fauna and flora with pastoral production
 - d. The expansion of ecologically-sensitive low-volume tourism, using pastoralists to provide services, particularly in the area of indigenous knowledge

PART I

1. Introduction: pastoral systems worldwide

1.1 Overview

Pastoralism, the use of extensive grazing in rangelands for livestock production, is one of the key production systems in the world's drylands. Nonetheless, throughout much of its long history its reputation has been unflattering, its practitioners marginalised by sedentary cultivators and urban dwellers. Pastoral societies have risen and fallen, fragmented into isolated families or constructed world-spanning empires and their demise regularly announced, often in the face of entirely contrary evidence of their persistence.

By some paradox, anthropologists and social theorists have conducted a prolonged love affair with pastoralism, at times seeing it as an inevitable stage in the growth of civilization or perversely caricaturing it as an anarchic institution ready to pull down that same civilization. Planners have denigrated the mobility characteristic of pastoral societies and novelists have romanticised the wanderings of these same nomads. Development experts, remarking the enormous passing herds, first saw pastoral systems as rich in potential, and later castigated pastoralists as vulnerable and unable to invest in development. To all this, pastoralists have remained largely indifferent, since a certain scepticism towards the schemes and caprices of the external world is an almost inevitable product of the independent image they have of themselves.

The late twentieth century has seen a new upwelling of writing on pastoralism, both sentimental and aggrieved, regretting its inevitable demise and blaming pastoralists for their failure to respond to the vagaries of climate and the international economic system. Investment in pastoral development, which reached a high point in the 1970s, crumbles progressively every year. At the same time, however, pastoralists themselves have become far more articulate and able to communicate their concerns and desires to the outer world. The collapse of the Soviet Empire has opened up the great steppes of Central Asia for the first time in seventy years making accessible a whole world of pastoralism that had been essentially closed to researchers since 1919. Indeed, the likely effect has been to expand pastoralism, as refugees from now collapsed industrial enterprises that only functioned with significant subsidy have sought to revive the only method of subsistence that is practical through much of this region.

The time seems apposite then, for a view of pastoralism in the world as a whole, combining recent insights from archaeology and anthropology with twentieth century experiences of development. Despite a plethora of case studies, monographs and collected papers on African and Asian pastoral systems, integrated worldwide overviews of pastoralism are surprisingly few. The most recent essay in this direction is probably Khazanov (1984) which approaches pastoralism from a historical point of view, focusing on nomad relations with external societies and the origin of the state. The rich and complex literature on pastoral development is effectively ignored, perhaps unsurprisingly from the point of view of Soviet ethnography. More important, however, is the failure to integrate the biological, to recognise that pastoral society is above all driven by the nature and requirements of different species. This monograph is intended to try and provide a synopsis of the present and draw out the implications for the future.

1.2 Classifying pastoral systems

Pastoral strategies can be categorized in a number of ways. The most important of these are;

- a. by species
- b. by management system
- c. by geography
- d. by ecology

In addition to these there is a broad distinction between the developed and developing world. Extensive livestock production is practised in both Australia and North America, under very different conditions from elsewhere in the world, using fenced ranges and unambiguous tenure. This creates a level of investment in land and animals very different from 'traditional' systems.

Pastoralism evolved as a response to two factors, medium human population densities and the presence of extensive rangelands, usually in semi-arid regions, although the reindeer pastoralism found across the circumpolar regions of Eurasia is an exception to this. Where human population densities are too low, i.e. hunting-gathering was relatively easy, then the impetus to herd animals was absent. Hence pastoralism was absent from the rangelands of the New World and Australia in the pre-European epoch. It is debated whether the absence of appropriate species also has an impact on the evolution of pastoralism; for example, the camelids, the alpaca and llama, were domesticated as pastoral species in the Andes in the pre-Columbian era but no pastoralism developed in the New World plains, perhaps for lack of an appropriate species.

Pastoralism has had a vertiginous history in the realm of development agencies. The potential of the world's rangelands and the large numbers of livestock using them was for a long time seen as a major and underused resource and stimulated a vast body of research and development projects, both technical and social. The perceived failure of many of these projects and the linking of livestock to a spectrum of environmental damage caused a major retreat from support to pastoralism in the 1970s and 1980s. The 1990s saw the realisation that pastoralism remained in place, and moreover, the opening up of Central Asia, the largest pastoral region in the world, stimulated a renewed interest in, if not necessarily a wise application, of lessons learnt in the previous decades. The new millennium therefore seems quite an appropriate time to review the status of pastoral production worldwide and particularly to focus on the insights gained by comparing Asian and African pastoralism, as well as to review policy in the light of recent concerns about poverty and vulnerability¹.

Pastoralism is strongly associated with the presence of grasslands, but there are numerous grasslands without pastoralists. This is partly a reflection of history; pastoralists tend to exist in complex relationships with hunter-gatherers, and in most of the New World and Australia, pastoralism never developed because population pressure on land remained limited. Table 1 shows a summary of the regions of the world where pastoralism is found and gives a simplified summary of its status.

¹ The material in this book reflects some two decades' research into pastoralism, but also the insights of many colleagues. I would particularly like to thank Piers Vitebsky and the staff at the Scott-Polar Institute in Cambridge for giving me access to the world of reindeer pastoralism, and also David Bourn, Carol Kerven, Simon Mack, Paul Starkey, Stephen Hall, Cindy White, William Wint and Ian Wright, for discussion and insights over the years. Florian Sommer, Zoë Marriage and Robert Chapman have acted as research assistants on pastoral projects over the years.

Table 1. Regional zonation of pastoral systems

Zone	Main Species	Status
Sub-Saharan Africa	Cattle, camel, sheep, goat	Reducing due to advancing agriculture
Europe	Small ruminants	Everywhere declining due to enclosure and advancing agriculture
North Africa	Small ruminants	Reducing due to advancing agriculture
Near East and South-Central Asia	Small ruminants	Locally declining due to enclosure and advancing agriculture
India	Camel, cattle, buffalo, sheep, goats, ducks	Declining due to advancing agriculture but peri-urban livestock production expanding
Central Asia	Yak, camel, horse, sheep, goat	Expanding following decollectivisation
Circumpolar	Reindeer	Expanding following decollectivisation in Siberia, but under pressure in Scandinavia
North America	Sheep, cattle	Declining with increased enclosure of land and alternative economic opportunities
Central America	Sheep, cattle	Declining with increased enclosure of land and alternative economic opportunities
Andes	Llama, alpaca, sheep	Contracting llama production due to expansion of road systems and European-model livestock production but increased alpaca wool production
South American lowlands	Cattle, sheep	Expanding where forests are converted to savanna but probably otherwise static

It is no accident that the high-capital land management approaches common in Australia and the New World are in areas where populations were hunter-gatherers lived prior to colonial intrusions. Historically, forager cultures have proved the most vulnerable to aggression from agricultural and technology-based cultures; 'guns, germs and steel' against dispersed low-technology populations (Diamond 1997). Pastoralism developed in North and Central America post the Spanish era as Amerindian peoples gained access to European ruminants or migrants from the Old World settled and began to farm (Melville 1994). These have been adopted in very contrastive fashions, with such peoples as the Navaho developing what may be termed 'true' pastoralism, while others such as the Apache evolving highly-focused meat production through collective herds (Kunstadter 1965).

African pastoralists are very unevenly distributed; occupationally specialised pastoralists, principally dependent on camels, cattle and sheep, are virtually confined to the region north of the equator in semi-arid regions (Blench 1998). Agropastoral communities, owning cattle, sheep and goats, also occur in the northern region, but predominate south of the equator.

Estimating numbers for pastoral households worldwide is very speculative. There is a striking difference between Central Asia and Africa in this respect; pastoral societies in Asia tend to have very high populations but to have substantial non-pastoral sectors. The Kazakhs, for example, number some 10,000,000 in ten countries, but only a small fraction these are herders (Benson and Svanberg 1998). The other aspect of the situation in Central Asia, is that the creation of new countries with ethnic bases and freer movement across borders is allowing expatriate members of specific ethnic groups to return to their 'home', thus Kazakhs, Kyrgyz and Uzbeks and all now moving back to the state that bears their name. At the same time, the collapse of industries that had previously been supported by Russian subsidies has forced unemployed urban workers to begin herding with their rural relatives. The situation is therefore dynamic and can be expected to change further in coming years.

Any numbers are therefore highly speculative. De Haan *et al.* (1997) quote an estimate of 20 million households worldwide for pastoral households. Pastoral and agro-pastoral communities account for 20 million and 240 million individuals respectively in sub-Saharan Africa (SSA) (Swallow, 1994 in Holden *et*

al. 1997). Broadly speaking the economic importance of livestock within total household income rises as rainfall declines, and in desertic regions, dependence is near total.

1.3 Pastoral species

Table 2 is a schematic tabulation of pastoral species worldwide, showing their approximate geographical distribution and the main management strategies used to keep them. 'Enclosed' covers fenced or demarcated rangelands operating within a Western economy.

Table 2. Main pastoral species and management systems, worldwide

Species	Scientific name	Main regions	Nomadic	Transhumant	Agropastoral	Enclosed
Alpaca	<i>Lama pacos</i>	Andes	-	+	+	-
Bactrian camel	<i>Camelus bactrianus</i>	East-central Asia	+	+	+	-
Buffalo	<i>Bubalus bubalis</i>	Iran, India	+	+	+	?
Cattle (taurine)	<i>Bos taurus</i>	Europe, West Asia, West Africa	-	+	+	+
Cattle (zebu)	<i>Bos indicus</i>	Africa, Central Asia	+	+	+	+
Donkey	<i>Equus asinus</i>	Africa, Asia	+	+	+	-
Dromedary	<i>Camelus dromedarius</i>	Africa, West Asia	+	+	+	-
Goat	<i>Capra hircus</i>	Africa, Europe, Asia	+	+	+	+
Horse	<i>Equus caballus</i>	Central Asia	+	+	+	-
Llama	<i>Lama lama</i>	Andes	-	+	+	-
Reindeer	<i>Rangifer tarandus</i>	Circumpolar Eurasia	+	+	-	?
Sheep	<i>Ovis aries</i>	Africa, Europe, Asia	+	+	+	+
Yak	<i>Poephagus grunniens</i>	Highland Central Asia	-	+	-	-

The inclusion of buffalo in pastoral herds is rare and those in Iran are thought to derive from the migrations of the Zott Gypsies in the eighth century (see note in Digard 1981:30). In India, the Gujjar and other peoples practise vertical transhumance with buffalos between the foothills of the Himalaya and the alpine meadows (Garwahl 1981).

This discussion excludes birds, notably ducks and geese. Particularly in India, ducks and geese are herded by specialised pastoralists who move them from place to place to exploit changing feed resources. Given the very different parameters of such pastoralism from mainstream systems, they are not treated in the main text but a short discussion is given in APPENDIX II. Historically in Europe and the Middle East, pig-based pastoralism clearly existed, but there seem to be no clear modern cases of it, in part because the main areas where it was important have either switched to Islam or to enclosed production systems².

² The *dehesa* systems of Central Spain, based around cork-oak forests may well be the last survival of a major European swineherding tradition.

Another division of pastoralism that is less easy to model is the contrast between systems essentially based around a single species, and those based around the integrated production of several species. For example, although horses, donkeys, camels, goats, cattle and dogs are kept by nomads of Southwest Asia, sheep predominate and other animals are used for portage, riding, ploughing or herd management (e.g. Barfield 1981 for a description of the Arabs of northeast Afghanistan). By contrast, in Mongolia, and in the Northern Sudan, herders seem to manage 2-4 species of roughly equal importance simultaneously. Göbel (1997) shows that herders in the arid *puna* of northwest Argentina, herders keep a mixture of llamas, sheep and goats in roughly equal proportions.

1.4 Pastoral enterprises

The most common categorisation of pastoralism is by the degree of movement, from highly nomadic through transhumant to agropastoral. Cultivators also keep livestock for work or marketable products but these are not usually regarded as pastoralists. Any classification of this type must be treated as a simplification; pastoralists are by their nature flexible and opportunistic and can rapidly switch management systems as well as operating multiple systems in one overall productive enterprise. For example, West African cattle-herders can practise a system of regular transhumance for a long period, building up patronage relationships with farmers on their routes. However, in a case of extreme drought or disease stress, they will switch to highly 'nomadic' patterns, moving to new areas and breaking these relationships. When the crisis has passed they may revert to their former routes or move into an entirely new management mode.

1.4.1 Nomadism

Exclusive pastoralists are livestock producers who grow no crops and simply depend on the sale or exchange of animals and their products to obtain foodstuffs. Such producers are most likely to be 'nomads' i.e. their movements are opportunistic and follow pasture resources in a pattern that varies from year to year. This type of nomadism reflects almost directly the availability of forage resources; the more patchy these are, the more likely an individual herder is to move in an irregular pattern.

In popular imagination, 'nomads' wander from place to place without any logic –Ammianus Marcellinus described the Huns thus;

No-one ever ploughs a field in their country, or touches a plough handle. They are ignorant of time, law or settled existence and they keep roaming from places in their wagons. If you ask one of their children where he comes from, he was conceived in one place, born far away and brought up still further off.

Ammianus Marcellinus –*The Histories*

In reality, pastoralists' landscape is flecked with an invisible constellation of resources. They have to balance their knowledge of pasture, rainfall, disease, political insecurity and national boundaries with access to markets and infrastructure. They prefer established migration routes and often develop long-standing exchange arrangements with farmers to make use of crop residues or to bring trade goods. Pastoralists usually only diverge from their existing patterns in the face of a drought, a pasture failure or the spread of an epizootic. Nonetheless, this flexibility is often the key to their survival. Highly mobile camel people such as the Rashaida retained a much greater proportion of their herds than the neighbouring Beja in the droughts of the early 1980s because of the Beja attachment to set routes and pastures (RIM 1989).

In some regions of the world, nomadism is an ancient and relatively static subsistence strategy; for example among the 'nomads of the nomads' in the Empty Quarter of Saudi Arabia (Cole 1975).

However, along the ecotone between rangeland and arable land, movement between different strategies can be quite fluid. The tone of much of the literature suggests that the process of sedentarisation among nomads is irreversible, but as Glatzer (1997, 1982) shows clearly that limited opportunities for agriculturists in northwest Afghanistan have impelled some to turn to pastoral nomadism.

1.4.2 Transhumance

Transhumance is the regular movement of herds between fixed points to exploit seasonal availability of pastures. In montane regions such as Switzerland, Bosnia, North Africa, the Himalayas, Kyrgyzstan and the Andes, this is a vertical movement usually between established points and the routes be very ancient. There is strong association with higher-rainfall zones; if the precipitation is such that the presence of forage is not a problem, then herders can afford to develop permanent relations with particular sites, for example building houses. Horizontal transhumance is more opportunistic, with movement between fixed sites developing over a few years but often disrupted by climatic, economic or political change.

Transhumant pastoralists often have a permanent homestead and base at which the older members of the community remain throughout the year. Transhumance is often associated with the production of some crops, although primarily for herders' own use rather than for the market. In many temperate regions, where snow is likely to block animals' access to pasture, haymaking is an important component of the system. 'Make hay while the sun shines' is very significant advice in such systems; if the grass is not cut, dried and bundled during the summer, it may rot while being stored. Hay production in tropical systems is less common because the movement of the herds is between higher and lower rainfall zones, in the expectation that there will be forage in both sites. In West Africa, for example, there is a broad pattern of movement south in the dry season, when grass is available and insect problems are minimised, and a return movement north in the wet, when humidity-related diseases increase and there is pasture in the regions further north.

A characteristic feature of transhumance is herd-splitting; the men take away the majority of the animals in search of grazing, but leave the resident community with a nucleus of lactating females. There are many variations on this procedure and moreover the development of modern transport has meant that in recent times, households are not split up as radically; members can travel easily between the two bases. Whether it is milking females, weak animals or work animals that are left behind differs substantially between one system and another and may even vary within an individual system on a year-by-year basis.

Transhumance has been transformed by the introduction of modern transport in many regions of Eurasia. For example, the transhumance of sheep in Britain between rough grazing on highland areas and lowlands is now conducted entirely by putting the sheep in trucks and carrying them between grazing points. Many pastoralists in North Africa send their animals on transhumance by truck or on trains (Trautmann 1985). Wealthier countries in the Gulf, such as Oman and Saudi Arabia have made vehicles available at subsidised rates to pastoralists to assist with animal transport and it seems likely this pattern will be more and more frequent, especially as the problem of controlling animals in increasingly densely settled environments can only get worse.

1.4.3 Agropastoralism

Agropastoralists may be described as settled pastoralists who cultivate sufficient areas to feed their families from their own crop production. Agropastoralists hold land rights, use their own or hired labour to cultivate land and grow staples. While livestock are still valued property, their herds are on average smaller than other pastoral systems, possibly because they no longer solely rely on livestock and depend on a finite grazing area around their village which can be reached within a day. Agropastoralists make greater investment in housing and other local infrastructure and if their herds become large, they often send them away with more nomadic pastoralists.

Agropastoralism is often also the key to interaction between the sedentary and mobile communities. Sharing the same ethnolinguistic identity with the pastoralists they often act as brokers in establishing cattle-tracks, negotiating the 'camping' of herds on farms, which potentially exchanges crop residues for valuable manure, and arranging for the rearing of work animals which adds value to overall agricultural production.

1.4.4 Enclosed systems and ranching

Apart from the traditional pastoral systems described above, the fourth system of extensive livestock production may be described as enclosed systems or ranching, i.e. where the land is individually owned and usually fenced. The United States is an example of the gradual transition from common ownership systems prevalent in the nineteenth century to a fully enclosed system today. Ranching is the dominant system in North America, Australia and parts of South America, notably Argentina (Strickon 1965). Rivière (1972) describes these transitional systems for northern Brazil, where communal tenure is giving way to ranching. Some European systems could be described as ranching, although enclosures are often small and animals frequently supplemented in the field. As Ingold (1990) points out, there has been remarkably little description of ranching from points of view other than the technical and socio-economic descriptions tend to be uniformly hostile because the individual ownership of large tracts of land is seen as antisocial. Ranching, however, is an inevitable development in certain types of economy, where urban demand for protein makes the lax supply systems of conventional pastoralism unacceptable, and input supply can support the higher throughputs that justify ranches.

It represents a powerful ideology and the history of both colonial and post-colonial development and command economies is littered with failed attempts to introduce these systems both throughout the dry tropics and the temperate grasslands of Eurasia. In Nigeria, they have had a long and unsuccessful history dating from the early colonial era (e.g. Dunbar 1970); elsewhere in Africa, the late 1960s was the renewal of hopeful introductions and equally convincing failure (e.g. Galaty 1994:190). Livestock ranches have an interesting history in Southern Africa; in the colonial era these were established in Namibia, Botswana, Zimbabwe, Mozambique, and South Africa. Although a substantial proportion of these remain, in many places they have been gradually perceived as an unacceptable concentration of land in the hands of a single owner and are gradually reverting to more traditional tenure. In Zimbabwe, for example, large livestock enterprises are being invaded by smallholder settlers with the tacit approval of government.

The situation in North-Central Asia is a story of decollectivisation. Among Sakha and Even reindeer herders in Siberia, a system of managing wild reindeer seems to have operated in the pre-Soviet era (Vitebsky 1991, 1992; Van Veen 1995). After the imposition of Bolshevik rule, the land was divided into fenced enclaves and the herds collectivised and managed as very large ranches with centralised services. Although a suboptimal system of managing fodder resources, improved health of the animals and the ready market for their products acted as compensation in market terms. With decollectivisation after 1991, the fencing is gradually collapsing and veterinary services are in decline. The townships established to provide centralised social services are functioning less well and the product-buying

systems have faltered. Herders are compelled to re-establish older management systems whilst trying to develop new markets for their products in a situation where inputs are no longer subsidised .

1.4.5 Pastoralism and trade

The flexibility so characteristic of pastoral nomadism and the ability to transport goods and people have meant that pastoralism has long been associated with two other major livelihood strategies, trade and warfare. Prior to the evolution of modern transport, animals were the only method of moving large quantities of goods across land. Consequently, pastoralists often became involved in trade caravans, guiding, managing and supplying the appropriate livestock and sometimes themselves becoming traders. In the Sahara and Arabia, this evolved into a quite sophisticated form of blackmail, whereby the nomads both guided the caravans and extracted monetary payments to prevent them from raiding those same caravans (Sweet 1965). Long-distance trade in the Andes was a key function of llama breeders, and elaborate multiple-point trade systems have been recorded, based on exchange relationships lasting many generations (Orlove 1982:104). Similar camel-based systems traverse the deserts between Eastern Turkey and Northwest India, while the movement of yaks and long-legged sheep is essentially to the distribution of trade goods in the Himalayan region (Downs & Ekvall 1965; Jina 1999). A caravan trade still exists in the more inaccessible regions of the pastoral zone, but its economic importance has been much reduced by modern transport.

Frederiksen (1995) describes in detail the transformation of the Hazarbutz, pastoral nomads of eastern Afghanistan, who form a section of the Pashtun. Until the 1920s, the Hazarbutz lived principally as herders, concentrating principally on sheep, despite their name (which means 'a thousand goats'). As their migration routes coincided with a major arm of the silk route they began to be more involved, first in transporting and then in trading, typically bringing tea from Bukhara into Afghanistan. As they became more and more successful, an increasing number of households gave up nomadism and settled in Kabul or elsewhere, until by the mid-1970s less than 10% of the Hazarbutz were actually involved in pastoralism. The Soviet invasion scattered the population still further and many Hazarbutz now operate from Pakistan while those remaining in Afghanistan are unable to go on migration because of the security situation.

By no coincidence at all, pastoralism has also been associated with another type of trade, namely smuggling. The consolidation of national borders and the evolution of contradictory tariffs in neighbouring countries makes nomads the ideal group to smuggle contraband between these countries. This is particularly highly developed in the Near East and Central Asia, where extremely different economies border one another and long featureless frontiers are almost impossible to police. Bourgeois & Bourgeois (1972) describe the pastoral nomad smuggling systems of Afghanistan prior to the Soviet invasion and Abu-Rabia (1994) the important role the Negev Bedouin played in Israel in the 1950s, smuggling in both meat and scarce consumer goods with the tacit approval of the authorities. More recently, the Bedu in Jordan have played a key role both in smuggling primary products out of Iraq, tax-free consumer goods from Saudi Arabia to all other countries and small products such as cigarettes into Syria. Similarly, the Rashaida in Sudan are key intermediaries in the trade moving fat-tailed sheep across the Red Sea to Saudi Arabia and receiving consumer goods in return.

This has interesting consequences for both livestock production and intervention in the livestock sector. In many places where smuggling and trade are key sources of income, pastoralist economic dependence on livestock is slight, although trade depends on the pastoral way of life. As a consequence, animals are often few and little investment is made in either reproduction or health, since returns on these are low compared with, for example, bribing officials or buying four-wheel drive vehicles. So when development projects are proposed which make the assumption that pastoralism is the basis of the local economy, since speaking openly about smuggling is politically unacceptable, they usually run into sand literally

and metaphorically, as herders will never make the investments required by the project as their attention is directed elsewhere.

1.4.6 Pastoralism and warfare

The association between pastoralism and raiding is of great antiquity; Herodotos reported on the Scythian horsemen 2500 years ago. Since then, waves of raiders from Central Asia threatened Europe until the end of the Middle Ages. Barfield (1989) is a history of the dynamic relationship between the Chinese Empire and its nomadic raiders from the steppes over a period of 3000 years. Chatwin (1989) describes in some detail the ebb and flow of the association between pastoralism and military cultures across Asia. There is little doubt that the domestication of the horse contributed significantly to the evolution of both raiding cultures and large states. Horses made possible the rapid movement of large armies and the transport of goods, personnel and messages in a way that was impractical with any other livestock species. It is probably no accident that the cyclical nature of the conflict between nomads and the state was first described with some acuity by the medieval North African historian, Ibn Khaldun, in his study of history, the *Muqadimah* (trans. Rosenthal 1967). It also helps explain why so much of the discourse of pastoral nomadism is framed in terms of ‘crisis’ and ‘problem’ (§1.7); the explosive nature of relations with the state and the natural environment suggests to observers at any given time that a catastrophic cusp has been breached.

This type of centre-periphery warfare has largely ceased, and the probable key factor is the introduction of the aeroplane. Once the state can move around freely in rugged and remote areas and move troops and weapons to inaccessible areas, the previous advantage held by the nomad disappears. Only if the state is too impoverished to outmanoeuvre the pastoralists in this way, can the nomad persist with dissent. Nonetheless, the ability of nomads to move in hostile terrain continues to be perceived as a threat by national governments, as witness the continuing hostilities between the Saharan nomads, the Tuareg and Teda, and the countries in whose territory they live.

Brotherston (1989:244) notes that the llama was essentially to Inca military operations, providing both transport and food on the hoof, playing a role analogous to the horse. In regions where the horse was an introduced exotic, such as West Africa, this may have contributed to the failure of large states to develop. Although large North African horses were brought across the desert in the medieval period, the high costs of keeping them alive in a tsetse zone, meant that they could never support an empire on the scale of those in Central Asia (Law 1980; Blench 1993). Nonetheless, as horses became accustomed to West Africa, they played an increasing role in warfare and without the intervention of colonialism would perhaps have begun to underpin large state structures. The Fulbe in West Africa launched a jihad in the early nineteenth century which transformed the political map the Sahelian region.

An aspect of the colonial and postcolonial era relevant to this type of conflict is changing social structure and a breakdown in the acceptance of former hierarchical relations. Just as in the West, special interest groups increasingly challenge the process whereby the governments of nation-states make decisions for them, so sections of society at the bottom of the social pyramid in Africa have begun similarly to assert their rights. All across the semi-arid zone, pastoralist societies such as the Moors, the Tamachek and some Fulbe groups depended heavily on slave labour in the precolonial period. After the colonial conquest, slaves were given their freedom legally, although realising that freedom was often a lengthy process. However, as groups such as the Haratin [Moors], Bella or *Iklan* [Tamachek] and Rimaybe [Fulbe] moved away from their former masters, they retained both their language and lifestyle. Gradually, however, resentment at their former status has surfaced and they have responded either by denying their slave origins or antagonistic behaviour towards their former owners, some of whom have been reduced to poverty by the major droughts in the 1970s and 1980s.

In more subtle ways, authority systems that depended on farmers being subservient to pastoralists gradually collapsed in the post-colonial era. For example, in Nigeria, many non-Muslim populations were placed under a local juridical system controlled by the Hausa/Fulani during the colonial period. Court cases between herders and farmers tended almost invariably to be decided in favour of herders. However, after independence, farmers began gradually to take control of local authorities and thus judicial systems and their own appointees made decisions in courts. The result has often been a reversal of the previous bias.

In the case of seasonal pastoral migrations, committees were established throughout Anglophone West Africa to ensure that established cattle routes were respected by both farmers and pastoralists. These committees functioned into the early years of independence, but have now been largely disbanded. Many years of seasonal migration of cattle herds have created fertile north-south swathes. Declining soil fertility in many regions has made these attractive places to farm, outweighing the dangers of possible conflict. Farmers have also been emboldened by taking control of the local or regional administration in many areas.

1.4.7 Pastoralism and hunting

In many environments, pastoralism and agriculture have effectively eliminated all but small animals and commensals. However, especially in some parts of Africa and Central Asia, herders still interact with significant wildlife populations. This has two opposing consequences; the persistence of predators and the availability of hunted meat. Pastoralists have no sympathy with predators at all and usually end up in conflict with conservation lobbies, especially in Mongolia (p. 40). Curiously, few pastoralists are hunters; in contrast to farmers, where hunting is often regarded as a prestigious activity, hunting is a minor activity, often focussed on particular species. In Mongolia again, the main focus of hunting activity is the marmot, hardly high-status game in terms of large mammals. Similarly, over much of Africa, pastoralists don't hunt. It has been noted that the side of the Serengeti where pastoralists are resident suffers less from the depredations of poachers than where it is bordered by farming villages.

However, in some pastoral subarctic systems, such as that of the Saami of the Kola peninsula, hunting plays an important role in overall subsistence (Konstantinov n.d.). The Saami have relatively small reindeer herds which they exploit principally for household meat. Their herding system allows them to leave the reindeer to run wild for much of the year and during this period fishing, hunting and trapping of mammals predominate, both occasionally for meat but also for the pelts of high-value species sold for cash. The Kazakhs combine all these sources of income, both hunting with hawks on a recreational basis, hunting meat species and trapping fur animals and selling the pelts.

1.4.8 Pastoralism and fishing

Pastoralists divide sharply in their attitude to aquatic resources. In some regions, fishing and gathering of shellfish is essential to subsistence, elsewhere pastoralists regard such foods as taboo. For example, all along the coast of the Horn of Africa from Southern Egypt to North Kenya, an extremely dry region dominated by pastoral peoples, a prohibition on marine resources means that these go virtually unexploited, despite the sometimes desperate straits to which these peoples are reduced in times of drought or warfare. Inland, however, in the swamps of Southern Sudan, Nilotic pastoral peoples such as the Dinka and Nuer regard fish as an integral part of their subsistence. The Turkana have always had subgroups that exploited the fish in the lake that bears their name. Mongolian lakes remain largely unfished, but throughout much of the subarctic region, for example among the Chukchi and Saami, hunting of marine mammals and fishing is regarded as essential.

The sources of these rather marked cultural differences are not easy to determine, although it is evident they are of great antiquity. In some cases, this is because fishing people and pastoralists have systems of interlocking land use, for example in the Inland Delta in Mali (Gallais 1975a, 1984). Making more effective use of aquatic resources in pastoral areas might clearly be important for increasing food security, although experience suggests that changing entrenched dietary preferences is quite difficult. However, there could be considerable potential for increasing levels of co-operation between pastoral and fishing peoples to make effective use of a rich but fragile environment.

Apart from livestock producers, there are also nomadic fishermen and in some circumstances these are treated by the state in the same way. Nigeria, for example, has numerous pastoralists and also nomadic fishing communities moving from site to site in the sea Delta of the Niger, following estuarine aquatic resources. They face similar problems in terms of poor health and education and have successfully lobbied the government for access to funds intended for 'nomads'.

1.4.9 Pastoralists and non-pastoral species

Apart from their livestock, most pastoralists keep non-pastoral species, notably chickens and dogs. The Tuareg of the Hoggar keep dogs, cats, hedgehogs, chicken, guinea-fowl and pigeons (Nicolaisen & Nicolaisen 1997, II:173). Usually these enterprises are rather casual and vary considerably from one fraction to another. However, in West Africa, the chickens carried by Fulbe nomads grow very fat on the worms associated with animal dung and thus constitute a significant source of cash to the household.

Dogs are of considerable importance in the protection of livestock across a wide swathe of Eurasia, especially where wolves are a problem. Indeed in Hungary, and other parts of Eastern Europe, wolves have interbred with feral dogs. In Britain and some parts of Western Europe, dogs are also used to herd sheep, making a considerable saving on labour. This practice is not well-documented but it seems that despite the importance of sheep from the Near East to Central Asia, using dogs to herd is not known. In Central Asia and the Middle East, pastoral peoples such as the Bedouin and the Kazak use hawks for hunting.

1.5 History and origins of pastoralism

Although this book is principally an account of the situation of pastoralists in the present, it makes no apology for referring to the historical literature. The naïveté of much development literature concerning even the recent past is a rich source of error in the present. One all too common mistake is to suppose that a crisis in the present signals the final demise of pastoralism. If history shows anything, it shows that pastoralists and settled cultures establish dynamic relationships and that while pastoralism has a certain ethnic component, it is above all a way of life appropriate to particular economic and ecological circumstances. In other words, it may disappear briefly, but will always make its return because the settled need the mobile, to trade, to breed animals and to open up areas too remote for agriculture. Planning for pastoral societies must have this long-term perspective, it needs to assume that herds will always recover eventually as they have in the past and that the colonisation of inaccessible zones will always be the preserve of such peoples.

The origin of pastoralism has been much discussed, especially in an older type of literature, influenced, unconsciously perhaps, by Marxist historical schemas. Pastoralism was seen as an evolutionary stage in human history, a phase following hunting-gathering and leading thence to sedentarisation and agriculture. This may have seemed perfectly reasonable both because of a lack of archaeological evidence and because it unconsciously reflected the contempt in which settled peoples historically held nomads. It may also be influenced by the myth of Cain and Abel which places the burden of original sin unambiguously on the livestock producer. However, the expansion of archaeological data and a more careful reading of

the historical sources, especially in Asia, has demonstrated a more complex story (see Cribb 1991 for a review of modern theoretical developments). In most parts of the world, Africa excepted, agriculture seems to be earlier than pastoralism. Pastoralism develops from surplus, as individuals simply accumulate too many animals to graze them around a settlement throughout the year. In addition, as herders learnt more about the relations between particular types of ecology and the spread of debilitating diseases they gradually developed the practice of seasonally removing their animals from danger-zones.

The earliest literary references to a people who would appear to be pastoralists are the Amorites, who herded cattle, sheep, goats and donkeys in the Near East in the first half of the second millennium BC (Cribb 1991:10). Chronicles of the Hsia dynasty in China (2205-1766 BC) note the Ch'iang nomads, probably the ancestors of modern Tibetans, as weavers of fine wool (Miller & Craig, 1997:58 ff.). Herodotus mentions a number of peoples assumed to be pastoral across Central Asia: Russian archaeology has made remarkable and still little-known contributions to our knowledge of the Scythians, the Sauromations, the Saka, the Siberian Schythisna and the Mongols (see Davis-Kimball, Bashilov & Yablonsky 1995). The llama and alpaca are conventionally assigned dates of 6000 bp for their domestication, although differentiating their bones from their wild ancestors is a doubtful exercise.

Descriptions of a recognisably pastoral culture in Sub-Saharan Africa date back to Pliny (who described blood and milk drinking in the Horn of Africa). However, pastoralism is likely to be far earlier than these records. The exact origins of pastoralism can only be gauged from archaeology and in particular from careful osteometric work demonstrating the gradual divergence between wild forms of livestock and their domesticated relatives. Some claims have been made for domestic cattle in Northeast Africa as early as 9000 bp although not all scholars accept these dates and more solid dates are available for 6000 bp onwards (MacDonald and MacDonald 2000). However, the interpretation of osteometric evidence already depends on the assumption that early herders were controlling breeding; but it seems likely that the earliest stages of pastoralism involved the management of wild animals, as reindeer pastoralism does still today in some parts of the subarctic.

Pastoral culture spread out from the Nile Valley and North Africa, probably through the agency of the ancestors of present-day Berber populations (Blench in press). Pastoral production appears clearly in the archaeological record in both East and West Africa 4500-4000 bp (Marshall 2000). The exact routes and dates whereby pastoralism reached southern Africa are disputed (Bousman 1998), but there seems to have been pre-Iron Age transmission nearly 2000 bp, probably initially with sheep and shortly after with cattle. The elaborate cattle culture described by early travellers to the Cape (Boonzaier *et al.* 1996) was probably established only some five hundred years before the first navigators encountered the Khoikhoi.

1.6 Sources of information on pastoralism

The worldwide literature on pastoralism is extremely uneven, and determined by politics and security issues as much as by the need for empirical data. Pastoralism studies have historically been dominated by anthropologists; and the initial focus was probably East African pastoralists.

At any rate, in many ways the accessibility of East African pastoralists combined with a perception of the importance of their herds in the eyes of the colonial authorities led to a flowering of monographs (Asad 1970). Sudan is well-known and Kenya (Bollig 1990); but for example, the non-colonial status of Ethiopia meant that its many pastoral peoples remained unstudied and even today are little known (Abbink 1993). In West Africa, the dominance of the Fulbe stimulated a series of monographs in French covering the different subgroups (Dupire 1970; Benoit 1979; Bougeot 1981; Awogbade 1983; Blench 1984, 1985, 1991a; 1994). By contrast, the Kanuri-speaking groups of Nigeria and Niger are barely described (though see Conte 1991).

Pastoralism was widespread in southern Africa at the period of first European contact, but the extermination of the Khoikhoi and the Herero has led to a near-elimination of true pastoralism systems from the region (see Boonzaier 1987; Viveló 1977). Only in the extreme north of Namibia among the Himba does a recognisable pastoral system still exist (Bollig 1997).

Berber pastoralism in North Africa and the Sahara is relatively well described (Chapelle 1957; Bernus 1981; Baroin 1985; Nicolaisen & Nicolaisen 1997; Spittler 1998) but in West Asia and Northeast Africa, the emphasis has historically been on the Bedu and romanticised descriptions of their herding data back to the mid-nineteenth century (Oppenheim 1939-1952; Lancaster 1981; Blench 1998). This tradition has been in the British social anthropological tradition and the relative wealth of many of these countries has rather discouraged pastoral projects of the type that has been dominant in Africa.

Between Eastern Turkey and northwest India lies a region very imperfectly known. The south of Iran is rich in pastoral groups usually specialised in sheep and these are described in a number of monographs from the epoch of the Shah (e.g. Barth 1961; Bates 1973; Irons 1975; Digard 1981; Barfield 1981; Black-Michaud 1986). Since the Iranian revolution, all scholarly field-study appears to have ceased. Similarly in Afghanistan and Pakistan, political insecurity in the pastoral regions has all but halted research. Indian pastoralism in the Rajasthan desert has been extensively covered (e.g. Agrawal 1992; Casimir 1996; Kavoori 1991, 1996; Sansthan & League for Pastoral Peoples 1999) but the Tibet-style transhumance typical of the Himalayan region less so (e.g. Downs and Ekvall 1965; Ekvall 1968; Garwahl 1981; Goldstein and Beall 1990).

In Central Asia, the Soviet period produced a large literature, seen through a rather specific ideological filter; little of this literature has been translated and much is inaccessible (though see Khazanov 1984). After the break-up of the Soviet Union there has been a major expansion of materials on pastoralists in both the CIS countries and Mongolia, although the potential for outside scholars to study has been limited by political insecurity (e.g. Temple, Swift & Payne 1993; Mearns 1991, 1993; Van Veen 1995). At the same time, the desire of development agencies to mount projects has led to a burgeoning of development literature and consultancy reports; much of this material is frankly very weak.

Chinese-dominated regions of Central Asia were off-limits for a long period, but have now begun to open up. Although Tibet remains problematic, Mongol and Kazakh herders in northwest China are gradually being placed on the pastoral map. Longworth and Williamson (1993) is a major source for these regions, concentrating principally on sheep and wool production.

Pastoralism in north America is of recent origin, and in many cases the documentation is somewhat old, so the systems described may well have changed. For example, domestic reindeer were introduced into Alaska in the 1890s principally herded by the native Inupiat people (Beach 1985). At their height, reindeer numbered some 640,000 head in the 1930s. However, by the 1970s this had fallen to just 24,000 and the practice may well have disappeared altogether. Similarly, accounts of Apache and Navajo herding are more than thirty years old (Kunstadter 1965) and the situation is likely to have changed dramatically.

In the Andes, indigenous pastoralism was virtually ignored until the 1960s and the herding of llama and alpaca (auchenids) was considered to be a borrowing from European traditions, similar to Navaho sheep herding. Andean pastoralism is now known to be extremely ancient (Rick 1980). Pastoralism is confined to the semi-arid regions of the Andes in a habitat known as *puna*, between 3700-5000 masl. This type of herding is found in South-Central Peru, Bolivia and in northern Chile. By comparison with other types of pastoralism, publications are few and scattered (see review in Orlove 1982 and also Flores 1964; Nachtigall 1966; Webster 1973; Browman, 1974, 1982; Orlove 1977; Novoa 1989; Göbel 1997).

The emphasis placed here on the sporadic and interrupted nature of pastoralist studies in many regions is important, because of the highly flexible and opportunistic nature of pastoral society. Descriptive

monographs tend to fix a region or a people in time, but very often a restudy shows that major changes in species, breeding strategies and movement patterns has occurred. Basing development interventions on old data in the pastoral sector is a particularly inappropriate strategy.

For information to flow effectively, substantially more effort must go into translating and synthesising publications on pastoralism in languages other than English or French. Even monographs in German have a tendency to be ignored by the Anglo-American establishment; this is much more the case for Chinese and Russian. Similarly, approaches from different disciplines tend to write in ignorance of one another; animal scientists don't read anthropology and development literature often seems to be written in blissful ignorance of any other discipline.

1.7 The discourse of pastoralism

The literature of pastoralism is not simply an ordered body of empirical descriptive literature; to read through this material is to become aware of authors writing within a particular context. As much as nomadism is viewed negatively within many countries where it is practised so it is as often viewed positively by outsiders. Writers are frequently impressed by the independence of nomads, their ability to survive in extremely harsh landscapes and their cosmopolitan outlook compared with neighbouring farmers. The other side of this, however, is the discourse of the 'crisis' or 'problem'. Even from the early period, the literature is rich with articles and books analysing the crisis of nomadism or the problems nomads experience or are said to cause. Gloomy predictions as to the catastrophic decline of pastoralism are commonplace, although nomads surprisingly seem to outlast these forebodings. For example, one of the earliest texts on the Maasai (Hinde & Hinde 1910) was entitled 'The last of the Masai'. Many of the books and articles listed in the bibliography include words such as 'last', 'final' and 'end' even where this is manifestly not the case. Benson and Svanberg (1998) refer to the Kazakh as *China's last nomads* despite the fact that China has many other nomadic peoples, some indeed who seem to have been given a new lease of life by recent liberalisation.

In part this reflects an inevitable aspect of the nomadic system of production, frequent catastrophic collapses and recoveries. Climatic extremes and disease can cause apparently terminal livestock losses, while prosperity and stability in nation-states lead to agricultural encroachment on pastoral land. The presence of researchers while such processes are under way almost inevitably leads to dire prognostications; however, history should make it clear that the flexibility and opportunism insisted upon in their monographs in fact allows pastoralism to be constantly resuscitated.

The other side of this is that national governments often see pastoralists as a 'problem' and it is hard not to be coloured by this discourse especially when writing reports. If it is national policy to sedentarise pastoralists, then the failure of projects or initiatives to settle them transmutes into a problem. If it is accepted that pastoralism is simply a part of the national tapestry of lifeways, then the 'problem' evanesces. Much in the essay that follows describes attempts that have been made to provide solutions to these problems, but it is essential to remember that the existence and nature of such problems consists almost entirely of issues defined by outsiders. Pastoralists themselves often take considerable satisfaction in their lifestyle, sometimes to the extent of intentionally offending farmers with outrageous dress or customs.

More recently, the literature of pastoralism has taken a more reflexive academic turn, with authors less concerned about ethnographic reality and more with the vast literature and archive material that has now accumulated. Anderson & Broch-Due's (1999) *The poor are not us* is a good example of this; its theme reflecting the fashionable concerns of the aid agencies that fund much of the work now undertaken with its contributors relying heavily on archives and early published material to draw out past 'narratives' of rangeland degradation, pastoral fecklessness etc.

Given the vast body of publication and grey literature on pastoralism, it may seem invidious to suggest that yet more research is required. But recent literature describing the current economics, ecology and production systems is remarkably sparse for many regions. Chad, probably one of the most significant pastoral countries in Africa, must make do with descriptions that are more than fifty years old. The locations, size and status of many of its pastoral groups are presently unknown. If even a small part of the energy that has been directed towards the Turkana were turned to Chad, the picture of pastoralism in Africa would be more balanced. The situation is similar with the 'new' pastoral societies of Central Asia. They are not new of course, the rapid changes following decollectivisation makes much of the existing literature of historical interest.

2. Grazing and Nutrition

2.1 Rangelands: opportunistic use of patchy resources

Pastoralists are strongly associated with rangelands across the world, with the exception of reindeer, in part because their key asset, the mobility of their animals, makes it possible to exploit nutritional resources in regions unavailable to arable farmers. Rangelands is a broader term than grasslands, including regions where woody vegetation is dominant; moreover, it is common in texts describing land from the viewpoint of livestock production. Grasslands are just that, and the term has a more biological emphasis³. Some of the ecological literature attempts to distinguish 'rangelands' and 'natural' grasslands (for example, the Elsevier 'Ecosystems of the World' premises different volumes on this dichotomy – see Bourlière (1983) and Coupland (1993a). But closer examination of the descriptions suggests that either the origin of many grasslands is contentious or else grasslands become 'natural' if they are ancient human creations (see, for example, Gillson (1993a) on the grasslands of New Guinea).

The literature uses several terms for the main world's rangelands: African savanna, Eurasian steppe, South American savanna, North American prairies, Indian savanna, and Australian grasslands (Moore 1970: Groombridge 1992: 285; Solbrig, 1996). Estimates of their importance vary according to the regions included, but as figures given in the literature suggest, rangelands occupy between 18–23% of world land area, excluding Antarctica (Table 3).

Table 3 Estimates of the area of the world's rangelands

	Whittaker and Likens (1975)	Atlay, Dugvigneaud (1979)	Kettner, Olson, Watts and Allison (1983)
Savanna (million km ²)	15.0		22.5
Temperate grassland (million km ²)	9.0		12.5
Total (million km ²)	24.0		35.0
	%		%

Rangeland as % of world land area	16.1		23.7
Rangeland as % of world land area (excluding Antarctica)	17.9		26.5

Source: Groombridge (1992: 281)

³ There are two parallel series of international congresses, the International Rangelands Congress and the International Grasslands Society whose meetings alternate, but which are attended by largely the same constituency. So similar are these meetings that it has recently been proposed to merge the two societies, although this proposal remains controversial.

Grasslands are usually divided into four major types: tropical grasslands, prairie/steppe, temperate grasslands and tundra, determined either by the underlying soils or by climatic conditions. Table 4 shows the main categories of grasslands and their major zones of concentration:

Table 4 Classes of grasslands

Category	Where
Tropical grasslands	Africa, South America, northern Australia, India
Prairie/steppe	North America, Central Eurasia, South Africa
Temperate grasslands	Europe, North America, Australia, New Zealand, Asia
Tundra	All subarctic regions

The rangelands of the Tibetan Plateau are unique in that they are the highest grazing lands anywhere in the world. The greater part of the Plateau is above 4000m and some camps are as high as 5100m (Miller & Craig 1997:58ff.)

The main floral component of rangelands, grass, exists to be grazed, and over time co-adapts to both the intensity and quality of grazing. The long-term evolutionary history of a grassland ecosystem as well as the history of the last few centuries are therefore essential to understanding its response both to management and to new pressures on it.

In parts of North Africa and Southwest Asia, rangelands have been reduced in size, in part because the widespread use of irrigation technologies, both in traditional and more recently in hi-tech forms, has allowed agriculture to colonise much larger regions of the rangelands. As a result, what rangelands remain are considerably more arid than those exploited by pastoralists in Sub-Saharan Africa. Indeed, 'drought' conditions may be said to obtain most of the year. Responses to this have long since been developed, both in terms of species and the movement of resources. Pastoralism has traditionally been oriented around camels and sheep, with sheep becoming predominant in recent times due to their greater marketability. The movement of water and feed resources to arid areas has been practised since before ethnographers began to describe pastoral nomads (notably through the carriage of large water-skins on camel-back). Today pastoralists throughout the North Africa and Southwest Asia have relatively sophisticated trucking systems (of water, feed resources and the animals themselves) that allow them to exploit areas that would be unavailable in Sub-Saharan Africa (Blench, 1998).

The situation in Australia is somewhat different; Australian arid and semi-arid rangelands occupy nearly 70% of the continental land mass, much of it used for extensive livestock production (Groves, 1981). Australia's rangelands have been transformed subsequent to European settlement by:

- provision of artificial sources of water
- introduction of cattle, sheep and rabbits
- introduction of exotic forage species (e.g. buffel grass, *Stylosanthes*)
- changes to traditional burning patterns
- elimination of the dingo from most sheep areas
- and clearing of overstorey trees

(James et al., 1998)

In many arid or semi-arid rangelands in Australia and in North America artificial sources of water are so widespread that lack of rainfall results in localised feed shortages (Bennet, 1997). Large herbivorous mammals are able to continue grazing in areas which they would usually have abandoned (James et al., 1996). Native wild animal populations, which previously relied on drinking from natural sources, increase because they are able to persist in areas that were previously most of the time not habitable. Such 'artificial' increases in some species may have negative effects on others. The effects on native fauna are: the displacement of ground-dwelling bird species; changes to the distribution and abundance

of invertebrates (e.g. grasshoppers, ants and collembolans); possible recent extinction of some medium-sized native mammals; and indirect effect on wildlife populations through changing activities of predators (James et al., 1998:1). Another effect of artificial water sources is to maintain constant high levels of grazing pressure. Many native plant species are naturally not adapted to constant grazing and will tend to be eliminated in favour of exotics (Austin and Williams, 1988).

Rangelands in turn are strongly characterised by patchiness of resources and resilience in the face of climatic extremes. Especially where water resources are short, as in the semi-arid rangelands in Africa, the Middle East, the New World and Australia, vegetation has become adapted to patchy and variable rainfall. Reserves of seeds of particular species accumulate in the soil which will germinate when particular precipitation regimes occur. As a result, not only pasture availability but pasture quality may vary substantially; it is often difficult to predict which species may be abundant in a given year.

The situation in cold-weather rangelands is somewhat different since water availability is not usually a limiting factor, but rather the severe cold itself and a short flowering season bracketed by snow. Pastures are thus rather different in structure, with a very large number of flowering species competing to seed in a brief window. Abundance and quality are less often an issue for pastoralists than access, whether the barriers are snow or administrative. For this reason, cold-weather pastoralism tends towards systems based on transhumance and haymaking.

Traditional pastoralists broadly accept pasture and rainfall as a given and adapt their social and herding systems to take best advantage of them. The one exception appears to be in the Andes, where herders create irrigation channels to encourage the growth of *bofedales*, bunch grasses that are particularly important for llama nutrition (Orlove 1982:100). The stone-lined leets of Dartmoor constructed in the Neolithic period may also have the same purpose. But the economic importance of extensive livestock production in Australia and North America and the greater integration with the market has given greater impetus to evening out the unpredictability of rangeland productivity. Once mobile pastoralism in these regions had been eliminated through enclosure, the size of ranches was often large enough to still make use of movement within the property, especially as an increasing number of water sources were installed, blunting the impact of overall precipitation. Increasing borehole numbers has often been associated with pasture seeding, thereby encouraging numbers to increase well beyond the long-term capacity of the land to support them. The consequence has been, as the droughts of 1996-1998 in the mid-West of the United States and Australia demonstrate all too clearly, that even extensive livestock producers with high levels of access to infrastructural support and management tools can mistake short-term gains for long-term equilibrium and go out of business.

The vagaries of the weather have produced another technological response, increasingly sophisticated software programmes and databases intended to assist producers to both be aware of climatic data and to make real-time use of it in managing their stock. This particularly the case in Australia, where a series of blows to the pastoral industries have badly affected the economies of states dependent on them and where there is intense commercial competition to find better management tools. As a result, there is both an abundance of information available to pastoral producers and a plethora of commercial hard sell, often larded with exaggerated claims masquerading as science. While there is no doubt that real-time and historical climatic data are valuable, it remains to be seen whether practical producers can make use of it in such a way as to gain real advantages in stock survival rates.

Control of stock numbers is another important tool; pastoralists in open-access systems find it practically impossible to restrict overall numbers especially when pasture productivity is poor. The consequence has been the evolution of a minor industry, the calculation of carrying capacity. Despite a scientific superstructure, there is virtually no evidence that this has any scientific validity, as is evidenced by the fact that different experts come up with widely varying figures when asked to estimate the carrying capacity for the same piece of rangeland. Even without hand-held computers and innovative software, livestock producers in enclosed systems with experience of the landscape should be able to detect when

their herds are putting undue pressure on resources. However, this is not necessarily the case; recent evaluations of Australian properties suggest that overstocking is common with all too predictable consequences. One response has been the evolution of the Landcare movement/strategy which encourages producers to take a more holistic approach to the landscape and its management, rather than simply treating it as a more or less depleted resource.

Especially in enclosed systems, another strategy has been to seed rangelands with exotic species supposed to have greater nutritional properties. In recent times, this has been carried from small planes, using legumes such as *Stylosanthes*. The consequences of introducing exotic species into vegetational systems with a high degree of endemism such as that of Australia have been well-documented elsewhere; *Acacia albida*, an important browse plant in Sahelian Africa, is now characterised as an 'aggressive weed' in Australia, has out-competed local species and become the subject of an expensive elimination campaign.

Obviously, these strategies are relevant mainly to developed economies, although over-insertion of boreholes has afflicted semi-arid rangelands everywhere. Control of stock numbers in open-access rangelands is basically only possible in totalitarian regimes, and thus occurred in the former Soviet Union and in the pastoral regions of the Negev, at least for the Palestinians. Regretfully, the numerous projects, policies and strategy papers that have proposed the opposite have now joined consultancy documents on destocking in some limbo where such idealistic entities are finally laid to rest.

2.2 Silvo-pastoral systems

Although pastoralists are primarily associated with rangelands, almost everywhere they make some use of forest vegetation in their annual grazing cycle; the most extreme cases are Eurasian arctic reindeer systems, which are confined to forests. Reindeer are also a special case as they depend primarily on mosses rather than browsing the trees themselves. The ability of pastoral species to digest woody vegetation is highly variable; camels, donkeys and goats can live almost exclusively on such a diet, whereas cattle, yaks, buffalo and sheep can only consume very limited quantities unless they have been fed on browse from an early period. Livestock species also have differing capacities to access browse; camels have an advantage in that they can browse on thorny species with leaves unreachable by other species. Unlike goats, which uproot or strip shorter plants, camels rarely damage the biodiversity of environments in which they graze.

The differing capacities of individual species have had a long-term impact on both ethnic specialisations and the balance of environments. In the Horn of Africa, peoples that depend on 'browsing' species such as the Somali camel herders, border on arid-zone cattle producers such as the Boran and Turkana in Ethiopia and Kenya. Years of intensive grazing of grasslands cause gradual invasions of woody vegetation and gradually drive away grazing species, unable to digest the lignin. It seems likely that pressure from biting flies also increases as the shade provides a greater range of habitats, to judge by work in the Cameroon grasslands (Boutrais 1995). Peoples specialised in browsing livestock, such as Somali and Rendille, then move in and take over. However, over a long time span, grasslands re-invade, making the land again suitable for cattle and sheep.

Throughout much of Africa, trees are the characteristic haunt of tsetse and other biting flies, which makes more than seasonal use problematic. In vertical transhumance in the Himalaya, the winters are spent in forested areas, the animals only moving to meadows during the summers (Chakravarty-Kaul 1997). This has more to do with the cycles of snow than habituation to diet, but animals in these systems have become more adaptable than those in Sahelian Africa by virtue of the major diet changes to which they are exposed within the course of a year.

Increasing the amount of browse cattle can consume would certainly improve conditions for pastoralists in parts of Sahelian Africa, although presumably resources for browsing species would thereby be reduced. Some experiments with camels in Australia may be promising in this respect. Recent research on watering camels and cattle at the same trough when both are feeding in wooded grasslands, suggests that the enzymes that allow camels to digest browse may transfer across to cattle and increase their abilities to digest browse. If this were expanded to encourage semi-arid cattle producers to adopt some camels in their herd and adapt their watering strategies it might have a major impact on survival in some regions.

2.3 Supplementary feeding

Supplementary feeding seems to have had little place in traditional pastoralism anywhere in the world, in part because herds were so small and pasture resources so vast in the pre-modern era. However, stocking winter hay was practised all across the temperate world, where snow or other climatic conditions made it impossible to provide the herds with adequate food. Grass is usually cut in autumn and bundled in stores and rationed to the herds during the winter months. Mechanised grass-cutters and transport have increased the efficiency of this process, and the helicopter has made it possible to drop hay on herds isolated by snow. However, this is expensive, and while typically subsidised from military budgets in Central Asia in the past, its use is now only sporadic.

In this century, changes in supplementary feeding have been extremely significant following the increasing availability of agro-industrial by-products and transport systems to deliver them to remote areas. In semi-arid Africa, products such as cottonseed and groundnut cakes and molasses are now regularly sold to pastoralists, together with mineral licks. Throughout semi-arid West-Central Africa, cotton production was introduced in the colonial era as a cash crop, and its cultivation has remained an integral part of the economy in some countries. The main by-product of ginning cotton locally is cottonseed cake: an oily compressed cake that acts as a nutritious livestock feed. In the 1960s, cottonseed cake was introduced as an experimental diet-supplement in Nigeria, and had to be given away to herders (Otchere 1986). After some time, pastoralists gradually realised the value of these supplements; however, so did more intensive producers, especially those with stall-fed animals based around cut-and-carry. As a consequence, oil-seed cakes have become so highly valued that supplies are regularly bought up by wealthy urban entrepreneurs and rarely reach the markets or are available to ordinary cattle producers (Kaufmann and Blench 1989).

Increased globalisation of markets has also led to a highly significant international trade in animal feeds. Where herds have expanded far beyond carrying capacity as in most of the semi-arid steppeland of the Middle East, this is

Box 1. The desert in Jordan: a parking lot for herds?

It is generally considered that Bedu herds in Jordan in the pre-modern era were limited to some 150-200 animals, since this was all that could be managed by the labour available in a family unit. However, two changes have occurred to radically change this situation; the introduction of water trucks and the widespread availability of subsidised feeds. The buying of feeds has become the single most important household expenditure. *Every single livestock producer* interviewed in a survey of some 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. It is government policy not to allow purchase of subsidised feed for camels. Despite this, many of the camels, especially those kept for milk on the western edge of the rangelands, are fed on purchased feed. The use of these feeds has spiralled in the last few years with the ever-declining rangeland resources. The system of allocating subsidised 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 1000-2000 sheep are common. The forage resources cannot support herds of this size and desert is increasingly a place to store animals while trucking in sacks of feed.

Source: Blench (1995).

premised on supplementing herds with purchased feeds. The political significance of pastoralism in many countries in the region has had the consequence that national governments are tempted to subsidise these feeds thereby acting to swell herds to wholly unrealistic levels (Box 1).

3. Breeding and Reproduction

3.1 Breeding and reproduction in pastoral herds

3.1.1 Controlling bloodlines

Strategies in pastoral societies for controlling the breeding of livestock are extremely variable across the world. Pastoralism, by its very nature makes it difficult to control which animals breed, unless poor-quality males are excluded, either by mechanical means or by castration. Pastoralists are better at ensuring their herds do not mix with other herds than controlling breeding within their own herd. Nonetheless, different societies seem to have taken very different attitudes for reasons that are not always evident.

There is also a strong difference between species; camel pastoralists are much more likely to take a strong interest in breeding than sheep and goat producers. Musil (1928) describes the complex ideas about breeding of the Arabian Bedu. In contrast, Black-Michaud (1986) attributes extreme indifference to the Luri small ruminant herders of Iran. The Incas had a highly effective programme of recording the details of llama bloodlines, using *quipu* cords and a selection process to ensure that the strongest and fittest animals were used for breeding (Brotherston 1989:244). Mongolian herders make a very strong association between human and animal bloodlines; human ancestry is closely recorded and there is a sense that the same should be true for livestock, although this process was interrupted by the collectivisation of herds and the partial introduction of 'scientific' breeding practice. Many pastoral peoples in West Africa seem relatively indifferent about controlling breeding even among cattle, although they are well aware of the need to introduce new cattle races if their herds begins to exploit a different environmental niche (Blench 1999).

The notion that pastoralists should ensure they are breeding from high-quality males and that exotic stock would increase output has a long history in pastoral development. Horse pastoralism is replete with semi-mythological narratives of kings searching for stallions with near-magical attributes. In the real world, however, such introductions have not had the same success. In some ways, the reason is evident; pastoralists breed their animals to survive and produce under extremely harsh conditions and also to pass through climatic and environmental extremes. Animal breeders concentrate on marketable attributes and frequently focus on individual traits such as milk or meat production. Research stations are not ideal places to test livestock for extreme drought and disease stress. So the improved animals do not generally have the qualities that pastoralists really need, although of course they are pleased with the increased milk or meat output. As a consequence, the features of the introduced stock that make it attractive in the first place are rapidly eliminated and the overall herd output remains static.

Nonetheless, since pastoralists do engage in their own introductions, this must be possible; a more effective programme would work with animals genetically closer to those in the pastoral herds and under conditions more similar to those experienced by a real herd. Some progress in this direction has recently been made through 'open-nucleus' breeding schemes, where the pastoralist exchanges animals with those in an improved herd. More success in this area will come with a greater understanding of the conflict between pastoralists' goals and animal breeders' goals.

3.1.2 Castration

The castration of male animals is a common strategy among pastoralists in many systems. It has the advantage that animals may become fatter and are very often less aggressive and thus easier to manage. The disadvantage is that wrong decisions about the genetic attributes of those left entire, or indeed accidents to male animals may leave a herd breeding from poor-quality animals. One counter-strategy is the use of mechanical means to prevent animals reproducing; genital covers are quite widespread in Western Asia with sheep and goats. Castration was probably little practised in sub-Saharan Africa in pre-modern times because of the risk to the stock of males; however, the gradual spread of better health care has made it more widespread as a strategy. In the Andes, castration seems to have been widespread and across all species (Göbel 1997:42). Castration also depends on social institutions for the effective circulation of males; in some ways it has structural similarities to the effects of droughts and blizzards. If the number of potent high-quality males is at a minimum and one dies, then it is only possible to recover by borrowing animals from beyond the household or community. This works more effectively as the community is more cohesive, but also can lead communities to taking substantial risks in reducing numbers of males.

3.2 Hi-tech *ex situ* strategies

Pastoralism is not well adapted for *ex situ* strategies because of the lack of infrastructure in pastoral areas and the difficulties of access. As was suggested in 2.1.1, some societies take great care over bloodlines and controlled mating while other allow unrestricted access to females. For the former, the concept of introducing unknown semen or embryos into their intricate breeding mosaic seems unlikely to be easily accepted. For the latter, it may be introduced, but the consequences will probably be the same as more conventional introductions of improved breeding stock; the elements in the introduced line that make it attractive will be rapidly eliminated by the harsh conditions of pastoralism.

Nonetheless, pastoralists are also the owners and managers of rare livestock breeds and there is now increasing concern that these could be lost or progressively eliminated by genetic introgression. With the loss of such breeds there would be a corresponding loss of genetic traits, in some cases built up over millennia, for example, the resistance to extreme cold of Yakut cattle, to extreme water heights, as Criollo and Kuri cattle and trypanotolerance. Recent scientific advances have made more intricate possibilities available for conservation and monitoring. Cloning is presently carried out in real time, since the goal is not breed conservation, but the same technology could be adapted to clone extremely rare breeds or individuals containing valuable genes. Nonetheless, cloning technology is subject to the same objections as conventional cryopreservation, that it does not reproduce the evolving responses of a live population.

The mitochondrial DNA of cattle is now routinely extracted through PCRs and can be used not only to establish the evolutionary history of breeds and species but also for routine monitoring of genetic variability within populations. DNA can be used to measure directly levels of homozygosity and thus the degree of inbreeding and thereby forming the basis for planning conservation programmes. ILRI, the International Livestock Research Institute, has taken the lead in this area and is presently engaged in DNA characterisation of African cattle breeds.

All these techniques are strictly concentrated in the developed world at present and within the scientific establishment of a few countries. Some are controlled by patents owned by large agricultural companies who will only license these technologies for their own profit. Nonetheless, as with transgenic crops, the technology will probably spread quickly to parts of the developing world with a sophisticated science infrastructure and not at all to many other countries. The whole area is too new to make any secure predictions, but access to information, as in many other areas, may perpetuate inequity although not along conventional developed/developing world dichotomies.

4. Animal Health

4.1 Pastoralists and the health of their animals

One of the significant asymmetries between farmer and pastoralist is that the capital of the latter is tied up in living animals and these are subject to catastrophic declines through disease. An epizootic can rapidly eliminate an entire herd, well before the veterinary services reach the area. This has had two consequences historically, that pastoral herds never became very large and herders developed elaborate systems of loans and animal exchange to reduce risk in case of this type of disaster. It seems fairly clear that there were no effective remedies against major epizootics such as rinderpest, anthrax, CBPP etc. in the pre-modern era. The rinderpest epidemics that swept through Africa in the 1890s devastated pastoral herds throughout the continent and brought whole herding systems to an end. Major epizootics that could wipe out whole herds and even debilitating diseases such as brucellosis were virtually untreatable. The principal response to trypanosomiasis was simply to avoid vast swathes of the continent, whilst rinderpest could only be combated by taking the entire herd into a remote area.

A consequence of this has been that, after an initial period of suspicion, pastoralists have generally engaged with modern veterinary medicine with enthusiasm. The consequence has been a major socio-economic transformation that essentially sabotages the notion of a 'traditional' pastoralist. Vaccinations and drugs allow pastoralists to increase the size of their herds and to expand into regions previously closed to them (see Boutrais (1986, 1995) and Blench (1994) for documentation of the movement of herds into sub-humid regions of West Africa previously closed to cattle). By the 1930s, the Navaho had accumulated extremely large sheep herds because of the level of services available to them (Hoover 1931). Fixed veterinary services have reduced the flexibility of pastoralists to move their herds, placing greater stress on areas near where services are provided (Bovin and Manger, 1990). Unprecedented pressure was placed on feed and water resources, as well as keeping alive stock that would have died in previous conditions, creating large herds of poorly fed animals, often harbouring sub-clinical pathogens.

A major problem has been that after internationally-organised campaigns against epizootics, the normal veterinary infrastructure has been unable to cope with supplying a service of similar quality and pastoralists then become desperate for medicines. This usually stimulates the evolution of an extensive black market in drugs, many expired and some blatant fakes, which can cause havoc with pastoral herds. Nonetheless, recent years have seen considerable improvements in the techniques of reaching remote pastoral communities with veterinary services. The most important of these is the training of 'paravets' who can treat minor ailments and recognise epizootic conditions and major traumas and alert the veterinary authorities. Such programmes are in operation in Ethiopia, Kenya, Somalia, Uganda, Chad, CAR and Mali with varying degrees of success (Catley and Walker, 1997). In addition, traders and private vets (in some countries) are both making drugs available in remote areas and treating animals; this has the advantage of providing some service where the government may provide none, but the obvious drawback that there is no control over the quality and dosage of drugs. Pastoralists are increasingly taking control over the medication of their herds and are thus forced to make choices based on a very concrete appreciation of the economics of using drugs versus the value of an individual animal.

However, there is another, longer-term consideration. Just as the labour-intensive nature of traditional water-points limited the use that could be made of them and thus the potential for pasture degradation, so the low-level effectiveness of traditional veterinary systems kept down herd size and thus pressure on resources. Veterinary programmes are usually initiated without any consideration of the consequences for overall animal production (Konczacki 1978). The medical aspect simply takes precedence, as it does in human medicine, and programmes are often self-perpetuating. When the impact on environmental resources *is* considered, it is usually accompanied by the pious hope that pastoralists will voluntarily de-stock since their animals now have greater survival rates. The introduction of modern veterinary

medicine demands a whole new management system, as the nature of a major threat, disease, is thereby radically changed (Bernus 1983). Herd maximisation is justified by the argument that if there are more animals to begin with, the impact of shock events will not be so devastating. However, when resource availability becomes the single most important factor limiting herd size, this argument breaks down: the more the animals, the greater the shock.

4.2 Traditional remedies

Pastoralists are usually highly knowledgeable about the behaviour and physiology of their animals and in many places have developed traditional remedies for some complaints, especially chronic pathogens, prior to their access to modern veterinary medicine. This is not always the case; for example, among the Luri of Iran there is marked disinterest in the health of animals and even a limited interest in modern remedies reflecting an underlying low investment in the health of individual animals (Black-Michaud 1986:50). The study of this 'ethnoveterinary' knowledge of animal health and indigenous remedies has now accumulated a considerable literature (see e.g. McCorkle 1986; Mathias-Mundy and McCorkle 1989).

Essentially there are two views about this type of ethnoveterinary practice; that it is of limited value and only a resort when modern remedies are not available, or that it is a grossly under-utilised resource that has been displaced as a result of the machinations of the drug companies. Prior to the colonial era, the ability of livestock producers to deal with viral diseases and pathogens other than ticks or worms was extremely limited. This is somewhat controversial; an alternative view is that ethnoveterinary techniques were widespread and more effective than they appear to be in hindsight. What is certainly true is that local remedies remain in use and pastoralists will continue to resort to them while the infrastructure to supply and the cost of modern veterinary drugs remains out of reach. Failures in the delivery of veterinary services have a deleterious effect on the trust placed by pastoralists in the state and are often responsible for the diffusion of iatrogenic diseases, notably when animals gather for vaccinations that fail to arrive and thus further transmit the pathogen the exercise is intended to protect them against.

4.3 Trypanosomosis and the campaigns to eradicate tsetse

Trypanosomosis is a disease-complex associated with the tsetse fly *Glossina* spp. found through much of Sub-Saharan Africa affecting wildlife, humans and livestock (Bourn *et al.* 2001). In humans it is the cause of sleeping-sickness, which is usually fatal in the strain typical of eastern and southern Africa. Wildlife vectors include antelope species, bush-pigs and monitor lizards which may acquire long-term symptomless infections. Livestock are more or less susceptible, and may undergo progressive debilitation leading to death, or may develop partial or near-complete immunity. Tsetse flies inhabit most environments in tropical Africa except highlands and extremely arid regions, but their presence is very much dependent on animal hosts and suitable habitats. The drastic environmental changes of the twentieth century have greatly reduced the habitats and wildlife hosts of tsetse, and hence their overall distribution and abundance has declined..

The control of tsetse and trypanosomosis was a major concern of colonial authorities with the first international conference on human sleeping sickness held in London as early as 1907. With the eventual decline of human sleeping sickness, attention turned to control of the disease in livestock and continues to be a major focus of donor investment through the ISCTRC (International Scientific Council for Trypanosomiasis Research and Control) and various national bodies in East and West Africa. Yet two very different narratives exist of the history of research and action in the control of tsetse and trypanosomosis. Contrasting these is instructive in understanding how international bodies make policy for pastoralists with limited regard for empirical data and scant concern for the very people they are attempting to assist.

In the first version, trypanosomosis is responsible for human sleeping sickness and lowered animal production. More importantly, it keeps livestock out of much of the continent, thus decreasing access to a reliable source of protein and income generation, thereby affecting nutrition and maintaining poverty. If the tsetse fly can be eliminated, or trypanosomosis defeated chemically, then livestock production will both be more productive in its traditional locales and spread to those where it is absent. The major beneficial consequences would be improved protein supply and more effective farming through animal power. Hence the launching of major long-term programmes, to eliminate tsetse through chemical spraying and/or sterile male release (Putt *et al.* 1980). Although these have been reported to be 'successful' in a series of annual and project reports, somehow they are never successful enough to solve the problem. Indeed in 1995, the Programme Against African Trypanosomosis (PAAT) the co-ordinating body for international agencies, noted that 'despite all the efforts and expenditure devoted to research on and control of African trypanosomosis, it is generally accepted that in general terms the impact of the disease is as great today as it was forty years ago' (quoted in Bourn *et al.* 2001). The conclusion is not, however, that something may be defective in the analysis of the problem, but that efforts must be redoubled with even larger and more extensive projects.

In the second version, trypanosomosis is just one of many diseases affecting African livestock, and the patterns of production in the continent reflect human adaptation to its incidence (Ford 1971). In areas where game is abundant, tsetse is abundant and livestock correspondingly rare; humans can thus hunt to supplement their diet. Hence also, although some species of ruminant have been adapted to high-humidity conditions and are kept by forest-dwelling communities, these are never in significant numbers and are usually kept as a prestige enterprise rather than for economic purposes. When hunting eliminates wildlife hosts and arable expansion removes tsetse habitats, livestock move in, making up the protein deficit caused by wildlife elimination. Pastoralists are well aware of the threats that more humid environments pose to their stock and have developed intricate cross-breeding strategies to limit mortality in their herds. Blench (1998b, 1999a) describes the cross-breeding strategies of the Fulbe in West Africa that allow them to move into derived savanna cleared by cultivators on the northern edge of the forest in West Africa. In a somewhat poignant image, a government project in Nigeria imported at considerable cost a large number of 'trypanotolerant' ndama cattle from the Gambia by air and settled them on a ranch in the humid zone. However, mortality was substantially higher among the ndama cattle than in the pastoral cattle herds passing by outside the fence which were better adapted to local conditions.

Tsetse programmes have proceeded in Africa curiously innocent about both biology and infrastructural capacity. *Glossina* spp. are too diverse and co-adapted to the African environment to be defeated by simple warfare analogies. The claimed victories in tsetse eradication have almost certainly been due to anthropic effects, hunting out of vectors and habitat conversion rather than the strategy itself (Bourn *et al.* 2001). It is probable that the success of campaigns in the area of human health, for example those against smallpox and yaws, have unduly influenced those planning for tsetse eradication. But these were susceptible to single-shot vaccinations and were given large-scale international infrastructural support. The troubling persistence of malaria would perhaps be a better parallel, highly polymorphous and habitat-dependent, it requires the sort of sustained attention on the part of national governments that it inevitably does not receive.

This story has no moral except that once established, different narratives have their own inertia; these parallel interpretations of the situation will continue into the future. But they do illustrate how pastoralists' actual strategies are inevitably ignored in the rhetoric of national and international agencies, irrespective of how often the term 'participatory' is repeated. In some ways there are ironic parallels with the foot and mouth epizootics that affected Europe in 2001. In much of the world, foot and mouth is accepted as a continuing pathogen and its effects minimised. Systems that excluded it completely made themselves vulnerable to a rapid and devastating spread with consequent massive losses of stock and disruption of the rural economy.

5. What do pastoralists produce and how do they market them?

5.1 Dairy products

Pastoralists almost everywhere in the Old World depend heavily on livestock milk products for nutrition; both directly by consumption and through sales of dairy products to adjacent farmers to acquire grains or other foods. The exceptions to this pattern of exchange are where pastoralists are so remote from arable areas that this is not practical. The pastoral peoples in the centre of deserts, such as the Sahara, and in extremely cold areas such as Siberia, have no opportunity for such sales (for the Hoggar Tuareg, see Gast *et al.* 1969). Similarly, the evolution of processing technologies, such as cheese and yoghurt-making, are driven by climate; in extreme cold there may be limited value in elaborate preservation technologies. Processing technologies are also driven by breeding seasonality; for example, in most of sub-Saharan Africa, breeding is uncontrolled, with the consequence that animals can come into oestrus at any time, with some milk thus available all year round. In temperate zones, oestrus may be naturally highly seasonal or herders may control breeding through mechanical means or enclosure. Milk is thus seasonal and if herders depend on sales for carbohydrates then they must preserve the product and sell it when there is a market opportunity.

Dairy products thus exhibit a wide variety of storability. In an extreme herding economy such as Mongolia, where fresh milk is only available for part of the year, there is a strong requirement for a diversity of products to meet nutritional requirements throughout the year. Table 5 shows the principal dairy products made by Mongolian herders;

Table 5. Mongolian dairy products

Mongolian	English
<i>Aaruul</i>	Solidified dried curds
<i>Urum</i>	Clotted cream
<i>Shar Tos</i>	Reduced Butter
<i>Tsagaan Tos</i>	Fermented butter?
<i>Ezgi</i>	Caramelised curd
<i>Aartz</i>	Boiled yoghurt
<i>Tarag</i>	Yoghurt
<i>Byaslag</i>	Cheese
<i>Airag</i>	Fermented mares' milk
<i>Huruulsuun suu</i>	Boiled milk
<i>Tsurum</i>	Dried yoghurt

Source: Blench (1995)

In Iran and Afghanistan, a similarly wide range of products is made essentially from small ruminant milk (e.g. Ferdinand 1969; Martin 1980; Digard 1981). Generally speaking, dairy products in Eurasia seem to be much more complex and varied than those in Africa, which probably reflects greater exposure to climatic extremes and thus the need to devise products with differing degrees of storability. There is also considerable variation in attitudes to fresh milk; in Africa and Europe this has historically had a high cultural value among livestock producers, although in Iran it is rarely if ever drunk without processing (Digard 1981:198).

All species produce milk, but the culture of dairying varies between species. For example, although Cleopatra 'bathed in asses' milk' donkey milk seems no longer drunk anywhere in the world on a regular

basis though it is often an ingredient in magical remedies⁴. Table 6 shows a summary of a variety of dairy products produced from the milk of different species.

Table 6. Dairy products by species*

Product	Camel	Horse	Donkey	Cattle	Yak	Buffalo*	Sheep	Goat	Reindeer
Fresh Milk	+	+	–	+	+	+	+	+	+
Yoghurt	+	–	–	+	+	+	+	+	–
Butter	–	–	–	+	+	+	+	+	–
Ghee	–	–	–	+	+	+	+	+	–
Cheese	+	–	–	+	+	+	+	+	–
Fermented milk	–	+	–	–	–	–	–	–	+

Source: Collated from FAO (1990) and other sources

*Buffalo are very rarely herded by pastoralists (although see Digard 1981)

Reindeer milk yields are extremely low and thus reindeer are only occasionally milked and no products are made from the milk (Fondahl 1989).

Llama and alpaca were not traditionally milked and it seems that Andean populations were lactase-intolerant, pointing to a long history for this situation (Orlove 1982). Dairying in South America is thus entirely an introduced culture and probably the sale of dairy products such as cheeses originally developed because of a market among individuals of European descent. Nonetheless, where herds are mixed, combining llamas with small ruminants, cheese-making represents a significant economic activity (Göbel 1997).

A constant factor among pastoral populations is the assignment of milk and milking to women (Little 1994). Men usually only milk animals for their immediate consumption but almost everywhere, women are assigned the right to milk animals for feeding the family and for sale, where there are surpluses. This has been positive for women where the external market for milk has increased demand, for example in Sudan where the introduction of rural cheese factories pushed up prices (Michael 1987). However, where the comparative prices of milk and meat shift in favour of meat, men become more concerned about calf survival and thus pressure women to take less milk.

Milk yields of pastoral herds are almost everywhere very low compared to farmed species in modern intensive systems. West African cattle may give as little as one litre a day, compared with up to sixty in highly intensive stall-fed systems. The inevitable experiments on university and research station farms have shown that the capacity of 'traditional' breeds is much higher when their nutritional regime is changed. But pastoralists do not operate under these conditions, but have rather to contend with a range of subclinical pathogens, constant movement, and the need to balance calf survival against human nutritional needs. So, despite being the recipients of reams of good advice and the beneficiaries of countless projects intended to increase yields, this situation remains much the same.

Another aspect of pastoral dairying that has frequently been the source of near moral panic among developers is hygiene. Although hygiene in dairy production represents a major cost to intensive milk producers, pastoral societies have virtually no outgoings in this respect, since they generally take no special precautions. Since the principal consumers and purchasers of their products attach no importance to this they can compete effectively with packaged products from intensive systems and see no need to adopt additional technologies that increase costs without also increasing market price. If, however, pastoralists operated in countries with onerous regulations concerning dairy hygiene that were actually enforced, their production systems would be threatened; but almost by definition pastoralists are remote from such regimes.

⁴ Apparently, fresh donkey milk was widely available in nineteenth century London as an alternative to the highly adulterated cow milk sold by dairies.

It has been observed in various regions of the world that the terms of trade are slowly but inexorably moving against pastoral producers (Swift 19xx). In other words, the value of their milk, either exchanged directly against grain or sold to buy grain, is gradually declining. The reasons for this are manifold but can be reduced probably to a single underlying cause, the spread of competing products in a market once dominated by milk. For example, in semi-arid West Africa, milk was once the gift of preference to visitors and the status of an individual confirmed by the amount of milk they drank. The availability and prestige of beer and soft drinks has largely displaced milk and it has become something of a poor person's drink, thus forcing down the price. In addition, the tendency of Western economies to produce surplus milk has the consequence that there are frequently surpluses of dried milk powder which are either dumped in countries with a pastoral sector or sent as development assistance. The sporadic and aseasonal availability of such a competing product makes it problematic for pastoralists to predict the market value of their own product.

Apart from milk, live animals can also yield blood and this has been historically exploited in Eastern Africa and the horn of Africa, although it is a practice looked on with distaste by pastoralists elsewhere. Pastoralists such as the Maasai bleed cattle with a special hollow arrow and mix the blood with milk. The Dodoth and perhaps other pastoralists also bleed small ruminants, making a cut above the eye. Yields are not high as individual adult animals give about a litre a month during the wet season and less in the dry, while small ruminants give only about 0.25l (Deshler 1965). Although nutritious and apparently safe, it seems unlikely this practice will have potential to spread to other pastoral regions.

5.2 Meat preservation

The preservation of meat is extremely variable among pastoralists and reflects both the seasonality of slaughter and market access. For example, where the majority of animals are slaughtered at one time of year, notably in cold-weather sites such as Mongolia and Siberia, meat must be preserved, but can often be kept fresh by simply freezing it. In the arid tropics, there is less impetus to slaughter at a particular time of year because of aseasonal oestrus and thus significantly less interannual weight variation. Meat is occasionally smoked, especially for market, but pastoralists usually match the species slaughtered to the occasion and consume all the meat before it goes bad.

5.3 Hides, skins and other products

Apart from meat and milk, livestock fibres and hides can also be of substantial economic importance. Woolled sheep tend to be found in temperate zones; for example there were hardly any wool sheep in Sub-Saharan African pastoral systems or in South-Central India. Wool is one of the high-value products that is not facing significant competition from an equivalent external product; the evidence is that globalisation of trade has caused wool and cashmere production to expand. Alpacas, for example, are tending to expand at the expense of llamas because their wool commands a better price on the international market. The exact definition of 'wool' versus 'hair' is somewhat variable; products from camelids are listed under hair in some statistics and wool elsewhere. Orlove (1977:205 ff.) has a useful discussion of this problem in relation to the Andean wool trade. Table 7 shows the main fibre and hide products traded by pastoralists by species.

Table 7. Livestock products other than dairy by species

Livestock products	Camel	Horse	Donkey	Cattle	Yak	Sheep	Goat	Reindeer	Llama	Alpaca
Hair	+	+	+	+	+	+	+	+	-	-
Wool	-	-	-	-	-	+	-	-	+	+
Cashmere	-	-	-	-	+	-	+	-	-	-
Hide	+	-	-	-	-	+	+	+	+	+
Tail	-	+	-	-	-	-	-	-	-	-
Antlers	-	-	-	-	-	-	-	+	-	-

Camelids are defined as having wool along with sheep. However, the cashmere produced by goats, yaks and Bactrian camels is very close to a wool. Reindeer antlers can be harvested both mature, when they are used for handles and other implements that require bone, and immature when they are prized for medicine, especially in Korea and other SE Asian countries.

All the products except hides can be harvested sustainably but hides come only post-slaughter. Pastoralists are usually more concerned about animal survival than the quality of hides, so these are often of limited market value. Enterprises requiring quality skins very often prefer to work with specialised sedentary producers. For example, the Sokoto Red goats of the Sahel used to produce morocco bindings are never drawn from pastoral herds. In West Africa, however, there is a substantial market in hides for human consumption, so much so that leather for shoe production has to be imported. In large economies such as Nigeria, this can lead to quite startling frauds such as the passing off of donkey or camel skins as cattle hides in remote markets.

In the traditional sector, almost all post-abattoir products are of some economic value; blood is dried and sold as fertiliser, horns and bones are clean and ground up as animal feed. However, animals are sold live and this disposition of minor products is in the hands of traders leaving little room for improving the added value of pastoral products.

5.4 Work animals

One way of gaining added value from pastoral species is through their use as work animals. Working animals are more likely to be found among agropastoralists or farmers, but the boundary between the two is highly permeable. In West Africa, for example, it is not uncommon for farmers in semi-arid regions to use cattle for ploughing or carting produce during the rainy season and then hand the animals to occupationally specialised pastoralists for the remainder of the year. This enables them to exploit the economies of scale that come with the management of large herds, or alternatively to avoid the labour outlay associated with cut-and-carry management.

Table 8 shows the same species of animal as the other tables and the types of work performed by animals. An additional column notes the importance of the dog which is a key species used for herding throughout much of semi-arid Eurasia.

Table 8. Working animals by species

Uses	Dromedary	Bactrian	Horse	Donkey	Cattle	Yak	Buffalo	Sheep	Goat	Reindeer	Llama	Alpaca	Dog
Riding	+	+	+	+	+	+	-	-	-	+	+	-	-
Portage	+	+	+	+	+	+	+	+	+	+	+	+	-
Cartage ^o	+	?	+	+	+	+	-	-	-	+	-	-	-
Tillage ⁺	+	+	+	+	+	-	+	-	-	-	-	-	-
Threshing	-	-	+	+	+	-	-	-	-	-	-	-	-
Rotational machines*	+	-	+	+	+	-	+	-	-	-	-	-	-
Drawing water	+	?	+	+	+	-	+	-	-	-	-	-	-
Herding	-	-	-	-	-	-	-	+	+	+	+	-	+

^oIncludes pulling sledges, both for human and agricultural products transport

⁺Includes, planting, ploughing, harrowing, weeding and lifting

*Sugar-cane mills, oil-mills and clay brick making mortars

It should be emphasised that there is a strong negative correlation between the presence of pastoral buffalos and their use as work animals. Normally the key areas where they are used for work, such as Egypt and lowland SE Asia they have no pastoral role.

Reindeer are used for riding and pulling sleighs, but a recently published photograph of the Dolgan (a Turkic group related to the Sakha in Yakutia) shows reindeer hitch to a crossbar pulling carts on wheels.

Sheep and goats are not usually used as pack animals, but they are essential to the system of vertical transhumance in part of the Himalayas (Downs & Ekvall 1965). Similarly, goat-carts are used on a small scale in Honduras, although but could not be described as a significant widespread technology. The use of reindeer for herding is a key element in the entire production system; reindeer brought up in the household can be trained to round up and lead the semi-wild herds. Much the same is true of goats, for example among the Bedu, where a trained goat will manage a flock of goats and sheep.

5.5 Selling pastoral products

The orientation of pastoralists towards the market has been extremely variable across the world, according to accessibility and ecology. Pastoralists have always had to exchange some products with outsiders for basic foodstuffs and minor household goods. Extreme weather pastoralists have generally reduced this to minimum because of the difficulties of such trade. However, West African pastoralists seem to have co-evolved with highly sophisticated long-distance trade networks, and indeed make use of them to pass information about both market conditions and forage resources (Blench 1996).

Until recently, many pastoralists functioned essentially without cash, exchanging livestock products directly for external goods. In the command economies, prices were completely arbitrary, fixed at the centre and without regard to availability and access costs, and thus the inverse of a market system. In the sheepherding systems of Central Asia, Russian demand for wool caused the replacement of the hardy breeds with Merino varieties, which could only be kept alive with high levels of external inputs (see Van Veen 1995 for Kyrgyzstan). But as monetarised systems and commoditisation have penetrated the region this has caused major adaptation problems. In Kyrgyzstan at least, the system is expected to revert to coarse wool and meat as more traditional breeds gradually replace the exotics.

The general problem of operating in a monetary economy is that pastoralism is essentially a 'slow-response' system; the reproductive cycle of livestock is not adapted to making major changes in strategy over a short period. Thus if the price of dairy products falls dramatically, a herd cannot be suddenly switched into meat production. It is no accident that livestock producers in the developed world are usually enmeshed in complex webs of subsidies and price-support mechanisms; they would otherwise soon go out of business in a world of rapidly changing market conditions.

Although agencies dominated by economists are prone to forget this, pastoralism is above all a cultural system and the close relationship between people and animals is essential to its persistence. The theoretical literature on pastoralism was dominated by an argument about the rationality of pastoral strategies. As far back as the 1920s, Herskovitz (1926) argued for the existence of 'cattle complex', in other words a skein of close cultural ties between herders and their animals that meant that their management practices were remote from rational economic strategies. In particular argument focused on the maximisation of herd size through the retention of 'useless' animals such as barren females. The rise of development economics meant that this anthropological view was regarded as unacceptable and much ink was expended trying to show that whatever pastoralists did was somehow 'rational'⁵. The debate itself now seems outmoded; pastoralists have their own culture and their management strategies develop within their cultural

Box 2. The Raika and their camels

The Raika/ Rebari people of Western Rajasthan are specialised camel-breeders who raise camels to sell as work animals to farmers and traders. However, they maintain a remarkable number of economic restrictions on the products of camels, which is not serving them well in the changing economy of India. Raika do not slaughter camels and will not eat camel meat. Female camels cannot be sold and it is against custom to make commercial gain from milk and wool. Moreover, camel milk cannot be processed in any way. One of the consequences of this is the existence of large herds of females with almost no adult males, which in turn is leading to low reproductive rates and less than optimal bloodlines. Moreover, the restrictions on making a profit from animals are leading young people to turn away from camel production and seek jobs in towns. These cultural constraints have been strongly maintained, leading both to falling camel production and economic fragmentation rather than responsive systemic change.

Source: League for Pastoral Peoples (1999).

⁵ Much of this argument was entirely circular; for example, if pastoralists maximised herd size this demonstrated their rationality as they would have a higher number of animals post-catastrophe. If they rid the herd of unproductive animals this was equally rational in terms of classical economics.

frame of reference. The result is often at cross purposes with outsiders' views; but then the recommendations of experts have a distressing habit of contradicting themselves over time, as changing attitudes to biodiversity and minor breeds demonstrate. Box 2 illustrates a case where customary management ideas seem very remote from modern ideas, but also underlines strongly the importance of a profound anthropological understanding of cultural constraints as a prerequisite to effective development.

5.6 Worldwide demand for protein

A series of recent analyses have shown the remarkable speed at which worldwide demand for animal protein is rising and project its likely increases over the next two decades (e.g. De Haan *et al.* n.d.; Delgado *et al.* 1999). Table 9 shows projections for meat consumption based on FAO annual data since 1982;

Table 9. Actual and projected meat consumption by region

Region	Annual growth of total meat consumption		Total meat consumption		
	1982-1994 percent	1993-2020 percent	1983	1993	2020
China	8.6	3.0	16	38	85
Other East Asia	5.8	2.4	1	3	8
SE Asia	5.6	3.0	4	7	16
India	3.6	2.9	3	4	8
Other South Asia	4.8	3.2	1	2	5
Latin America	3.3	2.3	15	21	39
West Asia & North Africa	2.4	2.8	5	6	15
Sub-Saharan Africa	2.2	3.5	4	5	12
Developing world	5.4	2.8	50	88	188
Developed World	1.0	0.6	88	97	115
World	2.9	1.8	139	184	303

Source: Delgado *et al.* (1999)

The suggestion is that it will be particularly in East Asia and Latin America that demand will rise, which squares with a more general understanding of the increasing wealth and growth of cities and market-driven economies in these regions. Projecting demand in the developed world is more problematic, since fashion and levels of confidence in the safety of intensively produced livestock products have an increasing influence on consumption. Changing societal patterns can often make new domesticates attractive; demand for stronger-tasting meat with a low fat content has accelerated the supply of antelope and ostrich.

Similar figures are given for milk; by 2020 projections suggest that developing countries will consume 100 million metric tonnes more meat and 223 million metric tonnes more milk than in 1993. At present, people in the developed world obtain 27% of calories and 56% of protein from animal food products, compared with 11% and 26% in the developing world; a well-known relationship between increasing income and meat consumption suggests that these percentages are set to rise in the developing world.

In terms of the sources of meat; the fastest growth areas are in pork and poultry; production costs fall more rapidly for monogastrics wherever land costs are high. Monogastric are also more efficient at converting feed and can typically be supplied with agro-industrial by-products from the cities. Sere & Steinfeld (1996) give the following rates for the increase of different livestock production systems in recent decades (Table 10);

Table 10. Source of increases in world meat supply

System	% increase
Industrial livestock production	4.3
Mixed farming	2.2
Extensive grazing	0.7

There is little doubt that these trends will continue; however, this is misleading in terms of determining the attention that should be paid to each system. Industrial production is monomorphic, it has only a single output goal. Both mixed farming and extensive grazing are polymorphic; they provide work animals, supply rural households with protein, function as a store of wealth in areas where banks do not penetrate and often play a key role in ceremonial life. Moreover, they frequently make it possible to produce protein in terrain and eco-climatic conditions unusable in conditions of industrial production.

5.7 Globalisation of the trade in livestock products

A major factor transforming the situation of pastoralists in the twentieth century has been the globalisation of the trade in livestock products. In the pre-modern era, pastoral products could be divided sharply between those that depended on rapid consumption such as fresh milk and meat and those that withstood relatively long-distance movement such live animals, fibres and skins. The comparative advantages of extensive producers have meant that they have always had an advantage over agricultural regions which has stimulated a lively trade. Long-distance commercial networks are common in pastoral areas and pastoralists are frequently themselves involved.

However, enclosures in Europe and the gradual spread of both new transport, notably railways and steamships and subindustrial livestock production, especially in the area of fibres, created for pastoral producers both an opportunity and a threat. Roads opened up new markets for products such as wool and cashmere and brought increased numbers of potential buyers, but they also allowed the movement of products previously confined to local areas, such as milk and meat. As urban consumers became more demanding, especially in the area of hygiene, the balance of the market shifted against pastoralists and towards enclosed systems. This has reached its apogee in the 1990s where a sequence of health scares in intensive production systems has forced the imposition of hi-tech traceability so that all livestock products can be tracked from source to consumer. No pastoralist can compete in this market.

The other consequence has been that the large-scale livestock production characteristic of developed economies frequently produces unsaleable surpluses, often as a consequence of an intricate nexus of subsidies. Frozen meat and milk powder periodically glut world markets and eventually end up being sold in developing countries at unrealistic prices or being distributed as food aid. National governments usually accept this situation because it partially satisfies urban demand; cities are close at hand and pastoralists are usually far away. Dairy products imported into sub-Saharan Africa rose more than 300 per cent between 1972 and 1982 with the an increase of dairy consumption as a percentage of total consumption from 1-27 per cent (Von Massow 1989:7-9). But the inevitable impact is to depress production in the pastoral zone. Ironically, these processes are affecting European livestock producers in much the same way; hill farmers in Wales are going out of business because of a catastrophic decline in prices due to international competition.

In the case of fibres, the situation is more encouraging, as an international market for high-quality fibres remains quite buoyant. For Andean pastoralists, penetration of the international wool trade came relatively early, with wool being bought for export by the middle of the nineteenth century (Orlove 1977). Falling demand for the coarser llama fibres and increased demand for fine wools has had the consequence that alpaca production, previously of minor significance has become of much greater importance.

5.8 Evaluating productivity

One of the common arguments against extensive livestock production systems is framed in terms of low productivity; measuring offtake from pastoral herds or milk yields from ruminants and comparing them to industrial levels suggests to a certain type of economist that this is an ineffective use of land and resources. More attractive is the relative output argument; high-input, high-output exotics are usually measured over a short time-slice gives them attractive characteristics compared with landraces. However, over longer periods, when subjected to environmental stress, subclinical pathogens and unpredictable feed supplement costs often make them less economic, if only because mortality is almost inevitably higher. In the case of the economics of large ruminants, for smallholders even one dead animal can be a catastrophic loss, because accumulated profits from outputs are unlikely to allow another animal to be bought. Collecting data to show this is difficult, because project cycles are typically 3-5 years and this is barely time enough for exotics to be introduced and to reach their productive phase. The typical structure of evaluations does not allow sufficient time to elapse for a true comparison to be made, which would have to be over a period of a decade or more, in the case of slow reproducers such as cattle, camels and yaks. No absolute figure for such a period can be given as it follows the reproductive cycle of individual species, but it should allow a female to develop from birth to a maturity represented by several parturitions.

Box 3. Measuring output over time

Non-diverse livestock production systems are profitable because revenues are sufficient to cover the cost of the special attention needed to preserve a uniform and non-climax vegetation. Where such effort relies on planted pastures, it may also benefit from economies of scale. Outputs from such systems are usually higher when measured over short periods of time against 'complex', diversified production systems such as those involving an elaborate interface with woodland. The greater the simplification of the genetic base, the greater the risk from pathogens. The likelihood of a pathogen eliminating the resource base and thereby causing major food insecurity is hard to quantify. The political pressure for food in the present can often outweigh the potential for famine in the future.

6. Management and the mitigation of vulnerability

6.1 Migration

Johnson (1969) identifies the combination of animals herded and the role that agriculture assumes in a pastoral group's economy as being the most influential factors determining migration. The first and most obvious response to drought is to move the animals to areas where there is still pasture and water. This is probably the major motor for the expansion of pastoralism, especially in the case of the eastward expansion of the Fulbe across the West African savannahs. In the pre-colonial era, pastoralists were limited principally by disease and more occasionally by insecurity. In the present century, these have taken second place to the occupation of land by cultivators and the presence of boundaries that impede free passage.

The migration of pastoralists to areas of higher productivity alleviates stress on less productive or exhausted land. Conversely, if the movement of pastoralists is restricted, already marginal land becomes more overused. Johnson (1975) observes that if pastoralists face a long journey stock deaths increase, and they must weigh likely losses from the migration against comparable losses were they to stay on suboptimal land.

The creation and maintenance of corridors reinforces co-operation between the agricultural and pastoral sectors. However, corridors which are too long or too narrow tempt hungry animals to graze on the crops on either side; pastoralists have to use more labour to keep their herds under control, and the potential for aggravating the conflict between cultivators and pastoralists is apparent.

A major exception to this was Central Asia in the Soviet era where an extensive military infrastructure which controlled pastoral movement was based on unrealistic cost structures. Another curious exception was Israel post-1967, where extreme militarisation of the Negev led to major constraints on Bedouin ruminant production, through registration of herds, prohibitions on traditional migrations, and more surreally, campaigns against black goats (Abu-Rabia 1994).

6.2 Changing herd composition

A long-term recovery strategy and insurance against the impact of future droughts is changing the species in the herd. Although cattle are prestigious and highly valued in the market, they are vulnerable to drought in comparison to camels and goats. The relatively high rainfall in the 1960s encouraged pastoralists all across the Sahel to switch from camels to cattle, even populations such as the Tuareg (in Mali) who have been historically identified with camel-culture. The droughts of the 1970s demonstrated that this was an unwise strategy and their recurrence in the 1980s underlined this point.

These types of changes in herd composition can also apply within species. In West Africa, cattle breeds that specialise in grass are more prestigious than those that can digest a high proportion of browse. However, where low rainfall or high grazing pressure has changed the species composition of the landscape so as to favour shrubby vegetation, the herder with cattle that can tolerate a higher proportion of browse in their diet will survive better. In a concrete example, Fulbe herders in Nigeria, faced with rapidly vanishing grass in the semi-arid zone, have switched their herds from the Bunaji breed, which depends on grass, to the Sokoto Gudali, which can digest browse much more easily (Blench 1999).

Strategies relating to species diversification vary; there are advantages in owning a variety of species, so that whatever climatic events occur, there will be survivors. For example, the multi-species herd typical of Mongolia and the Andes may well be a reflection of the extreme climatic variability. However, maintaining such herds is a luxury that only the wealthier can afford. Herds of different species are generally split up, most commonly into browsers and grazers, so the available forage can be exploited most effectively.

Within species, herd diversification takes place during a drought. Productive animals, particularly females, receive priority treatment, whilst the bulk of the herd is sent to find pasture further afield. This allows milk to be obtained from the subsistence herd, or from relatives, while the rest of the herd does not exhaust the grazing (Dahl and Hjort, 1976). Larger animals, particularly camels, although resilient in a drought, will die in numbers after a critical point. After drought, smaller stock reproduce more rapidly, allowing the herd to recover, and acting as capital which can be exchanged for larger animals later on. Rebuilding a herd of camels by comparison is a slow process.

6.3 Predation

In the pre-modern era, predation on pastoral herds was a major concern of virtually all pastoralists and a constant demand on herding labour. The expansion of agriculture and the spread of modern weapons in the early twentieth century has largely eliminated predators in whole ecosystems, for example, wolves, lynxes and leopards in circum-Mediterranean systems, hyenas and lions in West Africa. In the Soviet era, military-style collective hunts against predators in Central Asia and Siberia substantially reduced the impact of predation, although elimination was never practical. Predation remains a significant threat in the Andes, where pumas and foxes often take young animals (Göbel 1997).

However, external changes are affecting views of predation and thus attitudes towards the wholesale elimination of predators. Many species, such as wolves, bears and snow-leopards, are now seen as endangered and therefore as the object of conservation efforts rather than as a nuisance to be eliminated.

Projects have been established in Mongolia, for example, to encourage herders to conserve snow-leopards by accepting the losses and providing alternative sources of income to compensate for them. In Namibia, where more traditional livestock ranches are increasingly interspersed with wildlife enclosures, predators such as leopards and cheetahs are on the increase, partly because a certain level of predation is accepted as necessary to the health of a wildlife stock. Similarly, in North America and Scandinavia, the re-introduction of wolves into National Parks has caused considerable controversy, as they inevitably pass beyond the boundaries of the park and kill livestock outside. Such losses are not acceptable to livestock producers and the rather mythic status of wolves has allowed them to articulate panic messages somewhat out of proportion to the wolves' actual depredations.

The consequence has been a policy war between these competing interests, played out in front of an interested media. There is little or no doubt that environmentalist and conservation concerns will win out; the strength of these lobbies across the developed world is constantly growing and they are well-funded and articulate. Wildlife, where picturesque, can often contribute more than pastoralists to national economies in hard currency, which is what counts with policymakers. Moreover, it has become clearer that there are ways to develop interlocking wildlife and pastoralist systems that allow both systems to flourish; such types of co-conservation are beginning to appear in East Africa (Bourn & Blench 1999).

6.4 Theft

A problem rarely addressed by livestock services, but which weighs heavily in the investment decisions of livestock owners, is the prevalence of theft. It is not worth investing in quality animals if the likelihood is that they will be stolen. Owners will not pay out for supplementary feeds if the only effect of fattening animals is to increase their attractiveness to thieves.

Livestock raiding has something of a romantic history and in parts of the world, such as the Kenya-Ethiopian borderlands or Madagascar the successful rustler gains prestige (e.g. Fukui and Turton 1977; Todd 1977; Bollig 1990; Turton 1991). There is, moreover, an argument that this chronic raiding acts to maintain an ecological balance (e.g. Sweet 1965). However, more commonly theft is practised by urbanised individuals linked into the market system who can sell their haul rapidly to butchers. Cattle and sheep are the animals most commonly stolen, because of their relatively high market value and because they can be driven away. Livestock theft is problematic in administrative terms; national authorities are often unsympathetic to pastoralists to begin with and perceive the expenditure of policing resources on lost sheep as futile. The consequence of this is that not only do herders need to allocate considerably more resources on guarding animals, but they tend to arm themselves and treat stock-raiders to summary justice. This in turn tends to aggravate the authorities still further as they then see pastoralists as forming unregulated militias.

7. Social and cultural institutions of pastoralism

7.1 Social structures

The basis of pastoral organisation almost everywhere in the world is the clan, a set of patrilineally-related households traced in theory to an apical ancestor. Such groupings can be very small and the ancestry to a very shallow time-depth or so great that the ancestral figure is semi-mythical, in which case, the working kin group is a lineage. The preservation of these genealogies is very important, especially to the aristocratic strata of nomad society as Khazanov (1984:142) points out, as it legitimates their position. Well-known exceptions to this rule are the Tuareg, who had matrilineal descent groups in some areas and the subarctic peoples such as the Saami, Chukchi and Koryak who had neither unilineal descent groups nor elaborate genealogies.

One of the most distinctive features of pastoralism in East Africa and the Horn is the system of age-sets. Among the Boran of Southern Ethiopia, for example, men born within a seven-year cohort fall into named age-sets and these have rights and privileges within society, as well as acting as a powerful force for cohesion and a calendrical system (Legesse 1982). Similar systems are found among many neighbouring peoples as well as among settled Ethiopian peoples (see Beaman 1981 for the Rendille system) and are probably not distinctive to pastoralism despite their central importance in these societies.

A key aspect of pastoral systems is the strong relationship between wealth in livestock and labour. Herds that grown beyond a certain size cannot be managed with household labour and outside herders must be sought. In the twentieth century, this is generally through hired labour, but formerly it was often through slavery or vassal castes. The great herds of cattle owned by Fulbe herders in modern Niger in the nineteenth century were managed by slave labour and many pastoral societies in Africa and the Near East, developed elaborate caste systems based on slaves and non-slaves. In the case of the Tuareg, for example, society was divided into;

Imajeɾen	nobles
Iklan	(former) slaves
Izeggaren	agricultural labourers
Ineden	blacksmiths

Marriages between these groups were formerly forbidden and even today remain uncommon. However, when slaves were freed in the colonial era, they stayed with their original camps for some time, but have gradually broken away and now form independent households, often remote from their original site so that traditional authority cannot be brought to bear. Similar systems were found throughout much of the Bedouin areas (Peters 1990) and in the Horn of Africa.

7.2 Role of women in pastoral society

The role of women among pastoralists has been much debated, in part because pastoral societies are male-dominated to a much greater degree than most other subsistence systems. Despite the well-known exception of the Saharan Tuareg, the great majority of pastoral societies are patrilineal and male-dominated. The reason for this is much debated, but the root cause appears to be related to the importance of not dispersing viable herds. In an exogamous system, if women can own significant herds of their own, then on their marriage they will take these away to a new camp and potentially deplete the herd of an individual household. Many pastoral societies practise pre-inheritance, the father dispersing the herd among his sons prior to his death, since the principle of patrilocality means that they will anyway remain in the same physical herd. In pastoral societies, particularly those affected by Islamic inheritance rules, some animals go to daughters on the death of the household head, but these are then 'managed' by the woman's brothers (see Tapper, N. 1991 for the workings of this on the ground).

In most pastoral societies gender roles are strongly marked, and indeed patterns seem extremely similar across the world (cf. Dahl 1987). Women are typically responsible for milking and dairy processing; they may or may not sell the milk, but they usually have control over the proceeds to feed the family. Men are responsible for herding, and selling meat animals and in systems when a herd is split, women usually stay in a fixed homestead while men go away with the animals.

Pastoral societies typically tend towards monogamy because of the importance of the division of labour. In other words, for a pastoral household to be viable, there must be wife to carry out key tasks. If there are too many polygynous households, they will be unviable. There are exceptions to this rule, the Maasai being one well-known example. The Maasai system of age-grades, where young men are assigned to a social category,

moran 'warriors', who are not allowed to marry, makes it possible for older men to have several wives. Only once a young man has graduated from being a *moran* is he able to marry.

7.3 Pastoral identities

Throughout much of Eurasia, pastoralism is interwoven with the culture of itinerants; other groups who move around supplying services to fixed communities. The most well-known of these are the Gypsies, spread from Wales to India under a variety of names and associated with a variety of occupations. Rao (1982, 1987) has christened these groups 'peripatetics' and described some of their activities, notably those concerned with crafts. As with the gypsies and horse-coping, some peripatetics play an important role in livestock trade although they generally do not produce food. These groups are particularly numerous between Afghanistan and India. Interestingly, they fall into caste, endogamous groups and are often stereotyped as ethnically distinct in the same way as pastoralists and treated as in the same category by national governments (Olesen 1994:25). In Afghanistan both pastoral nomads and peripatetics live in tents, but those of livestock producers are black goat-hair tents while peripatetic tents are white.

7.4 Land tenure and the CPR debate

Pastoral systems have been at the heart of many debates on the nature of Common Pool Resources (CPRs). While settled farmers usually develop relatively explicit systems of tenure, many pastoral peoples have fluid systems that are hard to pin down, in keeping with their opportunistic grazing strategies. Where pasture is extremely patchy and likely to appear in different sites each year, investing heavily in ownership of a specific piece of land is hardly worthwhile. However, the negative side of this is that farmers can come and cultivate the land of herders where regularly graze their stock without taking permission. Pastoralists, because they are generally operating in remote areas without access to schools, rarely have literacy as a tool to register land claims and so are outcompeted both by farmers and by urban-based ranchers. In Jordan, the Badia rangelands were the preserve of sheepherders because agriculture was considered to be impossible. However, a combination of boreholes and new irrigation techniques is pushing farms ever further into traditional grazing land and government is unwilling to halt this process because of its own political constituency.

Tenure is thus divided both by ecology and by the potential for agriculture. In much of the snowy steppe, agriculture is not practical, so pastoralists compete with one another for prime sites. The same is true in the subarctic regions, where reindeer herders do not interact with farmers. In much of Central Asia, the command economies over-rode traditional access rights and created mapped and demarcated territories for collectivised units. These are in the process of being dismantled and more traditional access rights are being re-asserted. However, legal frameworks for this new situation are only now being evolved.

Pastoralists in all parts of the world are not deemed to have tenure sufficiently strong that it cannot be overridden by the state in the search for minerals. Land can be appropriated for building and transport infrastructure and generally without compensation. There is no doubt that for pastoralism to survive, effective tenure must be developed in many parts of the world. This is proving difficult, because few governments have the political will to protect pastoralists against the vested interest of urban groups. The usual indicator of tenure in the ranching areas is the fence, a high-investment strategy that is only effective in countries with specific legal frameworks in place.

8. Pastoralism and the state

8.1 The edge eats the centre

Once a pastoral society develops beyond clan and lineage organisation, it must develop more elaborate hierarchical structures. Khazanov (1984:228 ff.) reviews the many theories of the evolution of the state among nomads, once a subject of much scholarly debate and the source of many improbable historical typologies. Powerful and extensive states were most common in Asia, where the links between pastoralism and warfare were well-developed and there was the potential to accumulate enormous storable wealth. In the subarctic and the semi-arid pastoral zones of Africa, the inability to store wealth other than livestock and the difficulties of keeping horses (the pre-eminent raiders' animal) alive meant that the large-scale kingdoms typical of the steppes never developed. Accounts of visitors to the courts of the Khans underline the enormous wealth and sophistication that had accumulated over time and the ferocious means such rulers employed to maintain their authority intact. The Mongol empire once stretched from the shores of the Pacific to Poland, a land empire larger than any other in history (Jagchi & Hyer 1979). It would probably be inappropriate to link the Inca state to the use of llamas in vertical transhumance; similar systems in the Alps are historically associated with democratic tendencies.

Nonetheless, a correlated feature of such empires was their inherent instability. Despite their effective warfare techniques and the rapid evolution of the Mongol Empire, its failure to settle the furthest areas of its conquest meant they soon shook free their new rulers. Long lines of communication and mobile armies made dissent and secession all too easy and only by settling and essentially discarding nomadism was it possible to form a more permanent political institution (Barfield 1989).

In West Africa, the Fulbe, cattle nomads spread across the Sahelian region, began a Jihad from 1804, conquering the seven original Hausa kingdoms of today's northern Nigeria and pushing eastwards to northern Cameroon. They settled as rulers of the kingdoms they conquered, dispensed with their cattle and in most cases switched to the language of the peoples of their empire. Meanwhile, their 'brothers', those who still herded cattle migrated still further into Central Africa, impelled onwards by ever-increasing arable expansion.

8.2 Pastoralists and national borders

Pastoralists, with their military traditions and high mobility, have not historically been loyal subjects of nation-states. For the same reason, states they have founded tended to be short-lived. This has been unproblematic until the twentieth century when national borders have begun to play a key role in worldwide geopolitics and the free movement of livestock has been seen both as a security and health threat on the one hand and as a potential loss of national wealth on the other. Many West African states, while they depend on the meat and milk 'their' pastoralists produce and benefit from their opportunistic attitudes to national borders, simultaneously condemn herders for not staying within a confined range (Blench 1996). Throughout Central Asia, many pastoral peoples have been split by the establishment of states with heavily defended borders (e.g. Tavakolian 1984). Unlike Africa, where pastoral peoples move around relatively freely in open, arid spaces, peoples such as the Kazakh and the Mongols have been divided by states with highly varied policies. Moreover, sensitive border areas were generally closed to outsiders, so information on pastoral societies in these regions was tightly controlled.

PART II. Pastoralism and policy issues

9. Pastoral populations and rangelands

9.1 Competition with foragers

The economic importance of rangelands world-wide is extremely variable according to the socio-economic system in which they are embedded. In developed economies, such as Australia and America, rangelands are essentially marginal terrain suitable for low-intensity stock-rearing and hunting. In pluralistic economies such as Brazil, high-density vegetation such as rainforest, of crucial importance to hunter-gatherers and smallholder farmers, can be all too easily converted to low-fertility savanna of interest to wealthy ranchers. In Africa and Central Asia, rangelands are essential to the subsistence of pastoralists, foragers and farmers dependent on rainfed crops. Such groups are generally the most vulnerable groups in the region, both because they depend on a variable climate to support a necessarily patchy resource, and because tenurial regimes tend to be more ambiguous in regions often regarded as a common pool resource.

The consequence of this is that there is a gradient of competition for access to rangelands. In developed economies, rangelands are given over to low-intensity grazing or protected areas. Conflicts that arise, such as the desire of governments to increase the area of national parks, assert claims for mineral rights or predation from protected species on livestock, are relatively minor and easily settled. However, in South America, where rangeland can be created at the expense of the livelihoods of the occupants of the forest, conflict has been prolonged and violent. The principal means of habitat conversion, burning, is, for practical purposes, irreversible. Once cleared, neotropical rainforest takes centuries to regenerate.

In Sahelian Africa, India and west-central Asia, competition for rangelands is intense, but, by and large, it is not usually a case of the wealthy and powerful versus the poor and dispossessed. Increasing population pressure is tending to push arable farming into more and more marginal areas, especially with the introduction of modern transport and low-cost irrigation techniques. This in turn places further pressure on pastoralists and foragers and thus on rangeland vegetation. Although there have been serious doubts about the long-term impact of 'overgrazing' and more emphasis laid on the resilience of rangelands, continuing intensive pressure implies poor producers of biomass for both livestock and wildlife.

The consequence is very often that the poorest groups are competing with one another for a limited resource. Across semi-arid Africa and in parts of India, conflict between expanding farmers and pastoralists is an everyday occurrence; the numbers and political power of the farmers, as well as tenurial regimes more supportive of agriculture than livestock, ensure that the farmers are generally dominant. At the same time, foragers and livestock producers may come into conflict, especially in southern Africa. The consequence is often to drive pastoralists into zones so arid that farmers cannot follow them – placing more pressure on these fragile environments and exposing the herders to greater risks of climatic uncertainty.

Foragers and pastoralists often live in overlapping territories, especially in Africa and Siberia. Prior to the twentieth century, land competition was not of major significance and these two interlocking subsistence strategies could effectively co-exist. However, as human population densities have increased and pastoral habitats converted, pastoralists are under pressure to define their territories. In Siberia, the system of managing wild reindeer, was transformed under the Soviet regime into a system of herding within bounded and fenced territories, thereby excluding such hunting peoples as the Nenets. In Botswana and Namibia, cattle-keepers such as the Kgalagadi, Herero and Ovimbundu have themselves faced exclusion from white-owned fenced ranches and have been pushed into further incursions on the hunting territories of the Khoisan. The Hadza hunter-gatherers of northern Tanzania have seen their traditional hunting territories increasingly eroded by pastoralists with more access and influence at the level of the administration. At the same time, the establishment of game fences, intended to exclude migratory herds of wild animals and thereby keep livestock disease-free, reduced the ability of hunters to follow game, especially across national boundaries.

One of the options that foragers often take when faced with pressure from outside forces to cease hunting is to become pastoralists or work with livestock. The Navajo turned to sheep-herding and native Australians frequently work as stockmen. The Khoikhoi of southern Africa were partly herders at first European contact, but also engaged in extensive foraging. The impact of European settlement was grim and one of the few locations where their society survived in altered form was in Namaqualand, the arid region in the extreme northwest of South Africa and adjacent Namibia. Reserves were created and managed on a communal tenure system. However, in the early 1970s, a new proposal was made to create the Richtersveld National Park, effectively sequestering 80,000 hectares from the Nama (Boonzaier *et al.* 1996). This reflected as much the extreme political marginalisation of the Nama as any protection of the minimal wildlife resources of the region. However, in a reversal of the usual course of events, advocacy groups joined with the Nama to protest the proposed exclusion. The effect was to halt the park creation until the end of the 1980s when grazing and foraging rights were conceded (or else compensation for their loss) and employment as rangers was offered as a priority to Nama.

Hunting and tourism in these regions remains a special case and of variable importance. The rangelands of west-central Africa, for example, are virtually devoid of large herbivores and infrastructure so unattractive as to make hunting and tourism insignificant. In eastern and southern Africa, however, wildlife constitutes a significant element of national income, notably in Kenya, Tanzania, Zimbabwe and South Africa. The system of national parks and a highly organised infrastructure means that the greatest proportion of income accrues directly to the state, rather than to nearby communities. As a result, poaching is rife and an adversarial relationship between park authorities and villagers is the norm. Although revenue-sharing systems have been put in place in some areas and heavily promoted by aid and development agencies, their contribution to livelihoods in these regions remains extremely small.

In Central Asia, the situation is somewhat different, since until recently, all protected areas were reserved by decree and certainly did not benefit from consultation with the local populations. The paradoxical consequence was an almost unparalleled level of habitat conservation. Similarly the system of collective farms was kept going with subsidised inputs, sometimes brought in at uneconomic costs. This had the effect of reducing pressure on the natural rangelands, as did the central control of animal numbers and relatively high levels of offtake. Tourism remains a nascent industry, and any income from it extremely volatile, reflecting the unstable politics of the region. However, the implosion of the collective farms has resulted in the regeneration of pre-Soviet patterns of pastoralism and grazing, increasing pressure on the rangelands and bringing herders into potential conflict with the management of poorly-resourced parks and protected areas. The lack of market infrastructure and the limited range of inputs means that Central Asian pastoralists are generally much poorer and more vulnerable than those in Africa.

9.2 Pastoralists and the environment

Pastoralists have not historically been perceived to have a good relation with the environment. Accused of overgrazing and desertification, more recently, they have been seen to be responsible for methane emissions and low feed-conversion rates. Some of these arguments have little technical validity, but this does not stop their being used in donor conferences. The most important arguments revolve around overgrazing and land degradation and the alternative use of rangeland to sustain a broader range of biodiversity.

Pastoralism may begin in Africa as early as 7000 BC, but its major impact is probably felt by about 3000 BC in both East and West Africa. Cattle and sheep do not reach the rangelands of southern Africa until about 300 AD. The widespread presence of tsetse would have constituted a major constraint to livestock in many regions, at least until trypanotolerant breeds were developed. Destroying tsetse habitat in woody vegetation and gallery forest would have provided an additional incentive for pastoralists to burn off forest cover. The twentieth century brought trypanocides, enhanced veterinary care and eliminated much tsetse habitat, providing an incentive to substantially increase herd sizes and thus grazing pressure (Blench 1995b). Hence the growth of a large and often problematic literature on range degradation and overgrazing.

Other literature has focused on range degradation and vegetation change due to overgrazing or to climatic variability (Adams, 1996; Behnke, 1994; Doughill & Cox 1995; Behnke & Abel 1996a,b,c; Blench and Marriage, 1999). Nonetheless, heavy grazing does change the composition of the vegetation (Hiernaux, 1996). The density of palatable perennial species falls as they are replaced by less palatable ones, because their competitive ability declines.

Another consequence of heavy grazing can be the spread of woody vegetation and the eradication of grassy areas (Arntzen, 1990). Adams (1996: 6), discussing the Kalahari in Botswana, reports that in 'low tree and shrub savanna' the combination of heavy grazing and the absence of hot grassfires causes the spread of dense, woody vegetation (bush encroachment). The spread of pure and persistent stands of species – such as blackthorn – means long-lasting and irreversible decline in species diversity (De Queiroz, 1993b; Dougill and Cox, 1995). This kind of bush encroachment means a decline in the productivity of the grazing for both cattle and goats, as well as wild herbivores. Adams (op. cit.) points out that bush encroachment in the Kalahari is distinct from other forms of vegetation change, both in terms of persistence and its exclusion of other species.

Box 4 Overgrazing in Africa's high-altitude grasslands

The Mambila Plateau in SE Nigeria is a typical high-altitude grassland of Adamawa. It was first colonised by Fulbe pastoralists in the 1890s in the immediate pre-colonial era (Blench 1991a). From then, waves of herds appeared from all parts of West Africa, until by the 1930s, colonial officers began to complain that overstocking would lead to environmental degradation. These were followed by a series of reports on the management of the Plateau. None of these recommendations had any effect on policy and by the time of the first aerial survey of numbers in 1984, the cattle population was in the region of 400,000. The signs of degradation were beginning to be highly visible, but even so, numbers continued to increase during the 1980s, until a second survey in 1990 estimated there were some 600,000 cattle. A decade later, in 1999, numbers have undergone a major crash, and the ubiquitous bracken and tussocks of inedible grass suggest that ecological collapse has finally drive away the vast herds. High-altitude grasslands are not resilient in the same way as Sahelian rangelands because they do not have a history of responding to climatic variability and have not co-evolved with a limited range of herbivores. In this way, overgrazing can occur and a potentially rich resource that might be managed sustainably becomes a barren wasteland.

Source: Author's observations

Apart from the semi-arid and subhumid savannas, Africa has a smaller number of high-altitude grasslands. The Ethiopian Plateau constitutes the most extended area, but the highlands of Uganda and Rwanda represent a similar ecology. In West Africa, the Fouta Djallon in Guinea and the Adamawa grasslands in Cameroun and Nigeria are comparable grasslands. Unlike the Sahel, the West African grasslands have historically had relatively low grazing pressure from wild herbivores and none from domestic animals because the foothills around these plateaux are humid forest that acted until recently to exclude cattle. The colonisation of these grasslands by pastoralists took place in the mid-to-late nineteenth century when the expansion of population cleared sufficient areas of tsetse to make it possible to reach them without unacceptable levels of mortality from trypanosomes. They represented almost ideal conditions for pastoralists, with lush grass, little competition with farmers and reduced disease problems. As a result, cattle herds came in increasing numbers, gradually changing the pattern of vegetation until they became almost unusable as a habitat for livestock (Blench 1998b). The Mambila Plateau in SE Nigeria represents a good case history of this type of cycle (See Box 4).

In silvo-pastoral systems, notably the reindeer-based systems of Siberia, the potential for overgrazing of mosses and lichens is both very real and long-recognised by herders. Moreover, the speed at which reindeer can reproduce means that without epizootics and blizzards they can soon strip their habitat. As a consequence, herders such as the Chukchi have developed culturally-sanctioned systems of destocking (Box 5).

Official attempts to encourage pastoralists to destock, to substitute 'quality for quantity' have not been conspicuous by their success. Indeed it is fair to say that in all non-authoritarian regimes they have been a complete failure. The reasons for this have been much debated. The traditional view derives from the 'cattle complex' concept first mooted by Herskovitz (1926), that pastoralists view their livestock, especially cattle, as part of a ritual and prestige nexus and not as a market enterprise and therefore reducing herd numbers would be equivalent to moving down the social ladder. The alternative view, that pastoralists *are* keyed into the market, but they also have elaborate risk-aversion strategies responding to uncertain disease and climatic regimes gained considerable ground from the 1960s onwards. According to this it is rational for each individual herder to keep a maximum number of animals in case of epizootics or drought; the more animals you start with, the more will be left after the disaster.

Various political systems have been unwilling to tolerate this *laissez-faire* situation and have simply enforced limits on herd sizes in relation to the determinations of range scientists as to carrying capacity. Israel, for example, compels Bedouin herders in the Negev to sell any surplus animals beyond a fixed herd size. Command economies such as for the former Soviet Union and Algeria controlled herd size and composition through powerful local institutions. The United States, trying to prevent overgrazing in the Hopi-Navajo region introduced a 'herd reduction' programme (Box 6).

Box 5. Keeping Chukchi reindeer herds in check

The Chukchi people herd reindeer throughout much of Siberia, east of the Kolyma river. Because of the importance of matching herd sizes with moss resources, they have developed a number of mechanisms of controlling herd size, somewhat surprising in terms of other pastoral societies. Herds are regularly split between family members and the new herds take off for pastures elsewhere. 'Assistants', i.e. hired herders are paid with stock and can often gather enough animals to form the nucleus of their own herd. 'Herd capture', the intentional mixing of a small herd with a large and the consequent disappearance of some animals from the large herd is tolerated. However, the Chukchi also kill pregnant does in order to prevent them from reproducing. At the annual sacrifices, when male fawns and bucks are killed each must be accompanied by a 'wife' thereby removing further females from the system.

Bogoraz (1902-9) and Leeds (1965)

Pastoralists do not usually manage pastures and generally do not plant them. Attempts to encourage the planting of pastures, such as through 'fodder banks' have not met with significant success.

Artificial water sources are now widespread in many arid and semi-arid rangelands. For example, in pastoral areas of Australia today there is at least one artificial waterpoint every 10km (Bennet, 1997: 11). Originally, establishing closely spaced water sources was intended to avoid the localised degradation that follows the concentration of many animals at few sites. Creating this dense network induced similar grazing patterns over large areas. The impact on biodiversity was negative because native species in Australia's arid and semi-arid rangelands are adapted to very light or no grazing pressure. Once biodiversity becomes a consideration, management should promote grazing patterns that are spatially heterogeneous rather than uniform. Fencing tends to be expensive for extensive areas, whereas water is a powerful and cheap tool for this purpose. If artificial water points were shut down in areas with a high conservation priority, grazing pressure would be reduced. Obviously, such a strategy is only applicable where artificial water sources are numerous and would not apply in Africa or much of South America.

Box 6. Persuading the Navajo to sell

A dispute between the Hopi and Navajo over the management of their shared territory goes back as far as 1882. In 1974, a programme of stock reduction was initiated, so that land could be demarcated and a programme of range management undertaken. To this end, a large-scale purchase programme was started with stock being bought from their owners at 150% market price. This was combined with threats to impound livestock once the voluntary period ceased. Poverty and unemployment in this region meant that many herders sold a large part of their stock. However, the consequence was that the herds were then unviable, since there was no immediate impact of range and infrastructure improvement. This created a cycle of further sales, household breakdown and increased nutritional problems as well as conflict with the authorities for those who tried to outmanoeuvre the system. The consequence was eventually exacerbation of the problem the programme was intended to solve.

Wood (1985)

9.3 Competing uses of the world's rangelands

Until recently, pastoralists were to a certain extent protected by the remoteness of their habitat. Its inaccessibility meant that it was written off by national governments. However, the evolution of modern transport and remote-sensing has changed this equation rather dramatically. Remote drylands, mountains and tundra are often the sites of valuable mineral deposits and new telemetric devices means that their presence can be detected. Similarly, the rise of the conservation lobby, and the fact that in remote areas, terrestrial fauna is likely to be better preserved, has created accelerating pressure to declare wildlife or biodiversity reserves, thereby taking land out of the pastoral orbit.

9.3.1 Pastoralists and the exploitation of mineral resources

Although mineral and oil extraction in the developed world are frequently subject to controversy, the presence of regulatory frameworks and highly-developed advocacy groups ensure public debate and eventually pressure to adopt sustainable and environmentally sound practice. This is very much less the case in the developing world, partly because of the relative economic importance of mineral revenues, with the consequence that governments are generally not keen to publicise details of either potential income or environmental impact.

Most developing countries have weak communications and transport infrastructure. The low populations in arid and semi-arid zones tend to make the opportunity-cost of developing these relatively high. Mining and oil enterprises therefore set up highly sophisticated telecoms and logistics supply systems which are independent of local structures. These are effective within the limited context of extraction but their isolation from the national system can be problematic in the case of community-awareness programmes, or indeed

disasters. Poor communications and weak CBOs in arid and northern semi-arid zones mean that government is rarely called to account for deficiencies in the monitoring of mineral extraction enterprises. The importance of mineral revenues is such that governments often have no regulatory framework in place, or else do not enforce one that has been enacted.

This is most evident in the former command economies where anxieties over the declining economy have pressured government to increase mineral extraction rates. Vitebsky (1990) discusses the impact on reindeer herders of the gas deposits in the Yamal Peninsula in the Soviet Arctic, and similar problems have arisen in relation to oil extraction in Siberia, for example among the Khanty of the Pim River (Stewart 1994/5). Reindeer have also been the principal pastoral species affected by escaping radiation. After the Chernobyl incident of 1986, reindeer and caribou all across the circumpolar regions accumulated such high levels of radioactivity in their tissues that the meat was unsaleable on the world market. This led to increased levels of hardship for pastoral peoples across the region, especially as no compensation was forthcoming. In addition, much unsafe meat was probably locally consumed and health issues relating to Chernobyl will continue to be of concern for many years to come.

9.3.2 Wildlife and conservation issues

The marginal lands that were previously the province of pastoralists are increasingly coming into focus as reserves of biodiversity. Their very inaccessibility has permitted the survival of species, especially macrofauna, eliminated in high-density agricultural areas. Consequently, there is pressure on governments to declare increasingly large regions as reserved areas, both because of the conservation lobby and the potential income from tourism (Bourn & Blench 1999). This has probably gone furthest in East Africa where large mammals are still most abundant and the tourist industry most highly developed.

The immediate consequence is conflict between pastoralists, government and conservation lobbies. Uncertainties about pastoral tenure have made it difficult for pastoralists to lodge effective land claims and very often potential grazing land is simply appropriated. Pastoralists then enter conservation areas which they consider traditional grazing areas and encounter game or forest guards with predictable results. In marked contrast to the high values placed on wildlife and wilderness in the affluent North, rural communities in rangeland areas have a long-standing and deep-rooted antipathy towards potentially dangerous and destructive wild animals (KWS, 1996; Western, 1997).

Two opposing views have evolved in response to this; either that it is correct to assign a high priority to wildlife both because of the income from tourism and the global importance of the conservation of biodiversity or that pastoralists have rights and that these should be protected. A widespread position is that pressure for establishing reserved areas is strong and well-funded and it would be better to make agreements with both pastoralists and villagers to compensate them for their loss of access to resources through revenue-sharing. Such agreements with villagers have been extensively tested in Zimbabwe through the CAMPFIRE programme⁶, but developing similar programmes with occupationally specialised pastoralists is altogether more difficult and although this is in development in East Africa there are no clear examples of success. Unlike villagers, establishing pastoral access rights in a fluid landuse situation is problematic and a fruitful source of disputes. Similarly the lack of a central organisation makes effective revenue-sharing more complex and open to manipulation.

The livelihoods of pastoralists and agro-pastoralists in the semi-arid rangelands of sub-Saharan Africa are vulnerable to drought, epidemics and loss of access to key natural resources. New perceptions of rangeland dynamics and the emergence of more community-oriented conservation philosophies have focused attention on the potential benefits of livestock and wildlife co-existence. Integrated management is an approach that

⁶ For a long time, CAMPFIRE was seen as a success, and numerous laudatory texts exist. However, the breakdown of law and order in many areas of rural Zimbabwe and poaching now rife, illustrates the often ephemeral sustainability of such initiatives.

can reduce vulnerability, enhance food security and mitigate the negative impacts of wildlife on the livelihoods of pastoralists and agro-pastoralists.

Interactions between pastoralists and wildlife occur on many levels. The nature and intensity of these interactions are evolving in response to changes in land use and availability. The general trend in higher rainfall areas is for the intensification of livestock production, with smaller herds on smaller tracts of land leading to a movement away from 'pure' pastoralism towards agro-pastoralism (Holden *et al.*, 1997). This is as much the result of political intervention, as pastoralists attempting to avert risk within a diminishing resource base in a non-equilibrium environment, by diversifying income sources. Pastoralists may thus be more willing to incorporate opportunities from wildlife into their livelihood strategies, especially through community based natural resource management initiatives in areas that possess 'sufficient' wildlife for sustainable use through consumptive and non-consumptive means.

Predation of livestock and humans is often cited as the major risk by pastoralists (and indeed non-pastoralists) who live near wildlife, particularly women, although, it is argued that such perceptions are exaggerated (Infield, 1996). Damage to crops and infrastructure by wildlife are also key issues. Simple protective fencing is easily destroyed by wildlife such as elephants, buffalo and zebra. In theory, both predation and infrastructural damage can be limited through improved physical protection. However, this is usually costly at the individual level, even though it may result in better health and performance of livestock overall.

In practice, the potential of wildlife to contribute to the sustainable rural livelihood strategies of pastoralists is constrained by many different factors. Perceptions of the costs and benefits of wildlife and the ability to limit or exploit them vary: national and international wildlife legislation; natural resource tenure; what type of pastoralists are involved, degree of community homogeneity, quality of institutional management and gender issues etc. all play a part (Arhem, 1984; Child 1995; Dalal-Clayton, 1989; Taylor, 1993; White, 1992).

Whatever ethical stance is taken, in management terms, the present situation is rather unsatisfactory. Kenya is one of the few countries where long-term monitoring of both wildlife and livestock populations allows us to assess change over time. Table 11 shows the change in these population over a period of some twenty years.

Table 11 Kenya Rangeland Livestock and Wildlife Population Estimates: 1970–1990s

	Est 70s	SE 70s	Est 90s	SE90s	70s-90s	%70-90	Stat. Sig. (p=0.9)
Buffalo	35,453	6,060	30,187	4,197	-5,266	-15%	
Camels	551,462	24,636	651,254	33,209	99,792	18%	+ve
Cattle All	3,319,749	157,958	2,911,496	83,333	-408,254	-12%	-ve
Donkey	95,059	10,884	85,350	5,021	-9,710	-10%	
Eland	25,775	3,376	19,123	1,242	-6,652	-26%	-ve
Elephant	39,108	6,008	14,923	1,808	-24,185	-62%	-ve
Gazelle Grant's	247,491	12,407	103,208	3,915	-144,283	-58%	-ve
Gazelle Thomson's	87,086	14,766	31,259	4,269	-55,827	-64%	-ve
Gerenuk	42,918	1,820	21,418	1,282	-21,500	-50%	-ve
Giraffe	62,255	2,808	50,080	2,337	-12,175	-20%	-ve
Greater Kudu	233	99	45	25	-188	-81%	-ve
Impala	116,177	8,930	67,934	3,194	-48,243	-42%	-ve
Kongoni	29,606	2,533	18,521	1,054	-11,085	-37%	-ve
Lesser Kudu	17,468	1,214	7,751	710	-9,716	-56%	-ve
Oryx	53,653	3,571	25,824	1,950	-27,829	-52%	-ve
Ostrich	25,716	1,772	33,871	2,798	8,154	32%	+ve
Topi	93,822	10,977	92,934	18,139	-888	-1%	
Sheep & Goats	6,473,519	263,793	5,696,021	173,426	-777,498	-12%	-ve
Waterbuck	12,309	1,476	5,260	733	-7,049	-57%	-ve
Wildebeest	224,404	49,582	173,354	38,918	-51,050	-23%	
Zebra Burchell	138,448	12,643	146,093	9,549	7,645	6%	
Zebra Grevy	10,364	1,355	4,868	871	-5,496	-53%	-ve
Total Wildlife	1,262,227		846,652		-415,634	-33%	-ve
Total Livestock	10,439,789		9,344,121		-1,095,600	-10%	-ve

Including: Baringo, Garissa, Isiolo, Kajiado, Kilifi, Ktui, Kwale, Laikipia, Lamu, Mandera, Marsabit, Narok, Samburu, Taita Taveta, Tana River Turkana and Wajir Districts (Source: GoK, 1996).

Source: Bourn & Blench (1999)

As the table shows, the only two species showing increases are camels and ostriches, both characteristic of highly arid environments. In other words, even considerable growth in conservation areas has not slowed the overall decline of wildlife populations and the pressure on rangelands exerted by cattle, sheep and goats has also led to a fall in their numbers.

Although wildlife constrains land use for pastoralists, the concept of integrating wildlife into their sustainable rural livelihood strategies, holds considerable theoretical appeal for marginal semi-arid lands. These areas are less productive for rainfed agriculture and wildlife is arguably better adapted to the semi-arid environment than livestock, which is more dependant on water and susceptible to trypanosomosis (Jansen et al., 1992; Infield, 1996). Therefore, the sustainable utilisation of wildlife may be the most effective way of exploiting Africa's comparative advantage in this area and can also benefit pastoralists (Cumming, 1990). The sustainable co-existence of livestock and wildlife in the east African rangelands is a realistic goal, but only where *de facto* natural resource managers receive a net benefit from multi-species management, as opposed to other forms of land use.

In Central Asia, the situation is somewhat different, since until recently, all protected areas were reserved by decree and certainly did not benefit from consultation with the local populations. The paradoxical consequence was an almost unparalleled level of habitat conservation. Similarly the system of collective farms was kept going with subsidised inputs, sometimes brought in at uneconomic costs. This had the effect of reducing pressure on the natural rangelands, as did the central control of animal numbers and relatively high levels of offtake. Tourism remains a nascent industry, and any income from it extremely volatile, reflecting the unstable politics of the region. However, the implosion of the collective farms has resulted in

the regeneration of pre-Soviet patterns of pastoralism and grazing, increasing pressure on the rangelands and bringing herders into potential conflict with the management of poorly-resourced parks and protected areas. The lack of market infrastructure and the limited range of inputs means that Central Asian pastoralists are generally much poorer and more vulnerable than those in Africa.

The other aspect of Central Asia is the tradition of shooting predators, notably wolves and snow-leopards, species rather regarded as conservation targets elsewhere. Wildlife organisations have recently begun operations to try and both develop alternative income generation strategies and develop compensation schedules for communities to prevent them from killing snow-leopards, accepting the cost of predation. How well these will work is too early to say, but the strategy depends on considerable external input. Ultimately, the cost of predation should be balanced by the revenues from conservation if community protection of species is to take root.

Commercial game ranching has grown out of livestock ranches established in the early colonial period, especially in Kenya and Zimbabwe. Most such ranches were established on an experimental basis, rather than for strictly economic purposes. However, Winrock (1992) argues that integrated wildlife-livestock production systems have the potential to make unique and important contributions to food production, employment and income generation opportunities throughout Sub-Saharan Africa. Multi-species systems involving mainly game or mixed ranching, safari hunting and tourism are increasing on private and communally owned land in parts of eastern and southern Africa. In Kenya, Tanzania, Malawi, Zambia, Zimbabwe, Namibia, Botswana, Mozambique and South Africa, among commercial farmers, between 10-20% are involved in game ranching (Cumming, 1990).

The dual use of livestock and wildlife spreads the economic and financial risk associated with their management, as well as making more efficient use of forage in areas less suitable for livestock ranching. Depending on marketing arrangements, wildlife can generate greater wealth at lower economic and environmental costs than livestock and arable agriculture and thus be a profitable rural sector (Kiss, 1990; Jansen *et al.*, 1992; Cumming and Bond, 1993; Game Ranching Ltd, 1995).

Financial and economic efficiency is related to the absence of competition from other types of land use. In Zimbabwe better returns on investment are found in Natural Region V (where rainfall is lowest) than in NR's III and IV (Jansen *et al.*, 1992; Kreuter and Workman, 1992). The relative economic efficiency of game ranching to livestock production improves with the introduction of safari hunting to game ranches e.g. Iwaba in the Midlands, the Matesi Area in NR IV, Buffalo Range and Limpopo Intensive Conservation Area in NR V (Kiss, 1990; Jansen *et al.* 1992; Child 1995).

10. Biodiversity

10.1 Maintaining livestock biodiversity

An issue of relatively recent concern is the conservation of livestock biodiversity⁷. Although a concern for 'rare breeds' has been a European theme since the 1960s, it was not explicitly either an economic or ethical enterprise. With the rise of a conception of

The breeds most relevant to biodiversity concerns are those that have co-evolved with a particular environment and farming system and represent an accumulation of both genetic stock and management strategies in relation to a particular environment. These have usually taken a long time to evolve and have characters, such as humidity-resistance, that cannot be easily developed. Breed, however, is a broad church, covering ornamental breeds of dog and rabbit and also what may be called 'research station constructs'. For example, many catalogues of breeds include recently developed crosses between, for example, a local breed and an exotic. This is particularly the case in the former Soviet Union where many existing 'breeds' have no

⁷ This section has been largely developed from Blench (2001a).

natural habitat but only persist in fields outside research stations (see Dmitriev & Ernst 1989). The Third FAO Worldwatch List (Scherf 2000) includes a large number of breeds of turkey and goose in Sub-Saharan Africa. These are not indigenous species and reading the text, it appears that all are twentieth century introductions, some of which have never left the research station. There appears to be no significant case for the conservation of such breeds except at the level of individual country priorities.

Local races and breeds of livestock disappear for a variety of reasons, some representing rational responses to changing economic, ecological or social conditions, others pressure from government bodies, development agencies or simply an inappropriate understanding of short-term gains against long-term viability. Where communities voluntarily replace one breed with another or cease keeping livestock in order to concentrate on other activities such as tree-crops, it would be inappropriate to pressurise these communities into conserving breeds; this should be the role of national institutions. Livestock breed conservation is a public good, both nationally and internationally, and is a long-term investment in future genetic resources. In many areas in Southern Nigeria, rising prices of tree-crops such as cocoa and palm-oil have caused the communities to dispense with their traditional dwarf cattle and goats to concentrate on these profitable crops. This is a perfectly rational medium-term strategy of their part; but it would be short-sighted of the national government to lose the genetic resource these livestock represent simply because of a temporary pattern in world trade. As to whether such a strategy is sustainable on the part of government, the analogy is not with an economic enterprise but an investment against unpredictable future developments. New antibiotics are expensive to discover and produce, and when discovered they may have be reserved against future, still unknown epidemics. So it is with genetic resources.

Existing baseline data remains too imprecise to hazard an estimate of the rate of loss, although this is possible in some developed countries. New breeds are always being created, especially by large livestock companies and on research stations, but this points to a fundamental asymmetry. A breed that has evolved over centuries in a particular socio-economic and pathogen niche cannot be 'replaced' by a modern breed, any more than a wild plant or animal that becomes extinct can be recreated in the laboratory.

Table 12. Factors accelerating erosion of livestock biodiversity

Factor	Description
Development interventions	Preference given to high-input, high-output breeds developed for benign environments. Commercial interests in donor countries promote use of relatively temperate-adapted breeds and create unrealistic expectations in developing countries
Specialisation	Emphasis on a single productive trait, e.g. dairying, leading to exclusion of multi-purpose animals
Genetic introgression	Crossbreeding and accidental introgression leading to loss of indigenous breeds
Technology	Machinery replaces work animals
Biotechnology	Cryopreservation equipment inadequate to store germplasm of threatened breeds. Artificial insemination and embryo transfer rapidly displace indigenous breeds.
Political instability	Can eliminate local breeds owned by vulnerable populations
Natural disaster	Floods, drought and epizootics preferentially affect remote or isolated human and livestock populations

Adapted from Hammond & Leitch (1996)

Projects and development aid for livestock have historically focused on large ruminants, and tend not to focus on work animals or small species, 'micro-livestock' (to adopt Vietmeyer's felicitous term). The only significant exception to this is occasional chicken projects, and even these have been dominated by attempts to establish large-scale intensive poultry production. These agendas have been wholly set by the priorities and economies of developed countries, reflecting both their research structures and commercial interests. The most notorious example of this is probably ILCA (the so-called 'International Livestock Centre for Africa') a CGIAR centre which refused to countenance research on animals other than cattle, sheep and goats, ignoring key African domesticates and work animals such as donkeys, camels and all types of poultry.

If poverty and sustainable livelihoods are the key agenda, and even if they are not but the priority is to work with species important to the majority of rural farmers, then the evidence is extremely strong to suggest that these priorities are very skewed. Most rural households depend on a scatter of small species for protein, with the slaughter of cattle or sheep as a very occasional festival meal. Micro-livestock often do not have to be fed, do not require substantial labour inputs and do not require access to land beyond the backyard. Sale of individual animals can provide small cash sums without threatening household capital in the same way as the sales of larger animals.

In many regions of the world where livestock are an important element in overall subsistence, the large ruminants are in the hands of professional pastoralists or ranchers. Such systems make an important overall contribution to national meat and dairy supplies, but often the majority of their output feeds the cities. Pastoralists in both tropical Africa and Central Asia have historically made significant investments in breeding races of domestic animal appropriate to the environment they exploit and are constantly exchanging and adapting bloodlines to meet changing external conditions. Typically, animals are bred for their ability to survive subclinical pathogens and to digest poor and variable pasture with yields of meat and milk only a secondary consideration. Local breeds are thus a key element in trying to ensure food security.

Although traditionally, New World indigenous species were used for a type of transhumant pastoralism, this has been largely replaced by ranching systems based on Eurasian ruminants. In the New World, much of the output from South America goes to supply the 'fast-food' market of North America. This may be important in terms of the priorities of the civil servants with whom developers often have to deal but not necessarily central to the concerns of those at whom their interventions are purportedly aimed.

There is a strong correlation between poverty and a high degree of genetic diversity, both for livestock and crop plants. This has been subject to two differing interpretations;

Box 7. The expansion of micro-livestock in Nigeria

Livestock production in Nigeria has been historically dominated by ruminants and these have been the focus of both veterinary services and animal production extension. However, an extensive national survey in 1990-1991 demonstrated that the preceding decades had seen a significant expansion of backyard species, both newly introduced and experimentally domesticated. Among these species were turkeys, rabbits, guinea-pigs, *Achatina* snails, turtles and giant rats. The principal reasons advanced for preferring these species were their low capital costs, the simplicity of feeding them with household scraps, the potential to keep them in confined spaces, the ease with which they were turned into cash, the absence of ritual accretions meaning that anyone could keep and sell them and the low veterinary costs. Poorer households were diversifying species to match the diversity of sources of their livelihoods.

Source (RIM, 1992).

- a) poor people keep a biodiverse range of species⁸ because they do not have access to high-output breeds and would like to switch to these if resources are available
- b) or because a range of species and breeds enables them to continue producing in uncertain environments and thus to manage risk effectively, as well as using a diverse range of outputs and permitting flexible allocation of labour

Interpretation a) is clearly favoured by development agencies who wish to promote exotics, crossbreeds and high-input systems. It also has the advantage of appearing to increase food security. However, interpretation b) seems to be emerging from several decades of ethnographic study of rural subsistence systems, suggesting that poor rural households trying to ensure their food security are above all interested in minimising risk. The risks induced by natural phenomena such as weather anomalies and insect or disease surges have now been compounded by an increasingly unstable socio-economic environment, where sudden changes in policy can make their produce uncompetitive. Development agencies have added to risk by rapid changes in policy and failure to provide long-term support to introduced species or inputs. An analogous situation is found in the health sector where Western medicine does not replace a diversity of local remedies but is simply added to them, sometimes with unfortunate effects.

Current approaches to livestock issues in the context of biodiversity are still uncommon, and often ill coordinated. Even the FAO, which is leading on the DADIS initiative, continues to send out free semen from Friesian cattle under the auspices of another programme, with no clear control on the use to which it will be put. Large livestock companies have significant political influence, especially in the United States, and approaches which run counter to their commercial philosophies often get short shrift in international decision-making. This is particularly striking in the Americas, where American aid and the purchase of 'modern' livestock breeds in development projects is still very prevalent. Even in SE Asia, where work is beginning in earnest on the evaluation of local breeds, development projects involving crossbreeding remain commonplace. The recent financial collapse in SE Asia and Brazil is likely to demonstrate rather bluntly just how unsustainable these strategies are, as householders who accepted the blandishments of these projects will no longer be able to afford the inputs necessary to keep their stock alive.

10.2 Maintaining rangeland biodiversity

Apart from conserving livestock biodiversity, there is the broader issue of maintaining the environments most pastoralists inhabit, rangelands (Blench 2001b). Rangelands do not represent an ancient climax vegetation that can be somehow be 'restored' to its natural state; those that exist on the world today represent the result of millennia of intense human activity. Even the grasslands that are thought to be edaphic such as those in Eastern Africa may well be ancient artefacts. This is not to say their management and biodiversity is not an issue. For pastoralists the maintenance of high levels of biodiversity in rangelands may be crucial to their survival strategy. But the extent of rangelands and the sort of biodiversity we wish them to exhibit are as much political and economic decisions as they are science-driven.

Rangelands, rather like the oceans, depend on setting priorities on a regional basis; grasslands do not stop at national borders, nor do the animals that exploit them recognise political boundaries. Conservation of biodiversity in rangelands involves the co-operation of different stakeholders, including foragers, pastoralists, ranchers, arable farmers, local and national governments and international bodies. Conservation approaches must recognise that rangelands are physically and institutionally fragmented. As populations increase the numbers and types of claim on these lands expand, cross-cutting and interlocking with one another. Institutional environments differ extremely not only from continent to continent, but also within single countries. Conservation has tended to focus on threatened and endangered species rather than landscape. However, it is the land owner and land user who have the closest contact with conservation of

⁸ This does not contradict the previous observation that the highest density of *breeds* is found in the developed world. Rural households can map a range of low-input species against diverse capital and labour availability.

biodiversity, and economically they are likely to be most affected by international programmes. If they see economic losses for themselves as a result of such programmes, it can be expected that they try to prevent, or sabotage conservation efforts. Even local governments may lack the will to enforce conservation rules and laws in such circumstances (Tisdell, 1995: 218).

At the local level, the incentive to conserve biodiversity is often limited, as the benefits are very broadly distributed. The global community benefits more from the maintenance of genetic diversity than individual smallholders, at least over the time-period of concern to individual households. Nevertheless, maintenance or restoration of habitats should be of equal or greater concern, because the best way to minimise species loss is to maintain the integrity of ecosystem function, and determination of status of each species and design of conservation measures to meet its needs can be largely avoided. Therefore it is important to create incentives at the local level to conserve biodiversity. Land owners and users will have to be awarded a larger share of the total gains from conserving biodiversity. Mechanisms which can be used for this purpose are: (a) subsidies for conserving biodiversity; (b) payment of royalties on the use of genetic material conserved; (c) utilisation of conserved areas for tourism with income transfer (Tisdell, 1995).

Rangelands are more perplexing environments than most when it comes to conserving or recreating their biodiversity. They are not visibly lost in the way of forests, nor do many shelter the headline species that attract funds and research. Some are characteristic of highly developed economies and have been managed in ways that do not necessarily elicit sympathy. Yet the role they play in the supporting subsistence households around the world, and the evident problems that arise when biodiversity is undermined and the range can no longer respond to extreme conditions argues that greater importance needs to be attached to rangelands.

11. Improving the livelihoods of pastoralist families and communities

11.1 Disaster management

11.1.1 Drought and the management of climatic anomalies

Livestock can fall victim to two main types of climatic anomaly, droughts and blizzards. These are very different in their impact on herders, since in blizzards, animals are cut off by snow and often unable to break through the sheet of ice that forms over the grass to feed. In this situation, a large number of animals are likely to die simultaneously, irrespective of herders' strategies and the condition of the stock. Droughts, however, are cumulative, and the gradual realisation that a drought is in progress causes pastoralists to move their animals rapidly in search of more favourable conditions. As a consequence, animals die slowly, with the weaker animals first, and are often sold in advance of likely death to realise some profit.

Droughts, or periods of unusually low rainfall, are part of the expected pattern of precipitation in semi-arid Africa, and in the past the common response of pastoralists was to move to areas with higher rainfall where the vegetation persisted. This was no more than an extension of typical intra-annual seasonal movement, with pastoralists clustered in more humid regions in the dry season and moving to drier zones when the rains begin to take advantage of the new grass. Pastoralists exist along a gradient of willingness and capacity to move, and those that shift rapidly and long distances in response to a coming drought are more likely to conserve their herds. Contributors to Gallais (1977) show that in the Sahelian droughts of the early 1970s, nomadic pastoralists survived better than their agropastoralist neighbours by moving their herds long distances.

Recent high-profile media coverage of El Niño and similar climatic anomalies has tended to present an image of unprecedented climatic crises. In reality, however, there is no unambiguous evidence that the climate is worsening although distributions are changing, as indeed they have always changed (Blench 1999; Blench and Marriage 1998, 1999). However, a series of rapid and external changes in the present century

have led to pastoralists being under unprecedented pressures and thus unable to respond appropriately. A bundle of factors are making long-distance opportunistic movement increasingly impractical, notably through the establishment of national frontiers, the expansion of cultivation even in very dry areas, and continuing increases in total livestock numbers. The consequence is that droughts now cause significant humanitarian problems and localised degradation, since large numbers of animals converge on certain pastures, especially around wells. This in turn is responsible for long-term impoverishment among pastoralists, since they must sell animals cheaply and cannot afford to re-buy them when the drought ends. At the same time it places extra stress on already ineffectual veterinary services, since weakened animals are more susceptible to pathogens.

In one sense, these cycles are increasingly understood by national governments, international agencies and NGOs, with the consequence that effective mechanisms are generally in place to deliver relief supplies to affected pastoralists. This however, has led to the perception that drought is essentially a humanitarian problem. As a result, policies to deal with the long-term consequences of drought and to try to prevent the cycle from simply repeating itself are best described as inadequate. There is considerable historical evidence that pastoralists who could not succeed in difficult climatic conditions or who lost their herds through disease simply left the agro-ecological zone and became settled farmers or traders. This was a brutal but effective mechanism of reducing pressure on resources. However, the provision of food aid has the effect of keeping in place populations who would otherwise move and initiate a new subsistence strategy.

All over Africa, improved water supply has been seen as the solution to evening out the variability in precipitation that leads to periodic crashes in livestock numbers through making pasture in waterless regions accessible. Arid rangelands generally have been the object of extensive well and borehole implantation and have encouraged herd expansion beyond the capacity of rangelands to support them. In the Somali region, a strong distinction is made between water from natural sources (*gall, saha*) and water accessible through wells (*el, sur*), boreholes, artificial basins (*war*) and cisterns (*birked*). Natural depressions are treated as accessible to all members of the section owning the land. In all other cases, the resource is controlled by the groups responsible for maintaining them. In recent times, individual ownership has begun to supersede collective ownership and controlled water resources are thought of as a source of cash income. Apart from external programmes, Somali areas in particular have been the subject of local investment to build groups of *birke*s, i.e. cisterns around which settlements often develop (Sugule & Walker 1998). The growth of these has been phenomenal since the mid-1980s. At the same time, new wells and boreholes have been constructed throughout Somalia. Some well-owners also have tankers and they sell water to pastoralists in remote pastures.

Such developments have several consequences; they increase sedentarisation and thus break down the traditional pattern of seasonal migration between dry and wet season pastures. Unlike camels, cattle and small ruminants cannot be away from a water-point for more than two days without serious health consequences. The expansion of water-points also encourages the herding of sale-oriented species, notably cattle. Cisterns often are associated with range enclosures and privatisation, thereby altering the open-access pasture system. Sugule & Walker (1998) note that pastoralists are aware of the negative consequences of an over-insertion of *birke*s and they cite an agreement between two clans to restrict the numbers of cisterns. However, they also observe that there is a growing tendency to cheat on such agreements or at least rewrite the rules. It seems very unlikely that customary agreements, *xeer*, can do more than temporarily limit the growth of *birke*s. In times of average or above rainfall, the *birke*d system is generally positive, although as herds become more static pathogen load increases and veterinary costs are higher. However, pastoralists now become more vulnerable to stress, and when the rainfall declines, the cisterns empty and the stock die because alternative water resources cannot be reached. In addition, pastoralists are most likely to have to sell animals when prices are lowest (in a drought or at the height of the dry season) to buy water when its prices are highest.

The present responses to drought and policies of governments, agencies and NGOs cluster around restocking and sedentarisation. Restocking can work on a local scale, although it is expensive in terms of management and seems to provide no evident insurance against further droughts, which on average seem to occur every

10 years. Although it is generally agreed that pastoralists are not responsible for ‘overgrazing’ in the way this was pictured in earlier literature, the inexorable increase of both herds and cultivation *has* placed unparalleled pressure on resources. Pastoralists themselves tend to insure against individual risk by dispersing animals in other herds; this is effective for individual herders especially as protection against epizootics but does not remove animals from the system. Unless there is more effective strategic thinking about the long-term consequences of present drought response strategies the cycle of crises is likely to continue.

11.1.2 Early warning systems: Idea and reality

The other great hope for rangelands has been remote-sensing. It was thought that the use of satellites should be able to detect pasture availability and abundance well before the usual land-based methods, and national governments would then be able to direct pastoralists to appropriate sites. In this it joined up with notions of early warning (see 11.1.2) intended to give relief agencies advance notice of likely crises. Although considerable resources have been invested in these methods, the results have been at best ambiguous. One reason is that remote-sensing is only a very crude tool for detecting pasture abundance and frankly cannot detect quality; pastoralists well know which species their animals eat, and this does not show up on false-colour images. However, even if this were somehow remedied, the problem of communications infrastructure remains. Even if information does reach national governments, their own systems of communication with pastoralists in remote areas are so poorly developed that they are unable in practice to get the information to producers in a credible form.

The basic idea of early warning systems is extremely attractive. Droughts occur in fragile rangeland areas quite frequently, and the result is a humanitarian disaster—plainly seen on television images. If we could know in advance that a drought was about to occur, this would allow us to do two things;

- ❖ warn the pastoralists to take appropriate action
- ❖ allow governments or relief agencies to put in place remedial strategies before the disaster occurs

Early warning systems seem to have been driven powerfully by technology, especially from the late 1970s. As rich, multi- (false)-coloured satellite images of desert areas began to appear, the illusion of omniscience appeared with them. The National Oceanographic and Atmospheric Administration (NOAA, 1999) and the Spot satellite earth observation system (Spot Image, 1999) could tell pastoralists that vegetation was going to be in short supply through the mysterious agency of the ‘normalised difference vegetation index’ (Infocarto 1999).

The value of such prediction engines remains controversial but disillusionment also set in from the opposite end of the equation. It became apparent that;

- ❖ Pastoralists were ahead of developers and could respond rapidly to subtle shifts in patterns of rainfall and vegetation. The problems that arose were often political and could not be addressed by development agencies; their responses included crossing national borders, especially when insecurity made their usual grazing inaccessible
- ❖ Governments and most agencies had procedures far too slow and cumbersome to respond in an effective way to climatological information and deliver it to those who might need it.

It may be, in addition, that there was problem of visibility. There is less exposure and credit to be gained from preventing something happening than from ‘saving’ people when it does. Early warning predictions put people in a position of greater knowledge, but does not necessarily equip them with the tools to use such knowledge. The 1980s phase of disaster response saw something of a dip in the popularity of early warning, although technical advances in climate modelling have led to some restoration of its credibility (Blench and Marriage, 1998). There are now numerous websites devoted to providing up-to-date information on such

climatic anomalies as the El Niño Southern Oscillation, and monitoring catastrophic events relevant to food security. They include, on a global basis, the USAID-funded Famine Early Warning System (FEWS, 1999), and on a regional level, one for South Africa (South Africa, 1999). Agencies now have somewhat less hubris about their capacity to respond, but the emphasis has now changed to influencing governments to building in an awareness of the impact of climatic anomalies in their long-term planning. Variability of climatic conditions is a reality that needs to be acknowledged and incorporated into government policy, as well as into individual- or group-level contingency plans.

Although the 1990s saw considerable advances in meteorology, problems remain, both on the technical side and in terms of packaging and presenting the product. Regional forecasts, such as those made for West and Southern Africa, provide probabilities about the average rainfall for the coming season which may help inform choices over seed selection, but as yet say nothing about the timing or distribution of rains. The relevance to pastoralists is, in any case, dubious. Pastoralism is essentially a *reactive* subsistence strategy, by which herds are taken to the areas of greatest productivity in a given year. Pasture depends on factors such as soil quality and water retention; for the foreseeable future, pastoralists will determine their movements either by what they observe, or by traditional transhumance routes. At the present, weather forecasting based on sea surface temperatures and satellite imagery is often too general and zonal to be of any value in a restricted field of operations. The alternative is thus to look for ground-based indicators, most notably livestock prices and herd movements, as well as talking to pastoralists (Hesse, 1987; Swift and Umar, 1991). One of the most well-known of these systems is the Turkana early warning system in Northern Kenya (Buchanan-Smith, 1992).

Whether technology options have failed rangeland producers remains controversial; their advocates point to specific successes. However, the long-term record does not seem to be very encouraging, either in the developed or developing world. This is almost certainly because the decisions pastoralists have to make to conserve their herd are too local to be captured by regional information systems. In terms of intensifying water and pasture supply, the usual rules of livestock systems apply; short-term gains do not lead to long-term sustainability. Moreover, changing ideas about the nature of a rangeland resource and importance of landscape maintenance are leading to long-term transformations of notions of the ultimate goal of pastoral production.

11.1.3 Security in pastoral zones

§1.4.6 discusses the close relationship between highly mobile pastoralists and warfare. The opposite side of this coin is that the remoteness of pastoral zones makes them typically in regions where borders are disputed and where mobile forces can easily conduct guerrilla warfare. The continuing conflict in the Horn of Africa illustrates this and the consequences for the pastoralists who reside there.

Prior to the establishment of nation-states, inter-ethnic conflict associated with access to grazing and cattle-raiding was common, notably in Northern Kenya and Uganda (Fukui and Turton 1977; Bollig 1990; Perner 1993; Hendrickson, Armon & Mearns 1999). But since the 1960s, border disputes and struggles for political power have meant that warfare has been endemic throughout the region. Increasingly sophisticated weapons have entered the region, including the familiar AK47, enabling raiders to pursue their objectives with far more lethal consequences. Somali raiding into NE Kenya has pushed the Turkana westwards and into confrontation with the Karimojong in Uganda, who in turn are raiding into Sudan. Less numerous and powerful pastoral peoples have no defences and are either forced to flee their grazing lands or their animals are stolen and they end up in the camps.

Disputes between nations carried out on an even larger scale can be highly destructive of pastoral enterprises as Eritrea-Ethiopia border war demonstrated. The sowing of unmarked landmines in pastoral areas can make whole regions off-limits. Donors are inevitably reluctant to supply even emergency food aid while resources are being diverted towards trans-boundary military confrontation and enthusiasm to fund long-term

development is still scarcer. Such conflicts also make the sort of regional planning essential to a coherent rangelands strategy still more difficult to establish.

11.2 Recovery strategies

11.2.1 Structural features of pastoralism

Pastoralism has some key structural features that differentiate it from other enterprises such as agriculture and fisheries and which are relevant to making long-term policies (Hogg 1997a). Among these are;

- a. Stock recovery. Pastoralism is a way of life and herd owners will invest in rebuilding herds without external intervention. As a consequence, the trend is always for livestock to exceed range resources. However, investment costs and recovery rates of pastoral herds are very slow compared with crops. Moreover, seeds can frequently be sourced externally at relatively low cost; stock adapted to specific climatic and range conditions is virtually unavailable⁹.
- b. Pastoralists are significantly more vulnerable than cultivators to fluctuations in terms of trade. A farmer replanting after a bad year can see grain stocks and prices recover in one year. Livestock owners flooding the market with salvage sales may not see the market recover for up to a decade.
- c. Pastoral herds always produce surplus animals, notably immature males and barren females, which can be eaten or sold to reduce pressure on resources. Nonetheless, the culture of a pastoral society strongly affects its attitude to the disposal of such animals.
- d. Because pastoralists must dispose of operating capital to buy resources when their herds are under threat (purchased water, fodder), poorer herd owners must sell a greater percentage of their herd to survive in comparison to richer herders. This increases wealth stratification and makes them more vulnerable in the next cycle of environmental stress.
- e. Crises affect pastoralists in an almost inverse fashion to farmers. When climatic factors reduce crop yields, market prices are high because of the scarcity value of grains. When the same factors affect the herders' ability to keep stock alive, prices plummet because of competition with other stockowners also attempting to sell animals.

Although these principles would seem to follow logically from the nature of the pastoral enterprise, aid and development agencies have often been slow to adapt policies to the specificity of livestock production, and development formulae are often applied to an undifferentiated class of poor or vulnerable people. This section explores experiences of trying to assist pastoralist to recover.

11.2.2 Sedentarisation and land tenure

Tenure and rights of access form an essential component of the analysis of alternative land uses for pastoralists and agropastoralists, especially in non-equilibrium environments where the availability of grazing and water varies. The regime experienced by a given stakeholder, affects the pattern of the costs and benefits of incorporating wildlife into their livelihood strategies.

The pre-colonial system in eastern Africa, was open-access, based on a virtually chronic state of warfare (Fukui and Turton 1977; Markakis 1989; Bolling 1990; Bol Aken 1991; Mawson 1991; Perner 1993;). Pasture and grazing rights were sustained by military force rather than any type of consensual system. Continuing inter-group raiding was as effective in building up herds as investing in improved livestock productivity, at least as far as the victors were concerned. Where arms have become widespread among pastoralists, as in Somalia, southern Sudan and adjacent regions of Ethiopia and Kenya, violent conflicts are continuing to the present.

⁹ As many restocking programmes have found, livestock that herders are willing to sell elsewhere, especially breeding females are usually only the poorest quality animals.

Clearly, there is no merit in perpetuating these systems, and the relative long-term security in the regions further south suggests that innovative strategies must be sought. The literature divides sharply into two camps; those proposing that all non-reserved land be converted into private ownership and those proposing communal tenure systems of different designs. There is now considerable experience of both types of strategy over the region as a whole. The form of land tenure has significant implications for tenure over other resources, such as wildlife.

Land tenure regulations in Tanzania are in a state of disarray (Shivji 1994). Compared with Kenya, very few ranches have been established in Tanzania. One of the few still operating is Mkwaja Ranch on the coast near Tanga, owned by Amboni Holdings Limited. The southern part of the ranch, which was more of a wilderness area with abundant wildlife and tsetse, has recently been sold to the Wildlife Division to expand the Sadaani Game Reserve.

The conflict between nomad and the settled farmer goes back to the earliest written records and is mythically symbolised in many cultures. Cain slew Abel, the Chinese emperors built the Great Wall to keep out the marauding hordes, the rulers of Egypt were constantly at war with nomads from the deserts west of the Nile¹⁰. The association of highly mobile pastoralists with raiding and warfare has been crucial in establishing negative stereotypes throughout history, whether the Twareg of the Sahara, the Mongols in Central Asia, the cattle-raids poeticised in the Tain or the present-day Somali *shifita* raiding into northeastern Kenya.

Typically the state sees only the threat and ignores the fact that pastoralists frequently exist on land that is too fragile or too variable to be intensively used and is moreover a significant supplier of pastoral products to farmers and urban populations. Government policy tends to favour the agriculturalist and faith in technical assistance given to farmers is reinforced by ethnic prejudices, since administrators come predominantly from agricultural backgrounds (Horowitz and Little 1987).

There is therefore a long history of the state attempting to settle pastoral nomads, often with very limited success. In Iran, for example, during the epoch of Rezâ Shâh (1925-1941) there was a concerted campaign not only to settle the pastoral nomads but also to eliminate their distinctive culture in terms of language, dress and authority structures (Digard 1990). During the administrative chaos in the Second World War, the nomads rapidly reverted to their former migratory patterns, and up to 1960, there was long series of councils restituting much that was appropriated during the 1920s and 1930s. However, during the rule of Mohamed Rezâ Shâh, persecution of nomads began anew and leaders of many groups such as the Qashqa'i fled into exile (Beck 1986). Following the departure of the Shah and the period of uncertainty, many returned to reform their authority structures. However, within a couple of years, Revolutionary guards were attacking with Qashqa'i with the same helicopter gunships used by the Shah.

Attempts to settle the pastoralists in the Middle East go back as far as 1910, when King Abdul Aziz moved Bedouin into Hijra schemes in Saudi Arabia. These centres grew until 1929, when a revolt destroyed them and by the 1950s they have completely reverted to herding settlements (Chatty 1996:19). Such schemes, far from being a discouragement, were replicated throughout the region, often under very different political regimes with very similar results.

Resettlement has had a similarly bad record in the Horn of Africa. Resettlement schemes in Northern Kenya and Southern Somalia have begun with the best of intentions and failed, because it is impossible to service any alternative form of employment effectively. Following the 1973-1974 drought, the Somali government engaged in large-scale settlement schemes for displaced nomads (Samantar 1991). The effect was to give land tenure to individuals on the scheme contrary to usual patterns of tenure in the region. However, the work itself was perceived as degrading and as a consequence, almost all men of working age returned to

¹⁰ There are references to pastoralists in the deserts west of the Nile Valley in Egyptian records. Ramses III defeated a Libyan tribe called the I-S-B-T-U usually identified with the Asbytes of Herodotos. The 'Tehenu' appear in Vth Dynasty sources (3200 BC) as livestock keepers of the Western Desert and later numerous other tribes are mentioned (Vernet and Onrubia-Pintado 1994:56).

herding or used their improved access to work abroad. The settlement schemes then became more like dry season encampments populated principally by children, women and old people.

However the conflict between these two groups does not justify one sector being sacrificed to the other, particularly given their symbiotic relationship between the two. The growing number of pastoralists and settled farmers who are diversifying into agropastoralism demonstrates the potential complementarity between herding and farming. Furthermore the scope for further collaboration is evident: inputs such as fodder, apart from simply crop residues, provide the possibility of greater diversification of herd-management techniques.

Even spontaneous sedentarisation does not necessarily entail any increase in production or food security and may, on the contrary, have the effect of shifting underemployment and hunger to other regions. Economic and military pressure on the Negev Bedouin has forced many to settle with often disastrous consequences for their society (Meir 1977). The growing urban population gives rise to greater demand for livestock and agricultural produce, whilst the labour force in rural areas dwindles, and depopulation of areas suitable for pastoralism only wastes natural and human resources. Niamir (1991) notes a drain of expertise as young people move out of the pastoral sector.

The encroachment of cultivation onto land traditionally held and grazed by pastoralists has forced them into increasingly marginal and unproductive land. Despite this, some interest groups argue that pastoralists are inherently inefficient and self-destructive, and should be settled, as is the official line in Nigeria, for example (Awogbade 1981). Besides the cultural damage involved in forcibly settling pastoralists, small-scale agriculture or urban unemployment does not necessarily offer a lifeline out of poverty.

The fact that nomads are often unwilling to settle suggests (particularly given the role of opportunism and adaptability in the decision-making process) that it is generally deleterious, except after some near-starvation critical point. Adverse conditions generally encourage pastoralists to wander more and further afield. If it were beneficial for pastoralists to settle, this is what they would do and until such time as this, the rationality of nomadism is evident.

Blame for the impoverishment of pastoralists has been laid at the door of the weather, 'pastoralist irrationality', sedentary farmers, and governments. However, to apportion blame is not to solve the problem, and a political problem lies as much in the relationships between the parties concerned as in the nature of the agents themselves. Cullis (1992) has suggested that future work for development lies in advocacy. Conflict between sedentary and nomadic groups has escalated in recent years in spite of the relationship of symbiosis and bartering which has been, and remains, essential to both sectors. An analysis which concludes that there are too many mouths and too little water does not explain the political alliances or address the need for diversity in order to maintain any part of the system. The temptation to see the world in terms of opposites rests on the assumption that clear distinctions can be made between sedentary and nomadic people, and consequently between pastoralists and agriculturists, but this is not borne out by the fluid and adaptable existences of many groups. The semi-nomadic pastoral populations of the Lahawin in the Sudan, for example, divide the year into migration and settlement phases, and the mobility of group members is dependent on the rainfall as well as other factors such as herd size (Gorman and Boosh, 1990). Other nomadic groups are known to choose an increasingly or decreasingly mobile existence depending on environmental conditions. Nomadic peoples often live on the land surrounding rainfed agriculture; in wet years agricultural practices are expanded, and during drier years, people return to pastoralism (Johnson, 1969).

Past external intervention has been informed by northern specialists, but the lessons of the integration of the pastoral system with other sectors points very forcefully towards the conclusion that future advice and thinking, whether from within the pastoral sector or without, should take a holistic view of the situation. Settlement does not reduce the consumption needs of pastoral groups, and the issues of food security and pressure on resources are not addressed by a policy of sedentarisation.

Issues of land tenure in the pastoral sector remain a fraught topic. Broadly speaking, prior to the modern era, traditional tenure in pastoral areas was either loosely framed or non-existent. Where a resource was patchy, and the pastoralist an opportunistic grazer it made little sense to establish elaborate tenurial regimes. The exceptions to this were where a valuable and fairly reliable resource was being competed for by a variety of players. For example, in the inland Niger Delta in Mali, a vast wetlands used for livestock, fisheries and rice-growing, a complex regime existed in the pre-colonial era to regulate access to pasture. The Beja, living along the Red Sea Coast of Sudan, seem to have 'owned' patches of rangeland for a very long time, reflecting the antiquity of their settlement in the region. In pastures subject to heavy snow, frameworks grew up to control access to meadows in the lee of hills where snow depths were the least.

The twentieth century, with the growth of the nation state and widespread demands to codify land ownership, has compelled pastoralists and others to think more coherently about tenure. In many regions, the absence of written documents has simply allowed farming and timber interests to take over pastoral land with any hindrance. This should not be thought of as a problem confined to the developing world; cases in court at present in Sweden are being brought by timber interests who are gradually eating away at Saami land and their success is based on the absence of written documents confirming Saami proprietorship. The irony in this case, of course, is that Scandinavian countries have a reputation for pastoral studies and projects, and these, conveniently located far away, take an entirely different approach to customary tenure.

Pastoral areas have been 'traditionally' managed under common property resource (CPR) management schemes, although these are really constructs of the colonial era. CPR areas are increasingly being recognised as complex and highly adaptable systems, involving multi-faceted rights to resources. They vary from open access, to communal use with reciprocal arrangements, to exclusive use and privatisation. In communal areas of Botswana, Namibia, Tanzania, Zimbabwe and Zambia, 12.5% of the land area is designated for wildlife use for the benefit of local communities (Kiss, 1990).

Communal areas in the semi-arid rangelands of eastern and southern Africa are under increasing pressure. Historically, the solution to many of the pressures faced in these areas was thought to lie in privatisation of communal resources. However, in terms of CBNRM, privatisation of resources can increase conflict between wildlife and livestock, increase tenure insecurity and gender-based discrimination (Birgegard, 1993; Hunter et al., 1990; Rutten 1992; Game Ranching Ltd, 1995; Lane and Moorehead, 1994, 1996; Lane, 1997).

Fragmentation of the rangelands complicates the sustainable management of a resource such as wildlife, especially in non-equilibrium environments (Scoones, 1995, 1996; Lane, 1997; Lane and Moorehead, 1994, 1996). The degree of investment/management in a resource is related to its value; this will vary according to when and where it is evaluated, as well as who is making that value judgement. For CBNRM schemes to function, neighbouring landowners may have to organise to join their lands together to manage wildlife and avoid conflicts over identifying producer communities. Strong institutional management, secure rights of tenure that build upon existing frameworks and conflict resolution skills are all likely to be important ingredients for the success of integrating wildlife into the sustainable rural livelihood strategies of pastoralists. These considerations suggest that larger tracts of land, with clearly defined and secure tenure rights, are likely to be easier to develop as wildlife management areas. However, this creates an inherent bias towards nationalisation or privatisation, reinforcing elite interests in commercial ranching or agriculture (White 1992).

11.2.3 Rethinking pastoral organisation

Pastoralists are not very prone to develop complex social institutions to defend their interests as a group, in part because their mobility and flexibility makes it hard for such institutions to maintain their coherence over long periods. The exception to this is when pastoralism is allied with military organisation, as in the case of the Mongols and other horse-mounted raiders of Central Asia, or in the states established by the Fulbe in

West Africa. However, when conquest leads to empire, the necessity to maintain a functioning administration effectively excludes actual pastoralists. Traditional social organisation thus focuses on the household and kin group with more nebulous clan entities providing social identity but not necessarily organisational capacity.

This has seemed highly unsatisfactory to outsiders encountering pastoral societies, for various types of co-operation would seem to be a precondition for development. Pastoralists moving through arable areas are frequently in conflict with farmers; it seemed logical to form agreements with farmers, to prevent this. The purchase of drugs, access to water and pasture would seem to be better regulated by local and regional associations. Moreover, the prejudice against pastoralists in many nation-states might be better combated by organisations that could effectively articulate their case to government.

In the command economies, the solution to this was relatively simple; through collectivisation, co-operation and association was simply forced upon people. This had both a good and bad side; it made the delivery of inputs simple and the organisation of necessarily collective operations such as predator hunts functional. It evened out the production of winter hay and ensured that the economic burden of herd loss would not fall on single households. The disadvantage was that the system was heavily subsidised from outside and subject to arbitrary pricing. As a result, there was no discrimination for competence and unsustainable production strategies were the rule. Despite the benefits, these systems are gradually collapsing following the fall of Communism and much more traditional social patterns are re-asserting themselves.

Outside the command economies, principally in Africa and the Middle East, the main tool in the armoury of developers has been the Pastoral Association (PA). By one means or another, pastoralists were encouraged to associate and to negotiate collectively with outside bodies for veterinary services, water development etc. Both the World Bank and regional NGOs such as SOS-Sahel have been involved in the promotion of PAs all across the Sahel since the 1970s. In East Africa, the system of 'group ranches' was developed, principally for the Maasai, to encourage a more comprehensive system of land ownership and thus investment as well as to provide centralised systems of livestock dipping. Elsewhere in Africa, Pastoral Associations were more fluid as governments have not generally had the resources to mount such a large-scale operation as the group ranches.

Whether PAs have really been successful and indeed how success is to be measured remains moot. Evaluations or 'institutional audits' generally suggest that these associations remain heavily dependent on external support (e.g. Hesse et al. 1998). Pastoralists were hit very hard by the droughts of the 1970s and 1980s and the rinderpest epizootic of the 1990s. As a consequence, what fragile social capital had been built up tended to dissipate as individual herdowners scattered. This may well be the problem with any sort of voluntary association of this type; where promoted by committed individuals it can be successful for some time. However, the logic of pastoralism is such that in a period of crisis, herds scatter and with them the associations.

Nonetheless, if pastoralism is to make any effective defence of itself in the coming millennium, it will have to develop new structures; existing social institutions have not served it well in a new era. It seems likely that new technology may change the equation in interesting ways. Proposals to use radio to communicate useful information pastoralists have been on the table for some time but they have generally been blocked by state control of the airwaves in almost all pastoral areas. Recent times have seen a significant relaxation of radio licensing in many countries and deregulation may well drive the provision of information services to pastoralists. Even more important is the evolution of affordable satellite phones probably also supplying internet access. These may allow pastoralists to link together and to learn about resources and inputs in remote places. Mobile phones have already transformed communications in many countries dogged by unreliable landlines and this process has every potential to drive even more far-reaching changes.

11.2.4 Restocking

Restocking, whether initiated by herders or organised by an external agent, attempts to rehabilitate herders within their environment rather than suggesting they settle and take up, for example, fish production¹¹. Rehabilitation relies, though, on there having been a significant change in the environment or in herder management of it. Returning to the *status quo ante* serves little purpose and contravenes the principle of constant readjustment in conditions of disequilibrium. Simply providing pastoralists with animals to replace those lost during drought does not take account of the fact that the available land, environment and management has not sustained the level of stocking. Restocking risks providing another hecatomb for the next drought. The loss of weight from animals during drought is of much less importance than the loss of animals through starvation, especially if rehabilitation through restocking will replace lost animals. Selling animals at appropriate points in the drought cycle maintains the possibility of autonomously rebuilding herds in better times. It is beneficial as a means of management, but is still geared towards maximising herd numbers.

Restocking is usually thought of as something perpetrated by agencies, but pastoralists have their own systems of insurance against drought. Herders prepare for drought and epizootics by 'lending' their animals to relatives or friends in exchange for looking after some of their animals in return. If a herd is caught up in a crisis and suffers high mortality, then the herder calls in these animals to form the nucleus of a new herd. Even where such an insurance mechanism is not in place, it is quite usual for relatives to lend animals, until they have produced sufficient offspring for the affected herder to rebuild a viable enterprise. Even so, such mechanisms were not always successful; hence the suicides of West African pastoralists who lose all their herds. Restocking by outsiders tends to result in distress sales or slaughtering. When implemented inappropriately, restocking risks achieving little more than postponing disaster and the decline of pastoralism, whilst interfering with indigenous recovery systems (Heffernan, 1995).

The need for a viable herd determines the nature of restocking programmes, and a herd which is large and diverse enough to support a family, providing a taxable surplus for purchasing necessities, is considered optimal. Despite the obvious weakness that such standards of sustainability are subjectively determined, this concept informs the level of restocking (Bernus, 1987). In some projects, pastoralists were given money in place of animals to have more autonomy in restocking. Mace (1989) records some successes with restocking, while stressing that even following restocking, families with fewer than one hundred goats will need some additional form of income. Moris (1988) goes further, and from work by Oxfam in Kenya, draws attention to the need to work within pastoral administrative mechanisms when interventions are made. Many NGO interventions rely on the provision of smallstock which do not provide food security, as pastoralists are dependent on the diversity of produce from their herds (Oba, 1992). Toulmin (1987, 1995) has considered both the drought cycle and restocking responses and concluded that restocking should only take place within a bundle of drought interventions and that these should be targeted at specific points in the drought/reconstitution cycle.

In some parts of the world, livestock raiding is a highly developed culture which not only constituted a threat to viable herds but also was one method of restocking a herd after a drought. Sweet (1965) argued that camel-raiding in Arabia was part of a larger system that maintained the ecological balance within the region. In East Africa and Madagascar, cattle-raiding was much more developed than in West Africa (Fukui and Turton 1977). Needless to say, this is one 'traditional' recovery mechanism not usually advocated by aid agencies, although it remains fairly widespread in the Horn of Africa. In southern Sudan, much of the conflict has found expression in cattle raiding, undermining food security in the region, and destabilising the population. The potential for livestock production as well as agriculture is significantly underused, and the situation is one of a cycle of threats to food security, leading to social upheaval, which in turn results in further food-security problems.

¹¹ This sounds satirical, but reflects the conclusion of more than one report on pastoralists in the Lake Turkana area of Northern Kenya.

11.2.5 Livestock banking

Livestock banking has been proposed on the analogy of cereal banks, to assist producers to carry stock across the difficult seasons. Livestock banking proposes that the expense of restocking can be spared if, during parts of the year, animals can be traded in to an independently owned 'bank' in return for a token. The animals are then tended until such time as the pastoralist decides to redeem the tokens. There is, however, a fundamental asymmetry between grains and animals, in that only the latter require feeding. This in turn demands a responsible, disinterested, well-established organisation to function as a holding operation for the stock, which seems, at the least, politically unfeasible. A system by which animals are fed at the expense of the government during the hardest parts of the year when grain is scarce and expensive seems improbable. It is not evident how such schemes would be able to fund the feeding of livestock when the pastoral system has proved incapable. Goldschmidt (1975) proposed a National Livestock Bank for Kenya, which would make sense if livestock planning were conducted according to very strict economic criteria. Such ideas have never been put into practice.

Other alternatives might include simply turning the animals into cash and then rebuying when prices are low. This would undoubtedly be effective for individuals who see a drought coming, but would cease to work, were it adopted by more than a small fraction of the pastoral community. This, of course is what livestock traders do all the time, speculating in animals as well as simply directing slaughter stock to the abattoir, and livestock producers generally despise them for it instead of imitating their model. Livestock insurance is yet another common proposal, which, despite its apparent attractions, has never been put into practice. The transaction costs of both registering animals and ensuring against fraud seem to be too high to make the scheme workable, even assuming pastoralists were willing to pay money up front for an eventuality that might not occur.

11.2.6 Economic diversification

A key strategy promoted by governments to address the crisis perceived to be afflicting rural areas of Europe is economic diversification. As the terms of trade move ever further against livestock producers, they are increasingly urged to diversify to ensure against further declines in the market. Carr (1977) after analysing the threats to Dasanetch society in Southwest Ethiopia, sets out an entire programme of economic diversification based on locally available resources. This is an old story with traditional pastoralists; catastrophe, whether climatic or epizootic enforces economic and often social change. However, for pastoralists within their ecozonal niche this is often not easy, because they are there precisely because of the remoteness of the region and the problematic climate. Projects to encourage diversification have thus often met with a rather stony response. Bollig (1997:82) discussing the Himba of northern Namibia, notes they conduct almost no outside activities and even their gardens are meant more as market buffers than as risk-aversion strategies.

The diversification of income, or engagement in temporary paid labour is an indirect means of restocking. Money gained in other sectors can be channelled into pastoralism, particularly after a drought when animal numbers are low and prices high (Horowitz and Little 1987). The integration of pastoralism with other sectors thus benefits the pastoralists' own restocking agenda; this, argue the authors, should be supported as alternatives to herding available to pastoralists are not likely to be as socially, ecologically or economically effective in the short to medium term. Large fluctuations in herd numbers can create 'green desertification' which occurs when livestock numbers are no longer capable of keeping back woody bush encroachments (Heffernan 1995).

Among the Bedouin of the Near East, however, economic diversification has become so extreme that dependence on sheep production is more symbolic than actual in many cases. 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, maintaining and perhaps even cementing their social structure while effectively discarding herding. This process is slower in remoter areas but in Oman, for example, Chatty (1996) found a relationship among the Harasiis pastoralists between smaller flocks and degree of dependence on wage labour.

12. Who should address these policies and issues?

12.1 Pastoralists in national, regional and global perspective

Pastoralists pose a number of problems for policymakers in relation to their transnational status. Unlike farmers, who are largely tied to the boundaries of the nation-state, pastoralists tend to cross borders freely in their quest for forage, whatever the wishes and policy of individual countries (Blench 1996). Pastoralists in Arabia have switched from being romantic figures of the desert representing tradition and freedom to becoming a 'national problem' (Chatty 1996:15). Most countries with an extensive pastoral sector have limited resources both to service the pastoralists and to police their frontiers. Individual countries inevitably want to see pastoralists as 'their' citizens, an enthusiasm which pastoralists exploit willingly, often by holding identity cards for several countries at once.

It is logical, therefore, to treat pastoralism on a regional basis, to draw up common policies in relation to health, forage and water resources, subsidies on feed etc. However, such an approach runs exactly counter to the burgeoning ideology of the nation-state and it has rarely been possible to develop such regional policy initiatives, let alone implement them effectively. Health provides a good example of this; with the JP-15 campaigns in the 1960s, it was possible to effectively eliminate rinderpest from Sub-Saharan Africa. However, to prevent the return of the disease a co-ordinated programme of vaccination of young stock had to be maintained. This was never feasible, with the result that 1984-5 saw a West Africa-wide rinderpest epizootic that killed up to one-third of the animals (see e.g. Nwosu 1987).

The primary task, then is to co-ordinate approaches, to persuade research and development agencies not to subvert each others' policies with ill-considered projects. Second is propagating an understanding of the significance of long-term sustainability in livestock projects, why it is that preliminary results after two years cannot apparently show impressive increases in productivity, while after ten years, the rural householders may be more impoverished than at the start of the project. As so often, what may be standing in the way of effective development is other development projects.

12.2 Key re-orientation of policy towards pastoralists

12.2.1 Constructing policy: telling the truth

No agency dealing with pastoralists does not now pay lip-service to the concept of participation; gone are the former top-down mandarins and bureaucrats to be replaced by the listening fieldworker. Pastoralists gather, express their problems, preferably by drawing conceptual maps in the dust, and solutions emerge, preferably based on the indigenous knowledge they have been hoarding these last few millennia. Agency or NGO then joins with pastoralist –happy cows and their owners appear in the annual report. At the inevitable workshop another victory for the participatory approach is announced; luckily no 'top-down' advocates appear.

Without some key realworld input the reader might be forgiven for thinking that things were never better for pastoralists. But as the evidence suggests, things are far otherwise. War and famine preferentially displace and impoverish pastoralists as their herds are obvious targets for hungry soldiers. Agricultural expansion increasingly cuts into pastoral land and cultivators extract the water feeding pastoral wells. Collapses in the

command economies have created widespread impoverishment of pastoralists because no corresponding infrastructure was established as a safety-net. Examples of governments shifting to pastoralist-friendly policies are few and far between¹².

The reason for this is that it is not in the interest of agencies concerned with pastoral development to identify national trends and policies as the source of pastoralists' woes. A neat project with no loose ends ideally involves a defined region or subset of population and includes elements of co-operation and improved social cohesion in addition to technical inputs. For this reason, various types of association all too frequently feature on the menu of options.

Unpalatable as it is, it may be time to skewer these untruths. Pastoralists, by the nature of their occupation, form loose and flexible social groupings. The closer they come to sedentarisation on a cline, the more likely they are to form cohesive social structures. But pastoralists are also opportunists and whenever a visitor arrives to suggest a project they listen in case something useful may emerge. But inevitably, no matter what they say to a passing development expert, they will do whatever seems expedient for their herds in the light of the current situation.

Relations between pastoralists, governments and developers thus come close to institutionalised dishonesty; many governments depend on the milk and meat from their pastoral sector to feed urban populations, although they are often unwilling to acknowledge this. Pastoralists have an inbred distrust of national governments and a dismaying unwillingness to pay more than lip-service to the values of the nation-state. Governments all too often repay them by violence and coercion, a consequence of their incomprehension. Such phenomena are not confined to the developing world; the treatment of gypsies in Europe suggest that highly developed societies feel equally threatened by mobile populations who do not subscribe to their values.

Governments are usually controlled by settled populations who regard mobile pastoralists as a threat or as the location of famines and emergencies. As a consequence, both governments and food-aid providers have tended to characterise arid rangelands as basket cases, requiring assistance at regular intervals, but not as potential zones for livestock and commercial development. This is reflected both in government policies and internally within MLAs where drylands are argued to be low return and therefore low-priority. Since the failures in African rangelands in the 1970s, investment in pastoralism by MLAs has been at very low levels. As a consequence, there is very limited recent experience and furthermore, much that has been learnt about pastoralists and their relation to rangeland ecology in the academic sphere has made no transfer at all to project design or emergency relief.

The consequence in turn is that pastoral peoples in rangelands feel they are neglected by government and are thus hostile to it, even when there is no larger conflict in progress. Relations between state and pastoralists thus tend to be confrontational at the best of times. The lack of infrastructural development makes it increasingly difficult for pastoralists to meet the hygiene demands of international livestock trade and thus to generate income other than by low-level local sales. Lack of government in remote areas makes possible the spread of modern weapons and thus pastoralists attempt to gain access to pasture by force rather than negotiation.

What must be recognised is that any sort of rational policy process involves some element of top-down imposition and some element of consultation and participation. Governments have access to regional information on climate, disease, feed supplies and water resources while pastoralists can provide a dense account of local conditions. It is obviously in the interest of governments to make as much of this information as possible available to pastoralists and to collate and synthesise their comments and

¹² One exception to this might be the oil-rich states of the Gulf who have given considerable financial assistance to their remaining pastoral populations. However, the result is not only unviable production systems that exist only within a bubble of subsidies but with the additional irony that the countries in question do not need the meat and milk produced by the pastoralists and give this assistance essentially from sentiment.

suggestions. But there will always be practical barriers since pastoral areas tend to be remote and inaccessible. Governments must make policy and resource decisions on less than perfect information and almost certainly some sector will be disadvantaged. This is inevitable in the real world; the key task is to make information flow between sectors as effectively as possible to try and minimise the impact on individual groups.

12.2.2 Rethinking policy clusters

Apart from key questions of who should be making policy and what mechanisms should be used to support it, policies towards pastoralists are themselves in dire need of reform. This is in part because key players in a position to influence the policy reform process are usually both highly conservative and commonly problematically close to the agendas of large modern livestock companies. Some clusters of policy reform revolve around;

- ❖ The general perception that livestock production is a poor gamble in development terms compared with increased crop production
- ❖ That animal protein is best supplied by monogastrics because extensive production is wasteful
- ❖ The idea that pastoralists, as vulnerable people in fragile environments, are better consigned to relief agencies than dealt with as a significant economic proposition.
- ❖ The notion that unfamiliar land tenure systems are not tenure systems at all and that national governments have the right to expropriate land for conservation, mineral extraction or marginal farming

More specifically, however, policy re-orientation should tackle the following;

- ❖ The tendency to ignore 'minor' species, camels, yaks, reindeer, llama, in favour of cattle, sheep and pigs.
- ❖ The calculation of the economic viability of projects in terms of single trait characteristics rather than total household support characteristics
- ❖ The estimation of the viability of production systems over short periods of time, which inevitably advantages introduced breeds.
- ❖ Ignorance of the value and significance of livestock and rangeland biodiversity and its role in increasing productivity in uncertain environments

The future of pastoralism will depend heavily on political decisions made by national governments managing significant grassland zones. Enclosed pastures are unlikely to see any significant extension, but conditions for existing pastoralists will become more difficult with land expropriation by both farmers and conservation lobbies. Working with pastoralists, based on a more sympathetic understanding of their production systems, could act both to protect their lifeways and to continue their capacity to produce protein on otherwise marginal land.

Experience to date suggests that technical inputs will only have a very limited impact on overall output. The key in the next millennium will be major policy re-orientation. Elements likely to become important are;

- ❖ Production of niche products, either unusual species or breeds, or meat and milk free from contaminants
- ❖ Crop-livestock integration, the effective use of pastoral outputs in mixed farming, particularly the extension of work animals
- ❖ Co-conservation, the development of interlocking strategies to link conservation of wild fauna and flora with pastoral production
- ❖ The expansion of ecologically-sensitive low-volume tourism, using pastoralists to provide services, particularly in the area of indigenous knowledge

12.3 Who should be doing what?

12.3.1 Intervention versus information dissemination

Traditionally at this point it is usual to conclude that developing countries need policy assistance and there are a wealth of international agencies, think-tanks and consultants ready to jump in and offer this advice. It is worth remembering, however, that much of the policy already in place results from this same process and one legitimate response would be to ask whether another proposed paradigm shift would be any more ephemeral than previous re-engineering. It is also clear that many countries have benefited from *not* taking international advice on pastoralism, livestock biodiversity, dairy production, traditional remedies and the like and have conserved a store of indigenous skills and knowledge which would perhaps otherwise have been jettisoned. It is useful to remember that the great reverence in which 'Indigenous Knowledge' is held is very recent and hardly backed up by the detailed field research that would actually contextualise such knowledge.

All interventions, whether 'top-down' or 'participatory' are problematic in retrospect. Over time, they have a poor record of bettering the lives of those they are intended to assist. At the same, with the world rapidly stratifying into 'information-rich' and 'information-poor' societies, it should be clear that pastoralists are bound to fall into the latter category. This follows both from the inaccessible regions in which they live and the structured confrontation with national governments that is so common. The consequence is that pastoralists will fall ever further behind in their capacity to deal with the modern world, whether it be in understanding livestock markets, gaining access to effective drugs or articulating their opposition to land expropriation.

The role therefore of both multi-lateral agencies and NGOs should thus be increasingly re-oriented towards information dissemination, instead of asking what *we* can do for *them*, asking what pastoralists might do for themselves with access to greater information. It may seem perverse to be recommending yet more information flow when there seems already to be an overload in this area. Indeed the problem is often choosing between a variety of sources whose quality is difficult to assess. But this is very much the perspective of the wired individual with the internet at their disposal. Most pastoralists and many who make policy decisions at the local level have extremely weak access to information, especially in electronic forms. Such information as might be useful is often contained in lengthy reports written in tortured English and is consigned to the back shelf along with all the other worthy documents. Better policies for pastoralism can flow from more accessible, better-presented information. The consequence of this is;

- a. Wider translation and synthesis of existing materials
- b. Consideration given to all types of media, notably radio, internet, CD-ROM, video and DVD.
- c. Much greater attention paid to style, and quality of visual material
- d. Development both of meta-resources and quality filters
- e. Improved feedback mechanisms between pastoral producers and agencies, governments and NGOs

12.3.2 Remediating uneven research

It should be clear from the above accounts that research and policy developments in pastoralism are extremely uneven. Pastoralists benefit from accessibility, picturesqueness and the dominant language of the country in which they happen to reside. A bibliography of the Turkana or the Saami would probably fill several fat volumes, whereas it is hard to track down a single substantive reference to some Indian or Ethiopian pastoral peoples. A pastoral programme should try for global comprehensiveness, ensuring that at least some information is available for pastoral peoples throughout the world and that valuable but antique monographs are updated.

Increasing penetration of tertiary education makes it more and more possible for pastoralist research to be carried out by a member of the pastoral group itself; the key here is probably a small application of funds in the right place as well as an option for translation and dissemination of the product. The role of multi-lateral agencies should thus be to identify gaps in the coverage and arrange opportunities for such gaps to be filled as well as making the product available to other pastoral specialists throughout the world.

12.3.3 Practical support

The promotion of pastoral production will undoubtedly remain controversial, but the argument that it is an effective use of land that cannot otherwise be used for agriculture, suggests that governments and others will continue to invest in it. If this is to be a productive enterprise, as opposed to a simply humanitarian project, then linking understanding with action will have to become more effective. This in turn means trying to root out entrenched attitudes, which probably do more harm than anything large herds of herbivores can achieve. This section has begun by suggesting the type of support to the pastoral sector, but it is also useful to know what support would be most valuable. The following suggestions emerge from the body of this review;

- ❑ The process of changing the policy and attitudes of governments towards pastoralists through education, publicity, studies, etc., must continue and develop paying attention to new media.
- ❑ Drought-response policies and mechanisms, as with other policies towards pastoralists, must be discussed and set at a regional level. The most crucial elements in this are co-ordination in protection against epizootics and the siting of water points.
- ❑ Regional decisions should determine the quality and type of services available to livestock producers and ensure that these have some comparability.
- ❑ The relevance of levels of insecurity and the effect these have on the decisions of livestock producers must be recognised—no matter how politically unpalatable these may be.
- ❑ Forced sedentarisation is both ethically dubious and unlikely to succeed. However, neither government nor NGOs need respond to a mythical ethical imperative to restore some fictional status quo.
- ❑ International agencies have a significant role both in combating misinformation and diffusing accurate information as it becomes available. This is relevant both in terms of countries with semi-arid regions and in donor countries.
- ❑ Technological developments will substantially improve the modelling of climatic events in the coming years, and international agencies should have a major role in making the results available rapidly and effectively, as well as in convincing governments of their relevance.
- ❑ The collapse of notions of land degradation and carrying capacity should not be used to justify simply increasing pressure on resources. Further research should generate models that can be used to monitor access and predict likely bottlenecks in resource availability.

Pastoralism, almost by definition, is an ecozonal phenomenon that is not bounded by the nation-state. Unless it is redefined as a regional issue, both technically and in terms of its institutions, it may be a significant casualty of the early twenty-first century.

13. Conclusion and recommendations

13.1 Why has pastoralism survived?

Given the forces ranged against it, it is perhaps surprising that pastoralism has survived at all. However, pastoral production systems do have some features in their favour;

- ❑ Flexibility
- ❑ Low costs
- ❑ Freedom of movement
- ❑ Light regulatory environment
- ❑ Operate in regions unsuitable for agriculture

Pastoralists have a long-term flexibility derived from their ability to exploit patchy resources. It has often been observed that the more 'nomadic' pastoralists are, the better they are able to survive climatic catastrophes such as blizzards and droughts (see for example, the accounts in Gallais (1985) of the Sahelian drought of the early 1970s). However, they are also able to switch species (as Jordanian Bedu have switched almost entirely from camels to sheep in the period 1970-1995), main saleable output (as Fulbe in the Igbo areas of Nigeria have switched from dairying to meat production) or even entirely out of pastoralism for a period.

When pastoralists come up against highly efficient modern era livestock industries they face major price competition for their products especially as these may often be dumped, sometimes by the same nations offering pastoralists emergency assistance with another arm. However, pastoralists do not have to meet sometimes onerous hygiene costs, packaging, transport and tariffs. Moreover, the single most important cost to all intensive systems is investment in land itself, both enclosing it and maintaining its productivity, a cost that pastoralists do not bear, except on the rare occasions when they destock to conserve forage.

The problems that pastoralists face are as much social and political as economic and resource-based. Just as medieval empires saw themselves constantly threatened by nomads on the frontier, so the modern nation-state has the stereotype that nomadic peoples are both backward, archaic and also a political threat. The arguments advanced by researchers concerning the potential for pastoralists to contribute to national productivity and inter-relate to settled farmers are over-ridden by concerns about their constant movement and thus a failure to control them both in economic and political terms. One consequence is often neglect of infrastructure in remote areas and consequently these concerns become a self-fulfilling prophecy; the nomads then do turn to opposing the state.

13.2 Key trends in twentieth century pastoralism

Whatever the future of pastoralism, its present shape has evolved under pressure from very distinctive twentieth century influences, making impossible any return to some prior imagined golden era. These factors are summarised in Table 13;

Table 13. Key factors shaping twentieth century pastoralism

Factor	Impact
Modern veterinary medicine	Increases in productivity and greatly enlarged herds
Modern weapons	Major decline in predator threats, increasingly violent ethnic conflict and high levels of insecurity
Enclaving	Collapse of traditional 'safety-nets' in terms of long-distance migration in periods of climatic extremes
International pressure for hygiene in slaughtering and dairying	Declining market for pastoralist products
Declining prestige of dairy products	Terms of trade running constantly against pastoral livelihoods
World market in livestock products	Governments import cheap meat, milk etc. to satisfy urban demand at expense of pastoral sector
Ideological interference by the state	Inappropriate social and management strategies adopted and maintained by a combination of subsidised inputs and implied violence
Alternative calls on pastoral labour	Pressure for children to go to school and younger people to earn cash outside the pastoral economy
Modern transportation infrastructure	Replaces systems where transport is a major element of economic production (llamas, horses)
Introduction of high-input, high-output exotic breeds	Makes pastoralists dependent on effective infrastructure where input supply is irregular, creating periodic crises
Emergency relief, restocking and rehabilitation programmes	Keeps non-viable households in pastoral areas, thereby accelerating the cycle of deficits
Conservation lobby	Pressure to turn previously pastoral land over to reserved wildlife/biodiversity regions with corresponding hard currency income from tourism
Encroachment on rangeland	Rangeland is being eliminated through the use of politically attractive but often uneconomic irrigation systems

Many of these new situations are being replicated in various regions of the world; the factors that have impacted so heavily on African pastoralists are affecting those in Central Asia. It would be gratifying if there were some 'read-across', some sense that lessons learnt in one geographic area and time-frame can be absorbed in the policy-making structures of another.

13.3 Where is pastoralism headed?

Evidence as to the future of pastoralism is generally discouraging; throughout Africa and the Near East pastoralists are being driven into ever more marginal areas through the gradual expansion of arable terrain. Transport and enclosed livestock production are forcing out the remaining pastoralists in the Americas and the circum-Mediterranean region. The marginal lands that were previously the province of pastoralists are increasingly coming into focus as reserves of biodiversity. In Central Asia, decollectivisation and the consequent loss of subsidised infrastructure provided by the former Soviet regime has paradoxically brought about a return of more traditional systems. At the same time, however, the veterinary services are declining, and market prices for livestock products now reflect the access problems of much of the region. The consequence has been accelerating impoverishment in many countries; a situation intermittently remedied by mineral revenues but not through the development of pastoral systems.

Pastoralism is likely to simply disappear in any region where it competes with agriculture. Nonetheless, it is increasingly being realised that politically popular but unsustainable development of rangelands, often dependent on the mining of fossil water, is not a long-term development strategy and in some decades pastoralists may reclaim such land. The ancient North African development of much of the northern Sahara through large irrigation channels is today only an archaeological curiosity in a pastoral zone. Pastoralists

remain a resource, a system of producing meat and milk cheaply in land that is otherwise hard to exploit and as such will still persist in some form. This resource can be protected and managed effectively or ignored and allowed to decline. Government policies are very unlikely to be uniform in this respect and pastoralists are thus likely to gravitate to regions where conditions are most favourable. The key is thus to disseminate improved understanding of pastoral society as broadly as possible, making both policy and the effective management of natural resources as widespread as possible.

APPENDIX I: The origin of pastoral species**Appendix Table 1. Domestic animals and their wild counterparts**

DOMESTIC FORM		WILD PROGENITOR		DATE AND REGION OF FIRST DOMESTICATION		DISTRIBUTION OF WILD PROGENITOR
Common	Scientific	Common	Scientific	DATE	PLACE	
MAMMALS						
<i>CARNIVORA</i>						
Dog	<i>Canis familiaris</i>	Wolf	<i>Canis lupus</i>	12 000BC	Iraq	N Hemisphere
<i>PERISSODACTYLA</i>						
Horse	<i>Equus caballus</i>	Wild horse	<i>Equus ferus</i>	3500BC	S Ukraine	Russia, Central Asia
Donkey	<i>Equus asinus</i>	African ass	<i>Equus Africanus</i>	4000BC	Egypt	N Africa, possibly W Asia
<i>ARTIODACTYLA</i>						
Pig	<i>Sus domesticus</i>	Wild boar	<i>Sus scrofa</i>	7000BC	Turkey	Europe, Asia and N Africa
Llama	<i>Lama lama</i>	Guanaco ?	Possibly <i>lama guanicoe</i>	4000BC	Andes: Lake Junin and ? Lake Titicaca regions	S. America: Andes
Alpaca	<i>Lama pacos</i>	Guanaco ?	<i>Lama sp.</i>	4000BC	Andes: Lake Junin region	S. America: Andes
Dromedary	<i>Camelus dromedarius</i>	Dromedary	<i>Camelus sp.</i>	3000BC	W Asia	Asia, possibly N Africa
Bactrian camel	<i>Camelus bactrianus</i>	Bactrian camel	<i>Camelus ferus</i>	3000BC	Central Asia	Russia, Central Asia
Reindeer	<i>Rangifer tarandus</i>	Caribou	<i>Rangifer tarandus</i>	? ?		Arctic, sub-Arctic
Water buffalo	<i>Bubalus bubalis</i>	Wild buffalo	<i>Bubalus arnee</i>	Not known	China/ SE Asia	India, SE Asia
Cattle (taurine)	<i>Bos taurus</i>	Aurochs	<i>Bos primigenius</i>	6200BC	Turkey	Europe, Asia, N Africa
Cattle (zebu)	<i>Bos indicus</i>	—	<i>Bos primigenius namadicus</i>	<4000 BC	India ?	India/ SE Asia
Yak	<i>Poephagus grunniens</i>	Yak	<i>Poephagus mutus</i>	Not known	Not known	Tibet, Himalayas
Goat	<i>Capra hircus</i>	Wild goat	<i>Capra aegagrus</i>	7-8000BC	W Asia	W Asia
Sheep	<i>Ovis aries</i>	Mouflon	<i>Ovis orientalis</i>	7-8000BC	W Asia	W Asia

DOMESTIC FORM		WILD PROGENITOR		DATE AND REGION OF FIRST DOMESTICATION		DISTRIBUTION OF WILD PROGENITOR
BIRDS						
<i>ANSERIFORMES</i>						
Goose	<i>Anser anser</i>	Greylag goose	<i>Anser anser</i>	<500BC	Europe, Central Asia	N Europe, N Asia to NW Africa
Chinese goose	<i>Anser cygnoides</i>	Swan goose	<i>Anser cygnoides</i>	<500BC	? China	Europe, Asia, N America, N Africa
Muscovy duck	<i>Cairina moschata</i>					Mexico to Peru and Uruguay
Mallard duck	<i>Anas platyrhynchos</i>			500BC		Europe, Asia, N America, N Africa

Sources: Groombridge (1992:390), Browman (1989:265)

APPENDIX II: Pastoralism with monogastric species**Ducks and geese**

Duck herding is quite widespread in Tamil Nadu, South India. Duck producers are so lacking in capital that they purchase ducklings from traders in return for a contract to sell the eggs produced back to the traders. Ducks feed mainly on freshly harvested rice paddies, which benefits farmers, as they loosen the soil, eat weeds and insects and drop manure. The ducks are nowadays moved between farms on trucks, although formerly they were herded. Traders pass to buy the crop of eggs once a week and the ducks can be sold for meat after two or three years. With careful management, these sharecroppers can become independent producers after several years.

(Adapted from Nambi 1999)

Appendix III: Worldwide Tables of pastoral peoples**Table 14. Africa**

Phylum	Branch	Language	Group	Location	Main Pastoral Species		
Afroasiatic	Omotic	Hamar	Hamar	S.W. Ethiopia	Cattle, sheep, goats		
		Cushitic	Bedauye	Beja	E. Sudan	Camels	
			Somaali	Somaali	Somalia	Camels	
			Afar	Afar	Somalia/Djibouti	Camels	
			Borana	Borana	Ethiopia/Kenya	Cattle, sheep, goats	
			Rendille	Rendille	Kenya	Camels, sheep, goats	
			Gabra	Gabra	Kenya	Camels	
			Chadic	Yedina	Yedina	Lake Chad	Cattle
		Berber	Tamasheq	Touareg	Central Sahara	Camels	
			Berber		Maghreb	Cattle, sheep, goats	
		Semitic	Arabic	Baggara/Shuwa	Baggara/Shuwa	N.E. Nigeria to Sudan	Cattle, sheep, goats
				Uled Suliman	Uled Suliman	Lake Chad region	Camels
	Rgeybat			Rgeybat	Libya	Camels	
	Shukriya			Shukriya	Sudan	Cattle	
	Rashaida			Rashaida	Sudan	Cattle	
	Kerana			Kerana	Sudan	Cattle	
	Moors			Moors	Mauretania	Camels	
	Nilo-Saharan	Saharan	Kanuri		W. and N. of Lake Chad	Cattle, Camels	
			Kanembu	Kuburi, Sugurti	N.E. Borno/ Niger	Cattle	
Teda/Daza Zaghawa			Teda (Tubu)	Nigeria/Niger/Chad Chad/Sudan	Camels, donkeys Cattle, camels		
E. Sudanic Nilotic			Maa	Maasai	Kenya/Tanzania	Cattle	
			il-Camus	Samburu	N. Kenya	Cattle	
			Turkana	Turkana	N. Kenya	Cattle	
			Karimojong	Karimojong	N.E. Uganda	Cattle	
			Jie	Jie	N.E. Uganda	Cattle	
			Shilluk	Shilluk	S. Sudan	Cattle	
			Anywak	Anywak	S. Sudan/ Ethiopia	Cattle	
			Dinka	Dinka	S. Sudan	Cattle	
			Nuer	Nuer	S. Sudan	Cattle	
			Atuot	Atuot	S. Sudan	Cattle	
Surmic		Didinga	Didinga	S. Sudan	Cattle		
		Murle	Murle	S. Sudan	Cattle		
Niger-Congo	Atlantic	Fulfulde	Fulbe	Senegambia-Sudan	Various		
	Benue-Congo	ociHerero	Herero	Namibia, Botswana	Cattle		
	Benue-Congo	ovaHimba	Himba	Namibia	Cattle		
Khoisan	Khoi	Khoi	Khoi †	Southern Africa	Cattle		

Table 15. Europe

Phylum	Branch	Group	Location	Main Pastoral Species
Indo-European	Slavonic	Vlach	Bosnia, Macedonia	Sheep
	Hispanic	Spanish	Northern Spain	Small ruminants
Vasconic		Basque		Sheep

Table 16. Near East and West Asia

Phylum	Branch	Group	Location	Main Pastoral Species
Indo-European		Baxtyari	Iran	Sheep
		Pashtun	Iran	Sheep
		Uzbek	Uzbekistan, Iran	Sheep
		Lur	Iran	Sheep
		Zuri	Iran	Sheep
		Sādāt	Iran	Sheep
		Baluch	Pakistan, Afghanistan, Iran	Sheep, camels
Semitic		Arab	Iran	Sheep
		Tāheri	Iran	Sheep
		Kurd	Iran, Iraq, Turkey	Sheep
		Shahsevan	Iran	Sheep

Table 17. India and Himalaya

Phylum	Branch	Group	Location	Main Pastoral Species
	Tibetan	Gaddi	Himachal Pradesh	Yaks, small ruminants
		Chang Pa	Ladakh	Yaks, small ruminants
		Ahar	Uttar Pradesh	
		Gadariya	Uttar Pradesh	Small ruminants
		Ahir	Uttar Pradesh	
		Gwala	Bihar, Bengal	
		Gaura	Orissa	
		Gowari	Madhya Pradesh	
		Bharwad	Gujarat	Small ruminants
		Dhangar	Maharashtra	Small ruminants
		Gavli	Maharashtra	
		Golla	Andhra Pradesh	
		Kuruba	Mysore, Tamil Nadu	Small ruminants
		Idaiyan [Yadava]	Tamil Nadu	
		Toda		
		Bhopa		
		Chopan	Jammu & Kashmir	Small ruminants
		Bakkarwal	Jammu & Kashmir	Small ruminants
		Gujjar [Gojar]	Rajasthan, Kashmir	Cows, buffalo
		Banihārā	Rajasthan, Kashmir	Cows, buffalo
		Rebari	Rajasthan, Gujarat	Camel
		Raika	Rajasthan	Camel

Table 18. Central Asia and Far East

Phylum	Branch	Group	Location	Main Pastoral Species
Altaic	Mongolic	Mongol	Mongolia, China, Russia	Cattle, camel, yak, sheep, goat
		Buryat	Russia	Cattle, sheep, goat
		Kazak(h)	Mongolia, Kazakhstan	Sheep, horse, cattle, camel
		Kyrgyz	Kyrgyzstan	Sheep, goat
	Turkic	Turkmen	Turkmenistan	Sheep, goat
		Tajik	Tajikistan	Sheep, goat
		Satan	Mongolia	Reindeer

Table 19. Subarctic

Phylum	Branch	Group	Location	Main Pastoral Species
Altaic	Turkic	Dolgan		Reindeer
	Turkic	Sakha [Yakut]		Cattle
Finno-Ugric	Finnic	Saami	Finland to Kola peninsula	Reindeer
		Komi	Kola peninsula	Reindeer
		Nenets	Siberia	Reindeer
Chukchi		Chukchi	Chukotka	Reindeer

Table 20. New World

Phylum	Branch	Group	Location	Main Pastoral Species
Eskimo-Aleut		Inupiat	Alaska	reindeer
Vasconic		Basque	Mid-west	sheep
Athabaskan		Navajo	Mid-west	sheep
Athabaskan		Apache	Mid-west	cattle
		Aymara	Andes	llama, vicuna, sheep
		Quechua	Andes	llama, vicuna, sheep

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Electronic resources

ODI

<http://www.odi.org.uk/pdn/index.html> -Electronic versions of Pastoral Network papers over some twenty years covering a wide range of pastoral topics.

UNDP

http://www.sas.upenn.edu/African_Studies/Hornet/past0698.html -Describes the system of Somali water points and the consequences of uncontrolled borehole digging.

USAID

<http://www.info.usaid.gov/fews/fews.html> - FEWS: Famine Early Warning System.

<http://www.info.usaid.gov/HORN/GHAI/cycle/nextstep.html> - GHAI (Feb 1999). Next steps for the Inter-Governmental Authority on Drought and Desertification including regional integration, early warning and local capacity building. The Greater Horn of Africa Initiative, United States Agency for International Development.

Links to Universities and Research Centres

<http://www.shef.ac.uk/uni/academic/I-M/idry/Esrcreport.html> -SCIDR (Feb 1999). 'Environmental change and poverty in Kalahari pastoral systems.' Full report of research activities and results. Sheffield Centre for International Drylands Research.

<http://www.unu.edu/unupress/unupbooks/80458e/80458E08.htm#11> -As part of a summary of a book on ecology in general, two sections describe pastoralism on the Iranian plateau and in Afghanistan.

<http://wwwparent.qub.ac.uk/geosci/teaching/modules/geog/ggy203/lect6/environment.html> -QUB (Feb 1999). Environments in transition: Aridification and desertification. Geography teaching modules, Queen's University of Belfast.

Rangelands

<http://cnrit.tamu.edu/SRM> - website for the US-based Society for Range Management

<http://www.forages.css.orst.edu> - website for the Forage Information System maintained by Oregon State University

http://www.icimod.org.sg/focus/rangelands/range_toc.htm -A very comprehensive site describing Himalayan pastoralism with particular attention to rangelands and biodiversity conservation.

<http://agronomy.ucdavis.edu/calrng/pub.htm> -A newsletter called, "Rangeland Communities" a newsletter about rangeland ecosystems, people and management put out by the University of California Cooperative Extension.