SUMMARY

Extensive pastoral production covers some 25 percent of the world's land area and produces 10 percent of the meat used for human consumption, while supporting some 20 million pastoral households. Pastoral production is split between the extensive enclosed systems that are typical of North America, Australia and parts of South America, and the open access systems of Africa, the Andes, Asia and Siberia, which are still largely the province of "traditional" producers. The breakdown of the command economies of Central Asia 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.

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 sedentarization which derive as much from political considerations as from a concern for the welfare of those they aim to settle. However, compelling pastoral nomads to settle has a very unsatisfactory history and is unlikely to meet with long-term success.

Pastoralists make substantial contributions to the economies of developing countries, in terms both of supporting their own households and of supplying protein - meat and milk - to villages and towns. The governments of these countries rarely respond to the contributions made by pastoralism by investing in the sector. The pastoral economic system is under increasing threat from globalization of the trade in livestock products and unpredictable import policies in many countries. Broadly speaking, the trend in the twentieth century was for the terms of trade to turn increasingly against pastoralists.

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 that have been eliminated from high-density agricultural areas. Consequently, there is pressure

on governments to declare large regions protected areas, in response to the conservation lobby and the potential income from tourism. Uncertainties about pastoral tenure have made it difficult for pastoralists to lodge effective land claims.

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 expropriate land. Work with pastoralists, and a more sympathetic understanding of their production systems, could act to protect their ways of life and enhance their capacity to produce protein on otherwise marginal land.

Experience to date suggests that technical inputs will have only a very limited impact on overall output. Only a major policy reorientation can protect and support pastoralism during the next millennium. The following are some of the elements that are likely to become important:

- production of niche products, either unusual species and breeds or meat and milk that are free from contaminants;
- crop-livestock integration, i.e. the effective use of pastoral outputs in mixed farming, particularly the extension of work animals;
- co-conservation, i.e. 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 through their indigenous knowledge.

Introduction: pastoral systems worldwide

OVERVIEW

Pastoralism, the use of extensive grazing on 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 poor and its practitioners marginalized by sedentary cultivators and urban dwellers. Pastoral societies have risen and fallen, fragmented into isolated families or constructed empires that span the world; their demise has been announced regularly, often in the face of entirely contrary evidence for their persistence.

In spite of this, anthropologists and social theorists have continued to pay much attention to pastoralism, at times seeing it as an inevitable stage in the growth of civilization or, alternatively, caricaturing it as an anarchic institution that is likely to pull down that same civilization. Planners have denigrated the mobility characteristic of pastoral societies and novelists have romanticized the wanderings of these same nomads. Development experts, noticing the enormous passing herds, first saw pastoral systems as rich in potential, but 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 saw a new upswelling 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 outside world. The collapse of the Soviet Union has opened up the great steppes of Central Asia for the first time in 70 years, making accessible a whole world of pastoralism that had been essentially closed to researchers since 1919. The effect of this has been to expand pastoralism, as refugees from now collapsed industrial enterprises, which only functioned with significant subsidies, have sought to revive the only

method of subsistence that is practical throughout much of this region.

This would therefore seem to be the right time to look at 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. One of the most recent essays on this subject was written by Khazanov (1984) who approaches pastoralism from a historical point of view, focusing on nomads' relations with external societies and the origin of the State. The rich and complex literature on pastoral development is effectively ignored, perhaps unsurprisingly within the context of Soviet ethnography. More important, however, is the failure to integrate the biological and to recognize that pastoral society is, above all, driven by the nature and requirements of different species. This monograph is intended to provide a synopsis of the present and draw out implications for the future.

CLASSIFYING PASTORAL SYSTEMS

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

- by species;
- by management system;
- by geography;
- by ecology.

In addition to these categories, a broad distinction is made between the developed and the developing countries. In both Australia and North America, extensive livestock production is practised under conditions that are very different from those found elsewhere in the world, using fenced ranges and unambiguous tenure. This creates a level of investment in land and animals that is very dissimilar from that of "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 very low, i.e. where hunting-gathering is relatively easy, there is little or no impetus to herd animals. Hence pastoralism was absent from the rangelands of the New World and Australia prior to the arrival of the first Europeans. It is debated whether the absence of appropriate species also has an impact on the evolution of pastoralism; for example, camelids, alpaca and llamas were domesticated as pastoral species in the Andes in the pre-Columbian era but no pastoralism developed on the New World plains, perhaps for lack of an appropriate species.

Pastoralism has had a vertiginous history in the realm of development agencies. The world's rangelands and the large numbers of livestock using them were, for a long time, seen as a major

and underused resource and this 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 of pastoralism in the 1970s and 1980s. In the 1990s it was realized that pastoralism had remained in place and, moreover, that the opening up of Central Asia – the largest pastoral region in the world – was stimulating a renewed interest in, if not necessarily a wise application of, lessons learned over the previous decades. The new millennium therefore seems an appropriate time to review the status of pastoral production worldwide and, with a particular focus on the insights gained by comparing Asian and African pastoralism, to review policy in the light of recent concerns about poverty and vulnerability.

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 the population pressure on land remained limited. Table 1 lists the regions of the world where pastoralism is found and gives a summary of its status.

It is no accident that the high-capital land management approaches common in Australia and the New World are in areas where populations of 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 after the Spanish era as indigenous peoples gained access to European ruminants, or migrants from the Old World settled and began to farm (Melville, 1994). These systems have been adopted in very diverse fashions, with such peoples as the Navaho developing what may be termed “true” pastoralism while others, such as the Apache, evolved highly focused meat production through collective herds (Kunstadter, 1965).

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

Estimated numbers of pastoral households worldwide are 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 and substantial non-pastoral sectors. The Kazakhs, for example, number some 10 million people across ten countries, but only a small fraction of them are herders (Benson and Svanberg, 1998). The other aspect of the Central Asian situation 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 homes, thus Kazakhs, Kyrgyz and Uzbeks are all now moving back to the states that bear their names. At the same time, the collapse of industries that had previously been supported by Soviet subsidies has forced unemployed urban workers to practise herding with their rural relatives. The situation is therefore dynamic and can be expected to change further in coming years.

De Haan, Steinfeld and Blackburn (1997) quote a worldwide estimate of 20 million pastoral households. In sub-Saharan Africa, pastoral and agropastoral communities account for 20 million and 240 million individuals, respectively (Swallow, 1994 in Holden, Ashley and Bazeley, 1997). Broadly speaking, the economic importance of livestock within total household income rises as rainfall declines, and in desert regions dependence is near total.

TABLE 1
Regional zonation of pastoral systems

Zone	Main species	Status
Sub-Saharan Africa	Cattle, camels, sheep, goats	Reducing because of advancing agriculture
Europe	Small ruminants	Declining everywhere because of enclosure and advancing agriculture
North Africa	Small ruminants	Reducing because of advancing agriculture
Near East and South-Central Asia	Small ruminants	Declining locally because of enclosure and advancing agriculture
India	Camels, cattle, buffaloes, sheep, goats, ducks	Declining because of advancing agriculture, but peri-urban livestock production is expanding
Central Asia	Yak, camels, horses, sheep, goats	Expanding following decollectivization
Circumpolar zone	Reindeer	Expanding following decollectivization in Siberia, but under pressure in Scandinavia
North America	Sheep, cattle	Declining because of increased enclosure of land and alternative economic opportunities
Central America	Sheep, cattle	Declining because of increased enclosure of land and alternative economic opportunities
Andes	Llamas, alpaca, sheep	Contracting llama production because of expansion of road systems and European-model livestock production, but increased alpaca wool production
South American	Cattle, sheep	Expanding where forests are converted to savannah, lowlands but probably static elsewhere

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”

refers to fenced or demarcated rangelands operating within a Western economy.

The inclusion of buffalo in pastoral herds is rare and those found in the Islamic Republic of Iran are believed to derive from the migrations of Zott gypsies in the eighth century (see note in Digard, 1981: 30). In India, the Gujjar and other peoples practise vertical transhumance with buffaloes between the foothills of the Himalayas and the alpine meadows.

TABLE 2
Main pastoral species and management systems worldwide

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

This discussion excludes birds, notably ducks and geese. Particularly in India, ducks and geese are herded by specialized pastoralists who move them from place to place to exploit changing feed resources. The parameters of such pastoralism are very different from those of mainstream systems, so bird pastoralism is not treated in the main text but discussed briefly in Annex 2. Historically, in Europe and the Near 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 switched to either Islam or enclosed production systems.[1]

Another division of pastoralism that is less easy to model is the contrast between systems that are 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 the nomads of Southwest Asia, sheep predominate, and other animals are used for portage, riding, ploughing or herd management (see, e.g. Barfield, 1981 for a description of the Arabs of northeast Afghanistan). By contrast, in Mongolia and the northern Sudan, herders seem to manage between two and four species of roughly equal importance simultaneously. Göbel (1997) shows that, in the arid *puna* of northwest Argentina, herders keep a mixture of llamas, sheep and goats in roughly equal proportions.

PASTORAL ENTERPRISES

The most common categorization of pastoralism is by the degree of movement, from highly nomadic through transhumant to agropastoral. Cultivators also keep livestock for work or as a source of marketable products, but this is not usually regarded as pastoralism. 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 the case of extreme drought or disease stress, they 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.

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 longstanding 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 drought, pasture failure or the spread of an epizootic. This flexibility is often the key to their survival. In the droughts of the early 1980s, highly mobile camel people such as the Rashaida retained a much greater proportion of their herds than the neighbouring Beja because of the latter's 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 ecozone between rangeland and arable land, movement among different strategies can be quite fluid. The tone of much of the literature suggests that the process of sedentarization among nomads is irreversible but, as Glatzer (1977, 1982) shows, the very limited opportunities for agriculturists in northwest Afghanistan have impelled some to turn to pastoral nomadism.

Transhumance

Transhumance is the regular movement of herds among fixed points in order to exploit the 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 are very ancient. There is strong association with higher-rainfall zones; if the precipitation is such that the presence of forage is not a problem, herders can afford to develop permanent relations with particular sites, for example by 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. In West Africa, for example, there is a broad pattern of southwards movement in the dry season, when grass is available and insect problems are minimized, and a return movement northwards in the wet season, when humidity-related diseases increase and there is pasture in the regions further north.

A characteristic feature of transhumance is herd splitting; the herders take most of the animals to search for grazing, but leave the resident community with a nucleus of lactating females. There are many variations on this procedure, and the development of modern transport has meant that in recent times households are not split so radically; members can travel easily between the two bases. Whether milking females, weak animals or work animals are left behind depends substantially on the system being followed, 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, in the United Kingdom, the transhumance of sheep between the lowlands and highland areas for rough grazing is now conducted entirely by trucks that carry the animals from one grazing point to another. Many pastoralists in North Africa send their animals on transhumance by truck or train (Trautmann, 1985). Wealthier countries in the Persian Gulf, such as Oman and Saudi Arabia, make vehicles available at subsidized rates to assist pastoralists with animal transport. It seems likely that this pattern will become more and more frequent, especially as the problem of controlling animals in increasingly densely settled environments worsens.

Agropastoralism

Agropastoralists can be described as settled pastoralists who cultivate sufficient areas to feed their families from their own crop production. Agropastoralists hold land rights and use their own or hired labour to cultivate land and grow staples. While livestock is still valued property, agropastoralists' herds are usually smaller than those found in other pastoral systems, possibly because they no longer rely solely on livestock and depend on a finite grazing area which can be reached from their villages within a day. Agropastoralists invest more 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 the mobile communities. Sharing the same ethnolinguistic identity with the pastoralists, agropastoralists often act as brokers in establishing cattle tracks, negotiating the "camping" of herds on farms (when crop residues can be exchanged for valuable manure) and arranging for the rearing of work animals, all of which add value to overall agricultural production.

Enclosed systems and ranching

As well as the traditional pastoral systems described in the previous paragraphs, there is a fourth system of extensive livestock production, which can be described as enclosed systems or ranching, i.e. the land is individually owned and usually fenced. The United States is an example of the gradual transition from common ownership systems, which were prevalent in the nineteenth century, to today's fully enclosed system. Ranching is the dominant system in North

America, Australia and parts of South America, notably Argentina (Strickon, 1965). Rivière (1972) describes transitional systems in 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 given supplements in the field. As Ingold (1990) points out, there has been remarkably little description of ranching from anything other than the technical point of view, 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 the urban demand for protein makes the lax supply systems of conventional pastoralism unacceptable and input supply can support the higher throughputs that justify ranches.

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

The situation in North-Central Asia is one of decollectivization. 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 collectivized and managed on very large ranches with centralized services. A suboptimal system of managing fodder resources improved the health of the animals, and the ready market for their products acted as compensation in market terms. With decollectivization after 1991, the fencing is gradually collapsing and veterinary services are in decline. The townships established to provide centralized social services are not functioning as well, and the product-buying systems have faltered. Herders are compelled to re-establish older management systems while trying to develop new markets for their products in a situation where inputs are no longer subsidized.

Pastoralism and trade

The flexibility that is characteristic of pastoral nomadism, combined with its ability to transport goods and people, has 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 the countries of the Persian Gulf, this evolved into a fairly sophisticated form of blackmail, whereby the nomads 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 that lasted many generations (Orlove, 1982: 104). Similar, camel-based, systems traverse the deserts between eastern Turkey and northwestern India, while the movement of yaks and long-legged sheep is essential to the distribution of trade goods in the Himalayan region (Downs and 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 the transformation of the Hazarbuz, who are pastoral nomads of eastern Afghanistan and form a section of the Pashtun. Until the 1920s, the Hazarbuz lived principally as herders, concentrating on sheep (despite their name, which means “a thousand goats”). Because their migration routes coincided with a major arm of the silk route, they became more involved in transporting and then 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 percent of the Hazarbuz were actually involved in pastoralism. The Soviet invasion scattered the population still further, and many Hazarbuz now operate from Pakistan, while those remaining in Afghanistan are unable to migrate because of the security situation.

It is no coincidence that pastoralism has also been associated with another type of trade: smuggling. The consolidation of national borders and the evolution of contradictory tariffs in neighbouring countries makes nomads the ideal group for smuggling contraband between such 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 and Bourgeois (1972) describe the pastoral nomad smuggling systems of Afghanistan prior to the Soviet invasion, and Abu-Rabia (1994) the important role that the Negev Bedouin played in Israel in the 1950s, when they smuggled 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 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 the Syrian Arab Republic. Similarly, the Rashaida in the Sudan are key intermediaries in 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 proposed development projects assume 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 do not make the investments required by the project because their attention is directed elsewhere.

Pastoralism and warfare

Pastoralism and raiding have been associated since ancient times; Herodotos reported on the Scythian horsemen 2 500 years ago. Since then, waves of raiders from Central Asia threatened Europe until the end of the Middle Ages. Barfield (1989) gives a history of the dynamic relationship between the Chinese empire and its nomadic raiders from the steppes over a period of 3 000 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. The cyclical nature of the conflict between nomads and the State was first described by the mediaeval North African historian, Ibn Khaldun, in his study of history, *The Muqadimah* (Rosenthal, 1967). This cyclism also helps explain why so much of the discourse of pastoral nomadism is framed in terms of “crisis” and “problem” (see The discourse of pastoralism, on p. 11); the explosive nature of relations with the State and the natural environment suggests that a catastrophic cusp has been breached.

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

Brotherston (1989: 244) notes that the llama was essential to Inca military operations, providing both transport and food on the hoof and playing a role that was analogous to that of the horse. In some regions where the horse was an introduced exotic, such as West Africa, large States failed to develop. Although large North African horses were brought across the desert in the mediaeval period, the high costs of keeping them alive in a tsetse zone meant that they could never support an empire as large as those of Central Asia (Law, 1980; Blench, 1993). Nonetheless, as horses became accustomed to West Africa, they played an increasing role in warfare and, had colonialism not intervened, would perhaps have begun to underpin large State structures. The Fulºe in West Africa launched a jihad in the early nineteenth century which transformed the political map of the Sahelian region.

One aspect of the colonial and postcolonial era that is relevant to this type of conflict is changing

social structure and the breakdown of 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 to assert their rights. Across the semi-arid zone, pastoralist societies such as the Moors, the Tamachek and some Fulºe groups depended heavily on slave labour in the precolonial period. After the colonial conquest, slaves were given their freedom legally, although realizing that freedom was often a lengthy process. As groups such as the Haratin (Moors), Bella or *Iklan* (Tamachek) and Rimayºe (Fulºe) moved away from their former masters they retained both their language and their lifestyle. Gradually, however, resentment at their former status has surfaced and they have responded either by denying their slave origins or with antagonistic behaviour towards their former owners, some of whom have been reduced to poverty by the major droughts of the 1970s and 1980s.

In more subtle ways, authority systems that depended on farmers being subservient to pastoralists gradually collapsed in the postcolonial era. For example, in Nigeria during the colonial period, many non-Muslim populations were placed under a local juridical system controlled by the Hausa/Fulani. Court cases between herders and farmers tended almost invariably to be decided in favour of herders. However, after independence, farmers gradually began 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 English-speaking 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 the 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.

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, and usually end up in conflict with conservation lobbies, especially in Mongolia (see section on Predation, p. 34). Curiously, few pastoralists are hunters. In contrast to farmers, who often regard hunting as a prestigious activity, pastoralists view hunting as a minor activity, often focused on particular species. In Mongolia, the main focus of hunting activity is the marmot, which is not high-status game compared with large mammals. Similarly, pastoralists over much of Africa do not hunt. It has been noted that areas of the Serengeti where pastoralists are resident suffer less from the depredations of poachers than do areas that are 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. 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 the fishing, hunting and trapping of mammals predominate, occasionally for meat and also for the pelts of high-value species sold for cash. The Kazakhs combine all these sources of income, hunting with hawks on a recreational basis, hunting meat species and trapping fur animals and selling the pelts.

Pastoralism and fishing

Pastoralists can be clearly divided in terms of their attitude to aquatic resources. In some regions, fishing and the gathering of shellfish are essential to subsistence, while elsewhere pastoralists regard such foods as taboo. For example, along the coast of the Horn of Africa, from southern Egypt to northern 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 populations are reduced in times of drought or warfare. Inland, however, in the swamps of the southern Sudan, Nilotic pastoral peoples such as the Dinka and the Nuer regard fish as an integral part of their subsistence. Subgroups of the Turkana have always exploited the fish in Lake Turkana. Mongolian lakes remain largely unfished, but throughout much of the subarctic region, for example among the Chukchi and Saami, the hunting of marine mammals and fishing are regarded as essential.

The sources of these rather marked cultural differences are not easy to determine, although it is evident that 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 be important for increasing food security, although experience suggests that changing entrenched dietary preferences is difficult. However, there could be considerable potential for increasing cooperation between pastoral and fishing peoples in order to make effective use of a rich but fragile environment.

Some fishers are nomadic and, in some circumstances, the State treats these people in the same way as it treats nomadic livestock producers. In Nigeria, for example, as well as pastoralists, there are also numerous nomadic fishing communities that move from site to site in the sea delta of the River Niger to follow estuarine aquatic resources. Both of these types of community face similar problems in terms of poor health and education and have successfully lobbied the government for access to funds intended for nomads.

Pastoralists and non-pastoral species

As well as livestock, most pastoralists keep non-pastoral species, notably chickens and dogs. The Tuareg of the Hoggar keep dogs, cats, hedgehogs, chickens, guinea-fowl and pigeons (Nicolaisen and 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 Fulºe 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. In Hungary and other parts of Eastern Europe, wolves have interbred with feral dogs. In the United Kingdom and some other 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 in the Near East and Central Asia, the use of dogs for herding is not known in these regions; pastoral peoples such as the Bedouin and the Kazakhs use hawks for hunting.

HISTORY AND ORIGINS OF PASTORALISM

Although this monographs is principally an account of the present situation of pastoralists, it makes reference to the historical literature. The naivety of much development literature concerning even the recent past is a source of frequent errors about the present. One common mistake is to suppose that a crisis in the present signals the final demise of pastoralism. However, history 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 return because the settled need the mobile to trade, to breed animals and to open up areas that are too remote for agriculture. Planning for pastoral societies must have this long-term perspective, and needs to assume that herds will always recover eventually, as they have in the past, and that the colonization of inaccessible zones will always be the preserve of pastoralists.

The origin of pastoralism has been much discussed, especially in an older type of literature that is influenced, unconsciously perhaps, by Marxist historical schemas. Pastoralism was seen as an evolutionary stage in human history, a phase following hunting-gathering and leading to sedentarization and agriculture. This may have seemed reasonable, both because of a lack of archaeological evidence and because it unconsciously reflected the contempt in which settled people 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 increase of archaeological data and a more careful reading of the historical sources, especially from Asia, have 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 have started earlier than pastoralism. Pastoralism develops from surplus, as individuals simply accumulate too many animals to graze around a settlement throughout the year. In addition, as herders learned 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 appear to be pastoralists are to 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 – who were probably the ancestors of modern Tibetans – as weavers of fine wool (Miller and 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 knowledge of the Scythians, the Sauromations, the Saka, the Siberian Schythisna and the Mongols (see Davis-Kimball, Bashilov and Yablonsky, 1995). It is generally believed that the llama and the alpaca were first domesticated 6 000 years ago, although it is difficult to differentiate the bones of early domesticated animals from those of their wild ancestors.

Descriptions of a recognizably 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. Its exact origins can only be gauged from archaeology and, in particular, from careful osteometric work that demonstrates the gradual divergence between wild forms of livestock and their domesticated relatives. Claims have been made for the presence of domestic cattle in northeast Africa as early as 9 000 years ago, but not all scholars accept these dates and more solid ones are available for 6 000 years ago onwards (MacDonald and MacDonald, 2000). However, the interpretation of osteometric evidence already depends on the assumption that early herders controlled breeding, although it seems likely that the earliest stages of pastoralism involved the management of wild animals, as reindeer pastoralism still does today in some parts of the subarctic.

Pastoral culture spread 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 from between 4 500 and 4 000 years ago (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 2 000 years ago, probably initially with sheep followed shortly after by cattle. The elaborate cattle culture described by early travellers to the Cape (Boonzaier *et al*., 1996) was probably established only some 500 years before the first navigators encountered the Khoikhoi.

SOURCES OF INFORMATION ON PASTORALISM

Worldwide, the 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, the accessibility of East African pastoralists, combined with the colonial authorities' perception of the importance of their herds, led to a flowering of monographs (Asad, 1970). The Sudan is well known, as is 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 Fulºe stimulated a series of monographs in French covering the different subgroups (Dupire, 1970; Benoit, 1979; Bourgeot, 1981; Awogbade, 1983; Blench, 1984, 1985, 1991a, 1994). By contrast, the Kanuri-speaking groups of Nigeria and the Niger are barely described (but 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; Vivelo, 1977). Only in the extreme north of Namibia, among the Himba, does a recognizable 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 and Nicolaisen, 1997; Spittler, 1998), but in West Asia and Northeast Africa the emphasis has historically been on the Bedu, and romanticized descriptions of their herding date back to the mid-nineteenth century (Oppenheim and von Freiherr, 1939-1952; Lancaster, 1981; Blench, 1998c). Such an emphasis is in keeping with the United Kingdom 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 that is very imperfectly known. The south of the Islamic Republic of Iran is rich in pastoral groups, usually specializing 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 and League for Pastoral Peoples, 1999), but not the Tibet-style transhumance that is typical of the Himalayan region (e.g. Downs and Ekvall, 1965; Ekvall, 1968; 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 (but see Khazanov, 1984). Since the break-up of the Soviet Union there has been a major expansion of materials on pastoralists in both the Commonwealth of Independent States (CIS) countries and Mongolia, although the potential for outside scholars to study has been limited by political insecurity (e.g. Temple, Swift and Payne, 1993; Mearns, 1991, 1993; Van Veen, 1995). At the same time, development agencies' desire to mount projects has led to a burgeoning of development literature and consultancy reports, although much of this material is 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) are 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 out of date and the systems described may well have changed. For example, domestic reindeer were introduced into Alaska in the 1890s and were principally herded by the native Inupiat people (Beach, 1985). At their height in the 1930s, reindeer numbered some 640 000 head. However, by the 1970s this number had fallen to just 24 000, and the practice of herding reindeer may well have disappeared altogether. Similarly, accounts of Apache and Navajo herding are more than 30 years old (Kunstadter, 1965) and the situation is likely to have changed dramatically since then.

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). It is confined to the semi-arid regions of the Andes in a habitat known as *puna*, which lies between 3 700 and 5 000 m above sea level. This type of herding is found in south-central Peru, Bolivia and northern Chile. In comparison with other types of pastoralism, publications on Andean pastoralism are few and scattered (see review in Orlove, 1982 and also Flores Ochoa, 1968; 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 further study shows that major changes in species, breeding strategies and movement patterns have occurred. In the pastoral sector, basing development interventions on old data is a particularly inappropriate strategy.

If information is to flow effectively, substantially more effort must go into translating and synthesizing publications on pastoralism in languages other than English and French. Even monographs in German are often ignored by the Anglo-American establishment, and this is even truer of Chinese and Russian. Similarly, approaches from different disciplines tend to write in ignorance of one another; animal scientists do not read anthropology, while development literature often seems to be written in blissful ignorance of any other discipline whatsoever.

THE DISCOURSE OF PASTORALISM

The literature on 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. Although nomadism is viewed negatively within many of the countries in which it is practised, 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 that of 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 in 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 and Hinde, 1910) was entitled *The last of the Masai*. Many of the books and articles listed in the bibliography have titles that 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 of whom seem to have been given a new lease of life by recent liberalization.

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 on in monographs allow pastoralism to be constantly resuscitated.

The other aspect of this is that national governments often see pastoralists as a problem, and it is hard not to be influenced by this discourse, especially when writing reports. If it is national policy to sedentarize pastoralists, the failure of projects or initiatives to settle them transmutes into a problem. If it is accepted that pastoralism is simply one of the national ways of life, the problem disappears. This publication describes the 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 consist almost entirely of issues defined by outsiders. Pastoralists themselves often derive considerable satisfaction from their lifestyle, sometimes to the extent of intentionally offending farmers with outrageous dress or customs.

More recently, the literature on 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 have now accumulated. Anderson and Broch-Due’s (1999) *The poor are not us* is a good example of this; its theme reflects the fashionable concerns of the aid agencies that fund much of the work now being undertaken, while its contributors rely heavily on archives and early published material to draw out past narratives of rangeland degradation, pastoral fecklessness, etc.

Given the vast body of publications and grey literature on pastoralism, it may seem invidious to suggest that yet more research is required, but recent literature describing current economics, ecology and production systems is remarkably sparse for many regions. Chad, which is probably one of the most significant pastoral countries in Africa, must make do with descriptions that are more than 50 years old. The locations, size and status of many of its pastoral groups are at present 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. This situation is similar to that of the “new” pastoral societies of Central Asia. They are not new, and the rapid changes following decollectivization make much of the existing literature of historical interest.

[1] The dehesa systems of central Spain, based around cork-oak forests, may well be the last survivors of what was a major

European swine-herding tradition.

Biodiversity

MAINTAINING LIVESTOCK BIODIVERSITY

An issue of relatively recent interest is the conservation of livestock biodiversity.[6] Although a concern for “rare breeds” has been a European theme since the 1960s, it was not explicitly either an economic or an ethical enterprise. With the rise of a conception of biodiversity as a whole and the realization that the loss of domestic animal breeds is a loss of genetic capital in the same way as the loss of wild species is, interest gradually developed throughout the 1990s. Interest in European breeds has partly a hobbyist and antiquarian motivation. However, it has become apparent that the high diversity of breeds in many tropical or marginal areas is crucial to overall livelihood strategies.

The breeds that are most relevant to biodiversity concerns are those that have co-evolved with a particular environment and farming system and that 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 easily be developed. However, “breed” is a broad term that covers 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 a local breed and an exotic. This is particularly the case in the former Soviet Union where many existing “breeds” have no natural habitat and only persist in fields outside research stations (see FAO, 1989a). The Third FAO Worldwatch List (FAO, 2000) includes a large number of breeds of turkey and goose in sub-Saharan Africa. These are not indigenous species, and on reading the text it appears that they are all 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 and development agencies or simply an inappropriate understanding of

short-term gains against long-term viability. When 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 pressurize them to conserve breeds; this should be the role of national institutions. Livestock breed conservation is a public good, both nationally and internationally, and a long-term investment in future genetic resources. In many areas in southern Nigeria, the rising prices of such tree crops as cocoa and palm oil have caused communities to dispense with their traditional dwarf cattle and goats in order to concentrate on these profitable crops. This is a perfectly rational medium-term strategy, but it would be shortsighted of the national government to lose the genetic resource that such livestock represent simply because of a temporary pattern in world trade. As to whether such a strategy is sustainable on the part of a government, the analogy is not with an economic enterprise but with an investment against unpredictable future developments. New antibiotics are expensive to discover and produce and, when discovered, they may have to be reserved against future, still unknown epidemics. The same is true of genetic resources.

Existing baseline data are too imprecise to allow an estimate of the rate of loss, although this is possible to calculate 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 the 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
Specialization	Emphasis on a single productive trait, e.g. dairying, leading to exclusion of multipurpose animals
Genetic introgression	Cross-breeding and accidental introgression leading to loss of indigenous breeds
Technology	Machinery replaces work animals
Biotechnology	Cryopreservation equipment that is 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

Source: Adapted from Hammond and Leitch, 1995.

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

Box 7. The expansion of microlivestock in Nigeria

Livestock production in Nigeria has historically been dominated by ruminants which 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 increase the diversity of sources for their livelihoods.

Source: RIM, 1992.

If poverty alleviation and sustainable livelihoods are the key agenda (and even if they are not but the priority is to work with species that are important to the majority of rural farmers), there is strong evidence 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. Microlivestock often do not have to be fed, do not require substantial labour inputs and do not require access to land beyond the backyard. The sale of individual animals can provide small cash sums without threatening household capital in the way that the sale of larger animals does.

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 is used to feed the cities. Pastoralists in both tropical Africa and Central Asia have historically made significant investments in breeding races of domestic animal that are 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 New World indigenous species were traditionally 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 it is not necessarily central to the concerns of those at whom interventions are purportedly aimed.

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

a. Poor people keep a biodiverse range of species[7] because they do not have access to high-output breeds and would switch to these if resources were available.
b. Keeping a range of species and breeds enables poor people to continue producing in uncertain environments and thus to manage risk effectively, as well as using a diverse range of outputs and permitting a flexible allocation of labour

Interpretation a) is clearly favoured by those development agencies that wish to promote exotics, cross-breeds and high-input systems. It also has the advantage of appearing to increase food security. However, interpretation b) seems to be taking hold after several decades of ethnographic study of rural subsistence systems suggests that poor rural households trying to ensure their food security are, above all, interested in minimizing risk. The risks induced by such natural phenomena 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 produce uncompetitive. Development agencies have added to the risk by making rapid changes in policy and failing 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.

Approaches to livestock issues in the context of biodiversity are still uncommon and often inadequately coordinated. Even FAO, which is leading the Domestic Animal Diversity – Information System (DAD-IS) initiative, continues to send out free semen from Friesian cattle from another programme without careful control of the uses to which it will be put. Large livestock companies have significant political influence, especially in the United States, and approaches that run counter to their commercial philosophies often get short shrift in international decision-making. This is particularly striking in the Americas, where aid for the purchase of “modern” livestock breeds in development projects is still very prevalent. Even in Southeast Asia, where work is beginning in earnest on the evaluation of local breeds, development projects involving cross-breeding remain commonplace. The recent financial

collapse in Southeast Asia and Brazil is likely to demonstrate just how unsustainable such strategies are, as householders who accepted the blandishments of the projects will no longer be able to afford the inputs necessary to keep their stock alive.

MAINTAINING RANGELAND BIODIVERSITY

As well as conserving livestock biodiversity, there is the broader issue of maintaining the environments that most pastoralists inhabit, i.e. rangelands (Blench, 2001b). Rangelands do not represent an ancient climax vegetation that can somehow be restored to its natural state; those that exist in 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 that their management and biodiversity are not an issue. For pastoralists, the maintenance of high levels of biodiversity in rangelands may be crucial to their survival strategies. But the extent of rangelands and the sort of biodiversity they are expected to exhibit are as much political and economic decisions as they are science-driven ones.

As with the oceans, rangelands depend on priorities being set on a regional basis; grasslands do not stop at national borders, nor do the animals that exploit them recognize political boundaries. Conservation of biodiversity in rangelands involves the cooperation of different stakeholders, including foragers, pastoralists, ranchers, arable farmers, local and national governments and international bodies. Conservation approaches must recognize 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 landowner and the land user who have the closest contact with conservation of biodiversity and, economically, they are likely to be the most affected by international programmes. If they see economic losses for themselves as a result of such programmes, it can be expected that they will 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 do individual smallholders, at least over the time period that concerns individual households. Nevertheless, maintenance or restoration of habitats should be a main concern, because the best way to minimize species loss is to maintain the integrity of ecosystem function; determination of the status of each species, and design of conservation measures to meet its needs, can thus largely be avoided. It is therefore important to create local-level incentives to conserve biodiversity. Landowners and users will have to be awarded a larger share of the total gains from conserving biodiversity. Mechanisms that can be used for this purpose are: subsidies for conserving biodiversity; payment of royalties on the use of genetic material conserved; and utilization of conserved areas for tourism, with income transfer (Tisdell, 1995).

Rangelands are more perplexing environments than most others when it comes to conserving or recreating their biodiversity. They are not lost visibly, in the way that forests are, nor do many shelter the headline species that attract funds and research. Some rangelands are characteristic of highly developed economies and have been managed in ways that do not necessarily elicit sympathy. Yet the role they play in 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, argue for greater importance being attached to rangelands.

[6] This chapter has been largely developed from Blench, 2001a.

[7] 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.

Improving the livelihoods of pastoralist families and communities

DISASTER MANAGEMENT

Drought and the management of climatic anomalies

Livestock can fall victim to two main types of climatic anomaly: droughts and blizzards. These have very different impacts on herders. In blizzards, animals are cut off by snow and are often unable to break through the ice that forms over the grass in order 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, on the other hand, are cumulative, and the gradual realization 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 - the weaker ones first - and are often sold in advance of likely death in order to realize 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 vegetation persisted. This was no more than an extension of typical intra-annual seasonal movement in which pastoralists cluster in more humid regions during the dry season, moving to drier zones when the rains begin and they can take advantage of the new grass. Pastoralists vary in their willingness and capacity to move, and those that shift rapidly and for 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 because they move 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 crisis. In reality, however, there is no unambiguous evidence that the climate is worsening, although distributions are changing, as indeed they

always have changed (Blench, 1999c; Blench and Marriage, 1998, 1999). However, a series of rapid and external changes in the twentieth century have led to pastoralists coming under unprecedented pressures, to which they are unable to respond appropriately. A number of factors are making long-distance opportunistic movement increasingly impractical. Notable among these factors are 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 localized 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 buy them back 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.

These cycles are increasingly understood by national governments, international agencies and non-governmental organizations (NGOs), with the result that effective mechanisms to deliver relief supplies to affected pastoralists are generally in place. This, however, has led to the perception that drought is essentially a humanitarian problem. As a result, policies that deal with the long-term consequences and try to prevent the cycle from simply repeating itself are 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 for 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, because it makes pasture in waterless regions utilizable. Arid rangelands have generally been the object of extensive well and borehole implantation which has 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 that is accessible through wells (*el, sur*), boreholes, artificial basins (*war*) and cisterns (*birked*). Natural depressions are accessible to all members of the section owning the land. In all other cases, the resource is controlled by the groups responsible for maintaining it. In recent times, individual ownership has begun to supersede collective ownership, and controlled water resources are seen as a source of cash income. As well as external programmes, Somali areas in particular have also been the recipients of local investment to build groups of *birkeds*, i.e. cisterns, around which settlements often develop (Sugule and 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 sell water to pastoralists in remote pastures.

Such developments have several consequences; they increase sedentarization, 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 therefore also encourages

the herding of sale-oriented species, notably cattle. Cisterns are often associated with range exclosures and privatization, thereby altering the open access pasture system. Sugule and Walker (1998) note that pastoralists are aware of the negative consequences of inserting too many *birkeds,* 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 to rewrite the rules. It seems very unlikely that customary agreements, *xeer*, can do more than temporarily limit the growth of *birkeds*. In times of average of above rainfall, the *birked* system is generally positive, although as herds become more static pathogen load and veterinary costs increase. Pastoralists thus become more vulnerable to stress; when rainfall declines, the cisterns empty and the stock dies 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) in order to buy water when its prices are highest.

The present responses to drought, and the policies of governments, agencies and NGOs, focus on restocking and sedentarization. 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 ten years. Although it is now generally agreed that pastoralists are not responsible for overgrazing, as earlier literature implied, 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 to 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.

Early warning systems: idea and reality

The other great hope for rangelands has been remote sensing. It was believed that the use of satellites would make it possible to detect pasture availability and abundance well before the usual land-based methods could, and national governments would then be able to direct pastoralists to appropriate sites. Remote sensing was seen as being similar to notions of early warning, which is 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 cannot detect quality; pastoralists know which species their animals eat, and these do not show up on the false-colour images of remote sensing. In addition, even if this problem were somehow remedied, the problem of communications infrastructure would remain. When information reaches national governments, their own systems of communication with pastoralists in remote areas are so poorly developed that they are unable to pass it to producers.

The basic idea of early warning systems is extremely attractive. Droughts occur fairly frequently in fragile rangeland, and the result is humanitarian disaster - plainly seen on television images. If it were possible to predict in advance that a drought was about to occur, two actions could be

taken:

- pastoralists could be warned to take appropriate action;
- governments or relief agencies would be able to put remedial strategies in place before the disaster occurred.

Early warning systems seem to have been strongly technology-driven, especially since the late 1970s. As rich, multi- (false)-coloured satellite images of desert areas began to appear, the illusion of omniscience developed. The National Oceanographic and Atmospheric Administration (NOAA Web site) and the Spot Satellite Earth Observation System (Spot Image Web site) could tell pastoralists when vegetation was going to be in short supply through the mysterious agency of the "normalized difference vegetation index" (Infocarto Web site).

The value of such prediction engines remains controversial, and disillusionment has 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; for example, pastoralists' responses included crossing national borders, especially when insecurity made their usual grazing inaccessible.
- The procedures of governments and most agencies were far too slow and cumbersome to respond in an effective way to climatological information and deliver it to those who might need it.

In addition, there may have been a 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 do 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 Web sites devoted to providing up-to-date information on such climatic anomalies as El Niño Southern Oscillation and to monitoring catastrophic events that are relevant to food security. These include, on a global scale, the United States Agency for International Development (USAID)-funded Famine Early Warning System (FEWS Web site) and, on a regional level, a system for South Africa (South Africa Web site). Agencies now have somewhat less hubris about their capacity to respond, but the emphasis has changed to influencing governments to build awareness of the impact of climatic anomalies into their long-term planning. The variability of climatic conditions is a reality that needs to be acknowledged and incorporated into government policy, as well as 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, and these may help inform choices over seed selection but 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 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 and Davies, 1995).

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 in either the developed or the developing world. This is almost certainly because the decisions that 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 the importance of landscape maintenance are leading to long-term transformations of notions of the ultimate goal of pastoral production.

Security in pastoral zones

The section on Pastoralism and warfare (p. 7) discusses the close relationship between highly mobile pastoralists and warfare. In addition to the factors mentioned there, the remoteness of pastoral zones means that they are typically in regions where borders are disputed and 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, interethnic 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 and Mearns, 1999). However, 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 northeast Kenya has pushed the Turkana westwards into confrontation with the Karimojong in Uganda, who in turn are raiding into the Sudan. Less numerous and powerful pastoral peoples have no defences and either they are forced to flee their gazing lands or their animals are stolen and they end up in camps.

Even larger-scale disputes between nations can be highly destructive of pastoral enterprises, as the 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 transboundary military confrontation, and enthusiasm to fund long-term development is still scarcer. Such conflicts also make the sort of regional planning that is essential to a coherent rangelands strategy still more difficult to establish.

RECOVERY STRATEGIES

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:

- Stock recovery: pastoralism is a way of life, and herdowners will invest in rebuilding herds without external intervention. As a consequence, the trend is always for livestock to exceed range resources. However, the investment costs of pastoral herds are high and the recovery rates are very slow compared with those of crops. Moreover, seeds can frequently be sourced externally at relatively low cost; stock adapted to specific climatic and range conditions is difficult to obtain.[8]
- Pastoralists are significantly more vulnerable than cultivators to trade fluctuations. 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 market recovery for up to a decade.
- 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.
- Because pastoralists must dispose of operating capital in order to buy resources (water, fodder) when their animals are under threat, poorer herdowners must sell a greater percentage of their herds in order to survive than richer herders do. This increases wealth stratification and makes poorer herders more vulnerable in the next cycle of environmental stress.
- Crises affect pastoralists in ways that are almost directly opposite to the ways in which they affect farmers. When climatic factors reduce crop yields, market prices increase 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 who are 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.

Sedentarization 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 stakeholder affects the pattern of costs and benefits of incorporating wildlife into a livelihood strategy.

The precolonial system in eastern Africa was open access and based on a state of virtually constant warfare (Fukui and Turton, 1977; Markakis, 1993; Bollig, 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 intergroup raiding was as effective a way of building up herds as investing in improved livestock productivity was, at least as far as the victors were concerned. Where arms have become widespread among pastoralists, as in Somalia, the southern Sudan and adjacent regions of Ethiopia and Kenya, violent conflicts are continuing to the present.

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

The conflict between the nomad and the settled farmer goes back to the earliest written records and is mythically symbolized in many cultures. Cain slew Abel, the Chinese emperors built the Great Wall to keep out the marauding hordes, and the rulers of Egypt were constantly at war with nomads from the deserts west of the Nile.[9] The association of highly mobile pastoralists with raiding and warfare has been crucial in establishing negative stereotypes throughout history, whether these be the Tuareg of the Sahara, the Mongols in Central Asia, the cattle raids poeticized in the Tain or the present-day Somali *shifta* 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 that they are, moreover, a significant supplier of pastoral products to farmers and urban populations. Government policy tends to favour the agriculturist, and faith in the 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 what is now the Islamic Republic of 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 of the Second World War, the nomads rapidly reverted to their former migratory patterns and, up to 1960, a long series of councils restituted much that had been 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 Qashqafled 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 that the Shah had used.

In the Near East, attempts to settle pastoralists 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 had completely reverted to herding settlements (Chatty, 1996: 19). In spite of this discouraging outcome, such schemes were replicated throughout the region, often under very different political regimes but with very similar results.

Resettlement has had an equally bad record in the Horn of Africa. Resettlement schemes in northern Kenya and southern Somalia began with the best of intentions, but 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, even though this was 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 herding or used their improved access to find work abroad. The settlement schemes then became more like dry-season encampments populated principally by children, women and the elderly.

However the conflict between the two groups does not justify one sector being sacrificed to the other, particularly given their symbiotic relationship. 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 greater collaboration is evident; inputs such as fodder, as well as crop residues, provide the possibility of increased diversification of herd management techniques.

Even spontaneous sedentarization does not necessarily entail an increase in production or food security; on the contrary, it may have the effect of shifting underemployment and hunger to other regions. Economic and military pressure on the Negev Bedouin has forced many to settle, often with disastrous consequences for their society (Meir, 1997). The growing urban population places greater demand for livestock and agricultural produce while the labour force in rural areas

dwindles, and depopulation of areas that are 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 on to land that was traditionally held and grazed by pastoralists has forced them on to increasingly marginal and unproductive land. Despite this, some interest groups argue that pastoralists are inherently inefficient and self-destructive and that they should be settled, as is the official line in Nigeria, for example (Awogbade, 1983). Besides the cultural damage involved in forcibly settling pastoralists, small-scale agriculture or urban employment does not necessarily offer a lifeline out of poverty.

The fact that nomads are often unwilling to settle suggests that it is generally deleterious (particularly given the role of opportunism and adaptability in the decision-making process), 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, they would, but until such time arrives the rationality of nomadism is evident.

The weather, "pastoralist irrationality", sedentary farmers and governments have all been blamed for the impoverishment of pastoralists. However, apportioning blame does not solve the problem, and there is as much of a political problem in the relationships among the parties concerned as there is in the nature of the agents themselves. Cullis (1992) suggests 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 that has been - and remains - essential to both sectors. An analysis that concludes that there are too many mouths and too little water does not explain the political alliances or address the need for diversity to maintain any part of the system. The tendency to look at 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 on 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 while, in 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 point very forcefully to the conclusion that future advice and thinking, whether from within the pastoral sector or from outside it, 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 sedentarization.

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 tenure 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 to regulate access to pasture existed in the precolonial era. The Beja, living along the Red Sea coast of the 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.

During the twentieth century, with the growth of the nation State and widespread demands to codify landownership, pastoralists and others were compelled 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 without any hindrance. This should not be thought of as a problem confined to the developing world; at present, cases are being brought in Sweden concerning timber interests that are gradually eating away at Saami land. These are succeeding because of the absence of written documents confirming Saami proprietorship. The irony in this case is that Scandinavian countries have a reputation for pastoral studies and projects that are conveniently located faraway and take an entirely different approach to customary tenure.

Pastoral areas have been managed "traditionally" under common property resource (CPR) management schemes, although these are really constructs of the colonial era. CPR areas are increasingly recognized as complex and highly adaptable systems, involving multifaceted rights to resources. They vary from open access to communal use with reciprocal arrangements, exclusive use and privatization. In communal areas of Botswana, Namibia, the United Republic of Tanzania, Zimbabwe and Zambia, 12.5 percent 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 privatizing communal resources. However, in terms of community-based natural resource management (CBNRM), the privatization of resources can increase conflict between wildlife and livestock, and also increase tenure insecurity and gender-based discrimination (Birgegard, 1993; Hunter, Hitchcock and Wyckoff-Baird, 1990; Rutten, 1992; Game Ranching Ltd, 1995; Lane and Moorehead, 1994, 1996; Lane, 1997).

Fragmentation of 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 in and management of a resource is related to its value, which varies according to when and where the resource is evaluated, as well as to who is making the value judgement. For CBNRM schemes to function, neighbouring landowners

may have to organize to join their lands together in order to manage wildlife and avoid conflicts over the identification of producer communities. Strong institutional management, secure rights of tenure that build on 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 nationalization or privatization and reinforces élite interests in commercial ranching or agriculture (White, 1992).

Rethinking pastoral organization

Pastoralists are not very prone to develop complex social institutions to defend their interests as a group, in part because their mobility and flexibility make it hard for such institutions to maintain their coherence over long periods. The exception to this is when pastoralism is allied with military organization, as in the case of the Mongols and other horse-mounted raiders of Central Asia, or in the States established by the Fulºe in West Africa. However, when conquest leads to empire, the necessity to maintain a functioning administration effectively excludes actual pastoralists. Traditional social organization thus focuses on the household and kin group, while more nebulous clan entities provide social identity but not necessarily organizational capacity.

This has seemed highly unsatisfactory to outsiders encountering pastoral societies because various types of cooperation would seem to be a precondition for development. Pastoralists moving through arable areas are frequently in conflict with farmers; to prevent this, it would seem logical to form agreements with farmers. The purchase of drugs, and 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 organizations that could effectively articulate their case to government.

In the command economies, the solution to this was relatively simple: through collectivization, cooperation and association were simply forced on people. This had both a good and a bad side: it made the delivery of inputs simple and the organization of necessarily collective operations, such as predator hunts, functional. It also 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 subsidized 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 have been collapsing gradually since the fall of communism, and far more traditional social patterns are reasserting themselves.

Outside the command economies, principally in Africa and the Near 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. Since the 1970s, the World Bank and regional NGOs such as SOS-Sahel have been involved in the promotion of PAs across the Sahel. In East

Africa, the system of group ranches was developed, principally for the Maasai, in order to encourage a more comprehensive system of landownership, and thus investment, as well as to provide centralized systems of livestock dipping. Elsewhere in Africa, PAs 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, remain moot. Evaluations or "institutional audits" generally suggest that the 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 herdowners scattered. This may well be the problem with any sort of voluntary association of this type. When promoted by committed individuals it can be successful for some time, but 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 new 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 to pastoralists have been under discussion for some time, but 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 encourage 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 that have unreliable landlines, and this process has every potential to drive even more far-reaching changes.

Restocking

Restocking, whether initiated by herders or organized by an external agent, attempts to rehabilitate herders within their environment, rather than suggesting that they settle and take up, for example, fish production.[10] However, rehabilitation relies on there having been a significant change in the environment or in herders' 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 have 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 replaces 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 maximizing 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, the herder calls in the lent animals to form the nucleus of a new herd. Even when 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. Such mechanisms have not always been 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, while interfering with indigenous recovery systems (Heffernan, 1995).

The need for a viable herd determines the nature of restocking programmes, and a herd that 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 so that they would have more autonomy in restocking. Mace (1989) records some successes with restocking while stressing that, even following restocking, families with fewer than 100 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 small stock, which do not provide food security because pastoralists are dependent on the diversity of produce from their herds (Oba, 1992). Toulmin (1987, 1995) considers both the drought cycle and restocking responses and concludes 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 was a highly developed culture that not only constituted a threat to viable herds but was also a method of restocking a herd after a drought. Sweet (1965) argues that camel raiding in the Persian Gulf countries 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). This is one "traditional" recovery mechanism that is not usually advocated by aid agencies, although it remains fairly widespread in the Horn of Africa. In the southern Sudan, much of the conflict has found expression in cattle raiding, which undermines food security in the region and destabilizes the population. The potential for livestock production, as well as agriculture, is significantly underused and there is a cycle of threats to food security leading to social upheaval which, in turn, results in further food-security problems.

Livestock banking

Livestock banks that are similar to cereal banks have been proposed as a way of assisting producers to carry stock across 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 them. There is, however, a fundamental asymmetry between grains and animals, in that only the latter require feeding. This, in turn, demands a responsible, disinterested and well-established organization to function as a holding operation for the stock, and this seems politically unfeasible. A system in 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) proposes 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 buying them back 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 that, despite its apparent attractions, has never been put into practice. The transaction costs of both registering animals and insuring 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.

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, the latter are increasingly urged to diversify in order to insure against further declines in the market. After analysing the threats to Dasanetch society in southwest Ethiopia, Carr (1977) 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 niches 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 that 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 and the engagement in temporary paid labour are 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 Horowitz and Little, should be supported because the alternatives to herding that are 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, in many cases, dependence on sheep production is more symbolic than actual. Lancaster (1981) and Abu-Rabia (1994) describe how the Jordanian and Negev Bedouin have increasingly taken up a variety of seasonal and permanent employment outside the pastoral sector and are investing in permanent housing, thereby maintaining and perhaps even cementing their social structure while effectively discarding herding. This process is slower in remoter areas but, in Oman for example, Chatty (1996) found a relationship between smaller flocks and degree of dependence on wage labour among the Harasiis pastoralists.

[8] As many restocking programmes have found, the livestock that herders are willing to sell elsewhere, especially breeding females, is usually only the poorest quality animals.
[9] 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 Fifth-Dynasty sources (3200 BC) as livestock keepers of the Western Desert, and numerous other tribes are mentioned later (Vernet and Onrubia-Pintado, 1994: 56).
[10] This reflects the conclusion of more than one report on pastoralists in the Lake Turkana area of northern Kenya.

Who should address these policies and issues?

PASTORALISTS IN THE NATIONAL, THE REGIONAL AND THE GLOBAL PERSPECTIVES

Pastoralists pose a number of problems for policy-makers resulting from 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, regardless of the wishes and policy of individual countries (Blench, 1996). Pastoralists in parts of the Near East have changed 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 national frontiers. Individual countries inevitably want to see pastoralists as "their" citizens - an enthusiasm that pastoralists exploit willingly, often by holding identity cards for several countries at once.

It is therefore logical to treat pastoralism on a regional basis and to draw up common policies in relation to health, forage and water resources, subsidies on feed, etc. However, such an approach runs counter to the burgeoning ideology of the nation State and it has rarely been possible to develop 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 eliminate rinderpest effectively from sub-Saharan Africa. However, a coordinated programme of vaccination of young stock had to be maintained in order to prevent the return of the disease. This was never feasible, with the result that 1984-1985 saw a West Africa-wide rinderpest epizootic that killed up to one-third of the animals (see e.g. Nwosu, 1989).

The primary task, then, is to coordinate approaches and persuade research and development agencies not to subvert each other's policies with ill-considered projects. Second comes propagating an understanding of the significance of long-term sustainability in livestock projects - after two years, preliminary results cannot show impressive increases in productivity and, after ten years, rural householders may even be more impoverished than they were at the start of the project. As is so often the case, other development projects may stand in the way of effective

development.

KEY REORIENTATION OF POLICY TOWARDS PASTORALISTS

Constructing policy: telling the truth

All agencies that deal with pastoralists now pay lip-service to the concept of participation; gone are the former top-down mandarins and bureaucrats, to be replaced by the listening field worker. Pastoralists gather and express their problems, preferably by drawing conceptual maps in the dust, and solutions emerge, preferably based on the indigenous knowledge that pastoralists have been hoarding for millennia. Agency or non-governmental organization (NGO) then joins with pastoralist, and 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 input from the real world, it may seem that things have never been better for pastoralists. However, the evidence suggests that the reality is very different. 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 that feeds pastoral wells. Collapses in the command economies have created widespread impoverishment of pastoralists because no corresponding infrastructure has been established as a safety-net. Examples of governments shifting to pastoralist-friendly policies are few and far between.[11]

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 cooperation 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.

Difficult as it is, it may be time to correct these untruths. The nature of their occupation leads pastoralists to form loose and flexible social groupings. The closer they come to sedentarization, 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 emerges. Nonetheless, 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 among pastoralists, governments and developers thus come close to institutionalized 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 with violence and coercion, a consequence of their incomprehension. Such phenomena are not confined to the

developing world; the treatment of gypsies in Europe suggests 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 characterize arid rangelands as special cases that require regular assistance, but not as potential zones for livestock and commercial development. This is reflected both in government policies and internally within multilateral agencies (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 learned in the academic sphere about pastoralists and their relation to rangeland ecology has not been transferred to project design or emergency relief.

The result is that pastoral peoples in rangelands feel neglected by government and are therefore 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, so pastoralists attempt to gain access to pasture by force rather than negotiation.

It must be recognized 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 synthesize their comments and 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 information that is less than perfect and some sector will almost certainly be disadvantaged. This is inevitable in the real world; the key task is to make information flow among sectors as effectively as possible in order to minimize the impact on individual groups.

Rethinking policy clusters

Apart from the key questions of who should be making policy and what mechanisms should be used to support it, policies aimed at pastoralists are themselves in dire need of reform. This is in part because key players who are in a position to influence the policy reform process are usually both highly conservative and 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;

- the fact 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 reorientation should tackle the following:

- the tendency to ignore "minor" species such as camels, yaks, reindeer and llamas in favour of cattle, sheep and pigs;
- calculation of the economic viability of projects in terms of single trait characteristics rather than total household support characteristics;
- estimation of the viability of production systems over short periods of time, which is of inevitabe advantage to 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 on the basis of a more sympathetic understanding of their production systems could act both to protect their ways of life and to continue their capacity to produce protein on otherwise marginal land.

Experience to date suggests that technical inputs will have only a very limited impact on overall output. The key in the next millennium will be major policy reorientation. The following elements are likely to become important:

- production of niche products, through either unusual species and breeds or meat and milk that are free from contaminants;
- crop-livestock integration, through the effective use of pastoral outputs in mixed farming, particularly the extension of work animals;
- co-conservation, through the development of interlocking strategies that 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.

WHO SHOULD BE DOING WHAT?

Intervention versus information dissemination

Traditionally, 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 very process, and one legitimate response would be to ask whether another proposed paradigm shift would be any less ephemeral than previous re-engineering has been. It is also clear that many countries have benefited from failing to take international advice on pastoralism, livestock biodiversity, dairy production, traditional remedies and the like, and have conserved a store of indigenous skills and knowledge that 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 contextualize 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 whom they are intended to assist. At the same time, as the world rapidly stratifies 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 from their structured confrontation with national governments, which is 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 of multilateral agencies and NGOs should therefore be reoriented increasingly towards information dissemination - instead of asking what "we" can do for "them", asking what pastoralists might do for themselves were they to have access to greater information. It may seem perverse to be recommending yet more information flow when there already seems to be an overload in this area and when the problem is often choosing among a variety of sources whose quality is difficult to assess. However, this is very much the perspective of individuals who have the Internet at their disposal. Most pastoralists, and many of those who make policy decisions at the local level, have extremely weak access to information, especially in electronic formats. 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 other worthy documents. Better policies for pastoralism can flow from more accessible, better-presented information. The implications of this are the need for:

- wider translation and synthesis of existing materials;
- consideration of all types of media, notably radio, the Internet, CD-ROM, video and DVD;
- greater attention to the style and quality of visual material;
- development of both meta-resources and quality filters;
- improved feedback mechanisms among pastoral producers, agencies, governments and NGOs.

Remedying uneven research

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

Increasing the penetration of tertiary education makes it easier 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 multilateral 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.

Practical support

The promotion of pastoral production will undoubtedly remain controversial, but the argument that it is an effective use of land that could not 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, the linking of 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 any large herds of herbivores could achieve. It is also useful to know what support would be most valuable. The following suggestions emerge:

- The process of changing the policy and attitudes of governments towards pastoralists, through education, publicity, studies, etc., must continue, develop and include paying attention to new media.
- Drought-response policies and mechanisms, as with other policies aimed at pastoralists, must be discussed and set at a regional level. The most crucial elements in this are coordination of 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 they have some comparability.
- Levels of insecurity and the effect these have on the decisions of livestock producers must be recognized as relevant - no matter how politically unpalatable they may be.
- Forced sedentarization is both ethically dubious and unlikely to succeed. However, neither governments nor NGOs are under an ethical imperative to restore some fictional status quo.
- International agencies have a significant role in both combating misinformation and diffusing accurate information as it becomes available. This is relevant both in countries with semi-arid regions and in donor countries.
- In the coming years, technological developments will substantially improve the modelling of climatic events, 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.

[11] One exception to this might be the oil-rich States of the Persian Gulf that have given considerable financial assistance to their remaining pastoral populations. However, the outcome has been, not only unviable production systems that exist only within a bubble of subsidies, but also the additional irony that the countries in question do not need the meat and milk produced by the pastoralists, who are given assistance, essentially, for reasons of sentiment.

Conclusion and recommendations

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, including:

- flexibility;
- low costs;
- freedom of movement;
- light regulatory environment;
- operatation in regions that are unsuitable for agriculture.

Pastoralists have long-term flexibility that is based on 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 e.g. the accounts in Gallais, 1984 of the Sahelian drought of the early 1970s). However, they are also able to switch species (as Jordanian Bedu switched almost entirely from camels to sheep in the period 1970-1995), main saleable output (as Fulºe 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 very nations that are offering pastoralists emergency assistance. However, pastoralists do not have to meet hygiene, packaging and transport costs and tariffs that are sometimes onerous. 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 they are economic and resource-based. Just as mediaeval empires felt constantly threatened by nomads on the

frontiers, so the modern nation State holds the stereotype of nomadic peoples as backward, archaic and a political threat. The arguments advanced by researchers concerning the potential for pastoralists to contribute to national productivity and interrelate with settled farmers are overridden by concerns about their constant movement and, thus, a failure to control them in both economic and political terms. One frequent consequence is neglect of infrastructure in remote areas, making the concerns become self-fulfilling prophecies because nomads then do start to oppose the State.

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 it impossible to return to some imagined golden era. These factors are summarized in Table 13.

Many of these new situations are being replicated in various regions of the world; the factors that have had such a heavy impact on African pastoralists are affecting those in Central Asia. It would be gratifying if there were some “read-across”, i.e. some sense that lessons learned in one geographic area and time frame can be absorbed in the policy-making structures of another.

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

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 pastoralists’ 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 the expense of the pastoral sector
Ideological interference by the State	Inappropriate social and management strategies adopted and maintained by a combination of subsidized 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 in which transport is a major element of economic production (llamas, horses)
Introduction of high-input, high-output	Makes pastoralists dependent on effective infrastructure where input supply exotic breeds 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	Elimination of rangeland through the use of politically attractive but often uneconomic irrigation systems

increasingly coming into focus as reserves of biodiversity. In Central Asia, decollectivization and the consequent loss of subsidized infrastructure provided by the former Soviet regime has paradoxically brought about a return of more traditional systems. At the same time, however, 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 disappear in any region where it competes with agriculture. Nonetheless, it is increasingly realized 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' time 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 they will 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 therefore 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.

Grazing and nutrition

RANGELANDS: OPPORTUNISTIC USE OF PATCHY RESOURCES

Across the world, pastoralists are strongly associated with rangelands. (Reindeer herders are an exception to this generalization, in part because their key asset – the mobility of their animals – makes it possible for them to exploit nutritional resources in regions unavailable to arable farmers.) “Rangelands” is a broader term than “grasslands”, and includes 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 emphasis.[2] Some of the ecological literature attempts to distinguish rangelands from natural grasslands (e.g. the Elsevier Ecosystems of the World premises different volumes on this dichotomy – see Bourlière, 1983; Coupland, 1993). However, closer examination of the descriptions suggests that either the origin of many grasslands is contentious or grasslands become “natural” if they are ancient human creations (see e.g. Gillison, 1993a, 1993b on the grasslands of New Guinea).

The literature uses several terms for the world’s main rangelands: African savannah, Eurasian steppe, South American savannah, North American prairies, Indian savannah, 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 and 23 percent of the world’s land area, excluding Antarctica (Table 3).

TABLE 3
Estimated areas of the world’s rangelands

	Whittaker and Likens (1975)	Atlay, Ketner, Dugvigneaud (1979)	Olson, Watts and Allison (1983)
Savannah *(million km2)*	15.0	22.5	24.6

Temperate grassland *(million km2)*	9.0	12.5	6.7
Total *(million km2)*	24.0	35.0	31.3
Rangeland as % of world land area	16.1	23.7	20.7
Rangeland as % of world land area (excluding Antarctica)	17.9	26.5	23.1

Source: Groombridge, 1992: 281.

Grasslands are usually divided into four major types: tropical grasslands, prairie/steppe, temperate grasslands and tundra, which are 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 found**
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 more than 4 000 m above sea level, and some camps are as high as 5 100 m (Miller and Craig, 1997: 58ff.).

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

In parts of North Africa and Southwest Asia, rangelands have been reduced in size, in part because the widespread use of irrigation technologies (in both traditional and, more recently, high-technology forms) has allowed agriculture to colonize 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 been developed, and involve both the species used and the movement of resources. Pastoralism has traditionally been oriented around camels and sheep, with sheep becoming predominant in recent times owing 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 by camel). Today, pastoralists throughout North Africa and Southwest Asia have relatively sophisticated trucking systems (for water, feed resources and the animals themselves) which allow them to exploit areas that would be unavailable in sub-Saharan Africa (Blench and Marriage, 1998a).

The situation in Australia is somewhat different. Australian arid and semi-arid rangelands occupy nearly 70 percent of the continental land mass, and much of this area is used for extensive livestock production (Groves, 1981). Australia's rangelands were transformed subsequent to European settlement by the following (James, Landsberg and Morton, 1999):

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

In many arid or semi-arid rangelands in Australia and North America, artificial sources of water are so widespread that lack of rainfall results in only localized feed shortages (Bennet, 1997). Large herbivorous mammals are able to continue grazing in areas that they would usually have abandoned (James, Landsberg and Morton, 1996). Native wild animal populations that used to rely on drinking-water from natural sources increase because they are able to persist in areas that were previously not habitable for most of the time. 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 in the distribution and abundance of invertebrates (e.g. grasshoppers, ants and collembolans); possible recent extinction of some medium-sized native mammals; and indirect effects on wildlife populations through the changing activities of predators (James, Landsberg and Morton, 1999: 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 tend to be eliminated in favour of exotics (Austin and Williams, 1988).

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

The situation in cold-weather rangelands is somewhat different since water availability is not usually a limiting factor, while the severe cold and the short flowering season bracketed by snow are. Pastures are therefore rather different in structure, with a very large number of flowering species competing to seed in a brief season. Abundance and quality are less often issues for

pastoralists than is access, whether the barriers are snow or administrative. For this reason, cold-weather pastoralism tends towards systems that are based on transhumance and haymaking.

Traditional pastoralists broadly accept pasture and rainfall as givens and adapt their social and herding systems to take best advantage of them. The one exception to this appears to occur 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 the United Kingdom's Dartmoor, which were constructed in the Neolithic period, may also have the same purpose. The economic importance of extensive livestock production in Australia and North America and the greater integration with the market have helped to even out the unpredictability of rangeland productivity. Once mobile pastoralism in these regions had been eliminated through enclosure, many ranches had become large enough to allow the use of movement within the property, especially as more water sources were installed, and this blunted the impact of overall precipitation. Increasing the numbers of boreholes has often been associated with pasture seeding, thereby encouraging animal 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 good access to infrastructural support and management tools can mistake short-term gains for long-term equilibrium and end up going out of business.

The vagaries of the weather have produced another technological response: increasingly sophisticated software programs and databases intended to assist producers both to be aware of climatic data and to make real-time use of it in managing their stock. This is particularly the case in Australia, where a series of blows to the pastoral industries have had a bad affect on the economies of States that are 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 surfeit of commercial promotion, which is 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 them 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. As a consequence of this, the calculation of carrying capacity has evolved into a minor industry. Despite its scientific superstructure, there is virtually no evidence that this has any scientific validity, as is demonstrated by the fact that different experts come up with widely varying figures when asked to estimate the carrying capacity of the same piece of rangeland. Even without hand-held computers and innovative software, livestock producers in enclosed systems who have experience of the landscape should be able to detect when their herds are putting too much pressure on resources. However, this is not necessarily the case; recent evaluations of Australian properties suggest that overstocking is common, with predictable consequences. One response has been the evolution of the land care 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 that are believed to have greater nutritional properties. In recent times, this has been extended from small planes, using such legumes as *Stylosanthes*. The consequences of introducing exotic species into vegetational systems where there is 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 characterized as an “aggressive weed” in Australia, where it has out-competed local species and become the subject of an expensive elimination campaign.

Obviously, these strategies are relevant mainly to developed economies, although the insertion of too many 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. Unfortunately, the numerous projects, policies and strategy papers that have proposed the opposite strategy have now joined consultancy documents on destocking in some limbo where such idealistic entities are finally laid to rest.

SILVOPASTORAL 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, buffaloes 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 gain access to browse; camels have an advantage in that they can browse on thorny species with leaves that other species cannot reach. 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 specializations 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 drive away grazing species, which are 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 from work in the Cameroon grasslands (Boutrais, 1995). Peoples who specialize in browsing livestock, such as Somali and Rendille, then move in and take over. However, over a long time span, grasslands reinvade, making the land again suitable for cattle and sheep.

Throughout much of Africa, trees are the characteristic haunt of tsetse and other biting flies, and this makes anything more than seasonal use problematic. In vertical transhumance in the Himalayas, 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 that cattle can consume would certainly improve conditions for pastoralists in parts of Sahelian Africa, although resources for browsing species would thereby probably 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 include some camels in their herds and adapt their watering strategies it might have a major impact on survival in some regions.

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 to 200 animals, since this was all that could be managed by the labour available in a family unit. However, two changes have occurred to change this situation radically: the introduction of water trucks and the widespread availability of subsidized feeds. The buying of feeds has become the single most important household expenditure. Every individual livestock producer interviewed in a survey of 400 households spent some money on feeds. Feeds are purchased in bulk by the government and sold according to allocations denoted by the 1991 livestock census. It is government policy not to allow the purchase of subsidized 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 subsidized feeds on a per-head basis has created a major incentive to increase herd sizes, and in the Badia – the rangelands covering most of eastern Jordan – herds of 1 000 to 2 000 sheep are common. The forage resources cannot support herds of this size, and the desert is increasingly used to store animals while sacks of feed are trucked in.
Source: Blench, 1995a.

SUPPLEMENTARY FEEDING

Supplementary feeding seems to have had little place in traditional pastoralism anywhere in the world, in part because herds were very small and pasture resources 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 feed. Grass is usually

cut in autumn, bundled in stores and rationed to the herds during the winter months. Mechanized 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, although it was often subsidized 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 realized the value of such supplements; however, so did more intensive producers, especially those with stall-fed animals based around cut-and-carry businesses. As a consequence, oilseed cakes have become so highly valued that supplies are regularly bought up by wealthy urban entrepreneurs and rarely reach the markets or become available to ordinary cattle producers (Kaufmann and Blench, 1989).

The increased globalization 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 Near East, diets need to be supplemented with purchased feeds. The political significance of pastoralism in many countries in the region has had the consequence that national governments are tempted to subsidize feeds, thereby helping to swell herds to wholly unrealistic levels (Box 1).

[2] 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.

Breeding and reproduction

BREEDING AND REPRODUCTION IN PASTORAL HERDS

Controlling bloodlines

Strategies for controlling the breeding of livestock are extremely variable in pastoral societies across the world. By its very nature, pastoralism 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 that their herds do not mix with other herds than they are at controlling breeding within their own herds. Nonetheless, different societies seem to have taken very different attitudes, for reasons that are not always evident.

There is also great variety from species to species; camel pastoralists are much more likely to take an interest in breeding than are sheep and goat producers. Musil (1928) describes the Arabian Bedu's complex ideas about breeding. In contrast, Black-Michaud (1986) attributes extreme indifference to the Luri small ruminant herders of the Islamic Republic of Iran. The Incas had a highly effective system for 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 clear 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 collectivization of herds and the partial introduction of "scientific" breeding practices. Many pastoral peoples in West Africa seem relatively indifferent to the control of breeding, even among cattle, although they are well aware of the need to introduce new cattle races if their herds begin to exploit a different environmental niche (Blench, 1999a).

The notions that pastoralists should ensure that they are breeding from high-quality males and that exotic stock would increase output have 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, including 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. The result is that the improved animals do not generally have the qualities that pastoralists really need, although 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, it must be possible to do so; a more effective programme would work with animals that are genetically closer to those in the pastoral herds and under conditions that are 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' and animal breeders' goals.

Castration

The castration of male animals is a common strategy among pastoralists in many systems. It has the advantages that animals may become fatter and are very often less aggressive, thereby becoming easier to manage. The disadvantage is that incorrect decisions about the genetic attributes of those left entire, or 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 for sheep and goats are quite widespread in Western Asia. Castration was probably rarely practised in sub-Saharan Africa in pre-modern times because of the risk it poses 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 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 there are too few potent high-quality males, when one dies it is only possible to recover by borrowing animals from beyond the household or community. This works more effectively when the community is more cohesive, but can lead communities to take substantial risks in reducing the numbers of males.

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 Controlling bloodlines, some societies take great care over bloodlines and controlled mating while others allow unrestricted access to females. The concept of introducing unknown semen or embryos into the intricate breeding mosaic seems unlikely to be easily accepted by the former group. It may be introduced

for the latter, but the consequences will probably be the same as they are for more conventional introductions of improved breeding stock; the elements in the introduced line that make it attractive will rapidly be 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. The loss of such breeds would lead to a corresponding loss of genetic traits that have, in some cases, built up over millennia, for example the resistance to extreme cold of Yakut cattle, the resistance to extreme water heights of Criollo and Kuri cattle, and trypanotolerance. Recent scientific advances have made more intricate possibilities available for conservation and monitoring. Cloning is carried out to reproduce improved phenotypes at present, 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: it does not reproduce the evolving responses of a live population.

The mitochondrial DNA of cattle is now routinely extracted through polymerase chain reactions (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, the levels of homozygosity and, thus, the degree of inbreeding, thereby forming the basis for planning conservation programmes. The International Livestock Research Institute (ILRI) has taken the lead in this area and is at present engaged in DNA characterization of African cattle breeds.

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

Animal health

PASTORALISTS AND THE HEALTH OF THEIR ANIMALS

One of the significant asymmetries between farmers and pastoralists is that the capital of the latter is tied up in living animals which are subject to catastrophic declines through disease. An epizootic can eliminate an entire herd well before the veterinary services reach the area. Historically, this has had two consequences: pastoral herds never became very large, and herders developed elaborate systems of loans and animal exchange to reduce the risk caused by this type of disaster. It seems fairly clear that there were no effective remedies against major epizootics such as rinderpest, anthrax, contagious bovine pleuropneumonia (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, while 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 adopted modern veterinary medicine with enthusiasm. The result 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 that were previously closed to them (see Boutrais, 1986, 1995; Blench, 1994 for documentation of the movement of herds into subhumid regions of West Africa). 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 pastoralists' flexibility 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, and stock that would have died in previous conditions was kept alive, creating large herds of poorly fed animals that often harboured subclinical pathogens.

A major problem has been that, when internationally organized campaigns against epizootics have ended, the normal veterinary infrastructure has been unable to supply a service of similar quality, and pastoralists have then become desperate for medicines. This usually stimulates the development of an extensive black market in drugs, many of which have expired and some of which are blatant fakes, and this can cause havoc with pastoral herds. Nonetheless, over recent years there have been 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, recognize epizootic conditions and major traumas and alert the veterinary authorities. Such programmes are in operation in Ethiopia, Kenya, Somalia, Uganda, Chad, the Central African Republic and Mali, where they are achieving varying degrees of success (Catley and Walker, 1997). In addition, in some countries, traders and private vets are 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 is that there is no control over the quality and dosage of drugs. Pastoralists are increasingly taking control of 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 limited effectiveness of traditional veterinary systems kept down herd size and, thus, pressure on resources. Veterinary programmes are usually initiated without any consideration being taken of their 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, there is usually also the hope that pastoralists will voluntarily destock, since their animals now have higher 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 maximization 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 that limits herd size, this argument breaks down: the more the animals, the greater the shock.

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, before gaining access to modern veterinary medicine. This is not always the case; for example, among the Luri of the Islamic Republic of Iran there is marked disinterest in the health of animals and only 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 useful when modern remedies are not available, and that it is a grossly underutilized resource that has been displaced as a result of the machinations of drug companies. Prior to the colonial era, the ability of livestock producers to deal with viral diseases and pathogens other than ticks or worms is believed to have been extremely limited. This view is somewhat controversial; an alternative 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 supply infrastructure and the cost of modern veterinary drugs remain out of reach. Failures in the delivery of veterinary services have a damaging effect on pastoralists' trust in the State and are often responsible for the diffusion of iatrogenic diseases, notably when animals gather for vaccinations that fail to arrive, thereby increasing transmission of the very pathogen that the exercise is intended to protect against.

TRYPANOSOMIASIS AND THE CAMPAIGNS TO ERADICATE TSETSE

Trypanosomiasis is a disease complex associated with the tsetse fly *Glossina* spp., found throughout much of sub-Saharan Africa and affecting wildlife, humans and livestock (Bourn *et al*., 2000). 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 often acquire long-term symptomless infections. Livestock are susceptible at varying degrees, and may undergo progressive debilitation leading to death or may develop partial or near-complete immunity. Tsetse flies inhabit almost all environments in Africa, except the extremely arid, but their presence is highly dependent on animal vectors and, in many cases, gallery forest. The drastic environmental changes of the twentieth century continue to affect the numbers and distribution of tsetse; monitoring it is thus an ongoing and continuous exercise.

The attempt to eliminate tsetse, and thereby trypanosomiasis, has been a major feature of international and national livestock policy in Africa since the 1920s, with the first conference on the topic held in London as early as 1907. It has been, and continues to be, a major focus of donor investment through the International Scientific Committee for Trypanosomiasis Research and Control (ISCTRC) and various national bodies in East and West Africa. Yet there are two very different narratives of the history of research and action in the control of tsetse and trypanosomiasis. It is instructive to contrast these as a way of illustrating how international bodies make policy for pastoralists with only limited regard for empirical data and scant concern for the very people they are attempting to assist.

In the first version, trypanosomiasis is seen as being responsible for human sleeping sickness and lowered animal production. More important, it keeps livestock out of much of the continent, thereby decreasing access to a reliable source of protein and income generation and, consequently, affecting nutrition and maintaining poverty. If the tsetse fly can be eliminated - or trypanosomiasis defeated chemically - livestock production would become more productive in its traditional locales and would spread to those where it is currently absent (Ford, 1971). 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 or the release of sterile males and to develop effective trypanocides. Although these have been reported as successful in a series of annual and project reports, they have never solved the problem. Indeed, in 1995, the Programme Against African Trypanosomiasis (PAAT) - the coordinating body for international agencies - noted that "despite all the efforts and expenditure devoted to research on and control of African trypanosomiasis, it is generally accepted that in general terms the impact of the disease is as great today as it was 40 years ago" (quoted in Bourn *et al*., 2000). 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, trypanosomiasis is just one of many diseases that affect African livestock, and the patterns of production across the continent reflect human adaptation to its incidence. In areas where game is abundant, tsetse is abundant and livestock correspondingly rare; humans can thus hunt to supplement their diets. 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 animal vectors and arable expansion tsetse habitats, livestock move in, making up the protein deficit caused by wildlife elimination. Pastoralists are well aware of the threats that high-humidity 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 Fulºe which allow them to move into the derived savannah cleared by cultivators on the northern edge of the forest in West Africa. In a somewhat poignant incident, a government project in Nigeria imported at considerable cost a large number of supposedly 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 it was among the animals of pastoral herders who had adapted their "non-trypanotolerant" cattle to local conditions and transformed their enterprise to meat sales.

Tsetse programmes have proceeded in Africa in spite of a surprising lack of knowledge about both biology and infrastructural capacity. *Glossina* spp. are too diverse and too 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, the hunting out of vectors and habitat conversion rather than to the strategy itself (Bourn *et al.,* 2000). 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. However, the human diseases were susceptible to single-shot vaccinations and there was large-scale international infrastructural support. The troubling persistence of malaria would perhaps be a better parallel with tsetse; 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 tend to survive. These

parallel interpretations of the situation will continue into the future, and they 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 are minimized. Systems that exclude it completely make themselves vulnerable to a rapid and devastating spread, resulting in massive losses of stock and disruption of the rural economy.

What do pastoralists produce and how do they market it?

DAIRY PRODUCTS

Pastoralists almost everywhere in the Old World depend heavily on livestock milk products for nutrition, through both direct consumption and the sale of dairy products to adjacent farmers in order to acquire grains or other foods. The exceptions to this pattern of exchange occur where pastoralists are so remote from arable areas that it 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 sales (for the Hoggar Tuareg, see Gast, Maubois and Adda, 1969). Similarly, the evolution of processing technologies, such as cheese- and yoghurt-making, are driven by climate; in extreme cold, elaborate preservation technologies may be of only limited value. 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, so milk is available all year round. In temperate zones, oestrus may be naturally highly seasonal, or herders may control breeding through mechanical means or exclosure. Milk is thus seasonal and, if herders depend on sales to acquire carbohydrates, 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 need for a diversity of products that meet nutritional requirements throughout the year. Table 5 shows the principal dairy products made by Mongolian herders.

TABLE 5
Mongolian dairy products

Mongolian name	English name
Aaruul	Solidified dried curds
Urum	Clotted cream
Shar tos	Reduced butter
Tsagaan tos	Fermented butter
Ezgi	Caramelized curd
Aartz	Boiled yoghurt
Tarag	Yoghurt
Byaslag	Cheese
Airag	Fermented mares' milk
Huuruulsen suu	Boiled milk
Tsurum	Dried yoghurt

Source: Blench, 1995a.

In the Islamic Republic of Iran and Afghanistan, a similarly wide range of products is made, essentially from the milk of small ruminants (e.g. Ferdinand, 1969; Martin, 1980; Digard, 1981). Generally speaking, dairy products in Eurasia seem to be far more complex and varied than those in Africa. This probably reflects greater exposure to climatic extremes and, thus, the need to devise products that have differing degrees of storability. There is also considerable variation in

attitudes to fresh milk; in Africa and Europe fresh milk production has historically had a high cultural value among livestock producers, although in the Islamic Republic of Iran milk is rarely if ever drunk without processing (Digard, 1981: 198).

All species produce milk, but the culture of dairying varies from species to species. For example, although Cleopatra bathed in asses' milk, donkey milk seems not to be drunk anywhere in the world on a regular basis, in spite of being a common ingredient in magical remedies.[3] Table 6 gives 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, 1990b and other sources.

* Buffaloes are very rarely herded by pastoralists (but 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).

Llamas 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 an entirely introduced culture, and the sale of such dairy products as cheese probably originally developed to supply the market among individuals of European descent. Nonetheless, when 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 assignation of milk and milking tasks to women (Little, 1994). Men usually only milk animals for their own 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 the 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, therefore, put pressure on women to take less milk.

Almost everywhere, the milk yields of pastoral herds are very low compared with those of farmed species in modern intensive systems. West African cattle may give as little as 1 litre a day, compared with up to 60 litres in high-intensive stall-fed systems. Experiments on university and research station farms have shown that the capacity of "traditional" breeds is much higher when their nutritional regime is changed. However, pastoralists do not operate under such conditions, and have to contend with a range of subclinical pathogens, constant movement and the need to balance calf survival against human nutritional needs. So, despite the reams of good advice and the countless projects intended to increase yields, the situation has not changed significantly.

Another aspect of pastoral dairying that has frequently been the source of near 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, because they generally take no special precautions. Since the principal consumers and purchasers of the products attach no importance to hygiene, producers 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 pastoralists were to operate in countries with onerous regulations concerning dairy hygiene (which were actually enforced), their production systems would be threatened but, almost by definition, pastoralists are remote from

such regimes.

It has been observed in various regions of the world that the terms of trade are slowly, but inexorably, moving against pastoral producers (Swift, 1982). 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 probably be reduced to a single underlying cause: the spread of competing products in a market that was 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 was confirmed by the amount of milk he or she 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 resulted in frequent surpluses of dried milk powder which are either dumped in countries that have 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.

As well as milk, live animals can also yield blood, and historically this has been exploited in East Africa and the Horn of Africa, although the practice is 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 1 litre a month during the wet season and less in the dry, while small ruminants give only about 0.25 litres (Deshler, 1965). Although nutritious and apparently safe, it seems unlikely that this practice has potential to spread to other pastoral regions.

MEAT PRESERVATION

Meat preservation activities vary widely among pastoralists, reflecting 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 and can often be kept fresh by freezing. In the arid tropics there is less impetus to slaughter at a particular time of year because of aseasonal oestrus and the consequent significantly reduced intra-annual 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.

HIDES, SKINS AND OTHER PRODUCTS

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 globalization of the trade has caused wool and cashmere production to expand. Alpaca, for example, are tending to increase in numbers 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 under wool in others. Orlove (1977: 205 ff.) gives 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, according to the species.

TABLE 7
Livestock products by species

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

Camelids are defined as having wool, as are sheep. The cashmere produced by goats, yaks and Bactrian camels is also very similar to a wool. When reindeer antlers are mature, they can be harvested and used for handles and other implements that require bone. When they are immature they are prized for medicine, especially in the Republic of Korea

and other Southeast Asian countries.

Nearly all of these products can be harvested sustainably, but hides can be acquired only after 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 specialized sedentary producers. For example, the Sokoto Red goats of the Sahel, whose hides are 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 fertilizer, while horns and bones are cleaned 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 value added of pastoral products.

WORK ANIMALS

One way of gaining value added from pastoral species is through their use as work animals. Working animals are more likely to be found among agropastoralists or farmers, and 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 specialized 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 species of animal and the types of work performed by each. The final 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	Bactriancamel	Horse	Donkey	Cattle	Yak	Buffalo	Sheep	Goat	Reindeer	Llama	Alpaca	Dog
Riding	+	+	+	+	+	+	-	-	-	+	+	-	-
Portage	+	+	+	+	+	+	+	+	+	+	+	+	-
Cartage°	+	?	+	+	+	+	-	-	-	+	-	-	-
Tillage+	+	+	+	+	+	-	+	-	-	-	-	-	-
Threshing	-	-	+	+	+	-	-	-	-	-	-	-	-
Rotational machines*	+	-	+	+	+	-	+	-	-	-	-	-	-
Drawing water	+	?	+	+	+	-	+	-	-	-	-	-	-
Herding	-	-	-	-	-	-	-	+	+	+	+	-	+

° Includes pulling sledges, for both human and agricultural products transport.

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

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

Notes: It should be emphasized that there is a strong negative correlation between the presence of pastoral buffaloes and their use as work animals. Normally in the areas where they are used for work, such as Egypt and lowland Southeast 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 hitched 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 and Ekvall, 1965). Similarly, goat-carts are used on a small scale in Honduras, although this 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 reared 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.

SELLING PASTORAL PRODUCTS

Pastoralists' orientation 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 in order to acquire basic foodstuffs and minor household goods. Extreme-weather pastoralists have generally reduced this to a 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 make use of these networks 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 without regard to availability or access costs, and thus the inverse of a market system. In the sheep herding systems of Central Asia, the former Soviet Union's demand for wool caused hardy breeds to be replaced by Merino varieties, which could be kept alive only with high levels of external inputs (see Van Veen, 1995 for Kyrgyzstan). As monetarized systems and commoditization have penetrated the region, this has caused major adaptation problems. In Kyrgyzstan, 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 suddenly be switched over to 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 a "cattle complex", in other words a skein of close cultural ties between herders and their animals that meant that management practices were remote from rational economic strategies. In particular, argument focused on the maximization 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".[4] The debate itself now seems outmoded; pastoralists have their own cultures and their management strategies develop within their cultural frames of reference. The result is often at cross-purposes with outsiders' views, but the recommendations of experts are often contradictory over time, as changing attitudes to biodiversity and minor breeds demonstrate. Box 2 illustrates a case in which 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.

Box 2. The Raika and their camels

The Raika/Rebari people of western Rajasthan are specialized 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, and this is not serving them well in India's changing economy. 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 female camels 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: Sansthan and League for Pastoral Peoples, 1999.

WORLDWIDE DEMAND FOR PROTEIN

A series of recent analyses show 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, Steinfeld and Blackburn, 1997; 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

	Annual growth of total meat consumption		Total meat consumption		
Region	1982-1994	1993-2020	1983	1993	2020
	(percentage)		***(million tonnes)***		
China	8.6	3.0	16	38	85
Other East Asia	5.8	2.4	1	3	8
Southeast 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 and 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 demand will rise, particularly in East Asia and Latin America. This is consistent 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, for example.

Similar figures are given for milk; by 2020 projections suggest that developing countries will consume 100 million tonnes more meat and 223 million tonnes more milk than they did in 1993. At present, people in the developed world obtain 27 percent of calories and 56 percent of protein from animal food products, compared with 11 percent and 26 percent, respectively, 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. Monogastrics are also more efficient at converting feed and can typically be supplied with agro-industrial by-products from the cities. Sere and Steinfeld (FAO, 1996a) give the rates shown in Table 10 for the increase of different livestock production systems in recent decades.

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 on terrain and in ecoclimatic conditions that could not be used for industrial production.

GLOBALIZATION OF THE TRADE IN LIVESTOCK PRODUCTS

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

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 both an opportunity and a threat for pastoral producers. Roads opened up new markets for such products as wool and cashmere and brought increased numbers of potential buyers, but they also allowed the movement of products that had previously been confined to local areas, such as milk and meat. As urban consumers became more demanding, especially with regard to hygiene, the balance of the market shifted against pastoralists and towards enclosed systems. This trend reached its peak in the 1990s, when a sequence of health scares in intensive production systems 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 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 faraway. Dairy products imported into sub-Saharan Africa rose by more than 300 per cent between 1972 and 1982, while dairy consumption as a percentage of total consumption increased from 1 to 27 percent (Von Massow, 1989: 7-9). However, 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 caused by international competition.

In the case of fibres, the situation is more encouraging, as the international market for high-quality fibres remains quite buoyant. For Andean pastoralists, penetration of the international wool trade came relatively early, and wool was 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 resulted in alpaca production, which was previously of minor significance, becoming far more important.

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 more 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.

EVALUATING PRODUCTIVITY

One of the common arguments against extensive livestock production systems is framed in terms of low productivity; to a certain type of economist, measuring offtake from pastoral herds or milk yields from ruminants and comparing them with industrial levels suggests that pastoralism 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 span, which gives them attractive characteristics compared with landraces. In the longer term, however, 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 large ruminants, for smallholders even one dead animal can be a catastrophic economic loss, because accumulated profits from outputs are unlikely to allow another animal to be bought. Collecting data that demonstrate this is difficult, because project cycles are typically three to five years long – barely enough time for exotics to be introduced and 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 require a period of at least a decade 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 maturity as represented by several parturitions.

[3] Apparently, fresh donkey milk was widely available in nineteenth-century London as an alternative to the highly adulterated cows' milk sold by dairies.
[4] Much of this argument was entirely circular; for example, pastoralists' maximization of herd size was claimed to demonstrate their rationality, because it would leave them with a higher number of animals post-catastrophe. However, if they rid the herd of unproductive animals this too was seen as rational in terms of classical economics.

The management and mitigation of vulnerability

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 drive for the expansion of pastoralism, especially in the case of the eastward expansion of the Fulºe across the West African savannahs. In the precolonial era, pastoralists were limited principally by disease and, more occasionally, insecurity. In the twentieth century, these took second place to the occupation of land by cultivators and the consequent 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, land that is already marginal becomes even more overused. Johnson (1975) observes that, when pastoralists make long journeys, stock deaths increase and pastoralists must weigh likely losses from the migration against comparable losses were they to stay on suboptimal land.

The creation and maintenance of corridors reinforces cooperation between the agriculture and pastoral sectors. However, corridors that 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 occurred in Central Asia during the Soviet era when an extensive military infrastructure, which controlled pastoral movement, was based on unrealistic cost structures. Another curious exception was Israel after 1967, when extreme militarization of the Negev led to major constraints on Bedouin ruminant production through the registration of herds, prohibitions on traditional migrations and, surreally, campaigns against black goats (Abu-Rabia, 1994).

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 with camels and goats. The relatively high rainfall in the 1960s encouraged pastoralists across the Sahel to switch from camels to cattle, even among populations such as the Tuareg (in Mali), who have historically been identified with camel culture. The droughts of the 1970s demonstrated that this was an unwise strategy, and drought recurrence in the 1980s underlined the point.

These types of changes in herd composition can also be applied within species. In West Africa, cattle breeds that specialize 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, Fulºe 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 far more easily (Blench, 1999a).

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 multispecies herds that are typical of Mongolia and the Andes may well be a reflection of 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 that the available forage can be exploited most effectively.

Within species, herd diversification takes place during a drought. Productive animals, particularly females, receive priority treatment, while 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 serving as capital which can be exchanged for larger animals later on. Rebuilding a herd of camels, for example, is a slower process.

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 largely eliminated predators from whole ecosystems, for example wolves, lynxes and leopards in circum-Mediterranean systems, and 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 are therefore 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 increasing, 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 reintroduction 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 producers to articulate panic messages that are somewhat out of proportion to the wolves' actual depredations.

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

THEFT

A problem that is rarely addressed by livestock services, but that weighs heavily in the investment decisions of livestock owners, is the prevalence of theft. It is not worth investing in quality animals if it is likely that they will be stolen. Owners will not pay 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 some parts of the world, such as the Kenya-Ethiopia 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 chronic raiding helps to maintain an ecological balance (e.g. Sweet, 1965). However, more commonly, theft is practised by urbanized individuals who have links with the market system and can sell their haul rapidly to butchers. Cattle and sheep are the animals that are most commonly stolen, because they have relatively high market value and can be driven away on the hoof. Livestock theft is problematic in administrative terms; national authorities are often unsympathetic to pastoralists 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 to guarding animals, but also 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 the founders of unregulated militias.

Social and cultural institutions of pastoralism

SOCIAL STRUCTURES

The basis of pastoral organization 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 stretch back for only a short time span, 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, because it makes their position legitimate. Well-known exceptions to the rule are the Tuareg, who had matrilineal descent groups in some areas, and subarctic peoples such as the Saami, the Chukchi and the Koryak, who had neither unilineal descent groups nor elaborate genealogies.

One of the most distinctive features of pastoralism in East Africa and the Horn of Africa is the system of age-sets. Among the Boran of southern Ethiopia, for example, men born within a seven-year cohort fall into a named age-set, which has rights and privileges within society as well as acting as a powerful force for cohesion and a calendrical system (Legesse, 1982).

A key aspect of pastoral systems is the strong relationship between wealth in livestock and labour. Herds that grow beyond a certain size cannot be managed with household labour alone, 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 today by Fulºe herders in the Niger were managed by slave labour in the nineteenth century, 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:

- Imajer.en: nobles;
- Iklan: (former) slaves;
- Izeggar.en: agricultural labourers;

- Ineden: blacksmiths.

Marriages between these groups were formerly forbidden, and even today remain uncommon. 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.

ROLE OF WOMEN IN PASTORAL SOCIETY

The role of women among pastoralists has been much discussed, in part because pastoral societies are more male-dominated 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 reasons for this are 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, they will take these away on marriage 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 the animals 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 women's brothers (see Tapper, 1991 for the workings of this in practice).

In most pastoral societies gender roles are strongly marked, and patterns seem to be extremely similar across the world. Women are typically responsible for milking and dairy processing; they may or may not sell the milk, and they usually have control over the proceeds in order to feed the family. Men are responsible for herding and selling meat animals. In systems in which herds are split, women usually stay at fixed homesteads 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 a wife to carry out key tasks. If there are too many polygynous households, the system will become unviable. There are exceptions to this rule, the Maasai being one well-known example. The Maasai system of age-sets, in which young men are assigned to a social category, makes it possible for older men to have several wives because *moran* warriors are not allowed to marry. Only after a young man has graduated from being a *moran* is he able to marry.

PASTORAL IDENTITIES

Throughout much of Eurasia, pastoralism is interwoven with the culture of itinerants; groups who move around supplying services to fixed communities. The most well-known of these are the gypsies, who are spread from Wales to India under a variety of names and associated with a variety of occupations. Rao (1982, 1987) calls these groups "peripatetics" and describes some

of their activities, notably those concerned with crafts. As with gypsies and horse-coping, some peripatetics play an important role in livestock trade, although they generally do not produce food. Such groups are particularly numerous in the area between Afghanistan and India. They fall into casted, endogamous groups and are often stereotyped as ethnically distinct, as are pastoralists, whom national governments often put into the same catetogory as these other groups (Olesen, 1994: 25). In Afghanistan, both pastoral nomads and peripatetics live in tents; those of livestock producers are made out of black goat-hair, while peripatetic tents are white.

LAND TENURE AND THE COMMON PROPERTY RESOURCES DEBATE

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

Tenure is thus divided by both ecology and 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 overrode traditional access rights and created mapped and demarcated territories for collectivized units. These are in the process of being dismantled, and more traditional access rights are being reasserted. However, legal frameworks for this new situation are only now being developed.

The tenure of pastoralists in all parts of the world is not deemed sufficiently strong to prevent it from being overridden by the State in its search for minerals. Land can be appropriated for building and transport infrastructure, generally without compensation. There is no doubt that, if pastoralism is 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 interests 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 where specific legal frameworks are in place.

Pastoralism and the State

THE EDGE EATS THE CENTRE

Once a pastoral society evolves beyond clan- and lineage-based organization, it must develop more elaborate hierarchical structures. Khazanov (1984: 228 ff.) reviews the many theories of the evolution of the State among nomads, which was 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 subarctic areas 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 that were typical of the steppes did not develop. The accounts of visitors to the courts of the Khans underline the enormous wealth and sophistication that they had accumulated over time and the ferocious means that 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 and 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 of Europe are historically associated with democratic tendencies.

Nonetheless, a correlated feature of such empires was their inherent instability. Despite the effective warfare techniques and rapid evolution of the Mongol Empire, its failure to settle the furthest areas of its conquest meant that they soon shook themselves free of 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 Fulºe cattle nomads in the Sahelian region began a jihad in 1804, conquering the seven original Hausa kingdoms of today's northern Nigeria and pushing eastwards to today's 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", who still herded cattle, migrated still further into Central Africa, impelled onwards by ever-increasing arable expansion.

PASTORALISTS AND NATIONAL BORDERS

With their military traditions and high mobility, pastoralists have not historically been loyal subjects of nation States. For the same reason, the States that they founded tended to be short-lived. This did not cause particular problems until the twentieth century, when national borders began to play a key role in worldwide geopolitics and the free movement of livestock started to be seen 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, although they depend on the meat and milk that pastoralists produce and benefit from the latters' opportunistic attitudes to national borders, 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 (see e.g. Tavakolian, 1984). Unlike their counterparts in Africa, where pastoral peoples move around relatively freely in open, arid spaces, Asian peoples such as the Kazakhs and the Mongols have been divided by States that have highly varied policies. Moreover, sensitive border areas have generally been closed to outsiders, so information on pastoral societies in these regions has been tightly controlled.

Pastoral populations and rangelands

COMPETITION WITH FORAGERS

Worldwide, the economic importance of rangelands varies significantly according to the socio-economic system in which they are embedded. In developed economies, such as Australia and the United States, rangelands are essentially marginal terrain suitable for low-intensity stock rearing and hunting. In pluralistic economies, such as Brazil, high-density vegetation such as rain forest, which is of crucial importance to hunter-gatherers and smallholder farmers, can all too easily be converted to low-fertility savannah, which is of interest to wealthy ranchers. In Africa and Central Asia, rangelands are essential to the subsistence of pastoralists, foragers and farmers who are dependent on rainfed crops. These 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 where they are often regarded as a common property resource. As a consequence, there is competition for access to rangelands. In developed economies, rangelands are given over to low-intensity grazing or protected areas. The conflicts that arise – such as governments' desire to increase the area of national parks or assert claims for mineral rights, and protected species' predation on livestock – are relatively minor and easily settled. However, in South America, where rangeland can be created at the expense of the forest occupants' livelihoods, conflict has been prolonged and violent. The principal means of habitat conversion, burning, is irreversible. Once cleared, neotropical rain forest 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 since 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 compete 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 the existence of tenure regimes that are 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, and this places more pressure on these fragile environments, thereby 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 the two interlocking subsistence strategies could, effectively, coexist. However, as human population densities increase and pastoral habitats are 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, the Herero and the Ovimbundu 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 the northern United Republic of Tanzania have seen their traditional hunting territories increasingly eroded by pastoralists who have more access and influence at the administration level. At the same time, the establishment of game fences, which are intended to exclude migratory herds of wild animals and keep livestock disease-free, reduced the ability of hunters to follow game, especially across national boundaries.

When faced with pressure from outside forces to cease hunting, foragers often become pastoralists or start to work with livestock. The Navajo turned to sheep herding, and native Australians frequently work as stockmen. At the time of the first contact with Europeans, the Khoikhoi of Southern Africa were partly herders but also engaged in extensive foraging. The impact of European settlement was grim, and one of the few locations where Khoikhoi society survived, albeit in an altered form, was 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 sequestrating 80 000 ha from the Nama (Boonzaier *et al.*, 1996). This reflected the extreme political marginalization of the Nama as much as it did protection of the region’s minimal wildlife resources. However, in a reversal of the usual course of events, advocacy groups joined with the Nama to protest against the proposed exclusion. The effect was to halt the park’s creation until the end of the 1980s, when grazing and foraging rights were conceded (as was compensation for their loss) and employment as rangers was offered to Nama.

Hunting and tourism in these regions are of variable importance. The rangelands of West-Central Africa, for example, are virtually devoid of large herbivores and have infrastructure that is so unattractive as to make hunting and tourism insignificant. In East and Southern Africa,

however, wildlife constitutes a significant element of national income, notably in Kenya, the United Republic of Tanzania, Zimbabwe and South Africa. The system of national parks and highly organized 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.

Box 4. Overgrazing in Africa's high-altitude grasslands

The Mambila Plateau in southeast Nigeria is a typical high-altitude grassland of Adamawa. It was first colonized by Ful°e pastoralists in the 1890s in the immediate precolonial era (Blench, 1991a). After that, 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 complaints were followed by a series of reports on the management of the plateau. None of the 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 numbers continued to increase during the 1980s until a second survey, in 1990, estimated that there were some 600 000 cattle. A decade later, in 1999, numbers had undergone a major crash and the ubiquitous bracken and tussocks of inedible grass suggest that ecological collapse has finally driven 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.

PASTORALISTS AND THE ENVIRONMENT

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

Pastoralism may have begun in Africa as early as 7000 BC, and its major impact was probably felt by about 3000 BC in both East and West Africa. Cattle and sheep did 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 and enhanced veterinary care and eliminated much tsetse habitat,

providing an incentive to increase herd sizes and, thus, grazing pressure substantially (Blench, 1995b). This led to the growth of a large and often problematic literature on range degradation and overgrazing.

Other literature has focused on range degradation and vegetation change caused by overgrazing or climatic variability (Adams, 1996; Behnke, 1994; Dougill and Cox, 1995; Behnke and Abel, 1996a, 1996b, 1996c; Blench and Marriage, 1999). Heavy grazing changes 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). In his discussion of the Kalahari in Botswana, Adams (1996: 6) reports that in “low tree and shrub savannah” the combination of heavy grazing and the absence of hot grass fires 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, 1993a, 1993b; Dougill and Cox, 1995). This kind of bush encroachment leads to a decline in the productivity of grazing for both cattle and goats, as well as for wild herbivores. Adams points out that bush encroachment in the Kalahari is distinct from other forms of vegetation change, in terms of both its persistence and its exclusion of other species.

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 for controlling herd size, which is somewhat unusual among pastoral societies. Herds are regularly split among 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 herds. Herd capture, the intentional mixing of a small herd with a large one, and the consequent disappearance of some animals from the large herd are tolerated. However, the Chukchi 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.

Source: Bogoras, 1904-1909; Leeds, 1965.

As well as its semi-arid and subhumid savannahs, Africa also has a smaller number of high-altitude grasslands. The Ethiopian plateau constitutes the most extended area of grassland, but the highlands of Uganda and Rwanda represent a similar ecology. In West Africa, the Fouta Djalon in Guinea and the Adamawa grasslands in Cameroon 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 which, until recently, acted to exclude cattle. The colonization of these grasslands by pastoralists took place in the mid- to late nineteenth century, when population expansion cleared sufficient areas of tsetse to make it possible to utilize the grasslands without having to face unacceptable levels of mortality from trypanosomiasis. These areas represented almost ideal conditions for pastoralists, with lush grass, little competition from farmers and reduced disease problems. As a result, cattle herds came in increasing numbers, gradually changing the pattern of vegetation until it became almost unusable as a habitat for livestock (Blench, 1998b). The Mambila plateau in southeast Nigeria represents a good case history of this type of cycle (Box 4).

In silvopastoral systems, notably the reindeer-based systems of Siberia, the potential for overgrazing of mosses and lichens is very real and has been recognized 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 and substitute quality for quantity have not been particularly successful. Indeed, 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), which holds that pastoralists view their livestock, especially cattle, as part of a ritual and prestige nexus, and not as a market enterprise; reducing herd numbers would therefore be equivalent to moving down the social ladder. The alternative view, that pastoralists are keyed into the market but also have elaborate risk-aversion strategies responding to uncertain disease and climatic regimes, gained considerable ground from the 1960s onwards. According to this view, it is rational for each individual herder to keep a maximum number of animals as insurance against epizootics or drought; the more animals there are to start with, the more will be left after a disaster.

Box 6. Persuading the Navajo to sell

A dispute between the Hopi and the 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 range management undertaken. To this end, a large-scale purchase programme was started, with stock being bought from owners at 150 percent of market prices. This was combined with threats to impound livestock once the voluntary period ceased. Poverty and unemployment in the region meant that many herders sold a large part of their stock. However, the consequence was that 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 eventual result was exacerbation of the problem that the programme was intended to solve.

Source: Wood, 1985.

Various political systems have been unwilling to tolerate this *laissez-faire* situation and have enforced limits on herd sizes based on range scientists' determinations of 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 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).

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 there is at least one artificial water point every 10 km (Bennet, 1997: 11). Originally, establishing closely spaced water sources was intended to avoid the localized 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 over extensive areas, whereas water is a powerful and cheap tool for this purpose. If artificial water points were to be 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.

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 dramatically. Remote drylands, mountains and tundra are often the sites of valuable mineral deposits, and new telemetric devices make it possible to detect their presence. 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.

Pastoralists and the exploitation of mineral resources

Although mineral and oil extraction in the developed world is frequently the subject of controversy, the presence of regulatory frameworks and highly developed advocacy groups ensures 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, and the consequence is that governments are generally not keen to publicize details of either potential income or environmental impact.

Most developing countries have weak communications and transport infrastructure, and 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 telecommunication and logistics supply systems that 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 community-based organizations (CBOs) in arid and northern semi-arid zones mean that governments are 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 governments to increase mineral extraction rates. Vitebsky (1990) discusses the impact on reindeer herders of the gas deposits in the Yamal peninsula of the former 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 is 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 their meat was unsaleable on the world market. This led to increased hardship for pastoral peoples across the region, especially as no compensation was forthcoming. In addition, much unsafe meat was probably consumed locally and health issues relating to Chernobyl will continue to be of concern for many years to come.

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, that have been eliminated from high-density agricultural areas. Consequently, there is pressure on governments to declare increasingly large regions as reserved areas, because of both the conservation lobby and the potential income from tourism (Bourn and Blench, 1999). This has probably gone furthest in East Africa, where large mammals are still abundant and the tourist industry is highly developed.

The immediate consequence is conflict among 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 it is correct to assign a high priority to wildlife, because of the income from tourism and the global importance of the conservation of biodiversity; or pastoralists have rights that 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 programme,[5] but developing similar programmes with occupationally specialized pastoralists is altogether more difficult and, although this is in development in East Africa, there are no clear examples of success. Establishing pastoral access rights in a fluid land use situation is problematic and a source of disputes. Similarly, the lack of central organization makes effective revenue sharing more complex and open to manipulation.

The livelihoods of pastoralists and agropastoralists 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 coexistence. Integrated management is an approach that can reduce vulnerability, enhance food security and mitigate the negative impacts of wildlife on the livelihoods of pastoralists and agropastoralists.

Interactions between pastoralists and wildlife occur on many levels. The nature and intensity of these interactions evolve in response to changes in land use and availability. The general trend in higher-rainfall areas is the intensification of livestock production, with smaller herds on smaller tracts of land leading a movement away from “pure” pastoralism towards agropastoralism (Holden, Ashley and Bazeley, 1997). This is as much the result of political intervention as of pastoralists’ attempts 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), particularly women, who live near wildlife – although it is argued that such perceptions are exaggerated (Infield, 1996). Damage to crops and infrastructure by wildlife is another key issue. Simple protective fencing is easily destroyed by such wildlife as elephants, buffaloes 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 overall better health and performance of livestock.

In practice, wildlife’s potential to contribute to the sustainable rural livelihood strategies of

pastoralists is constrained by many factors. Perceptions of the costs and benefits of wildlife, and the ability to limit or exploit them, vary according to such factors as national and international wildlife legislation, natural resource tenure, the type of pastoralists involved, the degree of community homogeneity, the quality of institutional management, and gender issues (Arhem, 1984; Child, 1995; Dalal-Clayton, 1989; Taylor, 1993; White, 1992).

Whatever ethical stance is taken, in management terms the present situation is unsatisfactory. Kenya is one of the few countries in which long-term monitoring of both wildlife and livestock populations allows the assessment of change over time. Table 11 shows the changes in these populations over a period of some 20 years.

TABLE 11
Kenya rangeland livestock and wildlife population estimates: 1970s–1990s

Species	1970s estimate	1970s SE	1990s estimate	1990s SE	Difference	Percentage (p = 0.9)	Stat. Sig.
Buffaloes	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	88 333	-408 254	-12%	-ve
Donkeys	95 059	10 884	85 350	5 021	-9 710	-10%	
Eland	25 755	3 376	19 123	1 242	-6 652	-26%	-ve
Elephants	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	-55 827	-64%	-64%	-ve
Gerenuk	42 918	1 820	21 418	1 282	-21 500	-50%	-ve
Giraffes	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
Ostriches	25 716	1772	33 871	2 798	-8 154	32%	+ve
Topi	93 822	10 977	92 934	18 139	-888	-1%	
Sheep and 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	**10 439 798**		**9 344 121**		**-1 095 600**	**-10%**	**-ve**

Area includes Baringo, Garissa, Isiolo, Kajiado, Kilifi, Ktui, Kwale, Laikipia, Lamu, Mandera, Marsabit, Narok, Samburu, Taita Taveta, Tana River, Turkana and Wajir districts.

SE = standard error.

Sources: Government of Kenya, 1996; Bourn and Blench, 1999.

As Table 11 demonstrates, the only two species showing increases are camels and ostriches, both of which are 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 sustainable rural livelihood strategies holds considerable theoretical appeal for marginal semi-arid lands. These areas are less productive for rainfed agriculture and wildlife is better adapted to the semi-arid environment than is livestock, which is more dependent on water and susceptible to trypanosomiasis (Jansen, Bond and Child, 1992; Infield, 1996). The sustainable utilization of wildlife may therefore be the most effective way of exploiting Africa's comparative advantage in this area and can also benefit pastoralists (Cumming, 1990). The sustainable coexistence of livestock and wildlife in the East African rangelands is a realistic goal, but only if *de facto* natural resource managers receive a net benefit from multispecies 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 did not benefit from consultation with local populations. The paradoxical consequence was an almost unparalleled level of habitat conservation. The system of collective farms was also kept going with subsidized 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 the relatively high levels of offtake. Tourism remains a nascent industry, and any income from it is extremely volatile, reflecting the unstable politics of the region. However, the implosion of collective farms has resulted in the regeneration of pre-Soviet patterns of pastoralism and grazing, which are 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 mean 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, which are regarded as conservation targets elsewhere. Wildlife organizations have recently begun operations to try and develop both alternative income-generation strategies and compensation schedules for communities in order to discourage them from killing snow leopards by accepting the cost of predation. It is too early to predict how well these strategies will work, but they depend 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 International (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. Multispecies 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, the United Republic of Tanzania, Malawi, Zambia, Zimbabwe, Namibia, Botswana, Mozambique and South Africa, about 10 to 20 percent of commercial farmers are involved in game ranching.

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 that are 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 can, and can thus be a profitable rural sector (Kiss, 1990; Jansen, Bond and Child, 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 Natural Regions III and IV (Jansen, Bond and Child, 1992; Kreuter and Workman, 1992). The relative economic improvement that game ranching brings to livestock production increases with the introduction of safari hunting to game ranches, for example, Iwaba in the Midlands, the Matesi Area in Natural Region IV, and Buffalo Range and Limpopo Intensive Conservation Area in Natural Region V (Kiss, 1990; Jansen, Bond and Child, 1992; Child, 1995).

[5] 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, which is now rife, illustrate the often ephemeral sustainability of such initiatives.

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. Nowadays, the ducks are 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.

Source: adapted from Nambi, 1999.

III: WORLDWIDE TABLES OF PASTORAL PEOPLES

Africa

Phylum	Branch	Language	Group	Location	Main pastoral species
Afroasiatic	Omotic	Hamar	Hamar	Southwest Ethiopia	Cattle, sheep, goats
	Cushitic	Bedauye	Beja	East 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	Northeast Nigeria to the Sudan	Cattle, sheep, goats
			Uled Suliman	Lake Chad region	Camels
			Rgeybat	Libyan Arab Jamahiriya	Camels
			Shukriya	The Sudan	Cattle
			Rashaida	The Sudan	Cattle
			Kerana	The Sudan	Cattle
			Moors	Mauritania	Camels

Nilo-Saharan	Saharan	Kanuri		West and north of Lake Chad	Cattle, camels
		Kanembu	Kuburi, Sugurti	Northeast Borneo/ the Niger	Cattle
		Teda/Daza	Teda (Tubu)	Nigeria/the Niger/ Chad	Camels, donkeys
		Zaghawa		Chad/the Sudan	Cattle, camels
	East Sudanic Nilotic	Maa	Maasai	Kenya/United Republic of Tanzania	Cattle
		il-Camus	Samburu	North Kenya	Cattle
		Turkana	Turkana	North Kenya	Cattle
		Karimojong	Karimojong	Northeast Uganda	Cattle
		Jie	Jie	Northeast Uganda	Cattle
		Shilluk	Shilluk	South Sudan	Cattle
		Anywak	Anywak	South Sudan/ Ethiopia	Cattle
		Dinka	Dinka	South Sudan	Cattle
		Nuer	Nuer	South Sudan	Cattle
		Atuot	Atuot	South Sudan	Cattle
	Surmic	Didinga	Didinga	South Sudan	Cattle
		Murle	Murle	South Sudan	Cattle
Niger-Congo	Atlantic	Fulfulde	Fulºe	Senegambia-the Sudan	Various
	Benue-Congo	ociHerero	Herero	Namibia, Botswana	Cattle
	Benue-Congo	ovaHimba	Himba	Namibia	Cattle
Khoisan	Khoi	Khoi	Khoi	Southern Africa	Cattle

Europe

Phylum	Branch	Group	Location	Main pastoral species
Indo-European	Slavonic	Vlach	Republic of Bosnia and Herzegovina, the Former Yugoslav Republic of Macedonia	Sheep
	Hispanic	Spanish	Northern Spain	Small ruminants
Vasconic		Basque		Sheep

Near East and West Asia

Phylum	Branch	Group	Location	Main pastoral species
Indo-European	Baxtyari	Islamic Republic of Iran	Sheep	
		Pashtun	Islamic Republic of Iran	Sheep
		Uzbek	Uzbekistan, Islamic Republic of Iran	Sheep
		Lur	Islamic Republic of Iran	Sheep
		Zuri	Islamic Republic of Iran	Sheep
		S,d,t	Islamic Republic of Iran	Sheep
		Baluch	Pakistan, Afghanistan, Islamic Republic of Iran	Sheep, camels
Semitic		Arab	Islamic Republic of Iran	Sheep
		T,heri	Islamic Republic of Iran	Sheep
		Kurd	Islamic Republic of Iran, Iraq, Turkey	Sheep
		Shahsevan	Islamic Republic of Iran	Sheep

India and the Himalayas

Phylum	Branch	Group	Location	Main pastoral species
		Gaddi	Himachal Pradesh	Yaks, small ruminants
	Tibetan	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 and Kashmir	Small ruminants
		Bakkarwal	Jammu and Kashmir	Small ruminants
		Gujjar lGojar]	Rajasthan, Kashmir	Cows, buffalos

		Banih,r,	Rajasthan, Kashmir	Cows, buffalos
		Rebari	Rajasthan, Gujarat	Camels
		Raika	Rajasthan	Camels

Central Asia and the Far East

Phylum	Branch	Group	Location	Main pastoral species
Altaic	Mongolic	Mongol	Mongolia, China,	Cattle, camels, yaks, sheep,
the Russian Federation		goats		
		Buryat	Russia Federation	Cattle, sheep, goats
		Kazakh	Mongolia, Republic of Kazakhstan	Sheep, horses, cattle, camels
		Kyrgyz	Kyrgyzstan	Sheep, goats
	Turkic	Turkmen	Turkmenistan	Sheep, goats
		Tajik	Tajikistan	Sheep, goats
		Satan	Mongolia	Reindeer

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

The 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	Llamas, vicuna, sheep
		Quechua	Andes	Llamas, vicuna, sheep

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Electronic resources

Infocarto: Normalised Difference Vegetation Index
www.infocarto.es/ndvicr.htm

NOAA: National Oceanographic and Atmospheric Administration
www.noaa.gov/

ODI: Overseas Development Institute
www.odi.org.uk/pdn/index.html

Electronic versions of Pastoral Network papers over some 20 years covering a wide range of pastoral topics.

Spot Image: Spot satellite earth observation system
www.spotimage.fr/

South Africa: Embassy of South Africa, Washington, DC
www.southafrica.net/economy/forest-agri/ews.html

Southern Africa regional early warning systems to monitor people's access to food and water.

UNDP: United Nations Development Programme
www.sas.upenn.edu/african_studies/hornet/past0698.html

Describes the system of Somali water points and the consequences of uncontrolled borehole digging.

USAID: United States Agency for International Development

Famine Early Warning System (FEWS): www.info.usaid.usaid.gov/fews/fews.html
Greater Horn of Africa Initiative (GHAI): www.info.usaid.gov/horn/ghai/cycle/nextstep.html
Next steps for the Inter-Governmental Authority on Drought and Desertification, including regional integration, early warning and local capacity building.

Links to universities and research centres

Sheffield Centre for International Drylands Research (SCIDR): www.shef.ac.uk/uni/academic/i-m/idry/esrcreport.html

Environmental change and poverty in Kalahari pastoral systems: full report of research activities and results.
www.unu.edu/unupress/unubooks/80458e/80458e08.htm#11

Two sections of a book on ecology in general describe pastoralism on the Iranian plateau and in Afghanistan.
Queen's University of Belfast (QUB): www.parent.qub.ac.uk/geosci/teaching/modules/geog/ggy203/lect6/environment.html
Environments in transition: aridification and desertification. Geography teaching modules.

Rangelands

www.cnrit.tamu.edu/srm

Web site of the United States-based Society for Range Management.
www.forages.css.orst.edu

Web site for the Forage Information System maintained by Oregon State University.
www.icimod.org.sg/focus/rangelands/range_toc.htm

A very comprehensive site describing Himalayan pastoralism, with particular attention to rangelands and biodiversity conservation.
www.agronomy.ucdavis.edu/calrng/pub.htm

Rangeland Communities: a newsletter about rangeland ecosystems, people and management put out by the University of California Cooperative Extension.

Annexes

I: THE ORIGIN OF PASTORAL SPECIES

Domestic animals and their wild counterparts

Domestic form		Wild progenitor		First domestication		Distribution of wild progenitor
Common	**Scientific**	**Common**	**Scientific**	**Date**	**Place**	
MAMMALS						
Carnivora						
Dog	*Canis familiaris*	Wolf	*Canis lupus*	12000 BC	Iraq	Northern hemisphere
Perissodactyla						
Horse	*Equus caballus*	Wild horse	*Equus ferus*	3500 BC	Southern Ukraine	Russia, Central Asia
Donkey	*Equus asinus*	African ass	*Equus Africanus*	4000 BC	Egypt	North Africa, possibly West Asia
Artiodactyla						
Pig	*Sus domesticus*	Wild boar	*Sus scrofa*	7000 BC	Turkey	Europe, Asia and North Africa
Llama	*Lama lama*	Guanaco?	Possibly *Lama guanicoe*	4000 BC	Andes: Lake Junin and Lake Titicaca	South America: Andes

Alpaca	*Lama pacos*	Guanaco?	*Lama* sp.	4000 BC	Andes: Lake Junin region	South America: Andes
Dromedary	*Camelus dromedarius*	Dromedary	*Camelus* sp.	3000 BC	West Asia	Asia, possibly North Africa
Bactrian camel	*Camelus bactrianus*	Bactrian camel	*Camelus ferus*	3000 BC	Central Asia	Russia, Central Asia
Reindeer	*Rangifer tarandus*	Caribou	*Rangifer tarandus*	Not known	Not known	Arctic, sub-Arctic
Water buffalo	*Bubalus bubalis*	Wild buffalo	*Bubalus arnee*	Not known	China/ Southeast Asia	India, Southeast Asia
Cattle (taurine)	*Bos taurus*	Aurochs	*Bos primigenius*	6200 BC	Turkey	Europe, Asia, North Africa
Cattle (zebu)	*Bos indicus*		*Bos primigenius namadicus*	<4000 BC	India?	India/ Southeast Asia
Yak	*Poephagus grunniens*	Yak	*Poephagus mutus*	Not known	Not known	Tibet, Himalayas
Goat	*Capra hircus*	Wild goat	*Capra aegagrus*	7-8000 BC	West Asia	West Asia
Sheep	*Ovis aries*	Mouflon	*Ovis orientalis*	7-8000 BC	West Asia	West Asia
BIRDS						
Anseriformes						
Goose	*Anser anser*	Greylag goose	*Anser anser*	<500 BC	Europe, Central Asia	North Europe, North Asia to Northwest Africa
Chinese goose	*Anser cygnoides*	Swan goose	*Anser cygnoides*	<500 BC	China?	Europe, Asia, North America, North Africa
Muscovy duck	*Cairina moschata*					Mexico to Peru and Uruguay
Mallard duck	*Anas platyrhynchos*			500 BC		Europe, Asia, North America, North Africa

Sources: Groombridge, 1992: 390; Browman, 1989: 265.