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Global Review of the Economics of Pastoralism

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Background to the Global Economic Review

This review of the literature on pastoralist economics is a contribution to the global learning on the importance of mobile pastoralism as a form of productive and sustainable land management. The review is intended to highlight existing knowledge on the value of pastoralism, the gaps in this knowledge, trends in pastoral economies and policy options that can support drylands economies most effectively.

The initial desk review consisted of eight regional desk studies: 1) South Africa and the Horn; 2) West Africa; 3) Eastern Africa; 4) Northern Africa; 5) South America; 6) Asia; 7) Middle East; 8) Europe (see Annexe 1 for details of the countries included in each regional study). The studies were carried out by eight consultants with the brief of identifying the contribution of pastoralism to domestic and global markets, gathering productivity indicators and market behaviour, identifying indirect values and methodologies for analysing indirect values. These findings will inform a series of follow-up Knowledge Management projects in which national valuations of pastoralism will be conducted.

The World Initiative for Sustainable Pastoralism

Pastoralists are the best custodians of drylands environments, but their stewardship is undermined by inappropriate policies and strong competition over their natural resources. The World Initiative for Sustainable Pastoralism (WISP) is an advocacy and capacity building project that seeks a greater recognition of the importance of sustainable pastoral development for both poverty reduction and environmental management. WISP empowers pastoralists to sustainably manage drylands resources and to demonstrate that their land use and production system is an effective and efficient way of harnessing the natural resources of the world's drylands.

WISP is a three year GEF-funded project, implemented by UNDP and executed by IUCN (The World Conservation Union). Through consultative global, regional and national partnerships, WISP ensures that appropriate policies, legal mechanisms and support systems are established to enhance the economic, social and ecological sustainability of the pastoral livelihood system. WISP provides the social, economic and environmental arguments for pastoralism to improve perceptions of pastoralism as a viable and sustainable resource management system.

For more information visit the web site at www.iucn.org/wisp or contact the global coordinator at jonathan.davies@iucn.org

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Executive summary

Pastoralism is an adaptation to marginal environments, characterized by climatic uncertainty and low-grade resources. It has considerable economic value and latent potential in the drylands, and is central to the livelihoods and wellbeing of millions of the worlds poor, but the state of knowledge regarding this sector of the economy is weak. Pastoralism is not something to be tolerated until a 'modern' alternative can be found to replace it: it is a sophisticated system of production and land management that has itself been modernized in many countries, and is irreplaceable in extensive environments.

Yet, despite overwhelming evidence to the contrary, many policy makers consider pastoralism to be archaic and economically irrational, and in need of modernisation or replacement. Such conclusions are based on a narrow view of what constitutes value in pastoral systems. The policies that emanate from this thinking continue to devalue pastoralism, often at significant cost to national economies and to the natural environment.

This review has two broad objectives: reviewing the state of knowledge on pastoral economics around the world and; using a framework for Total Economic Valuation to identify important knowledge gaps. Using the findings, the report discusses trends in pastoral economies and policy options that can support drylands economies more effectively.

Holistically valuing a complex system

Pastoral systems are more than simply a mode of livestock production. They are also consumption systems that support 100-200 million mobile pastoralists globally: many more if extensive ago-pastoralists are included. They are natural resource management systems that provide a wide range of services and products that are nationally and globally valued, such as biodiversity, tourism and raw materials.

Appropriate policy decisions that affect pastoralists and drylands cannot be made without recognition of and information about their existing value. However, there is a multiple and extensive set of values associated with pastoralism: some are tangible but many are not; some can be measured but many cannot; and those that can be measured are often underestimated.

Two broad categories of value are emphasised in this report:

- **Direct values** consist of measurable products and outputs such as livestock sales, meat, milk, hair and hides. They also include less easily measured values such as employment, transport, knowledge and skills;
- **Indirect values** associated with pastoralism include tangibles such as inputs into agriculture (manure, traction, transport) and complementary products such as gum arabic, honey, medicinal plants, wildlife and tourism. They also include less tangible values including financial services (investment, insurance, credit and risk management), ecosystem services (such as biodiversity, nutrient cycling and energy flow) and a range of social and cultural values

Pastoral economies

Direct values

Pastoral production yields a wide range of livestock products depending on the context and the demands of the producer, and depending on the mix of livestock species that are herded. This range of products and species contributes to making customary pastoral systems significantly more cost-effective and productive than the meat-focussed ranching models that have been promoted in their place, with the potential to supply lower-cost products into markets. Even in terms of direct products alone, pastoralism has been shown to be from 2 to 10 times more productive than commercial ranching under the same conditions.

Despite gross underinvestment and neglect, both in the production system and the people themselves, most pastoralists routinely engage in marketing of livestock and livestock products, whether internationally, nationally, locally or at household level. Pastoralists thus make significant contributions to national economies and export earnings, particularly in developing countries, yet in many countries there remains a dearth of even this basic

information. Where data is available, the value of pastoralist production can be greatly underestimated since a large percentage of trade passes outside of official channels, exacerbated by lack of government investment in markets, coupled with a tendency to focus on regulation and taxation.

Where direct marketing and processing can be carried out, pastoralists are increasingly filling specialised market niches. This trend may continue given the growth in global demand for livestock products fuelled by higher disposable incomes (the so-called Livestock Revolution), combined with the 'communications revolution'. The extent to which pastoralists participate in different markets depends on the relative profitability of each at any one time. The great strength of pastoralism lies in its tremendous versatility and flexibility under changing and uncertain conditions.

Many pastoralists face constraints in realising the economic potential of their system owing to high transaction costs, such as long distances to processing plants, absence of formal markets, poor access to information and fair contracts, lack of financial services such as credit facilities, and excessive government bureaucracy and fees. Transaction costs reduce the returns to labour in the pastoral system, increase poverty and food insecurity amongst pastoralists and in some cases deter producers from participating fully in markets.

Indirect values

With the recent rethinking and new understanding of rangeland ecology over the past decade, it has become clear that grazing and browsing is vital for ecosystem health and productivity. Many rangelands systems are ecologically grazing-dependent, and a reduction of mobility of herds or complete exclusion of herds often results in reduction of essential ecosystem services and accompanying system biodiversity, health and stability.

Healthy rangelands are of value to many more stakeholders than pastoralists. They provide benefits to tourists and the tourism industry, they provide a range of natural products that are consumed far beyond rangeland boundaries, and they provide ecosystems services that have global benefits such as the replenishment of watersheds or the sequestration of carbon. The magnitude of these values is difficult to quantify, yet their importance for pastoralists and non-pastoralists is likely to be considerable.

Indirect values inevitably go unmeasured, and are often taken for granted. Pastoralists are rarely remunerated for protecting these goods and services and misguided efforts to eradicate pastoralism through neglect, expropriation of land or conversion of rangelands run the serious risk of eradicating these goods and services too. Of particular concern is the expropriation and conversion of key localised 'resource patches', which may constitute a small fraction of a dryland ecosystem but make survival and prosperity possible across the whole system. Plans to modernise or convert small or large areas of rangelands need to take account of the opportunity costs of lost ecosystem health.

Measuring value in pastoral systems

In terms of appreciating the true value of pastoralism, the overall challenge remains that knowledge gaps are generally larger than the available knowledge. Challenges include:

1. Assessing the value of sales and consumption of livestock and livestock products;
2. Understanding the indirect values associated with pastoralism such as tourism value, market chain value, ecosystem health value, and global climate value;
3. Measuring the social and cultural values of livestock and livestock products, including the generation of social capital.

However, these details need to be understood if the costs of modernisation or conversion of rangelands and rangeland resource patches are to be recognised. In broad terms, therefore, the task is to gather, validate and add to the body of evidence that more accurately reflects these multiple values of pastoralism.

This report includes a review of common methodological options available for valuing pastoralism and discusses the advantages and disadvantages of each. Two methods are recommended for future WISP projects: 'Benefits Transfer' and 'Participatory Economic Valuation'.

Benefit Transfer refers to extrapolating results from existing studies in similar environments or contexts and adapting them to the context under investigation. Whilst this approach is cost-effective, its main value lies in its potential to add to the body of readily available evidence by transferring useful but little known studies into the wider public domain.

Participatory Economic Valuation is an emerging methodology that is proving useful in assessing the value of intangible costs and benefits, whereby community members representing a specified population (e.g. a district or region) could assess the relative impact value of certain outcomes, dynamics and policies which they have themselves identified as being important. These relative impacts can also be estimated in absolute terms if financially measurable costs and/or benefits, such as milk production, are included in the set of parameters to be valued.

Recommendations

This review examines and critiques common and dominant pastoralist policies and the underlying premises on which they are based, and makes recommendations for appropriate modifications. The policies reviewed are grouped under four main headings: general pastoralist policies; pastoral marketing policies; rangeland policies; and the broader policy environment. A number of over-riding policy conclusions emerge:

- Policy processes should be less concerned with what technical options should be applied than with how technical and institutional reforms should be brought about. A participatory policy development process should be encouraged to accommodate the needs of different stakeholders and to connect researchers and institutions with the pastoralist reality.
- Appropriate and productive development in the drylands requires pastoralists themselves to be sufficiently empowered to influence policy and implementation on the national stage. To this end, enabling policies are needed to provide the necessary environment for empowerment and accountability.
- Greater technical insight is, nevertheless, needed and the new 'thinking' in range ecology suggests an urgent need for training of a new generation of range managers that can combine technical knowledge with socio-economic analysis.
- Policy must be informed by the real values associated with pastoralism and by an understanding that it is an economically viable and valid means of production. Pastoralism is an important contributor to many developing country economies and it could be made even more significant with appropriate policy support and relaxing of disincentives.
- The pastoral system relies on key resource pockets for its sustainability and viability, so alternative uses of those resource pockets present a significant opportunity cost of lost rangeland productivity in the wider rangelands.
- Policy must be informed by a more comprehensive understanding of the multiple values of drylands and pastoralism, beyond the narrow focus on commercial products. Environmental services (such as carbon sequestration, biodiversity, combating desertification and erosion) are increasingly highly valued in the global context and their promotion could represent an important economic potential.
- Valuation does not necessarily imply monetisation and there are important values that cannot be reduced to such terms. Using a holistic approach such as Total Economic Valuation, the full range of benefits from pastoralism can be brought into consideration, whether or not they have a monetary value.
- Enhancing the economic and environmental sustainability of drylands production cannot be achieved through sectoral policy change alone and changes are needed in a raft of policies that constrain pastoralism. For example, without changes in health and education policies, pastoralists will still face major challenges to enhancing their production, overcoming their poverty, and adding value to pastoral activities.

Economics and values of pastoral systems

Pastoralists constitute the majority of drylands inhabitants and, despite many efforts to change it, mobile pastoralism persists. Indeed, in Europe and Asia, policy makers are encouraging investment in pastoralism in the understanding that it is essential for sustainable environmental management in the rangelands. This flies in the face of 'conventional wisdom', yet a closer look at desertification indicates that it often occurs where policies have, deliberately or inadvertently, undermined the pastoralist system, for example where settlement and irrigation schemes place an inordinate pressure on the environment. Where pastoralism has been enabled and supported by appropriate policies, ecosystem integrity and biodiversity have in fact been enhanced.

The policy of sedenterisation in the drylands has been shown time and again to result in increased environmental degradation, reduced economic potential and eroded social and cultural systems. Rainfall in the drylands is low and unpredictable, both in terms of when it comes and where it lands, so the only practicable management system is an opportunistic one: to go where the resources are, when they are available. Most dryland ecosystems are ecologically grazing-dependent, and a reduction of mobility of graziers or exclusion of such graziers can result in a significant drop in biological diversity and reduced ecosystem health and stability.

The assumption that mobile pastoralism is archaic and economically irrational has long been part of the motivation behind the policy of sedenterisation. This belief has persisted and still influences policies in the drylands, despite evidence to the contrary. Yet evidence has been available for some time showing that pastoralism out-performs other land use systems in the drylands and that it is the most economically rational way to sustainably manage the drylands. Rather than exerting huge efforts to increase incomes through investment in alternative production systems, development planners would be well advised to first explore the options for enhancing this existing value. However, this needs a more thorough look at the factors that are currently constraining the system, and a greater recognition of the aspirations of the producers themselves.

Pastoral poverty in the marketplace

In countries where drylands predominate, poverty is particularly widespread. Key 'poverty factors', such as gender biases, high maternal mortality rates and low emphasis on child health care, are particularly poorly addressed in drylands areas. Governance failures are often deeper in drylands areas, due to geographic marginalisation and often compounded by ethnic differences between those governing and those governed.

Perceptions of pastoral economics are often swayed by the visible suffering that occurs during prolonged drought in some pastoralist areas, especially in Africa, yet insufficient effort is made to analyse the causes of famine. The doctrine that famine results from failure in food supply is too simplistic: famine results from entitlement failure. In pastoral areas, asset wealth is often high, if volatile, but markets do not enable pastoralists to convert that wealth at times of stress. Food entitlement failure in this case can also be considered market failure: high transaction costs, poor information flow to producers, lack of competition in supply of goods and services and inability to choose the time of sale, because of an absence of alternatives for investment of the wealth generated.

Selling livestock during favourable periods can often generate significant revenue, but this can be of limited value when few goods or services are provided that could make relevant and safe investments. Instead, the safest place to store wealth is on the hoof, where the returns to investment are substantial during good times, but with the inevitable downfall that its value is eroded at exactly the time when it is most useful. Furthermore, pastoralists do not exclusively rear livestock for market-based transactions. Pastoral systems rely on strong social organisation for spreading risk and managing adversity, and these social systems are underpinned by complex systems of livestock (and other goods and services) transfer. Rather than only focus on maximising off-take and substituting the internal economic function of livestock, it is necessary to think about the magnitude and value of the existing services that livestock provide.

In drylands areas, even where livestock wealth is relatively high and incomes from livestock are substantial, people may still engage in small scale, un-remunerative cultivation to ensure a supply of grain at certain times of the year. The labour expenditure is high and inefficient and may reflect the failure of markets to allow adequate compensation for similar labour invested in livestock. When such market failures are overcome, and goods become more readily available, pastoralists can shift from subsistence crop cultivation to fodder cultivation, making their return to labour, via the market mechanism, much greater.

Increased livestock productivity on its own, however, does not address the bigger issue of market failure. This failure can be overcome in a number of ways, including investing in markets and infrastructure and raising bargaining power by reducing transaction costs. Diversification of production can help, although not if it comes at a significant cost to the core economic activity (either through loss of land or diversion of labour). Raising the economic potential of the drylands also requires the provision of enabling incentives, including security over land and other resources, appropriate service provision, credit and banking facilities, access to government and relevant research and extension.

Growing urban wealth is having an impact in pastoral areas by increasing the demand for livestock products, and other natural resources, although producers frequently do not proportionately capture the benefits. The competitive advantage of drylands in producing livestock is also undermined by the exclusion of many developing countries from world markets for livestock and livestock products, although whether the solution is to invest heavily in meeting export standards, or to orientate efforts towards more localised markets remains an issue of debate. Regardless of whether a country prefers to exploit domestic or global markets, there remains a challenge of developing national market chains.

The value of pastoralism

The value of pastoralism is not confined to that which can be captured in the marketplace, although even this relatively straight forward information is itself hard to come by. However, pastoralism has a wide array of values that are entirely overlooked by market oriented surveys. When practiced effectively, pastoralism creates and maintains ecosystem health and stability, and as such it is a responsible for a range of environmental goods and services, which are enjoyed far beyond the boundaries of the pastoral system itself.

Pastoralism is truly a ‘system’, and comparisons with alternative land uses must also take this into account. The loss of a hectare of irrigable land to cultivation may result in the loss of livestock access to dozens of hectares of non-irrigable land. The cost, in terms of productive losses on the non-irrigable land, plus environmental degradation that comes through grazing reduction, may greatly out-weigh the economic gain of the hectare under cultivation and can cause very undesirable environmental outcomes. This represents a real lose-lose situation of biodiversity loss in both abandoned pasturelands and cultivated land and over-grazing in resource-poor pockets where pastoralists are left to graze their flocks.

Some of the direct economic benefits of pastoralism have been demonstrated and documented in the literature, yet the contribution to GDP and foreign currency earnings is rarely acknowledged in government policy. Instead of investing in markets, policy often favours taxation and regulation, driving an already thriving informal economy further out of the reach of government statisticians and tax officials. As a result, the value of livestock production in the drylands is often grossly underestimated in official statistics and thus does not attract the investment attention that it deserves.

It is tempting to say that the under-valuation of pastoralism creates a self-fulfilling prophecy: by declaring it worthless and therefore justifying non-investment, it has become economically unviable. Yet this study shows that this is not the case. Despite gross underinvestment and neglect, both in the production system and in the producers themselves, pastoralism continues to contribute healthily to national economies and export earnings. Although constraints to pastoral mobility have reduced its contribution to ecosystem services, as witnessed by the extent of desertification in the world’s drylands, National economies continue to benefit from the unrecognised indirect values of pastoralism in managing drylands environments. By recognising these multiple values of pastoralism and reversing the trend of underinvestment, development planners can both boost their rural economies as well as enable drylands populations to overcome their vulnerability.

Defining pastoralism

Numerous economic definitions of pastoralism exist, and most refer to Swift's (1988) definition that pastoral production systems are those "in which at least 50% of the gross incomes from households (i.e. the value of market production and the estimated value of subsistence production consumed by households) come from pastoralism or its related activities, or else, where more than 15% of households' food energy consumption involves the milk or dairy products they produce". Some countries have adopted their own definitions, such as Morocco where pastoralism is defined as a livestock system where rangelands account for more than 50% of animal feeding time (Benlekhal, 2004).

Definitions such as this provide a very useful rule of thumb, although exceptions can always be found. Stakeholders in the pastoralist system may not always fulfil such criteria, yet still consider themselves pastoralists. Others may shift, from year to year, between varying degrees of cultivation or off-farm labour that might periodically define them as non-pastoralist. This study focuses more on the production system than the producers: pastoralism rather than pastoralists. Pastoralism, regardless of the extent to which it contributes to the household economy, refers to any predominantly livestock-based production system that is mainly extensive in nature and uses some form of mobility of livestock.

Box 1 – Which system value?

In the ensuing discussion of Total Economic Valuation, it is important to be clear about which system is being valued: pastoralism, pastoralist or dryland. Although in many cases the values of each overlap, the categorisation of direct and indirect values is very different. For the sake of developing the conceptual framework, this classification is important, and therefore, to avoid confusion, this report attempts to adhere rigidly to the valuation of pastoralism: the livestock production system.

An overview of the economics of pastoralism

Mobile pastoralists are a large and significant minority, and often an ethnic minority, in many countries around the world. Precise figures are hard to come by, but when all types of mobility are considered, nomadic and transhumant pastoralists may number between 100 and 200 million people globally (FAO, 2003). If extensive agro-pastoralists are included, the number rises very sharply, and such people are a clear majority of dryland inhabitants. Pastoral livestock systems are in fact more than simply a mode of livestock production; they are also consumption systems that support this large global population, and they are natural resource management systems that support a wide range of services and products that are globally valued, such as bio-diversity protection, tourism and raw materials.

Policy decisions that affect pastoralists and the drylands cannot be safely made in the absence of information over their existing values. The multiple values of pastoralism must be understood and accounted for, whether or not they have a market value and whether they are produced or foregone. What is needed it a holistic valuation of all the goods and services that pastoralism provides.

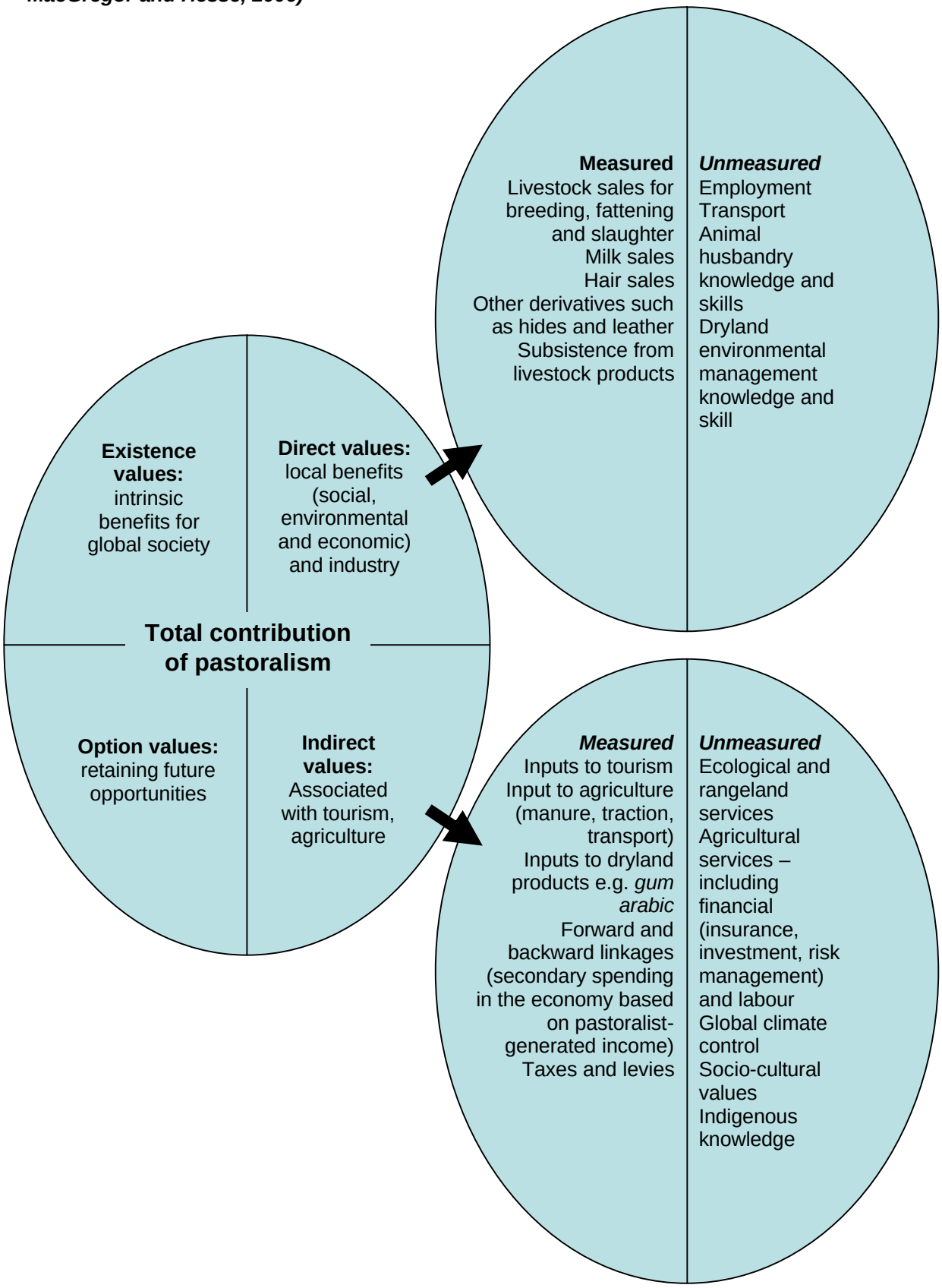
IIED's paper "Valuing pastoralism in East Africa" (MacGregor and Hesse, 2006) identifies a broad framework for assessing the benefits of pastoralism, looking beyond the immediate benefits of livestock and livestock products. This Total Economic Value (TEV) framework could provide a strong tool for understanding the true contribution that pastoralists make to their domestic economies (Figure 1).

The visible contributions of pastoralism to the economy are generally limited to the measurement of livestock sales and some by-products, such as dairy, hair and hides. Whilst these are challenging to quantify in themselves, they do not capture the full value of pastoralism. Two important points need to be recognised:

- There is a multiple and extensive set of values associated with pastoralism. Some are tangible but many are not; some can be measured but many cannot; and those that can be measured are often underestimated.
- Assessing an economic activity's total contribution to the national economy is one tool to identify, quantify and aggregate all values associated with that activity. However, it is

"misleading to assume that this is simply a process of monetising all aspects of economic life. Rather it proves as useful tool to explore the full range of costs and benefits emanating from an activity, which can also be used for lobbying in support of pastoralism" (MacGregor and Hesse, 2006).

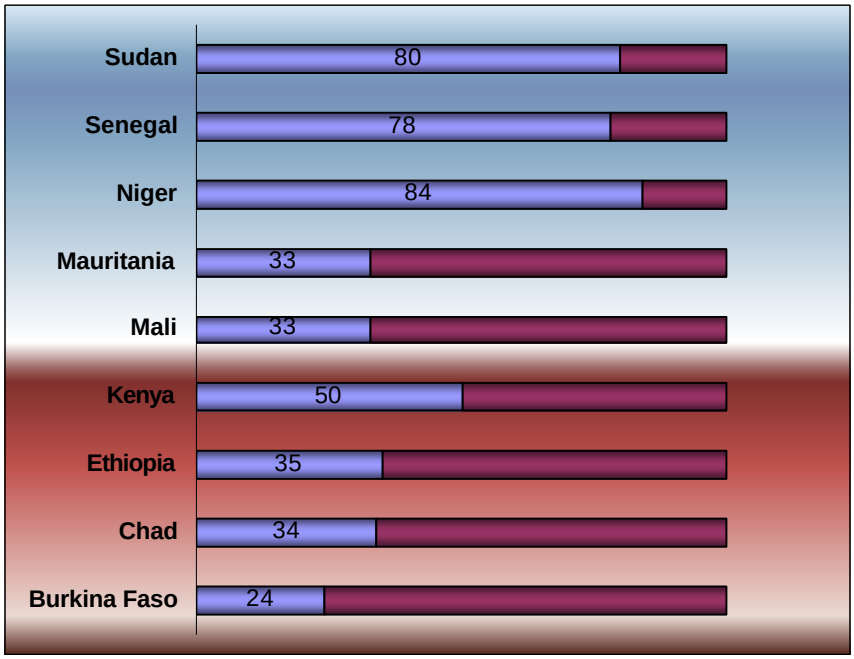
Figure 1 – Conceptual representation of the contribution of pastoralism (adapted from MacGregor and Hesse, 2006)



Direct values of pastoralism

Few countries have official agricultural data that is disaggregated to show the contribution of pastoralism, although in some countries the contribution or pastoralism is very significant. In Kazakhstan, despite 15 years of political and economic turmoil, the livestock sector, which is predominantly found in the drylands, provides 42% of agricultural GDP, down from 60% in the Soviet era when the agricultural sector as a whole made up 31% of Net Material Production (a Soviet measure of output) (World Bank, 2005). In Mongolia, pastoral livestock are responsible for around one third of GDP and are the second largest source of export earnings (32%) (UNDP, 2003). In Morocco, some estimates put the contribution of rangelands to agricultural GDP at 25% (Berkat, 1995). Figure 2 illustrates the estimated contribution of pastoralism to agricultural GDP in a range of African countries.

Figure 2 – Pastoralism as a percentage of agricultural GDP[1]



In countries with a dominant agricultural sector, pastoralism can be a significant controbutor to national GDP. Uganda's pastoralist and small holder livestock producers contribute 8.5% of total GDP, providing the country's fourth biggest foreign exchange earner (Muhereza and Ossiya, 2004). Ethiopia's pastoral dominated livestock sector contributes more than 20% of Ethiopia's total GDP, probably much more if other intermediate values of livestock are properly assessed (Aklilu, 2002). The leather industry is Ethiopia's second largest source of foreign exchange after coffee and, in 1998 alone, it exported US$41 million of leather and leather goods, primarily to Europe, Asia and the Middle East (STAT-USA, no date).

Products and productivity

The great strength and appeal of traditional pastoralism as a land use form is its tremendous versatility: it has the ability to continuously adapt to varying economic, environmental, social and political conditions and is inherently self-sufficient when necessary. This flexibility explains the great variation of production and marketing scenarios both between and within countries. Nevertheless, although pastoralism is context-specific, some generalisations can be drawn.

In many countries, pastoral production is carried out to provide multiple products rather than single products. Pastoral production tends to focus on live animal products, rather than slaughtered animals. Whilst commercial ranching focuses on the slaughtered products of

[1] All data from Salih, 1993, except Kenya (Republic of Kenya, 2000),

meat and hides, pastoral livestock provide additional products including milk, hair, blood, manure and livestock off-spring, and perform additional roles such as transport and draught power, food storage, a cash buffer, capital reserve and a hedge against inflation.

Pastoralism is a production system for marginal lands, and comparison with the sort of production performances that can be attained in less arid or less harsh conditions are misleading. Pastoralism is a means of exploiting extensive lands where returns can be attained at relatively low production cost. In the former Soviet Union, the pastoralist systems of Kazakhstan, Kyrgyzstan and Turkmenistan were estimated to have 50% lower production costs than other Soviet livestock systems. The Soviet Union duly transformed its rangeland states into the major national suppliers of pastoral products with Kazakhstan alone supplying 25% of Soviet lamb and 20% of Soviet wool (Kerven et al., 2002, ADB 1997).

Despite the importance of indirect values and non-tangible benefits of pastoralism, even in direct terms pastoralism has been shown to greatly out-produce ranching under the same conditions. Table 1 presents a range of study results from Africa that show the pastoral system to be from 2 to 10 times more productive than ranching alternatives.

Table 1 – Comparisons between ranching and pastoral production systems in Africa (Scoones, 1995)

Country	Comments	Sources
Zimbabwe	All studies show that the value of communal area (CA) cattle production far exceeds returns from ranching. If actual stocking rates are used, CA returns are ten times higher per hectare.	Danckwerts (1974) Jackson (1989) Barrett (1992) Scoones (1992a)
Botswana	Communal area production (in cash, energy and protein terms) per hectare exceeds by at least three times per hectare returns from ranches, even though technical production parameters are lower. The difference in soil erosion levels between the two production systems is negligible, despite differences in stocking rate.	Rennie et al. (1977) Carl Bro (1982) Hubbard (1982) De Ridder and Wagenaar (1984) Abel (1993)
Mozambique	Traditional systems have higher overall returns per hectare because of the multiple benefits of draft, transport, manure, milk and meat compared to the single beef output from ranches.	Rocha et al. (1991)
South Africa	Cattle production systems in the Transkei show higher returns per hectare, but lower productivity indicators, compared to ranches in the commercial white farming sector.	Tapson (1991, 1993) Richardson (1992)
Tanzania	The productivity of pastoral herds in the Ngorongoro Conservation Area were found to be comparable to commercial herds. Maasai multi-product outputs are higher than ranches on a per hectare basis.	Birley (1982) Homewood and Rodgers (1991) Homewood (1992)
Uganda	Recalculations of figures to include full range of costs and benefits show that dollar returns per hectare under pastoralism are two times higher than for ranching. Dollar returns per animal are a third higher.	Ruthenberg (1980) Behnke (1985a)
Ethiopia	The pastoral Borana system has higher returns of both energy and protein per hectare compared to industrialised ranching systems in Australia. Australian Northern Territory ranches only realise 16% of the energy and 30% of the protein per hectare compared to the Borana system.	Cossins (1985) Upton (1989) Cossins and Upton (1988)
Mali	Transhumant pastoral systems yield on average at least two times the amount of protein per hectare per year compared to both sedentary agropastoralists and ranchers in the US and Australia.	Breman and de Wit (1983) Wilson et al. (1983)

Additional livestock products and market niches

The majority of pastoralists consume milk and produce a range of dairy products, yet marketing of those goods is often limited or restricted. In Rajasthan, India, camel milk is a by-product of camel breeding which is traditionally consumed by herdsmen (especially on migration) and by their families. Pastoralist institutions in India recently mounted a successful legal challenge to the prohibition of camel milk sales (Agrawal et al., 2003). With increasing commoditisation of camel milk, and weakening of cultural taboos on the selling of camel milk, the income generated from milk sales can exceed the returns from selling the young male offspring.

Cultural taboos against the sale of dairy products have hampered market integration for a number of pastoral communities, but proscriptions are often seen to weaken in the face of marketing opportunities. This is the case in the Pashtun areas of Afghanistan, where surplus dairy products like milk, yoghurt or buttermilk have customarily been distributed freely to relatives or other needy people and sale of such products represents a threat to such social institutions. Pashtun dairy products are increasingly sought after in Afghanistan's markets and cultural restrictions on their sale are fading (Halbach and Ahmad, 2005).

Hides and skins are an important by product for most pastoralists, as in the case of the Astrakhan pelt, produced from Karakul sheep in the arid rangeland zones of Afghanistan, Uzbekistan, Kyrgyzstan and Turkmenistan. For the production of astrakhan pelts Karakul lambs have to be slaughtered before the second day after birth, and owners therefore remain with their flocks during the lambing period to decide whether to rear or to pelt a lamb. In the 1950s Afghanistan controlled the major astrakhan markets and, although market share was later lost due to lack of proper marketing and management and breeding of the Karakul flocks, during the years 2003 and 2004 the industry rebounded strongly. Investment opportunities exist in skin processing and in emerging leather manufacturing. Despite a shortfall in the skills and expertise to develop these industries, export performance indicates that the raw products are produced at internationally competitive prices (Halbach and Ahmad, 2005).

Wool is an important by-product for many pastoralists, particularly those in colder climates. In South America, pastoralists tap important niche markets for the sale of wool from their camelid species: Alpaca, Llama, Guanaco and Vicuña. Alpacas, for example, thrive in the harsh climates of the Peruvian, Bolivian, Chilean and Argentinean highlands, providing food, fuel, clothing, and transportation. They produce coloured wool that is much stronger than Merino sheep wool and is highly sought after in Europe, and Japan: in particular the 'cria' (young alpaca) fibre which commands a higher price. Globalization and the depression of meat and wool prices have imposed constraints on marketing from the pastoralist sector: some speciality commodities, such as Pashmina goat wool, and specialised breeds such as the Awassi sheep (from the Near East), are increasingly produced in Australia for international markets.

Cashmere is a niche pastoralist product worthy of mention, since World demand and prices for cashmere have risen sharply in the last few years. This has been driven by the entry of Chinese companies into the market, manufacturing low quality mass market garments, and fomenting domestic competition which has driven up prices for cashmere (Westhuysen, 2005). Most of the cashmere goats are raised in the western and northern pastoral zones of Inner Mongolia, Xinjiang and the Tibetan plateau, where they thrive on the shrubby, sparse and low output vegetation. China has 78 million cashmere goats that annually yield 12,000 tonnes of raw cashmere and produces 65-75% of the world's cashmere fibre (China Chamber of Commerce, 2005).

Livestock provide power for transport and traction for many pastoralists. Camels in India are primarily regarded as a draught animal and means of transportation, while its food potential is largely ignored. In the Thar desert, camel carts are still popular and remain a common means of transportation. Ownership of a camel and a cart is a good source of income, sufficient to support a family: the average daily income from camel carting was Rs 300 and Rs 140 in city and village areas, respectively, versus a daily expenditure of Rs 40/camel/day. Other uses of camel power include threshing, lifting of water and powering of oil mills. The camel is also used as riding animal, mainly in the Jaisalmer area, where it exerts considerable draw on

tourists, and is used by Indian Border Security Force for patrolling the desert border (LPPS, 2005).

Dung also makes an important contribution to the rural economy in many countries, which is often mentioned but rarely quantified. In India, about half of the total dung produced is used as manure and the rest as domestic fuel. In 1970–71 manure accounted for about 43% of the total value fertiliser used in agriculture. This declined drastically to 23% in 1980–81 and to about 13% during the 1990s. However the absolute value of manure has been increasing steadily (Birthal and Parthasarathy Rao, 2002). The use of dung has also traditionally played a role in maintaining relations between Rajasthan's camel breeders and farmers. With increasing use of chemical fertilizers, the importance of manure as an agricultural input has declined (Agarwal, 1998). However, in the meantime, agricultural input subsidies were abolished almost worldwide and, with soaring oil prices leading to escalating fertiliser prices, the value of dung may be set to rise again.

Livestock play a crucial role in providing risk insurance for most pastoralists, particularly so in high-risk drylands environments. In Turkey, livestock give increased economic stability to the farm household, acting as a cash buffer (small stock), a capital reserve (large animals) and a hedge against inflation. In a mixed farming system, livestock reduce the risk through diversification of production and income sources and therefore a much greater ability to deal with seasonal crop failures and other natural calamities (Akbay and Boz, 2005). The splitting of herds, and fluidity of ownership of individual animals, is an important insurance strategy for pastoralists that enables households to cope with the vagaries of climate and the uncertainty of their environment (Bayer & Waters-Bayer, 1995).

Pastoralist markets and marketing

The emerging picture of pastoralism is that it contributes strongly to national economies: more strongly than perhaps should be expected, given the extent of underinvestment and the absence of legal and policy support. However, it is also apparent that this vibrant sector of the economy is not bringing commensurate benefits to pastoralists, in the form of security and risk reduction. Part of this shortcoming may stem from market failures or from other factors which limit the either the engagement of pastoralists in markets or their returns from market-based activities.

Opportunities

Many pastoralists are increasingly engaging in market activity and livestock are being increasingly seen as a commodity for sale. This can bring penalties if it undermines customary institutions for resource sharing and risk management (Davies, 2006). However, market integration allows pastoralists to survive on smaller herds than would be possible with exclusive subsistence (McPeak and Little, 2006). If the necessary goods and services are available, it also offers pastoralists new opportunities for enhancing their livelihoods.

Despite the constraints to marketing, most pastoralists throughout the world supply markets, whether international, national, local or household. Marketing practices are well established, although the choice of market varies over time, depending partly on which market yields the highest returns. There is a tendency to talk of 'the marketplace', yet in reality livestock markets are composed of many different types of market and pastoralists can, under the right conditions, exercise a degree of choice (McPeak and Little, 2006). Transaction data from Tunisia illustrates the breakdown of pastoral sales by market and illustrates the range of markets that are available to producers. The 'immediate' market accounts for 40% of sales, 'local' markets 20%, 'transfer' markets (regional) 35% and 'large' markets (cities) account for only 5% (Ministry of Agriculture Tunis, 2006).

Investment in marketing may have been restricted in some countries due to the assumption that pastoralists live outside of the cash economy, or the belief that mobile production systems are not compatible with marketing or modern collection methods. Indeed, there may be some marketing advantages that come with a reduction in mobility. In Iran, traders will enter into collection contracts with sedentary households because they are easier to locate, whereas mobile households are obliged to travel to find the trader when they want to make a sale (Badripour, 2004). However, there are also numerous examples of how well mobile pastoralists can engage in marketing and how collection systems can be further modernised to accommodate the needs of mobile pastoralists, as discussed in the next section.

Some pastoralists are engaging in direct marketing and household-level processing, as in the case of Afghanistan's cashmere producers. However, government must play a role in enabling linkages and negotiations between producers, producer associations and big business and also in ensuring effective customs and border controls. An important opportunity for pastoralists may lie in the concept of 'Fair Trade' and 'Fair Contracts', although there are major constraints to global market access as discussed later. Given current high-income and global consumer tastes good potential also exists for building brands around the concepts of "natural range beef", "conservation beef" and "desert lamb", as in South Africa.

The range of opportunities is, theoretically, wide, but providing opportunity may not always be enough to change pastoralist's attitudes to the market. Producers might be better served if they were assisted to sell their produce 'better', rather than sell more – i.e. support is needed to make trade more remunerative (McPeak and Little, 2006). Few primary producers around the world are going to argue with that outlook, although there must also be great value in broadening the portfolio of products that can be marketed and expanding the element of choice over markets and sales.

Domestic trade

The rapidly increasing proportion of the World's population that lives in urban centres is generating a growing demand for livestock products: particularly milk and meat. There is a global increase in demand, but a significant part of that increase is in developing and emerging countries, offering important marketing opportunities for pastoralists. Urbanisation is routinely seen to raise demand for livestock products, partly through an increase in the proportion of a population that depends on the primary food producers, but partly through increasing affluence that leads to higher per capita consumption of meat and dairy products. The global rise in meat consumption is most noticeable in India, China and Brazil, the first two of which have significant pastoralist regions. However, meat consumption in Africa is also rising and may be set to rise at a comparatively higher rate than other regions over the next decade (Delgado et al, 1999).

Pastoralists in most countries appear to be integrated into their national market to some extent. In Iran for example, although mobile pastoralists number only about 2% of the entire population (1.3 million pastoralists) according to government figures, they satisfy about one quarter of the country's livestock needs (CENESTA, 2004). Morocco's caprine sector alone, which is almost entirely rangelands-based, produces 8 to 18% of the red meat production of the country (Ait Baba, 1997). However, many countries with pastoral populations are not self-sufficient in animal products and it is safe to say that, given the great underinvestment in the pastoral system, there is scope to increase the supply to national markets through appropriate investment in production and marketing. Indeed, securing domestic market share may be a great deal less risky than investing in global markets, where competition is fierce and consumer standards can be both costly to attain and fickle.

In many countries the best returns are obtained by home consumption. For example, across Southern Africa, evidence assembled shows very good reasons for the general lack of involvement in selling livestock: people keep livestock not to make money, but to save money. The main determinant of this strategy is high retail food prices, itself a function of remoteness, high transport costs and poor marketing systems (Behnke, 2006). Specifically, in Botswana, despite government policies that make the livestock sector artificially attractive, few pastoralists engage in sales. This may owe in part to tough standards set by Botswana's export-oriented livestock economy, with the high subsidies provided to that sector and the restriction on livestock movement that go with it. However, evidence also suggests that livestock fattening (to enhance live animal sales) will deflect milk away from human consumption, losing a staple part of the diet (Behnke, 2006).

Smaller producers may be better off supplying their own families and marketing windfall surpluses in good rainfall years, or selling livestock only when cash is needed. Beyond this, extra labour or capital is better deployed to secure off-farm or non-pastoral sources of cash that are more lucrative than producing agro-pastoral surpluses for sale (Behnke, 2006). Diversification into off-farm or non-farm cash earning, particularly through labour employment, appears to be a global trend amongst pastoralists.

Commercial involvement, when it does happen, may yield marginal gains. Again in Botswana, increased commercial involvement did not mean that herds could be managed more profitably

per head or even that animals could be sold at a higher rate. It simply meant that purchased inputs displaced domestic labour in the production process, and that specialized single-commodity production replaced the production of a diverse array of goods for home consumption (Behnke, 1987).

Regional Trade

Pastoralism is often associated with border areas and as a result the opportunities for informal trade are great: indeed, they are sometimes the only opportunities available. However, such trade is rarely captured in official statistics and is frequently considered as something illegal and undesirable. By failing to recognise and legitimise cross-border trade, government is more likely to promulgate inappropriate policies that result in economic loss to the national government.

Instead of facilitating this trade to stimulate local economies, and investing in those economies, government tend to impose tariffs and restrictions that ensure the trade remains in the informal, or black market, sector, relying on bribes at border posts where necessary. The cost to pastoralists of these policy failures is that "legal ambiguities" generate inefficiency in the market, which creates opportunities for markets to be disrupted by rent-seeking behaviour (McPeak and Little, 2006). More open, integrated and competitive markets are required, yet in government circles 'trans-border commerce often is still portrayed as smuggling and illegal and consequently remains subject to disruptive border closures and animal confiscations' (Little and Mahmoud 2005).

Such cross-border trade is common in Central Asia: yaks and cattle are driven across from Tajikistan to the urban markets of southern Kyrgyzstan; sheep from western Kyrgyzstan supply the populous Ferghana valley of Uzbekistan; horses are trekked across the mountains of northern Kyrgyzstan for sale in the richer communities of south Kazakhstan; cashmere goat fibre is trucked over the borders of eastern Kazakhstan and Kyrgyzstan to China; meat from northern Kazakhstan goes to Russia; karakul lamb pelts are sold from Turkmenistan to Russia (Kerven, 2006). The true value of livestock exports to each of the Central Asian countries and their populations is therefore very difficult to assess.

Cross-border trade is essential to food security in eastern Africa, where the export of livestock finances the import of essential foodstuffs such as rice, wheat flour, cooking oil and pasta. When the export of animals declines or is interrupted, food supplies dwindle and become expensive (Little, 2002). However, the benefit of cross-border trade to pastoralists is restricted by weak spatial integration, which results in a greater proportion of the proceeds of livestock sales accruing to non-pastoral agents. Pastoralists face unfavourable terms of trade as a result of declining prices for their animals and rising prices of their major purchases, and improving food security in the region requires greater market access for both sales and purchases (Little et al. 2001).

Global trade

In many countries pastoralism contributes significantly to export earnings. Ethiopia's leather export market, dominated by the pastoralist sector, provides 12% of total trade (EPA, 2003). Uganda's fourth export earner, hides and skins, relies on pastoralists and small holder producers for 95% of its produce (Muhereza, 2004).

Where global prices offer sufficient incentives, pastoralists are engage in significant global trade. The trade of live animals from Somali and Ethiopia to the Middle East, driven by high oil-based disposable incomes in the Middle East combined with geographic proximity, provides a useful example. Over the last three to four decades Somali pastoralists have experienced a significant change from a livestock subsistence society, which lived mainly on milk and meat as staple foods complemented occasionally with a little gain, to a livestock export oriented market economy developing comparatively sophisticated trade links (UNDP 1998).

The Southern African 'block' of Botswana, Namibia, Zimbabwe and Swaziland have preferential chilled beef quotas with Europe, which although dominated by commercial operations, allow limited participation by pastoralists when the latter have large enough herds. However, these countries have failed to meet their export quotas and despite huge

investments and subsidies into intensive livestock systems they are seeing their competitiveness in global markets eroded (Behnke, 2006).

It is worth remembering that pastoral systems are not, primarily, meat production systems. Global trade in pastoral dairy products are rarely given much attention, yet camel milk is a greatly under-exploited commodity in many pastoralist systems that offers great potential for economic gain, in both domestic and international markets. The global market for camel milk alone, most of which is produced in drylands areas, is estimated at 10 billion US$, with 200 million customers in the Arab world alone (FAO, 2006). Two countries with a dominant pastoralist population and a large national camel herd, Somalia and Mauritania, have both successfully established commercial camel milk enterprises that collect milk from fully mobile producers. This refutes the claim that milk collection is not practical in a nomadic or mobile context. However, the experiences of both countries suggest that centralised, private enterprise milk collection may have greater merit than household level processing of dairy products, where quality control is much harder to guarantee and securing long term marketing arrangements can be an obstacle (Tiviski Dairy Products, Mauritania: personal communication, 14.07.06).

Box 2 – Botswana's livestock sector

A number of African countries are looking at the experiences of livestock commercialisation in Botswana, which has a preferential trade agreement to supply chilled beef to Europe. The Botswana case is of interest, because the government has supported the sector with massive subsidies, of up to 50%, which makes the livestock sector artificially attractive. Botswana's capital-intensive and technologically sophisticated approach to livestock exports has long been considered more profitable than that of the Horn of Africa (Somalia and Ethiopia). However, today this difference is no longer so clear cut. In 1998/9 the Botswana Meat Commission posted its worst year since its formation in 1966 and only its fourth ever loss, yet it has subsequently recorded a financial loss in every year since then (except 2001). This deterioration is caused by a combination of escalating export costs, flat prices and competition for beef supplies from Botswana's increasingly prosperous domestic consumers (Stevens and Kennan, 2005).

The problems of Botswana's meat export industry are an instance of the 'Dutch disease' or "the tendency to reduce the competitiveness of all internationally traded sectors other than the one that is generating the high foreign exchange inflows" (Stevens and Kennan 2005). In an attempt to retain a broad-based export economy, the Government has been forced to subsidise cattle exports to the extent that its agricultural budget is estimated at over half of agricultural GDP. Between 1994 and 2003 the budget of the Ministry of Agriculture rose in current terms by 241%. The expenditure estimate of the Department of Animal Health as a whole rose over the same period by 220%, accounting for 47% of the Ministerial total by the end of the period, whilst that for Foot and Mouth Disease control shot up by 271%.

Marketing and transaction costs

Marketing of pastoral products is increasing around the world, sometimes with government support, sometimes in spite of government restrictions. A strong example is China, where the livestock share of agriculture doubled from 14-28% over the period 1949-1999 due to access to liberalised markets and investment in dryland areas (Kerven, 2006). Indeed, in China it is noticeable that drylands regions yield greater returns to government investment than other regions, in part because they have received comparatively less investment in the past (Hazell, 2001).

Marketing in pastoral areas is typically complicated by high transaction costs due to the long distances that the pastoralist must travel and the poor infrastructure that is generally found in the marketplace (Scoones 1995). Marketing institutions in pastoral areas are often poor and are not suited for procuring grain from livestock sales during a crisis, or for re-stocking after a crisis (McPeak & Barrett, 2001). Transaction costs can erode the returns to labour invested in livestock production and they can deter producers from participating in markets altogether (Drabenstott, 1995).

Important transaction costs are those of information asymmetry (where transacting partners have different capacity to access information) and the absence of institutions such as formal

markets (de Janvry et al, 1991). High marketing costs also arise when monopolies dominate the marketplace, when markets are far from the producer and where infrastructure is weak (Zaibet & Dunn, 1998). In pastoral areas there is a strong correlation between transaction costs and participation in markets (McPeak, 2002).

The multiple roles of pastoralist livestock need to be kept in mind when exploring the costs of marketing, since there may be a multitude of factors that influence the decision to sell livestock. Overcoming problems of access and infrastructure may improve the returns to livestock producers, but may not automatically lead to high levels of sale if livestock are being reared for other purposes (Perrier, 1995). Nevertheless, there is much evidence of increasing commoditisation of pastoral livestock and livestock products, which demands attention to marketing constraints and costs, whether for raising profits, reducing rent seeking or for increasing total economic output of pastoral systems.

As with many sections in this report, the full story is masked by the lack of data from pastoral areas: where government's default position is that pastoralism has no economic merit, there should be no surprise that no attention is paid to market failures. Yet examples of the losses incurred by pastoralists illustrate the significant constraint that is being put on these producers. Kenya provides one such example, where it is estimated that pastoralists should be obtaining up to 70% of terminal livestock prices but in reality they are only averaging 40% (Kibue, 2005).

Ethiopia presents a similar picture, where the proportion of transaction costs and service fees at the municipal market in Addis Ababa including broker fees is equivalent to an astounding 17% of the purchase price of a steer, 29% of a Bullock/oxen and 27% of a barren cow. It is little surprise that producers seek alternative markets or that smuggling of live animals, hides and skins from Ethiopia into neighbouring countries is costing the treasury an estimated US$100 million each year (BBC, 2001).

Illegal trade reflects the cost of going the legal route: "Superimposed structural constraints, especially in Sudan and Ethiopia, are affecting efficiency of domestic markets besides complicating the export procedures unnecessarily. The core of these problems (government barriers to cross-boundary livestock trade) is institutional ego and the drive to benefit institutionally (financially or otherwise) rather than collectively as a nation. The end results of such rivalries are duplication of effort, lengthy bureaucracy and wastage of time and resources that lead to inefficiency in international markets" (Aklilu, 2002).

Transport costs, of livestock and of goods purchased, are often prohibitive and act as a deterrent to traders. When individuals often are left to carry out transactions themselves, they incur heavy costs of time and resources and also loss of value (or even outright loss) of livestock brought to market (Sandford, 1983). Although it is common for pastoralist, indeed for any rural producer, to complain about the costs of brokerage, the importance of these brokers should not be underestimated. In Tunisia for example they account for 47% of all livestock sellers, whereas producers account for only a third. These middlemen provide a crucial service, alleviating producers of the high costs of travelling to markets, keeping up to date with market information, maintaining trade links with buyers etc. However, where government policies push trade into the black market, the opportunities and incentives for anti-competitive practices are greatly increased.

A number of market constraints are common to the majority of pastoral systems:

- Perishability and high transport costs of goods: lack of processing facilities mean that access to certain markets is limited, and transportation, although an option (particularly in the case of meat) is expensive and significantly reduces returns,
- Lack of financial services: producers do not have the necessary capital to underwrite cash expenses associated with marketing, they lack insurance and thus face risks of taking livestock to market, and they lose choice over the timing of sales,
- Lack of organised national markets: a critical factor is the lack of price information, and resultant exploitation by middlemen brokers, exacerbated by lack of livestock holding facilities, feed and water,
- Excessive government bureaucracy and fees: the extractive nature of government's involvement in trading leads domestic traders to seek unofficial channels.

Such expenses translate into significant 'transaction costs' associated with marketing, and represent a real opportunity for government investment in order to increase the efficiency of markets and raise the returns to producers.

Government involvement in pastoral marketing

Achieving the economic potential of pastoralist regions requires the provision of enabling incentives, including land and resource rights, access to credit and banking services, relevant research and extension and improved access to government, providing these rights and services are adapted to the pastoral context (Mortimore, 2005). The solution to pastoral marketing problems is not a simple one: it requires an overhaul of a wide range of policies to support pro-pastoralist development in the drylands.

Information is widely cited as a major constraint to trade, or a driver of the low returns that are often captured by producers. However, in many pastoralist societies, access to information is not enough on its own, but producers need to also develop the capacity to use that information (McPeak and Little, 2006). Even with information and the capacity to use it, pastoralists are unlikely to be inclined towards sales when desirable goods and services are either not available, or are costly or unreliable. Government may be well advised to consider what it is that pastoralists wish to purchase as much as they worry about how they generate income.

Unfortunately, the perception that pastoralism does not produce significant economic gain means that many governments fail to make the necessary public investments in market infrastructure, roads, security, education and human and institutional capacity building (McPeak and Little, 2006). Sometimes markets are also lost due to government action that terminates access to markets (through higher prices) or raises costs. In the ex-Soviet rangelands, for example, erosion of the Soviet-era markets was experienced after the withdrawal of government services, particularly veterinary services and supplemental fodder supply (FAO, 2001).

The role of government in developing and protecting global markets differs from one country to the next. Somalia and Ethiopia are relatively poor economies and are technologically underdeveloped but they are firmly integrated into global markets with impressive results in terms of both value and volume. This is achieved despite very unsupportive government policies and regulations (BBC, 2001). In other cases (for example, Southern Africa) strong or benign governments occasionally subsidise livestock producers and have high-end export markets, yet traditional smaller-holder households remain excluded from routine market involvement (Behnke, 2006).

In China's case, the development of wool and cashmere markets has been actively supported by the government; by contrast the shift out of wool into cashmere in the ex-Soviet rangelands coincides with the sharp reduction of government involvement in the post-Soviet era (Kerven, 2006). Government involvement is justified where a product can demonstrate sufficient returns over costs and pastoralists can exploit the low-input nature of their production system. The role of government therefore should be confined to either opening markets that fetch higher prices, or reducing production and/or marketing costs.

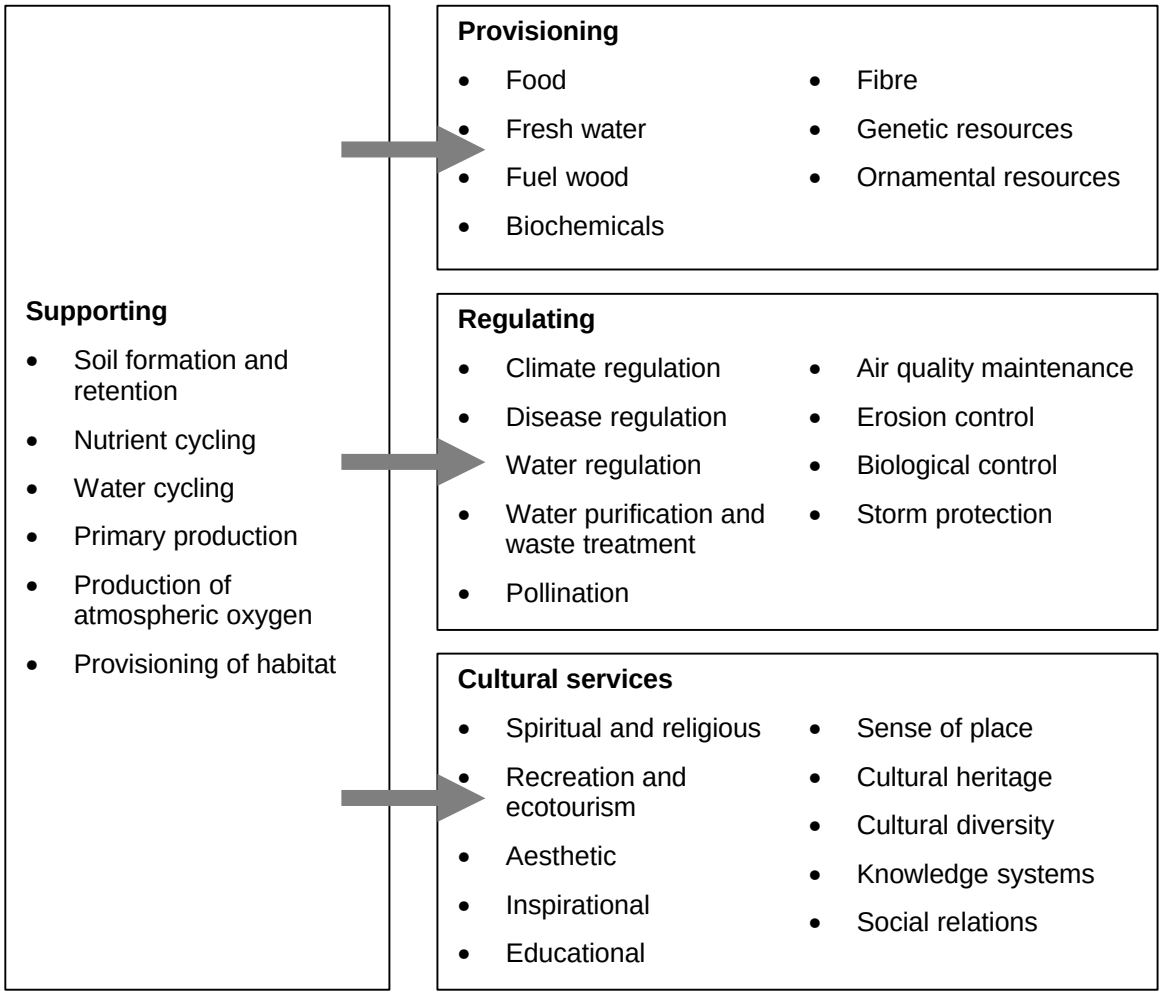
Indirect values of pastoralism

With the rethinking of rangeland ecology and the new understanding that emerged in the 1990s, it became clear that mobile pastoralism is vital for rangeland ecosystem health and sustainability. However, healthy rangelands are of value to many more stakeholders than pastoralists. They provide benefits to tourists and the tourist industry, they provide a wide range of natural products that are consumed far beyond the rangeland boundaries and they support ecosystems services that have global benefits, as illustrated in Figure 3.

The magnitude of these values is difficult to quantify, yet their importance for pastoralists and non-pastoralists alike may be immense. However, such values of often taken for granted, such as the replenishment of watersheds or the sequestration of carbon. In other cases, the value has already been forgone, as in drylands that have been degraded as a result of restrictions placed on pastoralism. The values inevitably go un-measured, pastoralists are

rarely remunerated for protecting these goods and services and mis-guided efforts to eradicate pastoralism run the serious risk of eradicating these goods and services too.

Figure 3: Ecosystem services (Millennium Assessment 2003)



There are significant complementary indirect goods and services associated with pastoral landscapes, and with pastoralism as a human activity, that stand to be lost or compromised by neglect, expropriation or conversion of rangelands. “To focus on commercial pastoralism, a human lifestyle of developed nations, is to further marginalize the ‘people’ issues of rangelands. More attention to other goods and services will help develop the flexibility needed for the proper use of the rangelands.” (Grice and Hodgkinson, 2002 citing Box, 1986). The import of this statement is clear: rangelands and rangeland stakeholders will benefit from an approach based on recognition of the multiple roles and values of rangelands, beyond the narrow focus on commercial products.

Environmental services (such as carbon sequestration, biodiversity, combating desertification and erosion) are increasingly highly valued in the global context and their promotion could represent an important economic potential. In most of Europe, pastoralism takes place in areas of High Nature Value (HNV), and in many places it is pastoralism that has created this High Nature Value after hundreds or thousands of years of existence. Since this land often cannot be used for other, more intensive forms of agriculture, the abandonment of pastoralism results in total abandonment of the land, and thus in the loss its pastoralism-related HNV (often through the encroachment by shrub and eventually reforestation): the ecological importance of pastoralism is indisputable. This was recognised by the Third International Conference on "Biodiversity in Europe" and the 8th meeting of the Council of the Pan-European Biological and Landscape Diversity Strategy (PEBLDS) in 2004, Madrid, which recommends attention to the role of pastoralism using traditional practices that can maintain biological diversity in mountain ecosystems.

Pastoralism in Europe is recognised as having a range of roles in managing rural areas: grazing of Swiss alpine pastures is vital for avalanche control and therefore essential to the tourism industry; grazing in the south of France is necessary for the prevention of fires (although only a few areas allocate payments for grazing as a fire prevention tool). In the UK, conservation trusts pay herders to graze their flocks on trust land that is grazing dependent, in order to maintain its aesthetic appeal.

Measuring indirect economic benefits

Indirect values consist of products or services some of which carry a market value, some of which a value can be imputed from a substitute (for example, firewood value expressed as the cost of charcoal equivalent), and some of which market values are difficult (if not impossible or inappropriate) to derive. The key challenge is how to value products or services to which no market value, or price, is articulated. Table 2 lists some of the approaches and techniques used for tackling specific value-types that are not articulated in the market.

Table 2: Summary of valuation approaches and techniques used (IUCN, 2005)

Approach	Technique	Nature of value	Advantages	Disadvantages
Stated preference	Contingent Valuation	All direct, indirect and non-use values	▪ Can be used for all value types	▪ Subject to many biases ▪ Large data requirements
	Choice Modelling	All direct, indirect and non-use values	▪ Can be used for all value types ▪ No bias	▪ Complex analysis ▪ Large data needs
	Participatory Economic Valuation (PEV)	All direct, indirect and non-use values	▪ Can be used for all value types ▪ Small data requirements	▪ Subjective
Revealed preference	Market price analysis	Direct values (extractives, inputs, Marketed products	▪ Reflect market prices ▪ More limited application	▪ Large data requirements
	Cost-based methods	Indirect use values	▪ Reflect market prices ▪ More limited application	▪ Large data requirements
	Productivity methods	Indirect use values	▪ Reflect market prices ▪ More limited application	▪ Large data requirements
	Avertive or preventive expenditure	Indirect use values	▪ Reflect market prices ▪ More limited application	▪ Large data requirements
	Travel Cost Method (TCM)	Tourism values	▪ Reflect market prices ▪ More limited application	▪ Large data requirements
	Hedonic Pricing Method (HPM)	Use value associated with change in environmental qualities	▪ Reflect market prices ▪ More limited application	▪ Large data requirements
Benefit transfer	Use of other empirical studies	All direct, indirect and non-use values	▪ Small data requirements ▪ Cost-effective	▪ Inapplicability of existing studies

Three broad approaches are listed in Table 2:

- 'Stated preference' essentially relies on direct elicitation of the value from a respondent, for example, the amount an individual was willing to pay for forest protection. Different techniques reflect the trade-off between subjectivity bias and heavy data and/or analysis requirements. The main relevance of values arrived through subjective means is not so

much in their exact value, as for the relative priority, direction and magnitudes of the values arrived at;

- 'Revealed preference' uses value proxies based on markets, for example, premiums paid for city housing according to the quality of the local environment. Whilst relatively objective and therefore accurate, this approach tends to be data intensive;
- 'Benefit transfer' simply refers to use of other studies to impute value, for example, studies valuing tourism from which a value of pastoralist-related tourism could be arrived at via credible assumptions. This method is the most cost-effective, although the applicability of the existing studies can be an issue for concern.

Table 3 illustrates an example of types of environmental values (in this case for forests) that could be typically derived from a mixture of the above methods (Box 1). There are similarities with pastoralist system value types. In this example, it can be seen that, while the annual contribution to GDP and export earnings to Kenya is US$4.22 million, annual value to forest adjacent households stands at US$94 million per year, with commercial value of US$11 million, tourism value of US$35million, and watershed protection service value of some US$35 million annually. The values also indicate the opportunity cost of conserving forests in terms of farming income foregone, the values of which are substantial. This likely indicates that the watershed value was not computed at a national scale, given that these forests are the source of Kenya's water supply. It can also be noted that less tangible values, such as carbon sequestration, biodiversity, climate control, employment and other social and/or aesthetic values, are also not computed.

Table 3: Estimates of economic values in Kenya's forests (Emerton et al., 1998)[2]

THE ECONOMIC BENEFITS OF KENYA'S FORESTS	
To the national economy:	
Contribution to GDP	US$ 4 million per year
Foreign exchange earnings	US$ 0.22 million per year
For forest-adjacent households:	
Kenya indigenous forests	US$ 94 million per year
Aberdares forest	US$ 165/hold/year
Arabuko Sokoke forest	US$ 135/hold/year
Kakamega forest	US$ 160/hold/year
Mau forest	US$ 350/hold/year
Mount Kenya forest	US$ 212/hold/year
Oldonyo Orok forest	US$ 100/hold/year
To commercial and industrial firms:	
Formal sector industry	US$ 2 million per year
Indigenous timber, Kenya	US$ 7.3 million per year
Indigenous timber, Kakamega forest	US$ 1.2 million per year
Indigenous timber, Mau and Trans Mara forests	US$ 0.3 million per year
To tourists:	
Forests in National Parks and Reserves	US$ 34.7 million per year
Mount Kenya forest	US$ 0.3 million per year
Watershed catchment protection values:	
South West Mau, Ol Pusimoru, Trans Mara	US$ 0.12 million per year
Mount Kenya	US$ 20.4 million per year
Aberdares	US$ 7.4 million per year
Mount Elgon	US$ 3.7 million per year
Nandi	US$ 1.6 million per year
Cherangani	US$ 0.4 million per year
Loita Hills	US$ 2.1 million per year
Agroforestry values:	
Fuelwood and crop productivity	US$ 330/ha/year
Fuelwood	US$ 0.60/ha/year

[2] Most of the data refer to the period 1992-1997, and are expressed in 1996 prices.

Timber	US$ 23/ha/year
Saved chemical inputs	US$ 9/ha/year
Dairy	US$ 144/cow/year
THE ECONOMIC COSTS OF KENYA'S FORESTS	
To the Forest Department:	
Development and recurrent expenditure	US$ 1.2 million per year
To local households:	
Animal damage around Shimba Hills National Park	US$ 0.45 million per year
Animal damage around Mount Kenya Forest	US$ 1.04 million per year
Opportunity costs of agriculture foregone, all Kenya's forests	US$ 307 million per year
Opportunity costs of agriculture foregone, Mount Kenya forest	US$ 72 million per year

Examples of indirect values

This section presents some examples indirect values of pastoralism. These include tangible complementary dryland products that are maintained by pastoralism, intangible complementary dryland products that are supported by pastoralism (e.g. tourism) and ecosystem processes and services that are enhanced or maintained by pastoralism.

Dryland products complementary to pastoralism

There are many products that come from pastoralist lands which are increasingly sought after. Many of these products have a high value on global markets and, for the most part, they are passively managed by pastoralists. Production or collection of these commodities is often central to pastoral livelihoods and could be considered a direct value of pastoralists. However, here they are considered as indirect values of pastoralism (as a production system), which mobile livestock keeping can enhance.

Gum arabic

Gum arabic is obtained from Acacia Senegal and A. seyal trees throughout the so-called 'Gum Belt' extending continuously from East to West Africa, as far south as Tanzania, encompassing most of Sudan, and across to Senegal. Gum Arabic is used in a multiplicity of industrial applications for confectionaries, flavours, health and dietary foodstuffs, pharmaceutical products, cosmetics and chemical applications such as inks and paints. Users include large multinational corporations including Coca Cola, Cadburys and GlaxoSmithKline. Demand is relatively inelastic, meaning that substitutes are inferior enough to ensure that demand continues, even though supply is somewhat sporadic mainly due to lack of build-up of buffer stocks. The main traditional producer has been Sudan, which realised US$50 million on average each year from 1979-1991. However, demand has always outstripped supply, and Chad and Nigeria are now making concerted efforts to engage in the trade (Somo, 2006). The main challenge facing this sector is in the cost-effective and timely harvest of gum, a role pastoralists are well suited to due to local knowledge of tree conditions over a wide area, and the fact that these activities can be carried out in conjunction with herding.

Honey

Honey represents another dryland product consumed globally, with apparently untapped potential. To take the example of Kenya, according to FAO, there is a marked decline in the value of honey imports into Kenya, from 63 metric tonnes in 2000 to 10 metric tones in 2003, due to the increased presence of high quality honey from local processing companies. Kenyan honey is generally expensive with the local price being higher than the international price, whilst demand apparently remains high due to its superior quality. Kenyan honey producer prices are higher than the US$1.25 pr kg being paid for organic honey internationally. It is far higher than the US$0.7 per kg being paid for bulk purchases. The fair trade market represents a more attractive market as the producers are paid a higher price of US$1.80 per kg. Most of the dryland areas have also little or no agricultural activity hence the use of chemical pesticides is limited or non-existent, which also renders the wax marketable (though it is often wasted). The potential exists then for the more profitable local market to be exploited before venturing out into exports (SNV 2005). Pastoralists are in the best position to

exploit harvesting opportunities due to local knowledge and cost-sharing in terms of harvesting time over large areas.

Medicinal plants

Medicinal and other high value plants provide important supplementary incomes to many pastoralists, as well as have importance for traditional remedies in areas that are typically poorly served with modern medical services. In Morocco, 48% of pastoralists collect medicinal plants and 70% wild mushroom and truffles (Steimann 1998). Iran recorded 39,000 tons of medicinal plant harvested (worth US$77.7 million) 1989-93, and many range plants exist with significant medicinal and industrial value (e.g. galbanum, gum Arabic, aloes, Artemisia). Some companies and countries are now starting to experiment with cultivation of such plants and to explore the synergies of a silvo-pastoral production system. Soaring world energy prices are driving the interest in oil-bearing trees that produce bio-diesel, with organic manure as a by-product rich in NPK (nitrogen, potassium and phosphorous) – an example is the Indian *Jatropha curcase L*. species of the Euphorbia family. Apart from local knowledge, one of the important roles to be played by pastoralists is in ensuring sustainable harvest of plants since this sector is susceptible to unlicensed over-exploitation by outsiders.

Tourist services

One of the greatest values associated with pastoral systems may be the tourism value. Three obvious aspects are wildlife tourism, cultural tourism, and aesthetic landscape value.

Wildlife tourism

Wildlife value is particularly significant in Africa, but extends to Asia, to a lesser extent South America and is relevant in Europe, particularly Eastern Europe. Significant data exists in the African context on the value of tourism on a per country basis, whilst in general, most of the wildlife attractions are savannah-based. It is also acknowledged that these wildlife populations are not viable if confined to protected areas and that in fact they utilise and rely on pastoral lands as an integral part of their existence (AWF, 2006). The value that can be assigned to pastoralism in the context of wildlife tourism is very significant. In addition, there is now substantial literature that shows that livestock grazing confers significant benefits to wildlife in terms of maintaining or enhancing biodiversity, and the ecosystem services that support such biodiversity, including water and nutrient cycles. This aspect is addressed in more detail later in this report.

Cultural tourism

Cultural tourism is an increasingly important aspect of the tourist industry. Traditional cultures evoke significant interest globally, as attested by the appreciation for and knowledge of the Maasai of Kenya and Tanzania, the Dinka of Sudan, the Tuareg of West Africa, the Bedouin of North Africa and the Middle East, Mongolian herders and the Pashtan of Afghanistan, for example. The significance of this value is illustrated by the amount of advertising for wildlife safaris in Kenya and Tanzania that utilises Maasai images and citations, where the image of the traditional pastoralist has become an icon.

Aesthetic landscape value

As with wildlife, aesthetically valued landscapes are of great value to the tourist industry and can be enhanced and protected by pastoralism. The previously cited examples from Europe illustrate that the managers of such landscapes are increasingly inclined to actively recruit pastoralists to graze their herds in order to effectively manage such lands. In such cases the market may directly determine the value of this services, although in most countries the service is not remunerated and the role played by grazers is entirely ignored.

Ecosystem services

It is becoming increasingly apparent that livestock productivity and conservation can be mutually reinforcing, and a number of diverse examples of such practices are emerging. A range of examples are given below of the use of livestock in managing ecosystems.

Animal maintenance of grasslands

African landscapes evolved with enormous herds of wild ungulates and like many rangelands are grazing dependent (Frank 1998). Research has shown that standard concepts of carrying

capacity are inappropriate in non-equilibrium environments such as the semi-arid to arid rangelands, and opportunistic pastoral systems, involving mobility and fluctuation in herd size, are more sustainable than constant stocking rates (Behnke and Abel, 1996; Dijkman, 1998; Breman and de Wit. 1983; Turner, 2003; Savory, 1999). A huge body of literature now exists showing that, under proper management, livestock are beneficial to rangeland productivity and biodiversity. Indeed, this is a logical conclusion when one considers the widely accepted concept of co-evolution – in this case, grazers and grasses – where grass plants reflect such symbiosis through ground-level growth points that can withstand severe 'harvesting' of plants from passing herds, particularly bulk grazers such as buffalo, cattle, zebra, hippo and white rhino. Other things being equal, animal-maintained grasslands would appear to support greater species numbers and richness than alternatives such as fire-maintained or bush-encroached grasslands, not only from the viewpoint of available food biomass, but also in terms of contribution to well-functioning water cycles, mineral cycles, and energy flow at system level.

Water cycling

This approach recognizes that grazing pressure can be timed to maximize plant productivity and overall biodiversity (Voison, 1998; Savory 1999). Taking into account that time rather than numbers of animals is what is to be managed, this method captures the benefits of grazing species and livestock mobility to dramatically increase grazing land cover. With increased soil cover, there is increased infiltration (decreased losses of water from runoff and evaporation) and subsequently there is more water available to recharge streams, bore holes and springs to support livestock and wildlife. This approach is being increasingly used by ranchers across the 'developed drylands' of the USA, Australia, Canada, Mexico and South Africa. Results from the US have been impressive with a 300% increase in the types of perennial species and an increase in beef productivity from 66kg/ha to 171 kg/ha (Stinner at al, 1997). Similarly an Australian wool producer used this approach to increase stock numbers while increasing the groundcover, enhancing species diversity, improving water quality in the rivers and dams, and building the diversity of birds for pest control, whilst setting aside one-third of their land as timber corridors for wildlife habitat (Land Water and Wool, 2006).

Habitat Protection

In the English landscape, over half of the 4000 sites of special scientific interest are of international importance and make up over 3.5% of the country. These are grassland, heath, wood pasture, floodplain and coastal marshes, all of which are recognized to require livestock grazing to conserve the associated wildlife habitats. Grazing plays a role in the maintenance of the species habitats through preventing scrub encroachment and removing plant material without cutting and burning, and thus giving area for species mobility. These areas respond differently to grazing, some negatively to undergrazing and others to overgrazing. Recent reforms in the EU's Common Agricultural Policy have removed the animal-head based subsidy, so uneconomic livestock grazing is likely be abandoned by farmers, putting the future is in the hands of market forces and English Nature, a government agency that champions the conservation of wildlife throughout England, is seeking ways to continue the use of grazing livestock for conservation (English Nature, 2006).

Protecting wildlife corridors

Through the LACOPE[3] project, research teams from seven European countries are contrasting four pastoral systems ranging from Reindeer Husbandry in Norway to Sheep grazing in Spain and Poland and Cattle grazing in the Swiss Alps to understand how large scale grazing systems can lend itself to biodiversity improvements and habitat creation for target species of EUROPA NATURA 2000 System[4]. This project stems from a perception that large scale nature conservation efforts have not been successful and it focuses on institutional arrangements among pastoralists. Early results have raised the importance of

[3] LACOPE is the Landscape Development, Biodiversity and co-operative Livestock Systems in Europe

[4] For information on EUROPA 2000, visit http://ec.europa.eu/environment/nature/home.htm

institutional mechanisms and the legal setting as well as the current socio-economic and technical trend (Gueydon and Roder, 2003).

Preserving and enhancing wildlife

The traditional conservation approach, whereby a section of land is essentially alienated from human activities, most importantly pastoralism, is drawing increasing criticism as it removes key resources upon which community members depend on for their livelihood. This has fuelled community resentment and ultimately has undermined support for wildlife conservation. Furthermore, experience is showing that wildlife populations do not appear to thrive under this model, except in situations where the conservancy is very large, which is often not socially and politically possible. In Kenya's Maasailand, the distribution of wild mammals was compared between parks, park border areas and outside parks. The greatest diversity and the highest concentrations of wildlife were found not inside the parks, but rather in the neighbourhood of grazing livestock. This surprising result shows that wildlife can gain from the presence of settlements and pastoralists. The existence of both land-use forms side by side is widely believed to be most beneficial for the maximisation of income and food security in rangeland areas (ILRI, 2006). New models are now being explored wherein boundaries between livestock and wildlife are erased, and where the whole range is brought into production. Under such a system, wildlife rotation simply mirrors livestock rotation, using maximum available land area and countering drought and dry seasons with significantly improved plant productivity, biomass and diversity across the whole area utilized, sufficient to withstand stress periods.

Livestock-Wildlife Disease and Predator Management

Wildlife are known disease reservoirs and sometimes vectors. However, in a review of current knowledge on the wildlife/livestock disease interface, Kock (2002) concludes "the interface…will need to be better understood by all the stakeholders. More research is needed, as are new philosophies and attitudes, and new approaches to livelihoods and resource use". Traditional pastoral management, particularly in Africa, has focused on managing livestock-wildlife interaction in time and space. This practice still followed today, but is made more challenging by the global trend of significant pastoralist loss of land and mobility. Predator management is a thus a further challenge for an already disadvantaged people. Two known approaches to managing the predators attracted by wildlife are well-documented: predator-proof corrals and; guard dogs. Livestock guardian dogs have a 1000-year history of use throughout Europe, including the more famous Anatolean shepherd dogs and Spanish Mastiffs, which specifically guard against wolves, bears and foxes. Alternatively, several initiatives are under way in Eastern and Southern Africa, to improve traditional night corrals to be effective against lion, leopard and hyena (WCS, 2005). However, these are less mobile than the traditional corrals, and can require some adjustment to grazing patterns and/or frequency.

Climate Change and Carbon Sequestration

Ecosystem process management, as discussed above (water cycle, mineral cycle, energy flow and plant succession, or community), holds significant implications in terms of increased rangeland biomass productivity and, by extension, adaptation to climate change. Recent evidence suggests that, by dint of the vast area they cover, grasslands have greater potential ability for carbon sequestration than forests.

Recognising the opportunity costs of replacing pastoralism

Pastoralism has been replaced in many countries to varying degrees and competing land-uses have received disproportionate support and incentives which have enabled them to oust pastoralism for key tracts of land. These changes sometimes indicate the seizing of opportunities by pastoralists, but they often reflect pressure over drylands resources and land, as in the case of some Maasai in Tanzania who have resorted to farming as a means to protect their land from encroachment. Similarly in Morocco, pastoralists encroach illegally on rangelands, using cultivation, as a mean of appropriation of the surrounding grazing land (Dutilly-Diane et al., 2005). Land use change is exacerbated by the breakdown in customary institutions that are needed for supporting extensive management.

Policies are overwhelmingly stacked in favour of the alternatives to pastoralism in the drylands, with services provided for sedentary people, in particular cultivators, and extension services in many drylands exclusively teaching crop cultivation practices. Key drylands resources are often fenced off for intensive agricultural investment without any consideration of the cost to the existing pastoral enterprise. Yet if the full value of pastoralism was considered, and the integral role of these key irrigable resource pockets was taken into account, a pragmatic decision maker would be much less hasty to annexe the land and undermine pastoralism.

Pastoralism is a system, in which small pockets of rich resources render vast tracts of low-grade rangeland productive. When a hectare of irrigable land is taken out of the pastoral system, its opportunity cost is not simply the cost of that irrigated hectare of pasture, but the tens of hectares of dryland pasture that have been rendered inaccessible as a result. With the current dearth of data on pastoral production it remains hard to quantify these costs, although a simple working estimate is sketched out in Box 3 to illustrate how such costs could be estimated.

Box 3 – opportunity costs of replacing pastoralism in the Afar region of Ethiopia

The Afar region of Ethiopia covers an area of 100,860 km^2 (Ministry of Foreign Affairs Ethiopia, 2002) and has a mean regional livestock population of 2,741,500 TLU (Secretariat for the Regional Co-ordinating Committee, 1999). This means an approximate average livestock population density of 4 hectares of rangeland per tropical livestock unit (TLU).

One TLU represents 1.4 cattle, and assuming that each herd consists of 70% mature females, four hectares of rangeland supports the equivalent of one adult female cow. One cow produces an average of 224 litres of milk per year allowing for lactation lengths and calving frequency (Dahl and Hjort, 1976, pp175). The following figures provide an estimate of the annual direct values accruing per TLU of cattle in Afar:

Direct value	*US$*
Estimated annual value of milk[5]	*54*
Mean annual livestock sales[6]	*15*
Annual herd growth rate	*9*

This selection of data does not capture the full direct value of pastoralism in Afar as it omits the value of leather, the value addition that is captured through the processing of butter and the transportation values of camels and donkeys. Nevertheless, the data provides an estimated mean pastoral livestock productivity of US$78 per 4 hectares.

However, the opportunity cost is a little more complex than this, as the irrigation of land not only removes that resource from pastoral production, but makes a larger area of rangeland, dependent on those key resource pockets, inaccessible (assuming that irrigation means exclusion of graziers). In Afar, it is unlikely that even 10% of the land could be irrigated, but by irrigating that portion, the larger rangeland region would be rendered unproductive.

Data on the irrigable proportion of Afar is not available, but an Ethiopian newspaper article claims that 25% of the Awash valley is irrigable[7] *and this figure is used even though it may be an exaggeration. Using this estimate, if the region's full irrigation potential was met, for each irrigated hectare, three un-irrigable hectares would be lost through access constraints. Thus each irrigated hectare comes with the opportunity cost of four hectares of lost pastoral revenue and the conservative estimate of direct opportunity cost of irrigation in Afar is US$78 per hectare.*

These figures obviously only address direct values and if the measurable indirect values were also taken into consideration added, the real opportunity cost would rise further.

[5] Estimated at 2 Ethiopian Birr or 0.24 US$ per litre

[6] Davies, 2004

[7] Ethiopian Herald, 25 February 1999

Indirect opportunity costs associated with alternatives to pastoralism include the loss of social security mechanisms, which could be measured by the cost of providing food aid to pastoralists whose livelihoods have been undermined or the cost of soil erosion from dryland cultivation (e.g. barley production in Algeria; wheat production in Kenya). Indirect opportunity costs also need to examine the loss of people-supporting capacity of the rangelands as pastoralism is replaced with less productive alternatives, such as ranching. This cost occurs in the form of unemployment and migration to settlements and urban slums.

However, the opportunity costs do not necessarily have to preclude investment in alternative economic practices in the drylands. If the value of pastoralism is recognised it may encourage planners to look at synergies between pastoralism and cultivation. For example, irrigation of key resource pockets could benefit pastoralism if part of the land were used for fodder cultivation and crop residues were made available.

Nevertheless, irrigated crop production has often proven to be unsustainable: soils become degraded by salinity and ground water resources are exhausted. In India, the government has supported irrigated agriculture in the Thar desert, by subsidizing power, fertilizer and high-yielding crops. As a result a tribe of "tubewell nomads" has arisen: farmers who pump up groundwater to grow crops such as mustard and wheat. As irrigation allows the growth of more than one crop per year, there has been a reduction in fallow periods, when pastoralists can graze their herds after harvest. The irrigated cropping commonly goes on for a few years, during which farmers deepen their wells with dynamite from time to time, until the groundwater level sinks below the reach of their pumps. Farmers then move on to the next spot, leaving behind barren, salty ground in place of the previous drought-resistant vegetation (Mathias, 2005). Pastoralism, on the contrary, has proven to be sustainable over the long term, having adapted to, and to some extent shaped, its environment.

A more holistic approach is required to value all uses of the drylands, to allow more balanced comparison between pastoralism and alternative land uses, and to provide the arguments for reducing opportunity costs of alternative development plans. This will allow more economically rational decisions to be made, including producing synergies between pastoralism and alternative land uses.

Towards a methodology for valuing pastoralism

This report highlights a range of different values that should be attached to pastoralism, but many countries lack even the simplest data on the direct contribution of pastoralism, and where there is data it is often insufficiently robust to convince policy makers. The lack of information allows policy makers and others to hold on to their beliefs in the economic irrationality of pastoralism. It allows the promulgation of policies that promote less economically or environmental sound production systems in the drylands. It enables government to implement policies that drive a thriving black market further underground and which contribute to impoverishment of pastoralists.

However, the indirect values of pastoralism could be of use in changing attitudes towards pastoralists, since the externalities of their system are of importance to many of their detractors. The tourist industry, which benefits already from pastoralist culture, could radically change its relationship with pastoralists if it understood the added value of grazing in wildlife sanctuaries.

A better understanding of the pastoral economy, in all its diversity, can help to develop supportive rather than obstructive policies. However, to understand the pastoral economy requires a much more comprehensive tool kit than has hitherto been applied. The examples presented in Table 1 include a number of extensive and costly research methods and a more cost-effective system of valuation may be required to make reasonable estimates of the magnitude of these values.

Some common challenges in valuing pastoral systems

- The knowledge gaps are generally larger than the available knowledge;
- Current valuation tools concentrate on per-animal productivity and commercial off take;
- Record keeping tends to exclude informal markets, where most transactions occur;

- Data on the pastoralist sector is not disaggregated from the wider livestock or agricultural sectors;
- The cost of collecting data from pastoralist areas is prohibitive, given distances, conditions and movement;
- Backward and forward linkages to the wider economy are often overlooked – in the Namibian case a multiplier of 1.8 multiplier used, but this serves to highlight the information gaps;
- Valuations tend to ignore the social role of pastoralism in terms of number of people employed and supported;
- Livelihoods are not neatly compartmentalised and many pastoral people diversify into off-farm activities;
- Climate and price fluctuations mean that any detailed analysis needs to work over long enough period (of several years) in order to obtain representative figures;
- It is necessary to work at different geographical scales and national data have to be refined by microeconomic survey;
- Methodologies for economic valuation of environmental services are becoming more common for on-site effects but off-site effects are generally poorly assessed.

Direct measurable values (live animals, milk, hides and other derivatives)

Data on direct measurable contributions of pastoral systems should be the easiest to obtain, although there are still challenges in estimating trade that falls outside of official or formal channels. Once broad estimates are made, it is then possible to assign prices and estimate the trade as a proportion of GDP. Estimating the contribution to foreign exchange earnings presents the challenge of disaggregating pastoralist data from the wider livestock sector.

Direct unmeasured values (employment, production and environmental management skills)

The benefit to wider society of employment in pastoral areas is very hard to quantify, but estimates of the cost of failing to support pastoral livelihoods can perhaps be developed through estimates of the costs of humanitarian intervention.

Indirect measurable values (subsistence, inputs to tourism, inputs to agriculture, market linkages, taxes)

Estimating subsistence values of pastoralism requires an understanding of consumption habits and patterns, but such estimates are not difficult to obtain. This subsistence value, when contextualised with the social values of livestock products, can be used to understand the potential for increased market involvement. The subsistence economy is also a valid component of GDP and the figures should be appropriately captured in the direct measurable value.

Indirect unmeasured values (Ecological and rangeland services, agricultural services, socio-cultural values, option and existence values)

These values remain a significant challenge to quantify, although some precedents have been set in non-pastoral environments. Some of the values may be more amenable to measurement, or more appropriate to measure, than others. However, reducing socio-cultural values to monetary terms could be both misleading and insensitive. However, a richer qualitative understanding would provide a stronger basis for convincing policy makers of the value of these 'goods'.

Valuation recommendations

Whilst rigorous studies would be useful in understanding the full value of pastoralism, such studies are currently few, and more rapid, extensive and cost effective methods are needed to enable practical but accurate portrayal of the total value of pastoralism. Useful types of data as well as appropriate methodologies of data collection and analysis are presented below.

Table 4 – information and potential data sources

Value	*Sources of data/information*
Sales	household level data on sales in-country market data national statistics for GDP and foreign exchange earnings
Subsistence	household level data estimates from neighbouring regions or countries
Complementary products	household and/or market data on extent and magnitude of associated dryland products such as medicinal plants, gum Arabic
Tourism	percentage of tourism sector supported by pastoral landscapes value of tourism to GDP and foreign exchange earnings employment
Market chain linkages	review of pastoralist-related 'value-added' market chains and multiplier effects within national economies global added value for medicinal plants (e.g. gum arabic)
Return-on-investment	review of national expenditures into support for pastoralist systems

More contextual interpretation, analysis and packaging will be possible with a comprehensive country-level situational analysis. In addition, total economic valuation will benefit from greater awareness of global efforts to value and compensate indirect goods, such as through Payment for Ecosystem Services (PES). The opportunity costs of either modernising or transforming pastoralist systems can be sketched out using available data and a form of cost-benefit analysis could be used to evaluate the use and impact of development expenditure, associated with either modernising pastoralism or developing alternative non-livestock production systems such as arboriculture and agroforestry.

Various methodologies are being developed for participatory economic valuation, for example, the current studies led by CARE International and supported by the African Wildlife Foundation (AWF) and IUCN which set out to assess the distributional costs and benefit of both community and nationally protected areas, across four countries: Thailand, the Philippines, Kenya and Uganda. This is proving to be a useful approach to assessing the value of intangible costs and benefits against the value of tangible costs and benefits. This method could be relatively easily adapted to the purpose of valuing intangible costs and benefits associated with pastoralism, whereby community members representing a specified scale (for example, district or region) could assess the value of certain dynamics and policies, in addition to outcomes, which they have themselves identified as being important. The main challenge is in identifying and bringing together target respondents. An additional challenge is in obtaining a representative household view, due to the fact that roles, responsibilities, earning and spending are largely segregated between men and women (CARE, 2006).

Policy Recommendations

The ability to withstand environmental shocks is a defining feature of pastoralism, but pressures on pastoral systems – many of which are a direct result of antipathetic policies – have undermined the customary ability to cope. This weakening of pastoralism has not been balanced by other risk-reducing advances that should be expected with 'progress', such as human capital development (education, health), access to financial capital (credit, savings) or improved access to markets & other infrastructure.

Overcoming the constraints to pastoralism is not a simple matter of adjusting one or two policies: in many countries a whole range of policies impose unnecessary constraints on pastoralism. This section puts forward recommendations for policies that must support pastoralism if the true economic potential, not to mention the environmental sustainability, of rangelands is to be achieved. The policies are presented in four categories:

1. Pastoral production policies
2. Pastoral marketing policies
3. Rangeland policies

4. Social policies

Pastoral production policies

Support pastoralist's priorities

Most policy dialogue is skewed towards production concerns, rather than system concerns. Policies remain focused on production-related interventions, even as national livestock policy is being reviewed to incorporate modern conditions, as in the 2005 Tanzania Livestock Policy Review Process (IIED 2006) and the Kenya Livestock Policy Review process (FAO-SARD 2006).

Whilst improvement in production and commercialisation remain important goals, livestock policy needs to concentrate more on pastoralist needs, which are not always market centred, and certainly not always oriented towards maximising off take. Policies should not be framed on the assumption that any change in the production system will automatically benefit pastoralism.

Policies and interventions should not remain externally driven, designed by non-pastoralists whose intentions may be noble, but who rarely understand pastoral systems, dynamics and needs. Greater consultation and input from pastoralists would serve to rectify many of policy design flaws and the use of multi-stakeholder policy analysis should become routine.

Support communal tenure

Demarcation and titling of land and elimination of mobility still remains the central pillar of most land policies in pastoralist regions. Aside from the serious negative economic repercussions for livestock production (see Table 1), and its highly damaging effect on drylands environments, privatisation of land is likely to penalise poorer members of the community since they will be denied access to resources that are currently accessible to all (IIED 2006).

Mobility is crucial to the economic viability of pastoralism and the environmental sustainability of rangelands, and customary tenure systems are vital to mobility. Some pastoral systems around the world benefit from dual tenure arrangements, for example with seasonal buffer zones privately titled and communal rights to larger and more extensive pastures. However, this is by no means uniform, and systems of communal tenure are an integral, almost defining, feature of pastoralism worldwide.

Box 4: Key elements of appropriate pastoral land tenure systems:

- *Protect mobility both within and between countries*
  - *Access to agricultural areas*
  - *Access to drought refuge zones*
- *Secure pastoral control over key resources in their "home areas"*
  - *Regulate the use of livestock watering points*
  - *Develop and enforce local agreements for resource access*
- *Enable negotiated and reciprocal access to resources between groups to accommodate variable and dispersed resources from year to year*
- *Facilitate multiple land use and over-lapping rights of access to resources*

Enhance mobility

The assumption that mobile pastoralism is archaic and economically irrational has long been one of the driving forces behind the policy of sedentarisation. This belief has persisted and still heavily influences dryland policy, despite overwhelming evidence to the contrary. Sedenterisation policies have also been influenced by the desire to control pastoralists, who are often considered as a political threat (Forni, 2003). Sedenterisation has itself had all the impacts that it was supposedly designed to mitigate: namely ecological destruction and economic irrationality. It has also led to the devaluation of socio-cultural norms and customary decision making structures.

This report clearly illustrates the superiority of mobile pastoral systems over ranching systems in the drylands. It also amply demonstrates that mobile pastoralism makes a great contribution to the national economies of developing countries. This is even evident when

data is incomplete, and there is certainly a much greater value than this, which is yet to be measured. Mobility may undergo changes, and there may be ways to enhance mobility or ways to regulate it, particularly based on customary systems of regulation. Mobility of the herd may not always demand mobility of the household, although in some labour intensive systems the two are hard to separate. However, policies that constrain mobility are economically and environmentally irrational and must be replaced with policies that actively enable mobility.

Provide legal support for pastoral policies

Whilst some national policies exist that advocate for the protection of pastoralists' rights to land and water through clearly demarcated areas, many such policies lack legal force, whilst competing activities, such as wildlife conservation and agricultural conversion, are given legal force (IIED 2006).

Developing economically and environmentally sound policies in the drylands is not enough and attention must be given to implementation of those policies. This therefore demands attention not only to legal frameworks, but also access to, and understanding of, the law. This is addressed in a subsequent section.

Invest government resources in the pastoral sector

Few countries have genuinely supportive livestock policies with associated budgets for appropriate extension services that enhance pastoralism. Indeed, there are very few appropriate production technologies offered to pastoralists through extension services anywhere in the world. Ethiopia provides a salutary example of underinvestment in the pastoralist sector: despite providing at least 20% of GDP and 12% of foreign exchange earnings, the Government allocated less than 0.3% of its recurrent expenditures on livestock between 1993/4 and 1998/9 (Aklilu 2002).

Extension and training tools need to be developed that are suited to the extensive nature of rangelands environments and which capitalise on existing pastoral knowledge. Local ethnoveterinary knowledge is increasingly attracting international attention and vet services need to be reorganised to accommodate this knowledge and augment it with modern veterinary knowledge. The advantages and values of local breeds also needs to be recognised, protected and capitalised on, for example through local breed improvement as opposed to exotic breed importation.

Recognise the overall value of pastoralism

Pastoralism clearly has multiple values, including both a wide variety of direct values that are rarely acknowledged and also an array of indirect values that, given the prevailing belief that pastoralism contributes to desertification, are generally denied. The drylands, and pastoralists, will benefit from recognition of these values, beyond the narrow focus on the most obvious commercial products. Environmental services (such as carbon sequestration, biodiversity, combating desertification and erosion) are increasingly highly valued in the global context and are an important option for pastoralists in the future.

Indirect values are seldom calculated or monetised and methods need to be developed and adapted to this end in the pastoral context. However, it is "misleading to assume that this is simply a process of monetising all aspects of economic life. Rather [valuation] proves a useful tool to explore the full range of costs and benefits emanating from an activity, which can also be used for lobbying in support of pastoralism" (IIED 2006).

Pastoral Codes

Cross-cutting policies, such as the Pastoral Codes or pastoral legislation of Guinea, Mauritania, Niger, Burkina Faso and Mali, could be useful in establishing the validity of pastoralism and providing a framework for other policy change. Such codes seek to regulate traditional forms of common access to rangeland resources whilst also taking into account modern legislative measures to protect individual and group-specific land rights. However, there are conceptual weaknesses in some of these codes and a lack of ownership amongst pastoral communities, which risks increasing their marginalisation. The complexities of the associated administrative procedures creates scope for non-pastoralists and local elites to capture pastoral resources and the codes also raise risk of reducing livestock mobility and individualising ownership of the commons (Hesse and Thébaud, 2006). Nevertheless, if

inclusion of pastoralists is ensured then such codes, or pastoral policies, may enable pastoralism to become a cross-cutting issue, influencing much more than just production and marketing policies.

Pastoral Marketing

Recognise the non-market value of diverse pastoral products

Policies for increasing or otherwise improving pastoralist markets must take into account the extensive, and highly valuable, non-market uses of pastoral goods. Livestock and livestock products have great value in most pastoral societies in cementing social relationships and reinforcing the complex customary institutions that make the system viable. Often the monetary value of goods is of secondary importance to their value in internal exchanges, and this not only influences the decision to participate in markets, but also indicates a significant opportunity cost of market involvement.

Pastoral marketing policies need to consider what constitutes an improvement in pastoral marketing, and should not only focus on increasing the off take of goods. Improving returns to livestock production, and reducing transaction costs, will confer important benefits on pastoralists. Such improvements may raise the total volume of trade, but more importantly will enable pastoralists to manage risk more effectively and build more resilient livelihoods.

Promote market value chains

Enhancing pastoralist's engagement in markets requires considerable market analysis in their country of origin as well as internationally. It cannot be assumed that market share exists, or that demand for a new pastoralist product can be automatically generated, and identifying existing opportunities to exploit is important. Recommendations from Afghanistan, adapted to the pastoral context, may be relevant in most pastoral contexts (Halbach and Ahmad, 2005):

- Determine opportunities and constraints in adding value and marketing meat and other livestock products, for instance wool, karakul, cashmere, handicrafts (rugs, carpets), hides and skins, and milk products.
- Determine opportunities for improving traditional technologies (e.g.) for milk processing, wool spinning and cashmere harvesting, and mechanisms through which international quality standards can be met and production can be increased.
- Determine potential markets (regional, national or international) and the mechanisms that need to be put in place to access these markets.
- Carryout economic assessments of different activities, for example the profitability of lamb fattening, including the investment required to reach international hygiene standards.
- Appropriate emphasis should be placed on import substitution rather than exclusive investment in export trade, with a vision of potentially reaching the export market in the future.

IFAD's experiences and lessons in developing India's Pashmina wool industry are also of global relevance (IFAD 2002):

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

Commercialisation of the livestock sector for export markets

Many countries already benefit greatly from export of livestock products, even though it is rarely acknowledged. There are opportunities to therefore invest in pastoralism to enhance this source of foreign exchange earnings. However, questions have been raised over whether it is prudent to invest disproportionately in export markets, given their high standards and associated costs, and the risks that come in this highly competitive arena (Scoones and Woolmer 2006). Nevertheless, domestic consumers in developing countries may also begin to demand increasingly safe animal products and therefore greater attention will be required to promote raise animal health standards even for national trade. Transboundary trade is also important for many pastoralists, and thus the control of transboundary diseases seems likely to become a growing concern for pastoralists in the future.

Demand for meat and milk is rising, and pastoralists are in a strong position to benefit from this demand. Commercialisation is an ongoing reality for most pastoralists and this trend seems likely to be sustained. However, policies need to be developed to enhance and facilitate trade, and to ensure that producers benefit appropriately. From a production perspective, livestock ministries would be well advised to explore the opportunities for developing locally adapted breeds rather than only focusing on exotic breeds that are suited to more intensive production systems. In many rangelands areas, enhanced local breeds and local crosses reared in extensive production systems may be the most effective way to harness natural resources and meet consumer expectations.

Reduce transaction costs

The transaction costs associated with participating in formal markets are often prohibitive for pastoralists. Transaction costs may be a principle factor deterring pastoralists from using markets, and they certainly erode the benefits that pastoralists can receive from market participation, and contribute to livelihood insecurity. Major transaction costs are imposed by the lack of accurate information on market prices, absence of formal markets, long trekking distances and high transport costs, inflated prices for traded consumer goods, lack of credit facilities, and excessive government bureaucracy and fees.

Costs of transport may be considered to be production rather than transaction costs (Dorward 1999), so distance from the marketplace may not be a direct transaction cost in its own right. However, it creates difficulties in accessing markets, which leads to reliance on traders and middlemen, and this leads pastoralists to receive a relatively small share of the end market value of their goods. Policies need to ensure that pastoralists are not penalised by unnecessarily complex or expensive market chains, without deterring traders from proving the crucial link between producers and consumers.

Provide incentives

Market failures have multiple and complex roots, and simple prescriptions, such as improving infrastructure, may be insufficient to make markets work effectively. Attention needs to be given to supply of desirable goods and services to pastoralists as well as to demand for livestock products from pastoralists.

Many pastoral goods have significant value when used for internal exchanges and markets generally do not provide equally valuable alternatives (e.g. insurance or credit services). In the absence of useful supply of goods there is little incentive to sell livestock or products and every incentive to hold on to them. Furthermore, the relative bulkiness of cattle and camels means that large amounts of revenue can be generated from their sale, a large portion of which is surplus to immediate requirements and often ends up as a loss to the transactor.

Rangeland policies

Understand and promote opportunism and flexibility

The carrying capacity concept has fostered the belief that stocking rates are too high and that this has caused over-grazing. This assumption has led to many decades of concerted destocking policies, has supported efforts to sedentarise pastoralists and has justified confiscation of land from pastoralists. It is now increasingly realised that time (spent grazing in one place), rather than animal numbers, is what must be managed to avoid overgrazing,

since overgrazing is the re-grazing of a plant that has not yet recovered from being grazed (Voisin 1955; Savory 1988).

Evidence increasingly shows that animals play an integral role in maintaining fundamental biological processes in the drylands, such as water and mineral cycling (Savory 1988). Furthermore, it is now widely accepted that the notion of carrying capacity is based on 'equilibrium' landscapes whilst drylands are predominantly 'non-equilibrium' and the fixing of static stocking rates is inappropriate. What is needed is acceptance in policy and law that mobility is absolutely essential for the environment and for the economies of drylands. Policies across the board must be designed to enable mobility, and specific laws are required for the protection of migration routes and for regulation of transhumance.

Protect key resource patches

Pastoralism depends on rich pockets of resources to enable survival through adverse seasons. These often tiny pockets are integral to the system, and without them the system breaks down. The profit per hectare in those key resource patches is higher under irrigation and intensive cultivation, but the loss, across the vast areas of adjacent drylands, is rarely considered. Such investment has the potential to make a few people very rich, but the cost is that very many people are impoverished, and simultaneously the environment is greatly degraded. Crop cultivation, especially irrigation, has been promoted in many dryland areas, but has often led to serious degradation, both through mismanagement and through the disabling of pastoralism.

A pertinent example is that of the Kilimanjaro region of Kenya, where conversion of the scarce main wetland systems upon which the wider landscape depends may constitute perhaps 2-3% of the landscape (Hatfield, personal estimation) whilst undermining productivity of the livestock system on the majority of the remaining 97% of land area. Conversion of pastoral resources must account for the indirect and the direct opportunity costs, in addition to private or market costs and benefits.

Support for customary dryland management systems

Hardin's (1968) concept of the 'Tragedy of the Commons' has been widely used to argue for private tenure, based on the assumption that access to a common resource automatically leads to overexploitation. Livestock owners are assumed to consider the grazing resource as a free commodity, and will logically maximise their herd size at the expense of other herders, without consideration of the natural resource. This theory is refuted extensively in the academic literature as it fails to recognise existing common property arrangements and management systems, and in reality reflects a situation of 'open access': a situation that is the exception rather than the rule.

Ironically, policy based on this rationale has undermined customary management, and in the process created a vacuum of management authority that has resulted in a significant trend towards an 'open access' system, or 'free-for-all': the very phenomenon the policies were supposed to overcome. This has been to the detriment of dryland people, national productivity and the underlying natural resource base. This irony is still lost on many policy makers, who fail to understand 'non-equilibrium' systems. Policies are still stacked against pastoralists, disabling their management systems and leading to both economic short-comings and environmental degradation, all of which continue to be blamed on the pastoralists.

To overcome economic failure, and reverse land degradation, in many of the world's drylands requires policies that enable customary institutions for resource management. However, these institutions are not static entities and there are ways that government can explore to collaborate with them over land and resource allocation. Government needs to recognise that the effectiveness of some of these institutions has been eroded and that continued erosion will lead to further economic weakening and environmental degradation. It may not be possible, or desirable, to return these institutions to their former state, but government must enable them to adapt to new realities. In making this transition, it is imperative that government helps pastoralists to avoid 'elite capture', whereby educated parts of society, using pastoralism as an ethnic label, exploit the weak understanding by pastoralists of their rights and responsibilities in order to profit from change.

Develop and disseminate appropriate technologies

Pastoralists' knowledge is a valuable resource for managing risky environments, in contrast to the narrower understanding that introduced technologies are often based on. The vast majority of large-scale policies and initiatives have not worked, mainly because they have been technologically-based, and lack the flexibility that people need to survive and prosper in these regions (Mortimore, 2006).

With the over-riding emphasis on substituting pastoralism with something that seems more 'modern', few efforts have been made to enable pastoralists themselves to adapt and enhance their production system. This is gradually beginning to change as development agents and pastoralists explore new technologies, a good example of which is the wide-spread adoption of community based animal health service delivery. However, inadequate attention has been placed on learning from pastoralists' production methods and finding ways to fit new technologies into those production methods. This process may be constrained to some extent by the low education of many pastoralists, although it is probably constrained to a greater extent by the inappropriate training of extension agents and the absence of useful extension packages.

With the new thinking in range ecology there comes an urgent need for training of a new generation of range managers and extension agents able to combine technical insight with socio-economic analysis. The quest for a simple carrying capacity number is inadequate for non-equilibrium rangelands. Instead a more sophisticated approach based on risk analysis is required: one which does not aim to produce a rigid scientific assessment appropriate for all producers for all times, but instead accepts that stocking strategies and management practices will vary according to a multiplicity of desired outputs and environmental/amenity services. The persistence of outmoded concepts and ways of working are likely to frustrate attempts to balance livestock production and environmental goods and services unless training curricula are radically altered in agricultural colleges and universities throughout the world (Leach and Mearns, 1996).

Invest in pastoralists as range managers

Conventional wisdom suggests that much of the blame for 'desertification' and land degradation in drylands rests with pastoral livestock production. There is now considerable literature that corrects this misconception, on two counts: first, the extent of dryland degradation is greatly exaggerated, because the underlying ecological dynamics have been misunderstood (Behnke et al. 1993, Swift, 1996); and second, the contributory role of livestock has been mis-specified (Mearns 1996, Sandford 1983, Homewood and Rodgers 1987, Behnke 1994).

Policies nevertheless tend to remain rooted in the misplaced conventional wisdom. Agricultural extension agents in drylands areas usually exclusively promote cultivation as an alternative to pastoralism, backed up with agricultural budgets that exclusively support crop production. These budgets need to be balanced to reflect both the current and the potential contribution of mobile livestock keeping to drylands economies. The value of pastoralism in managing rangeland environments and providing ecosystem services is still grossly under-estimated, but rangeland and environmental policies must recognise this important role if they are to be effective in sustainably managing the drylands.

The broader policy environment and pastoralist rights

Deliver basic services

Achieving the economic potential of the drylands, whilst conserving their biodiversity, requires strengthening of pastoralism, and this is not a discussion for a single line ministry or sectoral policy. Certainly, agricultural and livestock policies need to be adapted to be relevant to pastoralism, but without changes in health and education policies, pastoralists are still going to face major challenges in enhancing their production system and overcoming poverty.

As mentioned earlier in this report, in many countries pastoralism is greatly constrained by weakness in human capital: low levels of literacy, high levels of morbidity and low life expectancies. If the economic and environmental rationale of mobility is accepted then the constraints of static health and education services have to be overcome. An enabling

environment and a less prejudicial attitude towards mobile pastoralists would be an important starting point in overcoming service delivery failures.

Sustainable pastoralism requires the provision of appropriate services – efficient, culturally sensitive and (often) mobile – which requires a significant investment in education and training to ensure a supply of service providers. Effective service delivery also requires better understanding of pastoralist household dynamics and the increasingly sedentary nature of many pastoralist women, children and the infirm: mobility should not remain a convenient excuse for failure to get basic services and messages to pastoralists.

Similar arguments apply to armed conflict – particularly in a number of African pastoral settings. Although the roots of conflict may be complex and diverse, in all cases the conflict is marked by failure of government to provide adequate law enforcement and security, and in some cases military presence actively contributes to the conflict. Under such circumstances it is hardly surprising that pastoralists seek to provide their own security or that individuals exploit the ensuing breakdown in law and order for their own gain. Economic development of the drylands demands adequate security to protect and enhance mobility and communal tenure systems.

Create an enabling environment for policy change

Pastoral development requires the creation of a favourable institutional environment and the policy process "should be less concerned with what technical options should be applied than with how technical and institutional reforms should be brought about" (Mearns 1996, Thebaud at al. 1995). There is need for new "professionalism among government officials and others responsible for implementing policies, programmes and projects" (Chambers 1996, Pimbert and Pretty 1995).

"There is a fundamental need to recast the relationship between 'research' and 'policy-making', in order to make explicit the 'plural rationalities' of all stakeholders" (Thompson, 1993, quoted in Leach and Mearns, 1996). Much is now known about how to facilitate a genuinely participatory development process, but this urgently needs operational application". Echoing this is the sentiment expressed by a Maasai pastoralist attending a recent meeting of the Kenya Livestock Working Group (an FAO-SARD initiative to connect stakeholders to scientists and policy-makers): "Is it possible to get researchers and institutions interested or involved in our pastoralist reality?" (SARD, 2006).

Promote women's voice

The role of women in pastoralist societies is usually quite distinct from that of men, and pastoralist women often have limited decision making power, particularly when it comes to external dealings. Nevertheless, the gendered distribution of labour roles ensures that women play a vital role in the use of certain natural resources and in sustainable rangelands management. Pastoralist women have crucial roles in reinforcing the social institutions that provide the resilience of pastoralism, based on the power they have to use and distribute a range of resources.

In recent years, gender roles have shifted in many pastoral communities and the division of labour between men and women is not static. Economic interventions have sometimes led men to wrest control over important household activities when the activity assumes a greater market value. Women's customary institutions, for decision making as well as for environmental management, are often overlooked by simplistic and non-inclusive approaches to 'participation'. Participation is frequently applied in a haphazard and incomplete way that consults only a select few and confers power on those un-democratically elected decision makers. Women have been penalised by this approach above all.

Unless there is a specific emphasis on empowering women in pastoralist societies, participatory approaches risk further marginalising them from decision making processes. This has implications for their social development and their capacity to sustainably manage the natural resource base. This rationale applies equally to other marginal groups, such as youths, artisans and ethnic minorities within pastoralist areas.

Trends in pastoral economies

Pastoralism is an adaptation to a harsh environment, and it is characterised by opportunism and flexibility. This flexibility is being put to the test in the current environment of rapidly advancing globalisation, demographic expansion and continued penalisation of extensive livestock keeping. However, there is plenty of evidence around the world to show that pastoralism will keep on surviving and adapting. In fact this should not come as much of a surprise, given the escalating demand for animal produce and the existence of drylands in over 40% of the earth's surface: such land will inevitably be put to good use, and the most cost effective use is extensive livestock production.

Despite the resurgence of pastoralism in some Asian and European countries, tremendous losses of rangelands have occurred in the past that demand support for ongoing adaptation. Pastoralism has been shaped by many distinctive twentieth century influences and pastoralism will only survive and thrive if it is enabled to keep on adapting. Efforts to return pastoralism to some prior or imagined state are not realistic and are probably not desirable to most pastoralists, any more than to policy makers.

There is, however, only one sustainable solution to the twin problems of drylands poverty and degradation, and that is mobile pastoralism. It is possible to curtail the ongoing destruction of drylands by recognising that their greatest economic potential lies in mobile pastoralism and that, with appropriate policies, pastoralists will be the best stewards of the drylands. Enabling this custodianship requires appropriate policies, legal mechanisms and support systems that allow pastoralists to enhance the economic, social and ecological sustainability of their livelihoods.

However, pastoralism is itself changing, adapting to market forces as well as demographic pressures, and influenced strongly by policies that still encourage sedenterisation. Many pastoralist communities are increasingly sedenterizing, sometimes devoting labour to small-scale cultivation, even though the quality and success rate of that cultivation may be low. Yet in such infrastructure-poor areas as the drylands, even the opening of one or two roads can have a profound impact on livestock marketing. The opening of the Karakoram highway in Pakistan greatly effected animal husbandry in the area by enabling importation to the region of grain from the plains, enabling livestock producers to divert land for production of fodder for winter feed and has led to increased adoption of improved fodder technologies (Ehlers and Kreutzman 2000).

Sedenterisation, at least of the household, can bring potential benefits of access to services, since few countries have adopted models of mobile or community delivered service provision. It sometimes also improves access to markets, and can reduce transaction costs through improved communication. The labour demand for transactions can be very high in pastoralist areas and, in Iran for example, sedentary pastoralists benefit by attracting companies to routinely come and collect produce, whilst mobile herders are obliged to visit towns to make sales, and as a consequence, market supply by mobile groups is less reliable (FAO 2004).

However, sedenterisation of the household does not require sedenterisation of the herd, and indeed mobile pastoralism could be enhanced when part of the household is sedentary. Nevertheless, producing milk for consumption remains a central part of the livelihood of many pastoralists, raising challenges for sedentary communities, both in bringing adequate milk products to the household and also in ensuring that the labour force is in the right place at the right time. It may be beneficial to share and develop new technologies to overcome these constraints, including labour-saving technologies for milk storage and processing in the field and improved means of transporting dairy products from the herd to the household or market.

Trends in extensification or intensification are less clear cut. Examples have been presented in this report of increasing extensification as pastoralists revert to more environmentally and economically sound management systems in the aftermath of State driven experiments of intensification (in the former Soviet Union). Similar changes have been observed in Africa, for example in the wake of the collapse of government ranching projects in Uganda (Muhereza 2001).

However, the true trajectory in terms of intensification is hard to foresee, given the on-going loss of key tracts of pastoralist land for other, non-complementary uses. Pastoralism could

intensify to a degree if those key tracts were preserved for more enhanced forms of pastoralism, such as through the cultivation of fodder crops/trees or the enhanced management of household sub-herds for dairy production. Whether pastoralism will become a more extensive or intensive form of production than it is at present is hard to assess in a climate where pastoralism continues to be eroded and is seldom enhanced at all.

Production and marketing changes

Although many production and marketing activities are context-specific, some trends emerge from the regional surveys. In particular, pastoralists worldwide are engaging in cash-generating activities on an increasing scale, driven by a combination of changing aspirations (education, information and consumer goods) and as a livelihood diversification option to reduce exposure to natural resource fluctuations. In many cases, off-farm and non-farm income earning is being adopted in lieu of increased time investment into livestock production and marketing.

There appears to be an increasing dependence on markets for essential food stuffs. It has been observed that, amongst the Borana of southern Ethiopia, "as human populations grow in rangeland areas…pastoralists like the Boran will be forced to engage in more commercial livestock activity simply to increase human carrying capacity – exchanging animals for more calories as grain could be one means to this end" (Desta and Coppock, 2005).

As market engagement increases, some pastoralist groups are making important changes to their production system. For example, the migratory lifestyle of the Jabbans, or cheese makers, in Syria is slowly changing, and pastoralists are gravitating more from the Khanasser Valley towards the steppe where more dairy sheep are raised (Abdelali-Martini et al, 2006).

With the sedentarization of herders in South Tunisia there has also been a switch in the ovine race used from the Barbarine (fat tail, resistant to drought) to the Bergui or Queue Fine (thin tail, with higher growth rates). This is a response to changing urban demand for these animal species' products (Alary et El Mourid, 2005). In Algeria, the Barbarine population has decreased by 60% between 1990 and 2000 and the D'man population by 50% in the same period (Laaziz, 2005) and now the Ouled Djellal breed is dominant, but is crossed with other local races. This is a response to intensification of production practice, particularly in zones that were traditionally dominated by agriculture (Madani et al., 2003). As a result of market orientation in Morocco, producers are changing their herd composition, producing a greater proportion of cattle and switching from a mix composition (ovine, caprine, camel) to a unique specie and breed (Abdelguerfi et al., 2000).

Value addition

Value addition to pastoral products is increasingly common, mainly in the form of cottage industries which reflects the problem of perishability and difficulties in accessing processing facilities. Numerous examples exist, including cheese and yogurt production (Europe, the Middle East, North Africa and Asia), butter manufacture (Horn of Africa) and carpet-making (Near East, Central Asia). There may be significant scope to build on existing trade, enhance products and explore new markets. In many pastoralist regions there may also be scope to introduce new production technologies and new products with a view to developing new markets or substituting currently imported products. Technologies that have been tried and tested in a pastoral setting may be more likely to find favour amongst pastoralist groups, so technology transfer offers interesting opportunities for strengthening pastoral livelihoods.

There is increasing donor interest in value chain development as a means of improving the living standards of agricultural smallholders and capturing a greater share of profits at the farm gate. However, the experiences in dairy processing in Somalia and Mauritania suggest that for dairy processing at least, there may be greater merit in centralised processing, where it is easier to assure quality control and protect market access. This is of particular importance if producers are to benefit from international markets, where quality standards are generally higher.

Livestock and wildlife interaction

Conservationists are increasingly exploring ways to work with pastoralists for the conservation of extensive rangelands. The recent change in understanding of range ecology has convinced many people that pastoralism is necessary for effective rangelands management, and to

continue with policies that undermine pastoralism, or attitudes that alienate pastoralists, is to sow the seeds of failure of conservation. Several examples can be found in Eastern Africa of pastoralists grazing their stock in national parks and benefiting from tourist revenues.

The experience of European pastoralism is pertinent in this context. The importance of grazing species for conserving certain habitats is well recognised and managers of those habitats are contracting grazers to manage those resources. In some parts of Europe, re-introduction of predators, such as the wolf, bear and lynx, long resisted by pastoralists, is succeeding by offering generous compensation to producers for expenses and losses incurred to these predators.

Globalisation

The seemingly rapid progress in globalisation of trade offers constraints and opportunities for many pastoralists. In several countries covered by this review, international and even domestic market share has been lost to competitive foreign producers and their aggressive marketing policies. Australian wool has substituted locally-produced wool in the manufacture of the famous Afghan carpets, capitalising on a period of under-investment in processing facilities in Afghanistan. The result of this encroachment is that new wool facilities are being established in urban, rather than rural, settings, making it that much harder for local producers to recapture the market.

Marketing of livestock and dairy products from Africa has come up against serious obstacles in the form of trade restrictions and international sanitary and phtyo-sanitary standards, as imposed by the Office International des Epizooties (OIE). Meeting some of these standards may be out of reach of many countries with important livestock sectors and questions can be raised over the pertinence of the restrictions, and in particular the requirements for disease free zones. Nevertheless, consumer demand, particularly in developed countries, seems unlikely to tolerate a relaxing of these standards.

A more likely direction for pastoralist producers may be to satisfy national demand, providing they are able to compete against subsidised imports. Developing domestic marketing chains could lead to a general development of the pastoral sector that, over time, makes investment in international markets more attractive and cost effective.

The Livestock Revolution

Globally there is an unprecedented growth in consumer demand for meat, exemplified by a rise of 70 million metric tons between the 1970's and 1990's in developing countries alone, which has profound social, environmental and economic implications (Delgado et al, 1999; FAO, 2006). Globally the livestock is becoming agriculture's most important sub-sector (ILRI, 2006, Jutzi, 2006) and the drylands are in a position to play a major role in satisfying this burgeoning demand. The driving forces behind this trend are increased incomes and increased urbanisation, which increases the proportion of consumers to producers and raises their spending power, and hence their preference for animal products.

The livestock revolution is manifesting itself in different ways on different continents and in different development contexts. However, a universal question remains: is this boom industry destined to aggravate an already downwardly spiralling global environmental crisis or can it work to the advantage of people and the natural resource base which supports them? Although the global phenomenon is most noticeably driven by meat consumption in three 'developing' countries (Brazil, India and China), meat consumption in Africa has seen a 50% increase over the past decade, and this trend is expected to continue. Pastoralism offers great potential for increasing low input production and, with modest investment and significant policy change, pastoralism can play a major role in satisfying burgeoning consumer demand.

Steps forward

Pastoralists routinely make trade offs between livestock and livestock products and between the use value and commercial value of their assets. They trade off the value of selling livestock produce against the cost of purchasing replacement food. Yet for many herders, increasing commercialization is obligatory and this means that pastoralism is increasingly influenced by market forces.

Commercialization of livestock production may be facilitated by, or may be a driver of, settlement of at least part of the pastoral household. This could have negative consequences for livestock production in countries with a high proportion of drylands and greater efforts are required to ensure that sedenterisation of the household does not come at the cost of sedentary herding. Policy makers must realise that sedenterisation of herds in the drylands is economically irrational and environmentally catastrophic.

Stronger economic appreciation of pastoralism in its current form will help to convince policy makers of the comparative advantage of drylands in livestock production. Such valuation will help to prevent economically damaging policies that encourage substitution of pastoralism with crop cultivation. Investors need to be encouraged to the pastoral sector, but this will be facilitated by greater recognition by government and provision of basic services for marketing and also for supporting pastoralism.

Economic appreciation of pastoralism requires understanding of its direct and indirect values, and appropriate recognition of unmeasurable as well as measurable benefits. The significant value of the subsistence economy needs to be recognised and the real extent of livestock trade needs to be measured to accommodate informal exchanges if the true potential of pastoralism is to be recognised. The values of livestock in providing services to pastoralists, such as insurance and social support, need to be fully recognised and as market engagement increases, alternative sources of this security need to be provided, presumably through the market.

The pastoral economy is already strong, but pastoralist's livestock wealth is generally failing to bring commensurate security and risk reduction. Recognition of the existing value of trade and income should influence policy makers to allocate greater resources to enhancing mobile pastoralism, rather than substituting it with inferior production systems. Sweeping changes are required to ensure that services are provided in a form that enables mobile pastoralism and enhances mobile pastoral production, rather than placing unnecessary constraints on it.

The economic outlook for pastoralism

The examples presented in this report give an indication of some of the development trajectories that pastoralism may take, yet more must be done to consult the main stakeholders over the vision of the future. Past experience should be enough to deter development agents from assuming that they know what is best for pastoralists. However, it is also clear that pastoralists are not the only stakeholder in drylands development, and there is likely to remain divergence of opinion of which values of pastoralism, or the drylands they inhabit, should be promoted or ignored.

What this report has attempted is to draw attention to the different values of pastoralism so that more informed decisions can be made by all stakeholders, and so that when costs are incurred, they can be recognised and accounted for. The report has also shown some of the directions taken by pastoralists in different contexts around the world. The costs and benefits of these directions can be analysed and, above all, pastoralists from developing countries need to be exposed to these various experiences if they are to be able to make informed choices about their own development direction.

Mobile livestock rearing will almost certainly persist in developing countries, as is does in many developed countries, as the backbone of the economy of marginal areas and as the mainstay of ecosystem protection. Management will be 'professionalized', the system capitalized and the land area and animal numbers per herder may gradually increase (implying a depopulation of the rangelands). Although people may become more sedentary, livestock mobility will be enhanced and protected in many countries, although the reduction in labour input may lead to a shift in emphasis in the production system, away from 'live' products towards meat production, implying an overall reduction in gross productivity of the system. Socially, economically and environmentally, pastoralism will continue to become more market focussed.

In many countries, security will be more effectively provided leading to lower labour demands of herding, greater resilience and more 'system-integrity'. Increased security and greater political influence will lead to higher investment in pastoralist areas and the pastoral system will be enhanced rather than substituted. However, many of these changes imply major demographic shift, which requires attention to the human capital base in the drylands and to

developing means of absorbing labour in alternative sectors. Such changes are likely to not only relieve some of the population pressures currently facing the pastoral system, but will also generate benefits of household livelihood diversity, reduced risk, alternative sources of investment into pastoralism and influx of new ideas and technologies. Ultimately, successful economic development as well as sustainable land management in the drylands depends on pastoralist men and women being enabled to make informed choices and demand appropriate policies to support and enhance their production system.

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Annexe

List of countries studied by region

Region	***Countries***
South America	Peru Bolivia Chile Argentina
North Africa	Morocco, Algeria, Tunisia, Egypt, Libya
Middle East	Afghanistan, India, Iran, Iraq, Israel, Jordan, Pakistan, Palestine, Syria, Turkey
Horn of Africa	Somalia, Ethiopia
Southern Africa	Botswana, Zimbabwe, South Africa, Namibia, Malawi, Zambia
Europe	France, Spain, Switzerland, UK, Norway, Romania, Albania, Macedonia
West Africa	Burkina Faso, Mali, Mauritania, Niger, Senegal, Chad
East Africa	Kenya, Tanzania, Uganda, Sudan
Asia	Kyrgyzstan, Kazakhstan, Tajikistan, Uzbekistan, Turkmenistan, China, Mongolia, Siberia