Working Paper 117

DROUGHT AND LIVESTOCK IN SEMI-ARID AFRICA AND SOUTHWEST ASIA

Roger Blench

Zoë Marriage

March 1999
Overseas Development Institute
Portland House
Stag Place
London SW1E 5DP

Acknowledgements

The first version of this paper and the annotated bibliography was prepared as a keynote document for the FAO-sponsored Electronic Conference 'Drought and livestock in semi-arid Africa and the Near East', which took place between July and September 1998. The papers from the conference can be accessed at http://www.fao.org/ag/aga/agap/lps/drought1.htm. The authors are grateful to all those who took part in the conference, and the revision of this document reflects both specific comments on the text and some of the general discussion that formed part of the conference. We would like to thank Andy Catley, Maryam Fuller and Simon Mack for their observations and additional references; we hope their concerns are reflected in this revised text.

This working paper is distributed by the Overseas Development Institute (ODI), an independent, non-profit policy research institute, with financial support from the Food and Agriculture Organization of the United Nations (FAO) and the Natural Resources Institute (NRI) under funding from the Department for International Development. Opinions expressed do not necessarily reflect the views of ODI, FAO, NRI or the Department for International Development.

Roger Blench (r.blench@odi.org.uk) is a Research Fellow, and Zoë Marriage (z.marriage@ odi.org.uk) is a Research Assistant, at the Overseas Development Institute.

Editing, index and layout by Paul Mundy, Weizenfeld 4, 51467 Bergisch Gladbach, Germany; paulmundy@netcologne.de, http://www.netcologne.de/~nc-mundypa

ISBN 0 85003 416 7

Contents

Acknowledgements 2

Contents 3

Summary 4

1. Setting the Scene: Why Is Drought Important? 7
    1. 1 Semi-arid regions and the role of the traditional sector 7
    1. 2 Drought: Climatic anomaly or social construct? 9
    1. 3 Humanitarian crises versus long-term structural damage 10

2. 'Water, Water Everywhere, Nor Any Drop to Drink' 12
    2. 1 Rainfall patterns 12
    2. 2 Water development 12
    2. 3 Drought and land degradation 13
    2. 4 Livestock 13
    2. 5 Impact of changing veterinary practice 15

3. Who Responds to Drought? 17
    3. 1 The players 17
    3. 2 Government 17
    3. 3 Multi- and bilateral aid agencies 18
    3. 4 NGOs 19

4. What Do Pastoralists Do? 20
    4. 1 Migration 20
    4. 2 Restocking 20
    4. 3 Supplementary feeding 21
    4. 4 Changing herd composition 21

5. What Do Agencies Do? 23
    5. 1 Restocking 23
    5. 2 Livestock banking 23
    5. 3 Early warning systems: Idea and reality 24
    5. 4 Sedentarisation 25

6. Ethical and Policy Issues 27
    6. 1 Rights: Material and cultural 27
    6. 2 Policy: National and regional 27
    6. 3 Steps towards rethinking policy 27

References 29
    Publications 29
    Electronic resources 32

Annotated Bibliography 33

Index to Annotated Bibliography 131

Summary

Recent high-profile media coverage of El Niño and similar climatic anomalies has perhaps tended to obscure the fact that livestock producers in the fragile environments of Africa and the Near East are facing worsening problems of resource degradation that have rendered their existing strategies inadequate. This overview describes the existing situation and the changes in the present century that have led to pastoralists being under unprecedented pressures and thus unable to respond appropriately.

Droughts, or periods of unusually low rainfall, are part of the expected pattern of precipitation in semi-arid Africa, and the common strategy of pastoralists in the past was to move to areas with higher rainfall where vegetation persists. A bundle of factors has made this increasingly impractical, including the establishment of national frontiers, the expansion of cultivation even in very dry areas, and a marked increase in total livestock numbers. The consequence is that droughts in Sub-Saharan Africa now cause significant humanitarian problems and localised degradation, since large numbers of animals converge on certain pastures, especially around wells. This in turn causes long-term impoverishment among pastoralists, since they must sell animals cheaply and cannot afford to re-buy them when the drought ends. At the same time it places extra stress on already ineffectual veterinary services, since weakened animals are more susceptible to pathogens.

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

The present strategies and policies of governments, agencies and NGOs cluster around restocking and sedentarisation. Restocking can work on a local scale, although it is expensive in terms of management and seems to provide no evident insurance against another drought, which on average can be expected every 10 years. Although it is generally agreed that pastoralists are not responsible for ‘overgrazing’ in the way this was pictured in earlier literature, the inexorable increase of both herds and cultivation has placed unparalleled pressure on resources. Pastoralists themselves tend to insure against individual risk by dispersing animals in other herds; this is effective for individual herders but does not remove animals from the system.

The other approach to drought has been to develop more effective early warning systems, both using remote-sensing and ground indicators such livestock prices. Such systems do not apply specifically to livestock, but in regions where pastoralism is predominant, such as the rangelands of northern Kenya, projects have been established to make these as effective and community-based as possible. While there is no doubt that recent technical advances have made early warning systems much more accurate, whether these have led to more insightful ground responses remains open to doubt.

The overall conclusion is that while drought is treated as a once-off climatic anomaly, the situation will not improve because responses are treating consequences, not causes. Drought policy has to be based on a long-term understanding of both climatic patterns and the changes in human settlement

that have made the impact of drought so much more serious in recent times. In the light of this, some key recommendations are as follows:

- The process of changing the policy and attitudes of governments towards pastoralists through education, publicity, studies, etc., must continue.
- Drought-response mechanisms, as with other policies towards pastoralists, must be discussed and set at a regional level. The most crucial elements in this are co-ordination in protection against epizootics and the siting of water points.
- Regional decisions should determine the quality and type of services available to livestock producers and ensure that these have some comparability across national borders, otherwise the effect will be uncontrolled migration.
- The relevance of levels of insecurity and the effect these have on the decisions of livestock producers must be recognised—no matter how politically unpalatable these may be.
- Forced sedentarisation is unlikely to be constructive and is ethically dubious; however, there is no ethical imperative for government or NGOs to re-establish some mythical status quo.
- International agencies have a significant role both in combating misinformation and diffusing accurate information, as it becomes available. This is relevant both in terms of countries with semi-arid regions and in donor countries.
- Technological developments will substantially improve the modelling of climatic events in the coming years. International agencies should have a major role in making the results available rapidly and effectively, as well as in convincing governments of their relevance.
- The extension of comprehensible and useful information to small farmers is essential, as is the development of effective means of responding to the information they can provide.
- The collapse of notions of land degradation and carrying capacity should not be used to justify simply increasing pressure on resources. Further research should generate models that can be used to monitor access and predict likely bottlenecks in resource availability.

1. Setting the Scene: Why Is Drought Important?

1. 1 Semi-arid regions and the role of the traditional sector

The production of livestock remains a crucial element in the economies of African countries with substantial semi-arid regions. Below about the 400-mm isohyet, agriculture remains a risk-prone enterprise and, with the exception of occasional irrigation schemes, most areas with comparable precipitation have remained open rangelands. Although ranching is a significant element in the economies of Kenya, Botswana, Namibia, Zimbabwe and South Africa, throughout much of the continent traditional-sector pastoralism or agropastoralism is the dominant form of production. Where rainfall is extremely patchy and pasture resources must be exploited opportunistically, the producer with a high level of mobility can maintain a herd in land that is almost unusable for fixed-territory or ranch production. Moreover, mobile pastoralists do not have to pay any of the fixed costs associated with fenced pastures, and grazing is thus essentially a free resource.

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

Sub-Saharan Africa and the western Maghreb thus have a very distinctive production system, oriented towards cattle and still dependent on the movement of herds to grazing and water-points. The constraints imposed by the physical environment account for many of the distinctive features of African livestock production; the flexibility of the pastoralists is in inverse relation to the resources on which they depend. The downside of this is that services and infrastructure for livestock producers in semi-arid regions are correspondingly poorly resourced. Veterinary services are often of limited value, supplementary feeds are rarely available, and the forward planning associated with drought and emergency feed-supplies is only sporadically taken on board. The consequence is that in the face of a climatic anomaly such as drought, or a fast-spreading epizootic such as rinderpest, the impact on livestock producers in the semi-arid and arid zones is often severe.

The reasons for this are not far to seek. The contribution made by traditional-sector livestock production to national economies is often not very visible and correspondingly hard to quantify. Sahelian countries export the greatest proportion of their slaughter stock to urban centres in the coastal countries of West Africa. In eastern and southern Africa, the trade is less transnational, with most producers supplying the internal urban market, and countries such as Botswana exporting direct to the European Union. Much livestock is traded and slaughtered outside official routes and collection points, and therefore does not show up on national statistics, even where these are collated. As a result, civil servants and politicians consistently underestimate the contribution to the

national economy made by livestock producers, and are therefore less willing to budget for assistance to producers.

In addition, governments are usually controlled by representatives of the settled, agricultural populations and often categorise pastoral nomads as destructive, evasive (in terms of tax), and recalcitrant (often believed to be behind insurgency). They see nomadism as unproductive (compared with the overweight cattle on the covers of those glossy brochures left behind by the representatives of international feed and veterinary drugs companies). Pastoralists' mobility give them visibly less allegiance to individual national governments, and their refusal to form stable groups with which government can treat makes them seem all the less trustworthy. In addition, the arid and semi-arid zones where they operate are remote from centres of government and both inaccessible and expensive to administer.

At this point the academic establishment kicks in with its plaintive cry 'Studies show…'. Anthropologists and others have a long history of fascination with pastoralists, even in the era when the colonial governments maintained many of the stereotyped images still held today in all-too-many ministries. However, beginning in the 1960s[1], a new approach began to surface, suggesting that mobility was a perfectly rational strategy in regimes of variable rainfall and that the subsequent structural instability of social groups was a regrettable but entirely predictable result of this. Indeed after the droughts of the early 1970s, highly mobile pastoralists preserved their herds far better than their agropastoral cousins; pastoralists were making productive use of otherwise extremely marginal land.

Nonetheless, pastoralists remained accused of land degradation, but in the 1980s new approaches to rangeland ecology and visible evidence of the resilience of Sahelian pastures suggested that even this was confused (Behnke and Scoones, 1993). Livestock production is a relatively recent event in the evolution of Sahelian vegetation, which has a history of adapting to climatic anomalies and prolonged adverse conditions over a very long period (van der Hamman, 1983). The graminaceous flora has co-evolved with a large mammal fauna which was still abundant in this region until recently. Sahelian rangelands can have an appearance of areas suffering from severe erosion and degradation but, under the right precipitation conditions, can spring back to life. The same is true of the desert regions of the Near East, where some areas may have no rainfall at all for many years and yet still produce forage when rains do come. Much of the damage perceived and documented by livestock reports of the 1960s and 1970s[2] has proved not to be permanent, and is attributable to climatic variation rather than the activity of pastoralists. In retrospect, it seems unlikely that simple pressure from grazing stock would be enough to irreversibly degrade vegetation with such a long history of resilience. A likely interpretation is that consultants and scientists, trained in temperate grasslands where this type of degradation *is* possible, simply unconsciously applied their perceptions to an unfamiliar environment.

Studies are valuable, but they are not always the best way to affect the policies and practice of administrators who are driven more by received ideas and oral traditions within ministries. Whether pastoralists are effective users of marginal land may be less important than whether they are representatives of a scattered, somewhat alien culture, who do not stay put and benefit from

[1] Generally speaking. It is always possible to find early examples, especially in colonial records, of observers who questioned the prevailing wisdom.

[2] Although these findings are widely accepted among Africanists, it is striking that many of the same attitudes are resurfacing in consultancy reports on the new nations of Central Asia. The exact process is unclear, but it is as if all the older layers of ideas have been allowed to bubble to the surface in this 'new' context. Maryam Fuller (pers. comm.) observes that non-equilibrium models of range were developed for tropical and hot arid lands, and their applicability to temperate or cold arid lands remains to be tested. Degradation thus remains an extremely difficult concept to use.

'modern' life or produce livestock on demand for the good of the nation-state. Hence, ideas that pastoralists must be settled, with exotic breeds imported to upgrade their stock and pastures seeded for improved nutrition, still remain in currency long after their sell-by date has passed.

Understanding of drought and its impact on livestock producers in semi-arid regions has advanced substantially in recent decades; unfortunately, the incidence and impact of such droughts also seems to have increased. The response strategies of humanitarian and development agencies have begun to absorb and adapt this new understanding, but nonetheless the situation of Africa's livestock producers hardly seems to improve. In part this is because pastoralists do not exist in a vacuum, but in a complex matrix of national priorities and regional trends that can cross-cut the subtle local appreciation of a situation that makes humanitarian work effective. This paper describes some of the new understanding of drought in the context of Africa and the Southwest Asia and describes existing responses of pastoralists, governments and international agencies. The conclusions consider some of the next steps implied by this, in terms of technical research, national policy and larger ethical and social issues. An annotated bibliography of papers and documents relevant to this topic is given as an appendix.

1. 2 Drought: Climatic anomaly or social construct?

The monitoring, measuring and modelling of climate is usually conceptualised as a technical matter left to meteorologists and distinguished from the realm of both policy and crisis management. Scientists present technical data, while politicians, relief agencies and NGOs are to come up with appropriate responses. It is becoming increasingly clear, however, that such a simple division cannot be sustained. World weather systems constitute a unity, but climatic patterns and events are categorised according to social constructions. Thus 'drought' and 'floods' exist in relation to what is considered to be normal rainfall rather than as entities that can be defined objectively. Their severity and geographic extent reflects the cartographer's boundaries. In most parts of the world, reliable weather records are barely a century old, and thus normality is defined by a relatively short historical span, or even by personal memory. As longer data sets have become available, through palynology or ice-cores, normality has been redefined in relation to millennia rather than centuries. Different categories of 'normality' are available and can be selected for the purpose to hand (Blench and Marriage, 1998).

Climate is often conceptualised as a series of shock events punctuating a background of acceptable variation. Shocks, such as floods, high winds and drought, are discontinuities that are sufficiently anomalous within the lifetime of observers as to be classified as unpredictable and life-threatening. The nature of the discontinuity is framed by the region's ability to cope. Thus a rainfall deficit over a month in a sparsely populated region is natural variation; but a similar deficit in a heavily populated zone is an event with defined boundaries that can become a drought if the population is ill-prepared to manage it. Vulnerability to weather is a function of preparedness as well as of the event in itself. Improvement in weather-prediction services, as has occurred in Southern Africa, means that an understanding of the probabilistic forecasting potentially allows for greater preparedness in terms of migration patterns chosen, herd diversification and management, off-take levels and marketing.

For the agricultural sector, the selection of seeds and sowing times can be more reliably informed. Seasonal weather prediction and increasing understanding of teleconnections give a longer lead time to reduce the impact of extreme conditions on human activity. However, water shortage, land-tenure conflict and animal-disease problems cannot be solved by the increased awareness of weather indicators. The success of preventive or mitigating strategies depends on the strength and

effectiveness of socio-political and economic institutions, as well as the relative reliability of the teleconnection (Glantz, 1997).

1. 3 Humanitarian crises versus long-term structural damage

Since the mid-1970s drought in Africa has been associated with starving people, refugee camps and grim-faced aid workers speaking to the television cameras. Rock concerts, appeals and aeroplanes pounding the landscape with mysterious packages of essential foodstuffs have become part of the visual currency of the West. The key element is emergency response, and the appeal is the image of instant satisfaction allowed by logistical intervention.

However, once immediate survival is assured and the journalists go home, livestock producers face the long-term problem of household viability. Long-term rainfall deficits affect their essential capital, their herds, in a manner that can only be rectified over a number of years and cannot be the subject of some 'instant fix'. Following a drought, herds can take up to 10 years to regain their pre-drought reproduction capacity, due to depleted numbers and ill-health (Heffernan, 1995). Thébaud (1998), who studied pastoralists in Burkina Faso, suggests that some never do rebuild their herds and simply remain permanently in the agropastoral sector. The longer harsh conditions obtain, the greater the herd recovery time, thereby lessening herders' capacity to cope. There is now a fairly well-recognised sequence that occurs when herders are faced with extended rainfall deficits:

a) Herds and herders scatter in search of water and pasture. Some herders push (usually southwards) into higher-rainfall areas, where they risk not only conflict with settled peoples but also characteristic pathologies such as dermatophilosis and trypanosomosis. Other herds head towards fixed water-points such as boreholes, where the pasture may become exhausted and trampled in its hinterland and the animals die of starvation.

b) Drought causes the terms of trade to turn against producers. The price of essential grains rises markedly while the sale value of their stock falls dramatically, since many other producers are also trying to sell their animals in order to eat. This is accompanied by a deterioration in the quality and size of the animals on sale. Herders may also sell classes of animals, such as pregnant females, which they would normally retain.

c) Some animals are sold for slaughter, but many go cheaply as live animals to urban entrepreneurs who buy them as an investment. Such individuals have the funds to buy emergency feeds to keep the stock alive. When conditions improve, they often return the animals to the pastoralists to manage them.

d) As a consequence, many herders are gradually transformed from herder-owners to hired herders, with the predictable consequences of uncommitted management.

e) At the same time, the herders' desperation makes them relatively unreliable with stock they manage for village populations. Villagers then remove the stock from the pastoralists' care and set themselves up as herders, eventually creating further competition for grazing resources.

f) When the rainfall levels rise again, the price of domestic stock rises as producers try to restock. Since their capital is limited, the consequence is a large number of producers with non-viable herds (i.e. herds which cannot support their household). These household herds are then even more vulnerable in the next climatic anomaly.

g) Some pastoralists conclude that the species or breeds they herd are unsuitable for the ecozone in which they are trying to operate. Cattle people switch to camels and goats, or try to swap their dominant breed for one with a greater ability to digest browse or tolerate drought.

h) Other pastoralists must leave the system permanently and set up as agropastoral cultivators with small herds that generally do not need to go on transhumance.

These processes are now largely understood, not only by academics, but also by aid agencies and NGOs. Understanding does not necessarily generate solutions, partly because long-term structural assistance is more difficult to sell than emergency aid, and partly because there is something of a conceptual vacuum. Many agencies report ‘compassion fatigue’ as the millennium approaches; why, after more than 30 years of assistance to the semi-arid and arid regions of Africa, do things never seem to improve? This paper considers the solutions that have been proposed and asks whether government and agency policies are appropriate in the light of present experience.

2. ‘Water, Water Everywhere, Nor Any Drop to Drink’

2. 1 Rainfall patterns

The variability of rainfall in semi-arid Africa is well attested, and the timing and intensity of rain is as important with regard to crop production and grazing as the annual aggregate. Whether the rainfall in Sahelian Africa is actually declining has been the subject of much debate, but probably there is no entirely satisfactory response, since the answer depends on the length of the sample period and the reliability of data, especially from earlier periods (Nicholson, 1983). Analyses that begin only in the 1950s will certainly show a decline, as the 1960s were generally a period of high rainfall. In the Near East, in Jordan, for example, it is widely believed that rainfall has been declining in this century. However, an analysis of figures going back to 1921 suggested that there is no significant long-term trend (Blench, 1998). In southern Africa, a warming of around 0.05°C per decade has been recorded over the last century, and this has been accompanied by two or three severe drought years in the early 1990s; however, recent years have been wetter, casting doubt on the identification of trends (Hulme, 1996).

2. 2 Water development

Wells are traditional across much of Sahelian Africa, from Senegambia to southern Ethiopia, although south of this line they are infrequent or unknown. In West Africa, wells can be very deep (more than 100 m), and most of those in use today were constructed long ago and need only limited annual maintenance. Animal power is the main method used for lifting water, and the camel is the preferred species in most regions where deep wells are prevalent. These deep wells can be ‘owned’ by a local pastoral group, as in Mali, where such wells are frequently controlled by the Twareg. This permits access control and usually acts to prevent major pasture degradation in the hinterland of the well. The process of watering a herd at these wells is so labour-intensive that they usually do not allow numbers to rise to levels that cause major landscape degradation. However, pump-operated boreholes installed by agencies are not ‘owned’ in the same way, although they may be controlled by a settlement; without traditional sanctions it becomes very difficult to prevent access, especially as the water is initially abundant compared with animal-traction wells. The situation in Ethiopia is somewhat different, with large collective wells going down in gradated steps that depend on water being passed from one individual to another in a long human chain. These depend far more radically on co-operation between pastoralists and are similarly labour-intensive, limiting pressure on pasture resources.

During drought, livestock generally die of starvation rather than of thirst; low rainfall is insufficient to produce enough grazing for cattle, although their water requirements are usually met by pools. Typically, modern water development has been based around the construction of wells and boreholes, resulting in a concentration of grazing activity around them. Colonies of pastoralists collecting around water points lead to heavy pressure on pasture all year round (Leisinger and Schmitt, 1995). The indiscriminate siting of water projects is often as much to do with inter-agency rivalry as with consideration of the overall needs of pastoralists (Niamir, 1991). There is little incentive for pastoralists to move away from such water sources, as this would involve forfeiting possible future access to it. In some Sahelian countries, boreholes are owned by governments, although central management is practically impossible and undermines local capacity (Bernus, 1975). Social structures which previously provided a regulatory framework for resource allocation have been undermined by the political and media-oriented priorities of agencies with limited

understanding of either the technical or social issues. This can be understood as a sort of ironic reversal of the usual 'tragedy of the commons' narratives. Previously, the pasture resource was kept functioning as a common good by the local ownership of the water resource. Subverting such ownership structures and making water open access has the effect of degrading the existing open access resource, the pasture.

A borehole will provide a focus for sedentarisation or partial sedentarisation, and thus has an initial appeal for pastoralists for whom migration has high costs. But boreholes set in train a new range of problems concerning forage supply that may end up making matters worse in the long term. If a water development project is to be effective it has to be sensitive to local social dynamics and rely on local administrative structures (Bougeot, 1981). Wells which offer water but no fodder to herds create localised exhaustion of soil nutrients and subjects the area to trampling. Trampling leads to the increase of woody plants, and an invasion of low-palatability grasses, leading to greater erosion and lower productivity (Hodgkinson, 1992).

2. 3 Drought and land degradation

The degradation of soil has consequences for its continuing capacity to produce pasture or to be cultivated. Land degradation falls into two broad categories: that resulting from extended periods of drought, and that resulting from overuse through cultivation or grazing (Hiernaux, 1996). The effects of these processes have common elements: the depletion of soil nutrients, the decline in water retention, and the breakdown of soil structure. Further, reduced productivity of the soil leads often to an intensification of land use, exacerbating the problem and ultimately exposing the soil to erosion. The impact of grazing and browsing is a function of seasonality as well as intensity, and the restriction of mobility thus has more serious ramifications than if it were the number of animals only which was at issue (Hiernaux, 1996). Desertification may be conceptualised as extreme soil degradation. The UNCED definition of desertification includes climatic effects and human activity as factors contributing to it, and the 1993 UNRISD study sees the problem as affecting rural populations but also as having a knock-on effect on urban populations as scarcity pushes up food prices (Barraclough, 1995).

Soil fertility can be restored and erosion halted, but this has usually been more successful in higher-rainfall areas. Soil in the Sahel has low productivity potential on account of its low mineral content and poor nutrient fixation (Leisinger and Schmitt, 1995). Soil productivity is based not only on its quality, but also on the amount and distribution of water; rain-fed agriculture cannot become more productive by the application of nutrients alone. In southern Africa, changes in climate are expected to increase the existing environmental change in rangelands, accelerating bush encroachment (Hulme, 1996).

2. 4 Livestock

Livestock held by pastoralists in semi-arid regions represents livelihood, income and employment. The importance of livestock to national economies is masked by the fact that many transactions take place by barter, and tax revenue is not gained from communities which interact largely within an informal economy. Furthermore, the sale of livestock is by no means the crucial element of pastoralism, as only the surplus to subsistence requirements is taken to market (Aronson, 1980). Nonetheless, the gradual depopulation of rural areas as people gravitate towards cities, and the commensurate increase in demand from the urban sector for livestock produce, means that livestock can potentially play an increasingly important economic role.

In pastoralist activity, tradition plays a central role in herd-structure management, patterns of migration, and the value attached to individual animals and the herd. Pastoral techniques of herd and resource management have evolved in an environment that was stable within certain parameters for millennia. The imposition and monitoring of national borders, integration with a monetary economy, access to modern veterinary medicine and the proliferation of boreholes have been shocks forcing livestock-production techniques to evolve rapidly. With so many new uncertainties, developing new and appropriate herd-management strategies has not always proved possible either for the pastoralists themselves or for would-be development agencies.

Research into the precise nature of controls on herd structure is hampered by the fact that pastoralists are often reluctant to have their animals counted, and 'borrow' or 'lend' livestock, making precise ownership data somewhat elusive. Herds are split, with a milk-producing herd kept near the homestead, and other animals grazed wherever pasture can be found; consequently the term 'herd' can apply to the unit of ownership or of management (Dahl and Hjort, 1976). Development, though, is not undertaken solely by external institutions, and changes made by pastoralists and other livestock producers are crucial to the future of the sector. The rise in mixed farming, as cultivators buy livestock, and pastoralists plant crops, indicates a strengthening of contingency measures on a household level, whilst suggesting a broader breakdown of co-operation. Greater production is necessary for the increasing population in Africa, and food shortages are due more to this crisis of production than to general ecological decline (Bovin and Manger, 1990). The 'inherent functionalism' that assumes that people will make adaptive changes once carrying capacity is surpassed does not take account of the fact that people are constrained by available energy, and solutions must be found at a broader level than simply the local population (Bovin and Manger, 1990). Resource shortages, and under-production are not limited to rural areas, and depend in large part on linkages with urban users and service providers.

If carrying capacity has any discernible meaning, it is that *given a particular management system and with particular environmental conditions* a specific number of animals can reasonably be maintained. As environmental conditions are not under the direct control of the pastoralist, the fulcrum of change is in the management system. Pastoralist thinking tends towards the idea that improvement is defined as the increase in the number of animals that can be herded on a given piece of land. Increased integration with a monetarised market and less reliance on bartering and informal exchange-mechanisms means that cash has growing importance. This raises the status of off-take, as the goal of market transaction becomes the accumulation of money rather than the accumulation of animals. What the animal can be exchanged for depends on its quality, and the wealth of the herder is dependent on the accumulated value of the individual animals, rather than on the number possessed. An increase in urban demand due to growing population allows for a higher rate of off-take, prioritising once again the value of the animals (as more of them are sold) over the number (which is only significant within the confines of the pastoral system).

Given environmental variability, including the quality of grazing, the traditional pastoral strategy has been to keep herd numbers as high as possible, since all herders face the same environmental constraints. In the 1980s, the literature on pastoralism was interlaced with debates as to the 'rationality' of this procedure. An earlier stereotype, dating back to the 1920s, was that pastoralists were afflicted with a 'cattle complex' and simply kept large herds of thin cattle because their cultural and ritual systems commanded it. This was replaced with a view from agricultural economics that pastoralists were rational herd managers and that maximal herd sizes were a logical response to a highly uncertain common resource; if the availability of water and pasture is unpredictable, destocking is reducing your only capital asset when the rain may fall again tomorrow. Cullis (1992) asserts that subsistence pastoralism is more efficient when the highest number of animals is maintained, even if the health of individual animals is compromised. Fluctuations in the number of animals has been termed a 'dynamic equilibrium' between the nomad

and the environment, with substantial losses being part of the accepted cycle of events (Johnson, 1969). It is unlikely that most students of pastoralism would subscribe to such a mechanistic interpretation today; it has become clear that different pastoral societies respond very differently to environmental stress.

2. 5 Impact of changing veterinary practice

A major change that essentially sabotages the notion of a 'traditional' pastoralist has been the impact of modern veterinary medicine. Prior to the colonial era, the ability of livestock producers to deal with diseases and pathogens other than ticks or worms was extremely limited[3]. Major epizootics could wipe out whole herds and even debilitating diseases such as brucellosis were virtually untreatable. The principal response to trypanosomosis was simply to avoid vast swathes of the continent, whilst rinderpest could only be combated by taking the entire herd into a remote area.

Most African livestock diseases are now in principle treatable. Failures are usually failures in delivery, not an absence of technology. The immediate consequence of this has been to allow pastoralists to increase the size of their herds and to expand into regions previously closed to them (see RIM (1984 and 1989) and Blench (1994) for documentation of the movement of herds into sub-humid regions of West Africa previously closed to cattle). The consequence was to place unprecedented pressure on feed and water resources, as well as to keep alive stock that would have died in the previous conditions. The further result was large herds of poorly fed animals, often harbouring sub-clinical pathogens. Such herds were inevitably very close to the edge and minor variations in water and feed availability could have major consequences. Fixed veterinary services have reduced the flexibility of pastoralists to move their herds, placing greater stress on areas near where services are provided (Bovin and Manger, 1990).

Recent years have seen considerable improvements in the techniques of reaching remote pastoral communities with veterinary services. The most important of these is the training of 'paravets' who can treat minor ailments and recognise epizootic conditions and major traumas and alert the veterinary authorities. Such programmes are in operation in Ethiopia, Kenya, Somalia, Uganda, Chad, CAR and Mali with varying degrees of success (Catley and Walker, 1997). In addition, traders and private vets (in some countries) are both making drugs available in remote areas and treating animals in some countries; this has the advantage of providing some service where the government may provide none, but the obvious drawback that there is no control over the quality and dosage of drugs. Pastoralists are increasingly taking control over the medication of their herds and are thus forced to make choices based on a very concrete appreciation of the economics of using drugs versus the value of an individual animal.

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

[3] This is somewhat controversial; an alternative view is that ethnoveterinary techniques were widespread and more effective than they appear to be in hindsight (see Mathias-Mundy and McCorkle 1989).

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

3. Who Responds to Drought?

3. 1 The players

Apart from the emergency responses already mentioned, a large number of players are involved in attempting to rebuild their assets after a drought. Most crucially these are the pastoralists themselves, who have sometimes developed quite elaborate mechanisms for protecting their holdings against drought and epizootics. Other parties include government, multi- and bilateral aid agencies and NGOs. These groups may often take very different views of what is necessary in practical terms, but all tend to have the same long-term aim, to restore some imagined system where all the former producers are again supporting themselves through the off-take from their herds. However, it cannot be assumed that there is one level of equilibrium; the combination of conditions and actors is such that semi-arid environments are in a constant flux of disequilibrium, with continuous adjustment being made in response to adverse elements. One reason why, after extensive investment by non-governmental organisations and governments, the situation for Sahelian pastoralists has not improved and is in some ways significantly worse is that many of the forces which contribute to drought are the same ones which hinder the implementation of emergency or development intervention (Horowitz and Little, 1987).

3. 2 Government

Pastoralists and governments are not obvious partners. Pastoralists are governed by their own institutions regarding movement, loyalty and participation in social structure. Governments are interested in knowing where people are and what they are doing, in regulating land tenure and defining administrative boundaries. They encourage at least nominal identification with national norms of education, as well as military and political alignment. Sahelian governments are concerned with a development trajectory, and sectors that do not conform are seen as inherently subversive. Government policy that is based on the belief that pastoralists are a liability will naturally aim to weaken the role of the pastoral sector. In Nigeria, for example, government policy is hostile to the continuation of transhumant pastoralism, and the process of marginalisation will continue until there is a policy shift that integrates settled and nomadic livestock production (Awogbade 1989). In the Horn of Africa, the Ethiopian government has followed a similar line attempting to integrate pastoralists into sedentary society, focusing on livestock rather than herders. Technical solutions fail to capture the social dynamics and have led pastoralists in Somalia to believe that livestock policy is being used as a means of state control (Van Brabant, 1990). Alternative development of the pastoral sector, focusing on the contribution that pastoralists make to the national economy, as well as the political and cultural identity, would strengthen their role and the use that is made of marginal land.

Settlement offers at least the possibility of wage employment or agriculture, but a decision may be taken under duress and has no guarantee of success. The test is whether particular groups of nomadic peoples have gained by settling, primarily in terms of food security, and if they have not, whether they are free to return to nomadism or transhumance. The fragility of semi-arid environments means that constant adjustment is needed; if outsiders initiate sedentarisation, they remove from pastoralists both the implementation of such adjustment and the responsibility for it, by taking control of the situation. Settlement ceases to be a coping strategy, and becomes a permanent and imposed adaptation. The success of coping strategies depends in part on the margin for manoeuvrability.

To date, governmental and non-governmental response to severe drought and loss of animals has centred on restocking, emergency relief and settlement. Emergency relief provides a short-term, important function, but offers no adaptation of the present system of production, and it does not address the issue of the need for constant adaptation to changing circumstances. Emergency sets in when all layers of contingency have been peeled away, and only the development of better coping-mechanisms will impact directly on the number and severity of emergencies suffered.

The provision of emergency relief and the establishment of fixed food-distribution centres can lead to the concentration and sedentarisation of populations. Whilst relief aid is essential for immediate assistance after a disaster, the likelihood of exacerbating the problem through ill-conceived and randomly managed allocations is evident. Post-drought recovery is slowed when pastoralists are separated from their herds, and mobilisation is needed after temporary settlement in relief camps or near distribution points. Pastoralists will rationally rely on food handouts from the government or NGOs if it is easier or in some other way more profitable than creating solutions from within their own environment; Oba and Lusigi (1987) document how the Turkana have made a living out of collecting food aid.

In the Horn of Africa, Inter-Governmental Authority on Drought and Development (IGADD) acted to combat desertification and bolster food security through small-scale projects (Hopkinson, 1989). The strategy adopted was to work through small projects to avoid the tension between the need to increase output from marginal land and to invest in more productive areas. Social projects that increase access to food are necessary, but it is important for African governments to rectify elements of food insecurity which are within their control if external donors are to continue to play a role (Hopkinson, 1989). IGADD is currently implementing an international recommitment that prioritises regional integration and local capacity building. Early warning systems that integrate political, security, and social factors attempt to build prevention into the relief–recovery–development continuum (GHAI 1999).

In Botswana, the government buys meat through the Meat Commission during drought, and government advice on livestock rearing and marketing has been taken on board by the livestock producers. This follows an understanding of the consequences of drought, with the institution of a mechanism for moving, selling and slaughtering livestock, as well as a distribution network for supplementary feeding. During severe drought, the government issues slaughter quotas for the worst-hit areas. Further buffers can be built up with the establishment of fodder reserves including the use of surplus grazing for haymaking (Ward, 1978).

3. 3 Multi- and bilateral aid agencies

The role of the multi- and bilateral aid agencies over time has varied with both fashion and political circumstances. De Haan (1994) in his overview of the World Bank's involvement in pastoralism, identifies four phases in development thinking, from heavy capital investment, through range and livestock projects and support for pastoral associations, to a focus on natural resource management. The value and importance of the livestock resource in arid and semi-arid regions has attracted development projects, especially during the 1960s and 1970s, but it became gradually apparent that these had a strikingly low success rate. Pastoral projects were almost completely halted in the 1980s, and the emphasis shifted to food security and early warning systems. The prevalence of insecurity in some major pastoral areas such as the Horn of Africa suggested to the policymakers that the priority was humanitarian assistance rather than fatter cows.

Pastoralists have not gone away, of course. Their failure to settle and their continued success in supplying protein to remote markets despite the problems of rainfall deficits and in the face of other types of environmental problems has now begun to attract renewed interest, signalled by the World Bank paper 'Investing in Pastoralism' (Pratt et al., 1997). The realisation that pastoralism is not as environmentally damaging as earlier projections had suggested has also created a stimulus for a 'new look' at this sector.

3. 4 NGOs

Non-government organisations have historically always found pastoralism very alluring. Although this is in part driven by their poverty focus, there is something attractive about the independence of pastoralists and a barely concealed romanticism that has been quite significant in concentrating their energies. Past problems with pastoralism have been perceived to be an absolute shortage of water, to which boreholes were deemed an answer, and disease, which was attacked through the provision of veterinary medicine. Pastoralism allowed NGOs to provide simple technical solutions to these problems. These were combined with restocking of animals after drought, all of which prioritised animal numbers over effective management. Responses which concentrate solely on restoring the number of animals herded, whether through restocking or veterinary medicine, simply set the scene for increased loss the next time around. Technical advances have acted to shift the scarcity from livestock to other resources.

NGO interventions have not usually been accompanied by the necessary socio-political changes. Veterinary medicine potentially wipes out the only control on herd growth apart from drought, leading to a situation in which herds get larger and larger, only to face greater disaster when the rain fails. During times of plenty, pastoralists would scarcely accept that a greater profit could be made from herding fewer animals. For many this would be a contradiction in terms: cattle are treated as a unit of currency, and so an increase in the number of cattle *is* an increase in profit. During drought, pastoralists are in no position to negotiate, with livestock prices low and distress sales a necessary evil; the only contingency available is to have enough animals to sell or eat to maintain the food security of the household. Diversification of income includes engaging with capitalist markets outside the pastoral group or system.

Recent work by NGOs has taken account of the social factors which contribute to the success of implementation. Oxfam's 1995 report on food distribution in Turkana flags the importance of community involvement, registration and screening, distribution, and monitoring. Warren and Rajasekaran (1995) cite indigenous knowledge as a crucial factor in designing and implementing intervention.

4. What Do Pastoralists Do?

4. 1 Migration

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

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

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

4. 2 Restocking

Restocking is usually thought of as something perpetrated by agencies, but pastoralists have their own systems of insurance against drought. Herders prepare for drought and epizootics by 'lending' their animals to relatives or friends in exchange for looking after some of their animals in return. If a herd is caught up in a crisis and suffers high mortality, then the herder calls in these animals as the nucleus of a new herd. Even where such an insurance mechanism is not in place, it is quite usual for relatives to lend animals, until they have produced sufficient offspring to form a nucleus of a new herd. Even so, such mechanisms were not always successful; hence the well-developed cult of suicide among West African pastoralists who lose all their herds.

In East Africa and Madagascar, cattle-raiding was much more developed than in West Africa. This not only constituted a threat to viable herds but also was one method of restocking a herd after a drought. Needless to say, this is one 'traditional' recovery mechanism not usually advocated by aid agencies, although it remains fairly widespread in the Horn of Africa. In southern Sudan, much of the conflict has found expression in cattle raiding, undermining food security in the region, and destabilising the population. The potential for livestock production as well as agriculture is significantly underused, and the situation is one of a cycle of threats to food security, leading to social upheaval, which in turn results in further food-security problems. Restocking by agents external to such situations tends to result in distress sales or slaughtering. When implemented inappropriately, restocking risks achieving little more than postponing disaster and the decline of pastoralism, whilst interfering with indigenous recovery systems (Heffernan, 1995).

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

In countries such as Botswana, meat can be sold to agents, to marketing co-operatives or direct to the national Meat Commission (Ward, 1978). Wealthier farmers, whether engaged in livestock or agriculture, do not suffer as intensely as poorer farmers as a smaller proportion of their potential produce is needed to ensure food security, and losing income from the sale of surplus at the market does not have such a devastating effect. In the drought of 1965–6, 90% of Ethiopian farmers had supplementary sources of income, including the sale of livestock. The use of stored grain, engagement in employment, money borrowing and divestment of personal possessions all preceded migration (Wood, 1976).

4. 3 Supplementary feeding

Supplementary feeding had no place in traditional pastoralism, and even cut-and-carry systems were stereotyped as a practice of settled producers. However, the availability of industrial by-products such as oil-seed cakes and molasses has begun to change this situation. Throughout the semi-arid western parts of Central Africa, cotton production was introduced in the colonial era as a cash crop, and its cultivation has remained an integral part of the economy in some countries. The main by-product of ginning cotton locally is cottonseed cake: an oily compressed cake that acts as a nutritious livestock feed. In the 1960s, cottonseed cake was introduced as an experimental diet-supplement in Nigeria, and had to be given away to herders (Otchere, 1986). It has become so highly valued that supplies are regularly bought up by wealthy urban entrepreneurs and rarely reach the markets or are available to ordinary cattle producers (Kaufmann and Blench, 1989).

Urban dwellers choosing to invest in livestock make use of supplementary feeding during dry weather, and many pastoralists understand that purchased feeds can keep alive herds in times of major pasture shortages. However, such feeds are rarely available at affordable prices in the right places and are hardly significant for the mass of producers, although wealthier owners of larger herds are gradually taking advantage of the flexibility they offer. Supplies of supplementary feeding extend the amount of time for which it is viable for livestock producers to remain in the vicinity of a borehole.

4. 4 Changing herd composition

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

These types of changes in herd composition can also apply within species. In West Africa, cattle breeds that specialise in grass are more prestigious than those that can digest a high proportion of browse. However, where low rainfall or high grazing pressure has changed the species composition of the landscape so as to favour shrubby vegetation, the herder with cattle that can tolerate a higher proportion of browse in their diet will survive better. In a concrete example, Ful≡e herders in Nigeria, faced with rapidly vanishing grass in the semi-arid zone, have switched their herds from the Bunaji breed, which depends on grass, to the Sokoto Gudali, which can digest browse much more easily (Blench, 1994).

Strategies relating to species diversification vary; there are advantages in owning a variety of species, so that whatever climatic events occur, there will be survivors. However this is a luxury that only the wealthier can afford. Herds of different species are generally split up, most commonly into browsers and grazers, in order to profit maximally from the available pasture. Larger animals, particularly camels, are resilient in drought, but can die in numbers after a critical point. After drought, smaller stock reproduce more rapidly, allowing the herd to recover, and acting as capital which can be exchanged for larger animals later on. Rebuilding a herd of camels is a slow process by comparison.

Within species, herd diversification takes place during drought. Productive animals, particularly females receive priority treatment, whilst the bulk of the herd is sent to find pasture further afield. This allows milk to be obtained from the subsistence herd, or from relatives, while the rest of the herd does not exhaust the grazing (Dahl and Hjort, 1976).

5. What Do Agencies Do?

5. 1 Restocking

Restocking, whether initiated by herders or organised by an external agent, attempts to rehabilitate herders within their environment rather than suggesting they settle and take up, for example, fish production[4]. Rehabilitation relies, though, on there having been a significant change in the environment or in herder management of it. Returning to the *status quo ante* serves little purpose and contravenes the principle of constant readjustment in conditions of disequilibrium. Simply providing pastoralists with animals to replace those lost during drought does not take account of the fact that the available land, environment and management has not sustained the level of stocking. Restocking risks providing more sacrifices for the next drought. The accumulation of animals through restocking and gradual herd growth following drought is perceived to be the most important means of wealth creation. This arises from the fact that in the past, land was a considerably richer resource and herd animals a higher risk. The loss of weight from animals during drought is of much less importance than the loss of animals through starvation, especially if rehabilitation through restocking will replace lost animals. Selling animals at appropriate points in the drought cycle maintains the possibility of autonomously rebuilding herds in better times. It is beneficial as a means of management, but is still geared towards maximising herd numbers.

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

5. 2 Livestock banking

Livestock banking has been proposed on the analogy of cereal banks, to assist producers to carry stock across the difficult seasons. Livestock banking proposes that the expense of restocking can be spared if, during parts of the year, animals can be traded in to an independently owned ‘bank’ in return for a token. The animals are then tended until such time as the pastoralist decides to redeem the tokens. There is, however, a fundamental asymmetry between grains and animals, in that only the latter require feeding. This in turn demands a responsible, disinterested, well-established organisation to function as a holding operation for the stock, which seems, at the least, politically unfeasible. A system by which animals are fed at the expense of the government during the hardest

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

parts of the year when grain is scarce and expensive seems improbable. It is not evident how such schemes would be able to fund the feeding of livestock when the pastoral system has proved incapable. Goldschmidt (1975) proposed a National Livestock Bank for Kenya, which would make sense if livestock planning were conducted according to very strict economic criteria. Such ideas have never been put into practice.

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

5. 3 Early warning systems: Idea and reality

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

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

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

Despite advances in meteorology, there is still some way to go, both on the technical side and in terms of packaging and presenting the product. Regional forecasts, such as those made for West and Southern Africa, provide probabilities about the average rainfall for the coming season which may help inform choices over seed selection, but as yet say nothing about the timing or distribution of rains. The relevance to pastoralists is, in any case, dubious. Pastoralism is essentially a *reactive* subsistence strategy, by which herds are taken to the areas of greatest productivity in a given year. Pasture depends on factors such as soil quality and water retention; for the foreseeable future, pastoralists will determine their movements, either by what they observe, or by traditional transhumance routes.

The second problem faced by meteorology is one of credibility. Offering probabilistic forecasts to farmers opens wide the possibility of miscomprehension and misinterpretation. To gain credibility, meteorological services need not only to get the forecasts right, but to be believed to get forecasts right. Farmers and pastoralists make predictions about likely weather, and the challenge for

meteorological services is to outperform more traditional practices. At the present, weather forecasting based on sea-surface temperatures and satellite imagery is often too general and zonal to be of any value in a restricted field of operations. The alternative is thus to look for ground-based indicators, most notably livestock prices and herd movements, as well as talking to pastoralists (Hesse, 1987; Swift and Umar, 1991). One of the best known of these systems is the Turkana early warning system in Northern Kenya (Buchanan-Smith, 1992).

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

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

It may be, in addition, that there was problem of visibility. There is less exposure and credit to be gained from preventing something happening than from ‘saving’ people when it does. Early warning predictions put people in a position of greater knowledge, but does not necessarily equip them with the tools to use such knowledge. The 1980s phase of disaster response saw something of a dip in the popularity of early warning, although technical advances in climate modelling have led to some restoration of its credibility (Blench and Marriage, 1998). There are now numerous websites devoted to providing up-to-date information on such climatic anomalies as the El Niño Southern Oscillation, and monitoring catastrophic events relevant to food security. They include, on a global basis, the USAID-funded Famine Early Warning System (FEWS, 1999), and on a regional level, one for South Africa (South Africa, 1999). Agencies now have somewhat less hubris about their capacity to respond, but the emphasis has now changed to influencing governments to building in an awareness of the impact of climatic anomalies in their long-term planning. Variability of climatic conditions is a reality that needs to be acknowledged and incorporated into government policy, as well as into individual- or group-level contingency plans.

5. 4 Sedentarisation

The encroachment of cultivation onto land traditionally held and grazed by pastoralists has forced them into increasingly marginal and unproductive land. Despite this, some interest groups argue that pastoralists are inherently inefficient and self-destructive, and should be settled, as is the official line in Nigeria, for example (Awogbade, 1981). Besides the cultural damage involved in forcibly settling pastoralists, small-scale agriculture or urban unemployment does not necessarily offer a lifeline out of poverty. Pastoralists exist on land that is too fragile or too variable to be intensively used. Even spontaneous sedentarisation does not necessarily entail any increase in production or food security and may, on the contrary, have the effect of shifting underemployment and hunger to other regions. The growing urban population gives rise to greater demand for livestock and agricultural produce, whilst the labour force in rural areas dwindles, and depopulation of areas suitable for pastoralism only wastes natural and human resources. Niamir (1991) notes a drain of expertise as young people move out of the pastoral sector.

Arguments for sedentarisation revolve around the fact that it relieves the tension between settled and nomadic farmers. Government policy tends to favour the agriculturalist and faith in technical assistance given to farmers is reinforced by ethnic prejudices, since administrators come

predominantly from agricultural backgrounds (Horowitz and Little, 1987). However the conflict between these two groups does not justify one sector being sacrificed to the other, particularly given the potential for a symbiotic relationship between the two. The growing number of pastoralists and settled farmers who are diversifying into agropastoralism demonstrates the potential complementarity between herding and farming. Furthermore the scope for further collaboration is evident: inputs such as fodder, apart from simply crop residues, provide the possibility of greater diversification of herd-management techniques. Past external intervention has been informed by northern specialists, but the lessons of the integration of the pastoral system with other sectors points very forcefully towards the conclusion that future advice and thinking, whether from within the pastoral sector or without, should take a holistic view of the situation. Settlement does not reduce the consumption needs of pastoral groups, and the issues of food security and pressure on resources are not addressed by a policy of sedentarisation.

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

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

6. Ethical and Policy Issues

6. 1 Rights: Material and cultural

It is generally assumed that livestock producers have the right, like everyone else, not to be dead. In other words, there is a moral obligation to feed people who might otherwise starve. Gauging whether this is actually the case is not always easy, since it is in people's interest to lie in order to obtain greater benefits from a given agency. Nonetheless, assuming these issues are resolved, feeding people is relatively simple both ethically and practically.

The next questions are much harder. While it is relatively easy to decide when someone's life is under threat, a threat to an individual's 'way of life' is more difficult to determine. There are vested interests in attacking or preserving 'ways of life', and this could be caricatured by saying that pastoralists are rather photogenic, and it would be a pity of they took to Western dress and began feeding liquid concentrates to their stock. Drought, like any climate anomaly, threatens people's cultural patterns, but such patterns have had to change dramatically many times in the past in response to political and climatic shocks. The object of sentimentality must not be mistaken for an ethical issue: traditional pastoralists both in the Southwest Asia and West Africa managed a large part of their herds through slave labour in the nineteenth century, and were it to be argued that this 'traditional' system should be restored, it would have a generally low audibility. Conditions change, and not necessarily for the worse; in the nineteenth century there were no modern veterinary drugs, and mortality among herds was correspondingly substantially higher and life more difficult; a return to this state of affairs would be clearly undesirable.

In other words, there is no responsibility to undertake an essentially spurious enterprise, the restoration of a lost system; pastoralists take a risk like any entrepreneur in an inherently unstable environment. If they lose their herds and have to switch occupations they follow the route of many preceding generations. The dynamic between the 'desert and the sown' as Arab discourse has it, is integral to the pastoral process.

6. 2 Policy: National and regional

Apart from responding to humanitarian issues, governments and regional organisations have a more complex problem: to develop a policy that will somehow result in effective and sustainable use of rangelands. Given the mobility of pastoralists, any country that tries to wish away cross-border movement will not make effective policy. This can only be done through consultation. Any government that becomes too oppressive or ineffective will end up by driving away its pastoral population. Paradoxically, any government that is too helpful, in provision of infrastructure or veterinary services, will attract too many herders, and place its fragile rangelands under excessive pressure, thereby placing the herders at risk.

6. 3 Steps towards rethinking policy

The future of pastoralism depends on the objectives of the people involved, as pastoralists can only choose between the options available to them. Problems are likely to become more severe in the future as human population pressure increases. The causes, consequences and even the definition of environmental degradation are not as transparent as was once thought, and longitudinal

investigation of vegetation simply reveals its complexity. Livestock numbers are high and growing, whilst the livelihoods and conditions of pastoralists deteriorate. This suggests that policy fails to reflect many of the new insights into semi-arid livestock production systems.

The promotion of pastoral production will undoubtedly remain controversial, but the argument that it is an effective use of land that cannot otherwise be used for agriculture, suggest that governments and others will continue to invest in it. If this is to be a productive enterprise, as opposed to a simply humanitarian project, then linking understanding with action will have to become more effective. This in turn means trying to root out entrenched attitudes, which probably do more harm than anything large herds of herbivores can achieve.

Suggestions for initiating this process:

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

Pastoralism, almost by definition, is an ecozonal phenomenon that is not bounded by the nation-state. Unless we begin to see it as a regional problem, both technically and in terms of its institutions, it may be a significant casualty of the early 21st century.

References

Publications

Aronson, D. R. (1980) 'Must Nomads Settle? Some notes toward policy on the future of pastoralism'. In: *When nomads settle: Processes of Sedentarization as Adaptation and Response*. pp. 173–184. New York: J. F. Bergin Publishers.

Awogbade, M. O. (1981) 'Livestock Development and Range Use in Nigeria'. In: Galaty J., D. Aronson, P. Salzman and Chouinard (eds) *The Future of Pastoral Peoples*. Proceedings of a conference held in Nairobi, Kenya, 4–8 August 1980. pp. 325–333. Ottawa: International Development Research Centre.

Awogbade, M. O. (1989) 'The Nature of Nigerian Pastoralism: Nigerian Case in Perspectives'. In: Gefu, J. O., I. F. Adu, E. A. Lufadeju, M. S. Kallah, A. A. Abatan, and M. O. Awogbade (eds) *Pastoralism in Nigeria: Past, Present and Future*. Proceedings of a National Conference on Pastoralism in Nigeria, 26–29 June 1988. pp. 8–16. Ahmadu Bello University, Zaria: National Animal Production Research Institute.

Behnke, R. H. and I. Scoones (1993) 'Rethinking Range Ecology'. In: Behnke, R. H., I. Scoones and C. Kerven (eds) *Range Ecology at Disequilibrium: New models of natural variability and pastoral adaptation in African savannas*. pp. 1–30. London: Overseas Development Institute.

Bernus, E. (1975) 'Human Geography in the Sahelian Zone'. In: *MAB (Man and the Biosphere) Technical Notes. The Sahel: Ecological approaches to land use*. 67–74. Paris: UNESCO.

Bernus, E. (1983) 'Contemporary Nomadic and Pastoral Peoples: Africa and Latin America'. *Studies in Third World Societies*. Publication 17, Department of Anthropology, College of William and Mary.

Bernus, S. (1987) 'Meneka Pastoral Development Feasibility Study, Sociologist's Report'. pp. 41–57. Unpublished. (Location: Overseas Development Institute, London).

Blench, R. M. (1994) 'The Expansion and Adaptation of Ful≡e Pastoralism to Subhumid and Humid Conditions in Nigeria'. *Cahiers d'études africaines*, 133–135, 197–212.

Blench, R. M. (1998) 'Rangeland Degradation and Socio-economic Changes among the Bedu of Jordan: Results of the 1995 IFAD survey'. In: Squires, V. R., and A. E. Sidahmed (eds) *Drylands: Sustainable use of rangelands in the twenty-first century*. pp. 397–423. Rome: IFAD.

Blench, R. M. and Z. Marriage (1998) 'Climatic Uncertainty and Natural Resource Policy: What should the role of government be?' *Natural Resource Briefing Paper* 31. London: Overseas Development Institute. http://www.oneworld.org/odi/nrp/31.html.

Bougeot, A. (1981) 'Pasture in the Malian Gourma: Habitation by humans and animals'. In: Galaty, J., D. Aronson, P. Salzman and Chouinard (eds). *The future of pastoral peoples*. Proceedings of a conference held in Nairobi, Kenya, 4–8 August 1980. pp. 165–183. Ottawa: International Development Research Centre.

Bovin, M. and L. Manger (eds) (1990) *Adaptive Strategies in African Arid Lands*. Proceedings from a seminar at the Scandinavian Institute of African Studies, Uppsala, April 1989. Sweden: SIAS.

Buchanan-Smith, M. and S. Davies (1995) *Famine early warning systems and response: The missing link*. London: Intermediate Technology.

Catley, A. and R. Walker (1997) 'Somali Ethnoveterinary Medicine and Private Animal Health Services: Can old and new systems work together?' Paper presented at the International Conference on Ethnoveterinary Medicine Research and Development. Pune, India, 4–6 November 1997.

Cullis, A. (1992) 'Taking the Bull by the Horns: NGOs and pastoralists in coalition'. *ODI Pastoral Development Network Paper* 33d. London: Overseas Development Institute.

Dahl, G. and A. Hjort (1976) 'What is a Herd? Primary and practical considerations'. In: Dahl, G. and A. Hjort. *Having herds: Pastoral herd growth and household economy*, Stockholm Studies in Social Anthropology 2. pp. 114–129. Stockholm, Sweden.

De Haan, C. (1994) 'Overview of the World Bank's involvement in pastoral development'. *Pastoral Development Network Paper* 1994–5. pp. 1–6. London: Overseas Development Institute.

Glantz, M. H. (1997) 'Eradicating Famines in Theory and Practice: Thoughts on early warning systems'. *Internet Journal for African Studies* 2. 'Using science against famine: Food security, famine early warning, and El Niño.' http://www.brad.ac.uk/research/ijas/ijasno2/glantz.html

Goldschmidt, W. (1975) 'A National Livestock Bank: An institutional device for rationalizing the economy of tribal pastoralists'. *International Development Review* 17(2): 2–6.

Gorman, M. and A. Boosh (1990) 'A Study of East Atbara Lahawin Pastoral Society and Economy: An investigation of potential for improvement of food production in a drought-affected area'. CONCERN Sudan.

Heffernan, C. (1995) 'Restocking Pastoralists: A review of the literature'. MSc dissertation, Veterinary Epidemiology and Economics Research Unit, University of Reading. December 1995.

Hesse, C. (1987) 'Livestock Market Data as an Early Warning Indicator of Stress in the Pastoral Economy'. *ODI Pastoral Development Network Paper* 24f. 19p. London: Overseas Development Institute.

Hiernaux, P. (1996) 'The Crisis of Sahelian Pastoralism: Ecological or economic?' *ODI Pastoral Development Network Paper* 39a. 20p. London: Overseas Development Institute.

Hodgkinson, K. C. (1992) 'Elements of Grazing Strategies for Perennial Grass Management in Rangelands'. In: Chapman, G. P. (ed.) *Desertified Grasslands: Their biology and management*. Linnean Society Symposium Series 13. pp. 77–94. Published for the Linnean Society of London. London: Academic Press.

Hopkinson, N. (1989) 'Desertification, Debt and Structural Adjustment in Sub-Saharan Africa'. June 1989, *Wilton Park Papers* 18. Conference report based on Wilton Park conference 339:26–30. London: HMSO.

Horowitz, M. M. and P. D. Little (1987) 'African Pastoralism and Poverty: Some implications for drought and famine'. In: Glantz, M. (ed.) *Drought and Hunger in Africa: Denying famine a future*. ch. 4. Cambridge: Cambridge University Press.

Hulme, M. (ed.) (1996) 'Climate change and Southern Africa: An exploration of some potential impacts and implications in the SADC region'. Report commissioned by WWF International and co-ordinated by the Climate Research Unit, University of East Anglia, Norwich.

Johnson, D. L. (1969) 'Aspects of pastoral nomadism'. In: *The Nature of Nomadism: A comparative study of pastoral migrations in Southwestern Asia and Northern Africa*. University of Chicago Department of Geography, Research Paper 118. pp. 1–19.

Johnson, D. L. (1975) 'The State of Pastoral Nomadism in the Sahelian Zone'. *In MAB (Man and the Biosphere) Technical Notes. The Sahel: Ecological approaches to land use*. 75–87. UNESCO: Paris.

Kaufmann, R. von, and R. M. Blench (1986) 'Livestock Production Systems in the Subhumid Zone of Nigeria: Programme document'. ILCA Subhumid Programme, Kaduna, Nigeria.

Konczacki, Z. A. (1978) 'Some Speculations on the Prospects of the Pastoral Mode of Production'. In: *The Economics of Pastoralism: A case study of sub-Saharan Africa*. pp. 150–171. UK: Frank Cass.

Leisinger, K. M. and K. Schmitt (eds) (1995) *Survival in the Sahel: An ecological and developmental challenge*. International Service for National Agricultural Research (ISNAR)/ CIBA-GEIGY.

Mace, R. (1989) ‘Gambling with goats’. *Pastoral Development Network Paper* 28a, 1988–90. 16p. London: Overseas Development Institute.

Mathias-Mundy, E. and C. M. McCorkle (1989) *Ethnoveterinary Medicine: An annotated bibliography*. Bibliographies in Technology and Social Change 6. Iowa State University, Ames, IA.

Moris, J. R. (1988) ‘Oxfam’s Kenya restocking projects’. *ODI Pastoral Development Network Paper* 26c. 21p. London: Overseas Development Institute.

Niamir, M. (1991) ‘Traditional African Range Management Techniques: Implications for rangeland development’. *ODI Pastoral Development Network Paper* 31d (July 1991). 11p. London: Overseas Development Institute.

Nicholson, S. E. (1983) ‘Sub-Saharan Rainfall in the Years 1976–1980: Evidence of continued drought’. *Monthly Weather Review*, 111:1646–1654.

Oba, G. (1992) ‘Ecological Factors in Land Use Conflicts, Land Administration and Food Insecurity in Turkana, Kenya’. *ODI Pastoral Development Network Paper* 33a. 23p. London: Overseas Development Institute.

Oba, G. and W. Lusigi (1987) ‘An Overview of Drought Strategies and Land Use in African Pastoral Systems’. *ODI Pastoral Development Network Paper* 23a. 33p. London: Overseas Development Institute.

Otchere, E. O. (1986) ‘The Effects of Supplementing Feeding of Traditionally Managed Bunaji Cows’. In: Kaufmann, R. von, S. Chater and R. M. Blench. *Livestock Systems Research in Nigeria’s Subhumid Zone*. Proceedings of ILCA/National Animal Production Research Institute Conference held in Kaduna, 29 Oct–2 Nov 1984. pp. 204–212. Addis Ababa: ILCA.

Oxfam (1995) ‘Food Distribution in Turkana’. Report. Oxfam: Oxford.

Pratt, D. J., F. Le Gall and C. De Haan (1997) ‘Investing in Pastoralism: Sustainable natural resource use in arid Africa and the Middle East’. *World Bank Technical Paper* 365. Washington DC: World Bank..

RIM (1984) ‘Livestock and Land Use in Southern Gongola State’. (3 vols). Report by Resource Inventory and Management Limited (RIM) to LPU, Kaduna.

RIM (1989) ‘Livestock and Land Use in Niger and Anambra States, Nigeria’. (2 vols). Report by Resource Inventory and Management Limited (RIM) to FDLPCS, Abuja, Nigeria.

Swift, J. J. and Abdi Noor Umar (1991) ‘Participatory Pastoral Development in Isiolo District: Socio-economic research in the Isiolo livestock’. Final report. Mimeo from Isiolo Livestock Development Project, EMI ASAL Project, Isiolo, Kenya. 241pp.

Thébaud, B. (1998) ‘Entre rentabilité économique et viabilité de l’économie familiale: Le rôle de l’élevage dans la microéconomie pastorale et agropastorale’. In: *Proceedings of the 4th International Technical Consultation on Pastoral Development*, Ouagadougou, 24–27 March 1998. Ouagadougou: UNSO/UNDP.

Toulmin, C. (1987) ‘Drought and the Farming Sector: Loss of animals and post-drought rehabilitation’. *Development Policy Review* 5(2):125–148.

Toulmin, C. (1995) ‘Tracking through Drought: Options for destocking and restocking’. In: Scoones, I. (ed.) *Living with Uncertainty: New directions in pastoral development in Africa*. 95–115. London: Intermediate Technology Publications.

Van Brabant, K. (1994) ‘Cycles of Relief and Rehabilitation in Eastern Ethiopia: 1973–93’. *ODI Relief and Rehabilitation Network Paper* 4. pp. 21–46. London: Overseas Development Institute.

van der Hamman, T. (1983) ‘The Palaeoecology and Palaeogeography of Savannas’. In: *Tropical Savannas*. Ecosystems of the World 13. Bourlière, F. (ed.) 19–35. Elsevier: Amsterdam.

Ward, K. W. (1978) ‘Livestock Marketing and Supplementary Feeding in Times of Drought’. In Hinchley, M. T. (ed.) *Proceedings of the Symposium on Drought in Botswana*. National Museum, Gaborone, Botswana June 5–8, 1978. pp. 239–246. Botswana: Botswana Society in collaboration with Clark University Press.

Warren, D. M. and B. Rajasekaran (1995) ‘Using Indigenous Knowledge for Sustainable Dryland Management: A global perspective’. In: Daniel Stiles (ed.) *Social Aspects of Sustainable Dryland Management*, pp. 193–209. Geneva: John Wiley.

Wood, A. P. (1976) ‘Farmers’ Responses to Drought in Ethiopia’. In: Hussein, A. M. (ed.) *Drought and Famine in Ethiopia*. African Environment Special Report 2. 67–88. London: International African Institute.

Electronic resources

The dates refer to when the website was accessed for information.

FEWS (Feb 1999). USAID Famine Early Warning System. http://www.info.usaid.gov/fews/fews.html.

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

Infocarto (Feb 1999). Normalised Difference Vegetation Index. http://www.infocarto.es/ndvicr.htm.

NOAA (Feb 1999). National Oceanographic and Atmospheric Administration. http://www.noaa.gov/

South Africa (Feb 1999). Southern Africa regional early warning systems to monitor people’s access to food and water. Embassy of South Africa, Washington, DC. http://www.southafrica.net/economy/forest-agri/ews.html.

Spot Image (Feb 1999). Spot satellite earth observation system. http://www.spotimage.fr/.

Annotated Bibliography

This bibliography attempts to cover semi-arid Africa in a selective fashion. Needless to say, in the information age, uncovering references is much easier than knowing whether their content makes them worth seeking out. The function of the descriptions is to assist the reader in this.

Some websites are listed with the full web address. Their links are not always maintained, and they can be updated; this summary reflects the date when the webpages were printed out.

In some cases, the summary reflects the style of the author of the article, especially in terminology, and this has been retained. In a few cases, where the author has provided a short summary of his or her article, this has been taken over into the text followed by the annotation [Author].

In some cases, authors have published similar material in a series of articles or in an article and a report. The bibliographic references are given to these additional articles, but no further summary is appended. In a few cases, references have been included without a full abstract.

Geographical coverage is of necessity somewhat uneven and limited by the languages searched. The Portuguese literature for Mozambique and Angola has only been dealt with in a summary fashion, and material in Arabic relating to Sudan has not been searched.

Literature on Africa inevitably presents problems of orthography. One of the principal pastoral peoples of West-Central Africa, the Ful≡e, are referred to as Fulani, Peul, Fellatah and variants of these in the dispersed literature. We have tried to standardise on Ful≡e in the summary texts, but many titles of articles contain these variant ethnonyms. The key words and index can be used as a cross-referencing guide to indicate where similar terms refer to a single group of people.

The majority of the references are published books or articles in scholarly journals. Major reports are also included, but short documents and information sheets, pamphlets and the like from the many small agencies now concerned with this area are generally omitted, as they are hard to obtain. This area has been the subject of considerable journalistic interest, in part because of the frequent famines. There are thus a number of trenchant publications from environmental agencies that contain material of considerable interest.

The index contains the key words, authors, and selected terms from the reference titles.

This compilation represents continuing work, and we would be grateful if any readers who know of other relevant literature could forward the correct reference (and preferably a summary) to us.

1 Abbink, J. (1993) ‘Famine, Gold and Guns: The Suri of southwestern Ethiopia, 1985–91)’. *Disasters*, 17 (3), pp. 218–225. London: Overseas Development Institute.

2 Abbink, J. (1995) ‘Disaster, Relief and Political Change in Southern Ethiopia: Developments from within Suri society’. In: Sørenson, J. (ed.), *Disaster and Development in the Horn of Africa*. Basingstoke: Macmillan.

Key words: Ethiopia / Suri / drought / ecological crisis / weapons / conflict / social structure

The chapter describes the recent history of the Suri, a group of approximately 24,000 people engaged in transhumant pastoralism, shifting cultivation, and hunting/gathering in southern Ethiopia. The author considers how the Suri recovered from an ecological crisis in the mid-1980s, characterised by drought, crop shortages, cattle diseases, and conflict with neighbouring peoples. Through various strategies, including temporary migration, increased hunting and gathering, and exploitation of gold resources in the Lower Maji-Kibish and Upper Akobo areas, the Suri managed to survive as an autonomous group. However, this ‘success’ has come at a cost. By investing in cattle and especially guns, the Suri have forcibly re-asserted a claim to a resource niche along the Upper Kibish. The use of automatic weapons has acquired a cultural momentum of its own, with important consequences for Suri social structure and especially intergenerational relations. As other groups acquire modern arms, consensual forms of resource division have waned, and inter-group relations have become increasingly violent.

3 Ademosun, A. A. (1979) ‘Livestock Production and Health in the Sub-humid Tropics of West and Central Africa’. ILCA–NAPRI symposium on the intensification of livestock production in the sub-humid zones of West and Central Africa. 23–30 March 1979. Kaduna, Nigeria.

Key words: West Africa / Central Africa / Fulani / sedentarisation / livestock production / intensification / disease

The paper describes the production systems employed by nomadic pastoralists, the mixed livestock and crop farmers and the small sedentary farmers. The pastoralists, owning the majority of the cattle in the region are heavily depended upon for animal products. The chief threats to livestock are infectious disease, internal and external parasites and nutrient deficiencies and metabolic diseases, and the paper includes a description of the most common diseases. Inadequate nutritional requirements are more common among the nomadic herds, as settled farmers are in a position to supplement feed. From the premise that nomadism is pursued by necessity, the paper considers the possibility of nomads adopting a sedentary life if the conditions were appealing. There is an appreciation of the significance of adaptive culture traits which reflect the interaction between humans, domestic animals and the physical environment. This is taken in the context of technological changes outside the nomadic livelihood which impact on it; there must be an understanding of the interdependence between the nomads and the settled farmers. However the sedentarisation of the nomadic Fulani which is implied by the intensification of land use is not welcomed as a prospect either by the nomads, who consider settled life to be ‘monotonous, cumbersome, boring, unchallenging and retrogressive’ (p. 4), or by the farmers, few of whom would want the pastoralists to be settled nearby. Nonetheless, the paper proposes that ‘the settlement of the nomadic Fulani is socially and economically desirable as it will remove the major area of regular conflicts between the nomadic Fulani and the settled farmers and enhance good neighborliness’ (p. 17). The inclusion of the nomadic Fulani into mainstream society is seen as necessary for the provision of health and education. The objective of livestock intensification is the improvement of livestock through modern methods, these being the use of improved males, better grassland management and the use of supplementary feeds.

The intensification of livestock will necessitate an increased vigilance against disease. The argument for intensification is rooted in the growing demand for animal products and the inability of to supply this demand locally. Intensification will have to start gradually, with high subsidies, which can be reduced once the transition is underway. The paper concludes that the advantages of intensification and the sedentarisation that it entails outweigh the sacrifices that will have to be made.

4 Aronson, D. R. (1976) 'Niger Range and Livestock Project Social Soundness Analysis'. Annex H, pp. 137–176. Probably part of report for USAID (source incomplete).

Key words: Niger / Tuareg / Peul / transhumance / population pressure / terms of trade / herd management

The Niger Range and Livestock Project has the twin aims of increasing the incomes of pastoralists in central Niger, and finding a long-term ecological balance in the zone. Sheep epidemic and the risk of cattle- or camel-rustling have resulted in the overrepresentation of goats in the Tuareg herds. The Tuareg form a small, politically independent, group which is heavily involved in the market as a means of rebuilding their herds. They are relatively sedentary, but transhume along a northwest–southwest route to the salt cure. The Peul recognise the dominance of the Tuareg, and live in scattered and small communities and lack deep kinship groups; this makes census-taking difficult. They have few market needs and are irregular in their transhumance patterns. The paper outlines the forces which have brought change to the region. Firstly is the destruction of the Tuareg traditional political economy by the French, then the intensification of agriculture through the freeing of Tuareg slaves. The creation of a national boundary with Nigeria blighted the Tuareg trade routes, and this was followed by a decline in the terms of trade. Population pressure increased as a result of national social policy and the building of wells, and the onset of the Sahelian drought gave rise to higher losses. The project is experimental in nature, and has broad implications, particularly in the light of a changing environment, including the tripling of uranium-mine labour demands and the competition for salt trade. It is founded on the establishment of social organisation and communication, both of which are hampered by the low population density. There is no guarantee of success, and the project may see the number of pastoralists continuing to decline. However, if it is successful, pastoralists will be encouraged to change their management strategies by overcoming technical constraints which they now face, and their level of autonomy will be enhanced by their increased bargaining power in the economy of Niger. Replicability will be assured by the intensive research into herding management and the development of cost-effective technical intervention, although it is recognised that other areas have different social arrangements and managing practices.

5 Aronson, D. R. (1980) 'Must Nomads Settle? Some notes toward policy on the future of pastoralism'. In: Salzman, P. C. (ed.) *When nomads settle: Processes of sedentarisation as adaptation and response.* pp. 173–184. Praeger. J. F. Bergin, New York.

Key words: government role / herd management / sedentarisation / development / veterinary medicine / national economy / range management

Pastoralists have been settling and uprooting continuously, but current development thinking regards nomads negatively, rather than valuing the knowledge they have acquired from generations of adaptation. Similarly, pastoralists are generally unaware of the directions of government development planning. There are six features of pastoral life which need to be understood: pastoralists are engaged in multi-resource economies; they move out of necessity rather than choice; economic decisions are

made with a view to long-term security; production aims to maximise the number of goals, not just economic goals; ownership and management of herds may be in different hands; pastoralists are vigilant to changes in their environment. Policy directed towards pastoral communities must do away with stereotypical images of nomadic herders; sedentarisation is frequently unviable, which is why many pastoralists do not settle. Policy recommendations regarding pastoralists can come from two angles; either they hope to destroy pastoralism as a means of livelihood, or they hope to enhance the lives of the pastoralist as legitimate citizens. Assuming the latter position, areas for development would include access to veterinary medicine, and relations between pastoralists and other members of the population. The crux of the pastoralist system is not the contribution it makes to the national economy; on the contrary, it is often only the surplus to subsistence needs which goes to market. Priorities for development lie in improving the standard of living for pastoralists and secondly, increasing the growth of the national economy to which they contribute. The decline of pastoralism is not inevitable from an environmental point of view, as enough rangeland exists to support large numbers of people and herds.

6 Aronson, D. R. (1985) 'Implementing Local Participation: The Niger Range and Livestock Project'. In: *Nomadic Peoples* 18, June 1985 'Local participation in development decisions'. pp. 67–75. Oxford, UK: Berghahn Books.

Key words: participation / Niger / social status / culture / development / democracy

The paper examines the conceptual, ethical, and structural ambiguities which emerged in the Niger Range Livestock project, implemented between 1978 and 1983. Thinking around this time centred around pastoralists as superfluous to development schemes as they were nomadic, and in need of rescue from their own destruction. In this context, the introduction of participatory, beneficiary and socially sensitive development planning was surprising. The directive to ensure 'local participation' is about channels of information, not content, and is part of a democratic concern with government 'by the people'. 'Participation' assumes that everyone has an opinion to voice and that development should progress according to the aggregate will of the people, conditions which do not obtain in many pastoral societies. There is irony in the fact that anthropologists have favoured the politically loaded technique of participation. Involving local people is a complex issue: needs have to be defined, and policies which match the project capabilities. There is no culture-free source of information on universal validity, and anthropologists need to exercise their ethical choices as much as their scientific judgement.

7 Atampugre, N. (1993) 'Behind the Lines of Stone: The social impact of a soil and water conservation project in the Sahel'. 168p. Oxfam UK and Ireland.

Key words: Burkina Faso / *diguettes* / water retention / moisture levels / participation / erosion / social organisation

The Projet Agro-Forestier (PAF) in Burkina Faso was set up by Oxfam in 1979, and by 1982 had developed into a large-scale operation involved in helping farmers to conserve, protect and develop their natural-resource potential. The use of the water tube in the construction of stone *diguettes* or bunds has proved effective as a means of halting soil erosion. The project has been evaluated by means of written questionnaires, but oral histories have also been taken into account; the effectiveness of the *diguettes* is examined through an evaluation of PAF's ability to intervene, and the awareness of the farmers of the impact of the *diguettes*. The project has not stopped the pattern of lean years

interspersed with bumper years. There are three major types of soil in the Yatanga province: *zecca*, which is gravel-like soil composed of rock debris, ferruginous sandy-textured soils, and alluvial or clayey soils. The process of increasing soil fertility is hampered by the fact that there is no available fallow land for shifting cultivation, there is little access to chemical fertilisers, while the dry season is longer and rainfall is declining. The declining amount of water has its hardest impact on pastoralists who are forced to shift their migratory patterns as ponds dry out. The level of education is another factor affecting migration: although the school enrolment figures are high for the province, the literacy rates are low, so that although migration in search of employment is possible, there are few opportunities outside labouring. The option of trying out new farming techniques is considered too unreliable a gamble, making it difficult for outside agencies to promote innovations. The spread of *diguettes* across the province was therefore an important political step, and according to questionnaires evaluating the project, farmers were impressed by their impact. The major contribution made by the *diguettes* is the increase in water retention by the soil. The effort required to build them is a drawback, and some farmers have decided against building them for fear of flooding their land or because there are insufficient stones readily available or tools to build the walls. Yatenga is considered a high risk area as it has high population density and low soil fertility; about 40% of the population is considered at risk to famine. The drought in the 1970s is strong in the collective memory, and many livestock owners divested their cattle in order to buy grain; the small-stock prices fell so low that pastoralists risked selling all their animals, and still not achieving food security. The PAF project has not had dramatic effects as yet, although there is confidence that it provides more reliability in terms of water resources. It introduces a three-pronged approach to rural development integrating afforestation, agriculture, and animal husbandry. The project has focused on participation and presents itself as a response to farmers' views and needs. At a technical level, improvements brought about by the PAF are apparent: soil moisture levels have risen, cereal crops have increased, there is a wider variety of non-cereal crops, and natural vegetation is regenerating, but the social and economic benefits are less obvious. Attempts to reach the poorest factors are undermined by other developments such as the mounting pressure to privatise land. The future of participation in development is dependent on the effectiveness of local socio-political organisation.

8 Awogbade, M. O. (1981), 'Livestock Development and Range Use in Nigeria'. pp. 325–333 in Galaty, J., Aronson, D., Salzman, P. and Chouinard (eds) *The Future of Pastoral Peoples.* Proceedings of a conference held in Nairobi, Kenya, 4–8 August 1980. International Development Research Centre, Ottawa.

Key words: Nigeria / population growth / government role / overgrazing / Ful≡e / Fulani / symbiosis / settlement

Factors affecting the pastoral sector in Nigeria are: the increased demand for livestock produce as a result of increased population, drought in the Sahel, the need for government guidelines on management, and the increasing constraints on pastoralists. The challenge is to satisfy the demand without suffering from problems of overgrazing, over-intensive cultivation, and ecological disruptions; the official line is that settlement is the only solution. Inadequate information on livestock numbers means that it is impossible to assess the efficiency of range use. The Ful≡e are the major livestock producers, practising a transhumance pattern of husbandry, but their obstacles which include fodder and water shortage, lack of means for improved production, and disease risks have led many of them to adopt a sedentary life. This has been accompanied by a breakdown in the symbiotic relationship between the nomadic and sedentary communities; Fulani now often have to pay for grazing their animals on crop residues as the introduction of fertilisers has led cultivators to believe that manure is no longer needed. The establishment of grazing reserves is possible only if production capabilities of renewable resources and the optimal economic use of the potentials in these reserves

are linked into one system of interdependent actions. A complete overhaul of the role of goals and strategies for self-sufficiency is needed.

9 Awogbade, M. O. (1987) 'Grazing Reserves in Nigeria'. *Nomadic Peoples* 23, 1987. Commission on Nomadic Peoples, International Union of Anthropological and Ethnological Sciences. pp. 19–30. Oxford, UK: Berghahn Books.

Key words: Nigeria / cattle rearing / grazing laws / land tenure / settlement / modernisation / grazing reserves

The issue of settling nomadic cattle rearers is one which for many years now has generated considerable discussion in Nigeria's government circles. Since the grazing laws of 1965 was enacted by the then Northern Nigeria legislative assembly and with the commencement of the First National Livestock Development Project (FNLD), the settlement debate has assumed a progressively wider dimension. There are several obvious reasons for this official interest in settling Nigeria's livestock owners: It is estimated that traditional livestock owners control over 90% of the total national herd but have no right to land; the movement of herds limits their access to health facilities and the government's ability to institute improved management; traditional livestock owners do not participate in the political decision-making process. In addition, there is an establishment throughout the northern states of urban-based Fulani pressure group known as 'Miyetti Allah', representing the pastoralists' socio-economic and cultural interests. The group is also involved in protecting the land rights of pastoralists.

Currently, the direction of Federal Government policy seems to indicated the desirability of settling the traditional cattle rearers as a step forward in the essential process of establishing their land rights into a form which will provide incentives for returns to land and in land investment. Furthermore, settlement is expected to provide added incentives for returns for the gradual injection of modernisation process into traditional livestock production system.

It is in this light that grazing reserves are being established by all the state governments in Northern Nigeria to formalise land-tenure rights for the pastoralists, and to make possible the development of Nigeria's livestock resources by institution of a ranching system. The issue now is how to direct these developments so as to optimise the use of the reserves, while reaping the benefits of secure tenure and the advantages of a modern ranching system.

In this paper, we discuss these issues by examining: (p. 1) the development of grazing reserves; (p. 2) current experience gained in the established reserves; and (p. 3) aspects of socio-cultural dynamics which will be useful in articulating what should be the direction of development. [Author]

10 Awogbade, M. O. (1989) 'The Nature of Nigerian Pastoralism: Nigerian case in perspectives'. In: *Pastoralism in Nigeria: Past, present and future.* Proceedings of National Conference on Pastoralism in Nigeria 26–29 June 1988. Gefu, J. O., Adu, I. F., Lufadeju, E. A., Kallah, M. S., Abatan, A. A., Awogbade, M. O. (eds) pp. 8–16. National Animal Production Research Institute, Ahmadu Bello University, Zaria, Nigeria.

Key words: Nigeria / sedentarisation / modernisation / self-sufficiency / grazing reserves / population pressure

The major strands of livestock development are: the importance of livestock in the rural economy, the implication of pastoral nomadic practices within the framework of agricultural policies and the ongoing campaign on nomadic education. Impacting on these is the production philosophy of pastoralists and the social effect of this policy on Nigeria's self-sufficiency in food production. The agricultural policy essentially rests on expanding the resource base, and herder education takes the form of encouraging mixed farming; nomadic pastoralism is on its way out, as it is perceived by official bodies as wasteful and unproductive. There have been three phases of state intervention, the control and eradication of disease, the 'stabilisation' of the pastoral sector and the attempt to settle nomadic pastoralists as a precursor to introducing modernisation. The 'stabilisation' of the pastoral sector was heralded by three proposals: the establishment of grazing reserves protected by law, the provision of land rights to pastoralists, and the development of communal village grazing reserves as a means of bringing livestock to peasant agriculture. According to differential mobility and cultural values, pastoralists can be identified as transhumant, settled, peasant, or urban-based, these being employed by city dwellers who transfer some of their wealth into livestock. Most political forces in Nigeria are working against the continuation of transhumant pastoralism, and this is a trend which cannot be arrested without the deliberate formulation of a policy integrating nomadic and settled forms of production, but population pressure will eventually result in land-extensive methods such as transhumance being replaced by land-intensive methods such as fodder-based livestock production. The modernisation of the agricultural sector is inevitable and irreversible, and attention should be turned to protecting the socio-economic well-being of those affected by the transition.

11 Barraclough, S. (1995) 'Social Dimensions of Desertification: A review of key issues'. In: Stiles, Daniel (ed.) *Social Aspects of Sustainable Dryland Management*. pp. 21–80. John Wiley, UNRISD, Geneva, Switzerland.

Key words: UNEP / UNRISD / desertification / Sahel / degradation / environmental refugees / water management / conflict / land management

The 1993 UNRISD report for the UNEP on social dimensions of desertification focused around the provision of support to the individual farmer, the social impacts of drought, and 'environmental refugees'. Desertification is a socially defined concept as hunter-gatherers will have different views of land productivity from those held by cultivators. The UNCED's definition of desertification as 'land degradation in arid, semi-arid and sub-humid areas resulting from various factors, including climatic variations and human activities' is taken as the starting point for the discussion. According to this, there is extensive and spreading land degradation, and this has a primary effect on communities living on or near the affected land, and a secondary effect on a much larger scale through the world economy and prices inflated by scarcity. Estimates of 900 million people at risk from desertification do not help us to understand the extent of the problem, as they represent only rural populations in dryland areas where soil is believed to be in danger of becoming increasingly unproductive, and does not include urban populations or others who are affected by externalities such as water scarcity, price rises or war. Desertification is caused not solely by natural phenomena such as drought, or solely by human activity, but by the interaction between the two; in some cases there is clear evidence that human activity has a marked effect on local climate variations, but elsewhere it has only a minor role. Arresting the process of desertification involves understanding the interplay of factors, and an appreciation by those wielding power that all interests are at stake. Who is managing the land is an important question to ask.

Drought affects different parts of society in different ways; the falling price of livestock and the rising price of grain impact on producers. Many rely more heavily on self-employment, or become migrant workers. Those whose entire livelihood is derived from animals generally become less willing to sell

livestock, whereas those who rely on crop production become more willing to part with their animals. Droughts give rise to flows of ecological refugees; these follow paths other than the traditional nomadic paths, and are not necessarily in search of pasture. During the 1968–74 drought in the Sahel, whole families of pastoralists moved to urban areas, and some towns found their populations rising by 50%. However, to make too rigid a distinction between environmental refugees and political or economic refugees misses the point of the interaction between various causes and effects of distress. Finding alternative livelihoods locally, migration, and collective resistance are strategies employed in unfavourable circumstances. The tendency to blame population growth for pressure on the land is valid, in that if there were no people, there would be no anthropogenic causes of desertification. This is facile, however, and takes no account of the amount that people consume and the fact that this is significantly lower for the poor than for the rich; there are no simple cause-and-effect links between population size and the extent of land degradation.

12 Bates, D. G. and Paine Conant, F. (1981) 'Livestock and Livelihoods: A handbook for the 1980s'. In Galaty, J., Aronson, D., Salzman, P. and Chouinard (eds) *The Future of Pastoral Peoples.* Proceedings of a conference held in Nairobi, Kenya, 4–8 August 1980. pp. 89–100. International Development Research Centre, Ottawa.

Key words: herd management / development / local knowledge

The areas of uncertainty for pastoralists are: pasture, herds and livestock produce, water and transport. Political and economic sources of uncertainty are household and labour organisation, rights to stock and pasture, and the organisation of exchange relations. The purpose of the proposed handbook is to encourage research so that the knowledge and experience of pastoralists can be made available to developers. A regional approach is necessary, not as a means of searching for homogeneity, but because it focuses on the organisation and integration of functional diversity.

13 Baumann, M. P. O. (1990) 'The Nomadic Animal Health System (NAHA-System) in Pastoral Areas of Central Somalia and its Usefulness in Epidemiological Surveillance'. Master's thesis, University of California-Davis, School of Veterinary Medicine.

14 Behnke, R. H. (1992) 'New Directions in African Range Management Policy'. *ODI Pastoral Development Network Papers 1991–1993: Network Paper* 32c March 1992. London: Overseas Development Institute.

Key words: carrying capacity / range management / stocking / participation

There is a confusion arising between economic and ecological carrying capacity. If rangelands are to be successfully managed there must be a devolution of power to local communities, rather than an imposition of policy. There are four possible strategies of rangeland management which can be employed as a means of countering the effects on pastoralist livelihoods of erratic food availability. Firstly there is the option of high stocking, the long-term viability of which is dependent on the exploitation of other grazing area, particularly during times of drought; this is inhibited by the fact that extensive herd mobility is incompatible with ranching. The second possibility is 'tracking' whereby 'livestock owners refine their capacity to off-load or acquire stock according to forage availability'. Thus during times of shortage, the herd size is decreased through sale, reducing the risk

and damage of loss through death. Connected to this is the priority of maintaining the resistance of the indigenous breeds to fluctuation in feeding. Strategy 3 is the supply of additional feed inputs, but this opens the possibility of supporting artificially high stock rates; its obverse is the strategy of conservative stocking, which also has the benefit of offering a disposal mechanism during drought. There is a need for close integration between the commercial and the communal sector, but this would in practice provide more benefit to the commercial sector. The question of how to prioritise the small farmers and herders during drought is not fully resolved.

15 Behnke, R. H. (1994) 'Natural Resource Management in Pastoral Africa'. *Development Policy Review* 12: 5–27.

16 Behnke, R. (1995) 'Natural Resource Management in Pastoral Africa'. In: Stiles, Daniel (ed.) *Social Aspects of Sustainable Dryland Management*. pp. 145–152. Geneva, Switzerland: UNEP/John Wiley.

Key words: Africa / overgrazing / degradation / sustainability / local management / tragedy of the commons / mobility

African rangelands are not as susceptible to degradation as has been thought in the past. Their resilience comes from the fact that during the wet season, they produce more than is needed by animal populations, and during the dry period, when overgrazing becomes a real hazard, the vegetation retreats behind thorns and woody parts of the plant; dry periods are sufficiently frequent and harsh not to allow herbivore populations to reach a size which would challenge the vegetation. If a herder's stocks grow to numbers which the land cannot sustain, the equilibrium which allowed him to vary the off-take by tracking environmental fluctuations to maximise his produce changes into a non-equilibrium setting in which the herder is no longer in control of the rate at which animals die. Mobility is a major strategy employed by pastoralists in the face of an unproductive environment, and this challenges sedentary culture's view of land tenure. Pastoralists would find little advantage in having full control over a piece of occasionally productive land; however free-for-all access to land prompts concerns about the tragedy of the commons. What is needed is the unambiguous identification of a delimited group with a bounded resource if collective resource management is to be effective. Management costs of semi-arid areas must be low as productivity is low, and administrative intervention is not feasible. Strict boundary maintenance is not a high priority, and for resources which are not in high demand, customary and co-operative tenure constitutes an appropriate form of management.

17 Benson, C. and Clay, E. (1998) 'The Impact of Drought on Sub-Saharan African Economies: A preliminary examination'. *World Bank Technical Paper* 401. Washington DC: World Bank.

Key words: economic integration / national economy / macroeconomics / drought mitigation / government role / NGO role / external agents / food security / household food security / drought impact

Research into the macroeconomy of drought is scarce, and drought shocks have differentiated economy-wide impacts. It has typically been assumed that drought affects agriculture and particularly food supply, and that the economy is restored with the return of the rain. An examination of the economic impact of drought involves an assessment of the factors determining the scale and nature of

the vulnerability to drought, and the impact of drought on productive sectors and policy targets, and an identification of broad drought-management strategies appropriate across a range of types of economies. The interaction between drought shocks and the economy is complex; the concept of an *economic drought* concerns the impacts of poor rainfall on production activities, including water provision for human consumption. It resembles an internal supply-side shock, a disturbance beyond a country's control having non-marginal impacts on domestic economic variables. A country's vulnerability to drought is not dependent only on its proportion of arid lands, as adaptation is made within environmental constraints, and dry regions have finely honed coping mechanisms. Four types of economies respond to drought in different ways, simple economies, intermediate economies, complex economies and dualistic economies with large extractive-mineral sectors. This typology is a simplified rendition of a continuum of dynamic economic structures. Initial direct effects of drought include a downturn in agricultural and livestock productivity as well as the production of hydroelectric power. This has knock-on effects, which sometimes lead to the exacerbation of income inequality as a result of changes of income distribution, and a concentration of the effects of drought in the rural economy. In the context of drought, good governance applies to states which are genuinely committed to the well-being of all regions. In terms of external assistance, programme financial and food aid, emergency aid and advocacy are variously available to IFIs bilateral donors and non-governmental organisations. The growing integration of sub-Saharan African economies into international financial and commercial systems provides for greater complexity in the provision of support; however, neither public nor private sources have shown sustained interest in drought mitigation outside the period of drought shock. Farmers and subsistence farmers, on the other hand, are constantly aware and preparing for the onset of drought. The integration of economic drought mitigation, relief and rehabilitation is a priority, as is the coherence between individual programmes and policies. A more effective information system on the overlapping issues of food security and the economy will improve the interpretation of both.

18 Berland, J. C. (1979). 'Peripatetic, Pastoralist and Sedentarist Interactions in Complex Society'. *Commission on Nomadic Peoples Newsletter* 4, September 1979. pp. 6–8. Oxford, UK: Berghahn Books.

Key words: nomadism / agriculturalists / socio-economic systems

The concept of a 'nomad' should be broadened to include subsistence activities in addition to pastoralism, but excluding traditional hunting and gathering. 'Peripatetic nomads' are a spatially mobile group of entertainers, artisans, beggars and peddlers; whilst less numerous than pastoralists, these are the most widely dispersed of nomadic groups. These people combine specialist skills with spatial mobility and exploit human needs as primary resources within socio-economical systems, finding a peripatetic niche within a society which contains pastoralists, agriculturalists and urban-industrial communities who exploit a bio-physiotic niche.

19 Bernus, E. (1975) 'Human Geography in the Sahelian Zone'. pp. 67–74 in *MAB (Man and the Biosphere) Technical Notes. The Sahel: Ecological approaches to land use*. Paris, France: UNESCO Press.

Key words: historical context / nomadism / sedentarisation / water development / participation

The drought in the Sahel is not a new phenomenon, although its effects are arguably more far-reaching than those of previous droughts: while there is no trend towards greater aridity, there is a

decline in the amount of vegetation cover and a qualitative change of pastures, indicating desertification. There are various historical factors contributing to the increased pressure on the land: the break-up of warrior societies, the settlement of former servile labourers in the margin of the agricultural zone, and the improvement of medicines have led to human and animal population increase, and to this is added the pressure of extended cash-crop farming. Water development has taken the form of concrete borewells which have concentrated populations in these areas; although there is adequate water, the pasture suffers from heavy grazing and trampling. Management of the wells is practically impossible as they are government-owned, and this has contributed to the breakdown of traditional forms of resource regulation and ownership. The result of water development has been to increase the population pressure on some areas whilst leaving others completely unexploited. The decreasing vegetation is explained not by any climatological change, but by an imbalance in the pressure exerted on the land. Development failures in the past demonstrate the need to involve pastoralists in legislation and management.

20 Bernus, E. (1983) 'Contemporary Nomadic and Pastoral Peoples: Africa and Latin America'. *Studies in Third World Societies* 17.

Key words: livestock production / environmental degradation / range management / traditional systems / drought / population pressure / mobility

The question is posed as to whether range management exists under traditional forms of nomadic pastoralism, and if so, what form it takes. Secondly, did livestock-rearing services of the colonial era in French-speaking Africa of the Sahelian-Saharan belt take into account the problems of the pastoral economy, and have the contemporary livestock-rearing programmes of Niger incorporated range management. Improvements in veterinary medicine led to the dramatic increase in the number of animals herded, which led to disastrous loss of capital for pastoralists in the drought of 1969 to 1974. The challenge of pastoralism is to increase the yield from the herd without denuding the land, and this is what is captured by the term 'range management'. The absolute priority lies in the spatial organisation and the protection of the vegetation cover alongside livestock production, and this has always been a part of range management within traditional systems. Whereas previously it has taken the form of seasonal migration, it has become more obvious recently as intensification of land use has been accompanied by prolonged periods of drought. The problem now faced is how to adapt traditional methods of range management to present conditions in such a way that livestock producers feel themselves to be the beneficiaries of an operation in which they are a vital link.

21 Bernus, S. (1987) 'Sociologist's Report'. in Meneka Pastoral Development Feasibility Study pp. 41–57. Unpublished (copy in ODI library).

Key words: Niger / restocking / loans / herder organisation / drought contingency

The report evaluates the post-drought recovery mechanisms employed in the Menaka *cercle* in the republic of Niger, including the differing means by which loans can be made to restock herds after a period of distress. The author notes that in the case of pastoralists in Niger in 1976 that a cash loan was made, as this increased the farmer's sense of autonomy, and resulted in all these first loans being paid back. When loans of animals are made, there are decisions to be taken on how many animals are necessary to allow realistically for restocking, and how the loans should be repaid. The possibility of optimum size of a herd is also discussed, that being the number of animals which can produce milk

and meat for a family throughout the year, whilst allowing the family a marketable increase to cover tax, other food purchases, clothing and other necessities.

The second part of the project was to maintain the equilibrium between human pressure and available resources despite the extent of variation. The evaluation of this begins by airing the consideration that it may no longer be possible for all the inhabitants of the Menaka *cercle* to live as pastoralists. The project advocates permanent drought preparedness, involving divesting animals every year before the onset of the rainy season, and buying in animal food during the dry season in order to make the animals more resistant and more productive. The emphasis is on quality rather that quantity of animals in a herd. In terms of marketing infrastructures, an increase in the importance of local markets is a priority, together with export to outside markets and a regular supply of animal food.

The reduction in the number of animals necessitates a change in the management. This is problematic in that it demands definitions of reserved areas, and legislation. Ultimately the management must take the form of voluntary regulation, but this must be endorsed by politicians and civil servants. The project had been set up in the Menaka *cercle* in response to previous discussions on perceived needs. A number of sectors were highlighted as areas for improvement; the supply of necessary goods, the organisation of systems of loaning animals for the reconstitution of herds, the constitution of co-operative cattle herds, the establishment of a system of range management, and the organisation of work schemes to give salaries to the most impoverished.

22 Berry, L. (1975) 'The Sahel: Climate and soils'. In: *MAB (Man and the Biosphere) Technical Notes. The Sahel: Ecological approaches to land use.* pp. 9–17. Paris: UNESCO.

Key words: Sahel / climatic zones / rainfall variability / degradation / climate change / rainfall / erosion

The Sahelian zone extends between the Sahara in the north and the Sudanic zone in the south. The average climates indicate the dominant north-south climatic zones, along with regional variations. Rainfall is the crucial climatic element, varying in amount, timing and intensity. Past climates in the Sahel have fluctuated in a continuous and complex way; evidence for this lies in the fact that active sand dunes, the result of wind erosion, have at times been much further south than their present limits. Soils are assessed not only for their fertility but also for their vulnerability, their ability to cope with drought conditions. Results suggest that in the Sahelian zone, highest rates of soil-loss potential are found on ferruginous soils, where about 200 tons per km² can be lost each year. Besides the climate and degradation trends that may be detectable over broad areas, there is extensive variability at the local level, and care must be taken when seeking generalities between regions.

23 Blair Rains, A. (1979) 'Intensification of Livestock Production in the Sub-humid Tropics of West Africa'. In: ILCA–NAPRI symposium on the sub-humid zone of West Africa, Kaduna, 23–30 March 1979. 34p. Kaduna: ILCA.

Key words: West Africa / beef production / sedentarisation / off-take / tsetse fly / government ranch

The paper focuses on the roles of the physical environment, the human environment, primary production and feed in an analysis of livestock production. It highlights the potential for increased trade, and the movement towards the formation of new ranches. The integration of animals into existing small agricultural farms is a possibility, but there is greater optimism that livestock

intensification can accompany a sedentarisation of pastoralist communities, if tsetse fly can be eradicated. This would have the advantage of raising productivity as pastoralists could adopt dairy-oriented techniques, which would give a greater off-take than the nomadic cattle afford. However, there are capital costs involved in ranch development, and the viability of ranch farming depends on a supply of cheap immature cattle, cheap feed and a high price for meat if the costs of fencing, irrigation and management are to be covered. However, immature animals are seldom sold by pastoralists, and are not sold cheaply, so there is some ambivalence over the viability of government ranching. Despite the long-term benefits of the sedentarisation of pastoralists, the short term may result in the under-utilisation of productive areas and the disruption of transhumance patterns. In terms of persuading the pastoralists into a sedentary life, the paper recommends the granting of usufructory rights and an allocation of land which is as close as possible to the existing usage.

24 **Blakeway, S.** (1995) 'Evaluation of the UNICEF Operation Lifeline Sudan Southern Sector Livestock Programme'. Nairobi: UNICEF-OLS.

25 **Blench, R. M.** (1991) 'The Dessication of Lake Chad in 1990'. *Méga-Tchad Bulletin*, 91/2.

26 **Blench, R. M.** (1995) 'A History of Domestic Animals in Northeastern Nigeria'. *Cahiers de Science Humaine*, 31(1): 181–238. Paris: ORSTOM.

27 **Blench, R. M.** (1996) 'Pastoralists and National Borders in Nigeria'. In: Nugent, P., and Asiwaju, A. I. (eds) *African Boundaries: Barriers, conduits and opportunities*. pp. 111–128. Edinburgh: Francis Pinter for Centre of African Studies.

28 **Blench, R. M.** (in press) 'Why Are There So Many Pastoral Peoples in East Africa?' In: van Dijk, Han, de Brujn, Miriam and Breedveld, Anneke (eds) *Ful≡e Studies*. Leiden: Brill.

29 **Bohle, H. G.** (1993) 'The Geography of Vulnerable Food Systems'. In: Bohle, H. G., Downing, T. E., Field, J. O. and Ibrahim, N. (eds) *Coping with vulnerability and criticality*. pp. 15–30. Freiburg Studies in Development Geography, Verlag Breitenbach.

30 **Bougeot, A.** (1981) 'Pasture in the Malian Gourma: Habitation by humans and animals'. In: Galaty, J., Aronson, D., Salzman, P. and Chouinard (eds) *The Future of Pastoral Peoples.* Proceedings of a conference held in Nairobi, Kenya, 4–8 August 1980. pp. 165–183. International Development Research Centre, Ottawa, Canada.

Key words: Tuareg / common property / social strata / participation / land use / water development / social organisation

The Kal Tamacheq (Tuareg) define land boundaries and occupy it in common ancestry groups at different times of the year. The herds are split into ovines, which are cared for by servants, and bovines, which are tended by relatives. Strategies are employed which preserve pasture and keep the herds up to strength during May and June; the system is a non-anarchic collective use of natural resources. This has been largely upset by the interference of economic pressure, the introduction of capitalist-type markets, competition, administrative reorganisation and drought. Privatisation of land threatens to impoverish the poorest of the herders to the benefit of the richest of them, resulting in stratification. The Kal Tamacheq employ two major strategies for coping with the unpredictability of grazing. When moving to unfamiliar territory, animals accustomed to that area are introduced into the herd as leaders. The second technique is the provision of mineral salts which make up for dietary

deficiencies. The proposals made in the chapter prioritise improving the living conditions of the pastoralists as a development objective: areas for improvement are the level of development of local forces of production, the system of land use, the role of pastoralists in their own development. Progress is necessary in the region of water allocation; drilling cannot be seen as a solution to the problem, for physical and political reasons, including rights of access. Ponds do not produce the same recipe for conflict, and are managed collectively, and pond-deepening would at least start to address problems of water shortage. Any water-development project must be based on the socioeconomic practices of the region rather than technically oriented. Regulation of grazing land faces obstacles from ideological or religious, and bureaucratic quarters, as well as being subject to sabotage from corrupt rich herders. It is proposed that natural resource use is regulated by means of a transhumance council, aiming to revive traditional ways of thinking and decision making, whilst strengthening social cohesion. Multiple claims to resources such as ponds and salt-cure sites should be settled by inter-community associations. The major problem envisaged is the stabilisation of the prices of pastoral products.

31 Boudet, G. (1975) 'Improvement of Pasture and Livestock Exploitation in the Sahel: Proposals for management and land use'. In: *MAB (Man and the Biosphere) Technical Notes. The Sahel: Ecological approaches to land use*. pp. 89–98. Paris: UNESCO.

Key words: Sudanian zone / carrying capacity / range management / transhumance / cultivation / sedentarisation / disease

Development of the pastoral sector involves an appreciation of the specificity of the resources, and needs to make use of an inventory of forage resources, an inventory of water resources, an inventory of livestock numbers and a census of the human population. From these figures appropriate wet- and dry-season stocking rates can be calculated, and directives made for combating water-borne diseases. Many transhumant pastoralists move to the Sudanian zone during the dry season, returning to the Sahel at the beginning of the rains. During drought some settlement takes place, a process made more difficult by the scarcity of vacant land. Agricultural activity is linked to the concept of an extended Sudanese family. There is an area of intensively cultivated land near the village which is tended by the women. Further afield, and interspersed with the agricultural land are plots cultivated when people are not needed on the family fields; if these were to be grouped together, areas of deep soil would be reserved for grazing the village livestock. Further resources can be used by the reclamation of unhealthy regions from endemic diseases; these areas could be used for easing population pressure from over-populated regions, or sedentarising nomads.

32 Boudet, G. (1975) 'Pastures and Livestock in the Sahel'. In: *MAB (Man and the Biosphere) Technical Notes. The Sahel: Ecological approaches to land use.* pp. 29–40. Paris: UNESCO.

Key words: Sahel / nomadism / transhumance / wet-season pasture / dry-season pasture / range management / wildfires / population growth

The Sahel is characterised by continuous thornbush-steppe vegetation and delimited by the 100–200mm and 500mm isohyets. Active growth of Sahelian pastures takes place for 1 month in the north and 3 months in the south. The value of pasture area is determined by the production of edible material, the energy content of plant matter, and the nitrogen content of the forage. It is from such data that estimations about carrying capacity are made. Wild fires are frequent and extensive, particularly when the herbaceous biomass produced is above 1 ton/ha, resulting in forage deficit even

in years of good growth. Exploitation of the Sahel is predominantly in the hands of nomads, whereas livestock rearing is a transhumant activity, with herders following a precisely and traditionally defined route which makes optimal use of the forage. During the wet season, pastures close to stagnant pools are exploited; at the beginning of the dry season, pastures close to superficial ground water; and in the midst of the dry season, pastures irrigated by rivers or deep pools. Sanitary improvements have led to increased animal and human populations, and this has been accompanied by extensive water development following extensive research into resources. However this has led to sedentarisation around boreholes, upsetting floristic balances and threatening the health of the livestock. The exploitation of the rangelands has not improved, and there has been gradual erosion of traditional management practices. Pastures grazed in the rainy season are particularly sensitive to stocking rates, and it is essential to treat wet-season and dry-season pastures differently. Dry-season pastures, despite their desultory appearance, retain their productivity, providing the diaspores of the Graminiae have been disseminated and have not been trampled.

33 Bourn, D. (1978) 'Cattle, Rainfall and Tsetse in Africa'. In: *Journal of Arid Environments*. March 1978. pp. 49–61.

Key words: tsetse fly / rainfall / overgrazing / carrying capacity / overstocking

Increased population pressure has led to attempts to reclaim some of the 10 million square miles of Africa in which tsetse fly occurs. The paper traces the occurrence of tsetse fly, and its impact on cattle. In tsetse-free areas, cattle biomass increases with rainfall, but in countries partially infested with tsetse, no clear relationship with rainfall is shown, and countries with high incidence of tsetse have low cattle biomasses whatever the rainfall. The author concludes that if tsetse fly were to be eradicated, this could lead to an increase in the biomass of cattle in these regions. He cautions that this could entail the degradation of much of the land as has occurred in tsetse-free areas, and then the decline in productivity; he proposes that research into 'optimum carrying capacity' should be carried out in order to maximise production. He asserts that optimum carrying capacity predictions derived from meteorological statistics have some validity, and would be useful for desirable stocking levels for economic assessment of tsetse eradication programmes, and for livestock-development projects generally.

34 Bovin, M. (1990) 'Nomads of the Drought: Ful≡e and Wodaabe Nomads between Power and Marginalisation in the Sahel of Burkina Faso and Niger Republic'. In: Bovin, M. and Manger, L. (eds) *Adaptive Strategies in African Arid Lands.* Proceedings of a seminar at the Scandinavian Institute of African Studies, Uppsala, Sweden, April 1989. pp. 29–57. Sweden: SIAS.

Key words: WoDaabe / marginalisation / famine / ethnic conflict / sedentarisation / conservatism / opportunism / carrying capacity

The recurrence of drought in the Sahel means there is a necessity for pastoralists to incorporate 'drought potentiality' into their social and economic systems. The pastoralist group of the WoDaabe and the agro-pastoralist group of the Ful≡e Liptaako are people who no longer dominate the social systems, but have become, over the last 20 years, 'involved in a process of marginalisation along with impoverishment and proletarisation, sedentarisation and agriculturalisation' (p. 37). Those who have lost all their animals have a range of sub-optimal choices, including begging, making and selling jewellery or medicines, labouring or prostitution. Both languages make a distinction between drought and famine. Droughts are given descriptive names and are held responsible for the increase in tension

and conflict between ethnic groups in the Sahel. Whereas the western model of drought includes the climatic elements and the socio-political elements of drought, the Sahelian model includes the third element of Allah.

Methods of redistributing and circulating animals during times of drought, include the practice of loaning an animal for a season either for its milk or its offspring, and the redistribution after loss which ensures the survival of the family structure. The WoDaaBe are practising 'cultural resistance' (p. 50) in their dress and through their rejection of Islamic culture. Increased drought for them has meant an increased mobility, which has caused them a dilemma on account of their increased dependence on grain. The Ful≡e tend in the opposite direction, that is towards sedentarisation in the face of increased drought. Systems of redistribution such as borrowing a cow are no longer practised, and salaried herding is normal. The dichotomy between opportunistic and conservative stocking is rejected as survival depends on the ability to use both methods. However, conservative stocking takes account of the environmental carrying capacity as opposed to the needs of the pastoralist, whereas opportunistic farming includes the survival on the human population as well as the external environment.

35 Bovin, M. and Manger, L. (eds) (1990) 'Adaptive Strategies in African Arid Lands'. Proceedings of a seminar at the Scandinavian Institute of African Studies, Uppsala, Sweden, April 1989. Sweden: SIAS.

Key words: veterinary medicine / population growth / urban demand / export / social organisation

Arable cropping, pastoralism and agropastoralism are the major systems of production which have evolved in a resource-scarce, high-risk environment. The success of such strategies in areas of high evaporation, low soil-nutrient content and frequent erosion is attributable to their high degree of flexibility. Drought, warfare and disease have kept human and animal populations in some sort of balance, along with a low birth rate and high death rate; thus consumption needs have been kept low. The introduction of health and veterinary services has caused a decrease in flexibility which results in a concomitant increase in vulnerability. The crisis in Africa is due more to the inability of the region to produce for an expanding population than to a purely ecological decline. However 'inherent functionalism' whereby adaptation naturally follows when carrying capacity has been exceeded is rejected as groups are constrained by the available energy. The development of the nation state has meant an increase in the demand for grain in urban areas and for export, and for this reason amongst others it is necessary to look more broadly than simply at the local population to find solutions to problems of resource management and social organisation.

36 Brandt, H. and Lembke, H. H. (1988) 'Development Aid as a Continuous Contribution: The case of the Sahelian countries'. German Development Institute (GDI), Fraunhoferstrasse 33–36, D–1000 Berlin 10, Germany.

Key words: Sahel / drought / ecological degradation / overgrazing / donor role / conflict / macroeconomic stagnation

The study aims to explore whether Sahelian countries need continuous contributions to ensure their survival, what challenges face the international development co-operation, and what is the role of the German development co-operation in particular. The economic problems of the region are ascribed to the 'serious deterioration of climatic and external economic conditions' (p. I) as well as a poor

resource base, population growth, conflict and conceptual difficulties. For the last 25 years, agricultural productivity has been growing far more slowly than population. The position of the Sahelian countries both with respect to German aid, and structural adjustment programmes is that they are in such need of assistance that large portions of the population cannot survive without continuous assistance from donors; the maxims of 'basic-needs orientation' and 'helping the people help themselves' have meant that donors are committed to financing key sectors on a long-term basis. However, tying aid to development projects erodes the donors' bargaining power and counts them out of the development decision-making process. Efficiency in project work can be increased by concentrating on essential basic-needs sectors, specification of realistic objectives, realistic budgeting and careful selection of locations and intensity. The needs of the Sahelian region are determined in part by the weather; in comparison with the long-term average (1901–1984) no year between 1968 and 1984 had above average rainfall. If, as is mooted, this is a result of local anthropogenic ecological destabilisation and climatic deterioration, this has implications for development co-operation priorities. The evapotranspiration–precipitation cycle is adversely affected by overgrazing and deforestation which leads to water erosion. The clearing of West African forests reduces the rate of evaporation in the region, and the moisture content of the south-westerlies that bring rain; with the destruction of the vegetation, more heat is reflected by the bare earth (albedo). This, it is argued, is responsible for the spread of the desert southwards and explain the drought in the Sahel. However, this does not fully explain the drought conditions experienced thus far, and it remains to be seen how long they persist. If the drought proves to be long term, the report advocates making a distinction between three zones of action, an evacuation zone, a stabilisation zone, and a southern zone in which economic and social capacities can be developed.

37 Breman, H., Cissé, A. M., Djiteye, M. A. and Elsberse, W. Th. (1979) 'Pasture Dynamics and Forage Availability in the Sahel'. In: *Israel Journal of Botany* 28, 1979/80. pp. 227–251.

Key words: Sahel / forage / weather / bush fires / plant growth / rainfall variability / perennials

'Food is an almost uncontrolled factor in the cattle-raising systems of the Sahel. The available quantity and quality of the worst month determine stock density' (p. 227). The question arises as to how much forage varies from year to year and not simply within the year, and this is dependent on the weather, grazing and bush fires. The study warns against rangeland evaluation based on the study of only one season. Factors such as rainfall pattern and total rainfall, the mean growing cycle and the intensity of grazing are important, along with substrate properties which determine the risk of crust formation and runoff affect the type and distribution of vegetation. There is a danger of overestimating the usefulness of perennials and underestimating the value of intensively grazed land. Pastures of perennials have a large biomass quantity, but the quality is low during the rainy season. The heavy grazing during growth which keeps the quality high cannot be withstood by perennials. The perennials have greater value during the dry season, on account of their regrowth.

38 Buchanan-Smith, M. and Davies, S. (1995) 'Famine Early Warning and Response: The missing link'. London: Intermediate Technology Publications.

Key words: famine / early warning / relief / Ethiopia / Sudan / Chad / Mali / Kenya / donor agencies / Sahel / politics / food security

Famine early warning systems, many of which were established in the 1980s, have improved capacity to predict when famine is likely to occur, but this has not been matched by preventative response.

What is needed is a systematic analysis of what happens to early warning information once it enters the decision-making process. There are four categories of reasons for which early warning information is not fully used; these concern the nature of the information, the institutional context and institutional links to decision-makers, the broader political climate, and the logistical obstacles to an optimal response. The international relief system responds to famine once it is underway, but is badly equipped to respond to early warning; further, relations between donors and governments are often the most important determinants of response. The case for an early response is made on the basis that assistance must be developmental in nature and arrive before lives have been seriously disrupted by the necessity to sell off productive assets. The rising incidence and severity of short-term shocks make countries in the Horn of Africa and the Sahel particularly susceptible to famine, and nearly half the population faces chronic food insecurity. Mixed results of structural adjustment have left the poor more vulnerable to internal and external shocks. Macro-economic decline has increased inequalities between social strata, and people in famine-prone areas have little direct input into decision-making procedures relating to famine. It is important for early warning systems to detect pockets of acute food stress.

39 Campbell, D. J. (1991) 'The Impact of Development upon the Strategies for Coping with Drought among the Maasai of Kajiado District, Kenya'. In: Stone, Jeffrey C. (ed.) *Pastoral Economies in Africa and Long-term Responses to Drought*. Proceedings of a colloquium at the University of Aberdeen 1990, Aberdeen University African Studies Group 1991. pp. 116–127.

Key words: food security / Maasai / herd maximisation / cultivation / immigration / group ranch / government role

Cultural ecologists have emphasised the extent to which African pastoralists have adapted to meet the challenges of their environment, but there is a danger that such an approach ignores the social and political constraints within the group and those imposed from the outside, which determine access to coping strategies. The chapter challenges this with the hypothesis that food shortages, which are often associated with drought, reflect a breakdown of production systems to maintain a food supply. The chapter traces the history of the Maasai through the pre-colonial period, the colonial period and the post-independence period. The spread of cultivation resulted from the Maasai inviting relatives to cultivate grazing land, and from the fact that following independence and the division of Kajiado, land was sold for cash especially by those who had secured individual, as opposed to group, ranches. These processes led to the immigration of farmers, and consequently to population increase; at the onset of the 1974 drought it was evident that their coping mechanisms had been weakened. Those with smaller herds lost proportionately less than those with large herds, proving the rationale of expanding herd size as much as possible. More recently there has been further fragmentation through the subdivision of group ranches, especially in the north of the district; at the government level the emphasis remains firmly on the development of agriculture. Attention to other areas of possible income generation would entail national policy changes unacceptable to the government. The result is a deterioration in the food security and increasing dependence on governmental assistance; the official policy fails to recognise the herders' rationality, which has led to treatment of problems singly with no appreciation of the system behind it.

40 Catley, A. (1996) 'Pastoralists, Paravets and Privatisation: Experiences in the Sanaag region of Somaliland'. *Pastoral Development Network Paper* 39d. London: Overseas Development Institute.

41 Catley, A. (1997) 'A Review of the Oxfam–UK/Ireland Kotido Livestock Development Project (Animal Health Component), Kotido District, Karamoja'. Consultancy report for the Renewable Natural Resources Sector, Overseas Development Administration (UK), Uganda, March 1997. Edinburgh: Vetwork.

42 Catley, A., McCauley, H. M., and Delaney, P. (1998) 'Community-based Animal Health Services in the Greater Horn of Africa: An assessment'. USAID Office of Foreign Disaster Assistance, in cooperation with the USDA Famine Mitigation Activity, April–May 1998. Washington DC: USAID.

43 Catley, A., Said, M. Sh., Farah, M. A., Mohammed, A. Sh. and Handule, I. M. (1997) 'Veterinary Services in the Somali National Regional State, Ethiopia: A Situation Analysis'. Save the Children (UK), Regional Bureau of Agriculture Veterinary Services Support Project, Somali National Regional State. Addis Ababa: SCF (UK).

44 Cissé, S. (1981), 'Sedentarisation of Nomadic Pastoralists and 'Pastoralisation' of Cultivators in Mali'. In: Galaty, J., Aronson, D., Salzman, P. and Chouinard (eds) *The Future of Pastoral Peoples.* Proceedings of a conference held in Nairobi, Kenya, 4–8 August 1980. pp. 318–333. International Development Research Centre, Ottawa, Canada.

Key words: agropastoralism / livestock as capital / population pressure / ecological degradation

Broad definitions of pastoralists include herders who make their living through a combination of husbandry, agriculture and trade, these people numbering around 4–5 million in West Africa. Subsistence cultivators and herders have in common: the use of different types of animals, small family units, mobility and a dependence on agricultural communities. Sedentarisation takes place as a result of socioeconomic factors, and is characterised by farmers creating their ecological landscape rather than adapting to it; it is a symptom of, rather than a solution to, problems faced by nomadic communities. Pastoral and agricultural strategies in Mali both consist of attempting to minimise human intervention in the development of plant and animal species. The growth in agropastoralism amongst sedentary farmers can be explained by the fact that grain fed to livestock is a more secure investment than stored grain, as it does not depreciate and contributes to the long-term good of the herd. Pastoral activities involve fewer people and have a greater output per unit of labour. The tendency of the pastoralist towards cultivation and the cultivator towards livestock rearing can be explained in part by the growth in population which has led to a change in cropping patterns and a decrease in soil fertility.

45 Clark, N. T. (1985). 'The Effect of the 1973/74 Drought in Somalia on Subsequent Exports and Registered Slaughterings of Camels, Sheep, Goats and Cattle'. In: *Nomadic Peoples* 17, February 1985. Commission on Nomadic Peoples, International Union of Anthropological and Ethnological Sciences. pp. 53–57. Oxford, UK: Berghahn Books.

Key words: Somalia / off-take / sheep / goats / drought

Data from official exports and slaughters in Somalia between 1970 and 1981 (inclusive) shows variation in off-take trends of plus or minus 40–45%. Different species have different off-take trends. Off-take for sheep and goats is lowest 2 or 3 years after a drought, for cattle 3–5 years after a drought, and for camels 4–5 years after a drought. For total live-weight off-take the differing individual trends

are largely cancelled out, and the mixed flock/herd off-take variation is only plus 30% to minus 20% of the average. A drought results in lowered overall off-take in the drought year, increased off-take in the following year and slightly reduced overall off-take in the following 4 years. Sheep and goat off-take declines and recovers faster than the off-take of camels and cattle, regaining a 'normal' level 4 years after the drought. [Author]

46 Classen, G. A. (1980) 'Water and Livestock in Tropical Africa'. *The Water Resource*. Draft mimeo of chapter from larger publication. Copy in ODI library. 91p.

Key words: water resource / runoff / evaporation / appropriate technology

'The water resource of a country or region is determined by the prevailing climate which is a combination of the effects of the physical factors forming the hydrological cycle influenced by latitude, altitude, wind patterns and velocities and geomorphology' (p. 2). In tropical Africa more rain falls than can be used, and the challenge lies in applying technology to control floods and store water. Factors affecting available water include rainfall, evaporation and evapotranspiration, and runoff. Exploitation should be carried out with a view to overall ecology; over-development can result in attracting numbers of livestock which cannot be supported on the available forage. Enhanced rainfall can lead to an increase in the carrying capacity. The appropriateness of the technology used for water exploitation is of importance: its capital and benefits must exceed the costs, and it must be serviceable at a local level. The availability of water is, along with the availability of forage, economic factors and the level of development, one of the pillars of successful livestock production. The development of water technology is dependent on the geographical distribution of forage and seasonal variations. Simplicity and reliability are the key concepts to guide the design of water supplies in tropical Africa.

47 Cole, R. (1989) 'Measuring Drought and Drought Impacts in Red Sea Province'. Roy Cole (ed.), Research Officer, Oxfam Port Sudan. Oxford UK. 304p.

Key words: Sudan / coping strategies / food aid / migration / flood / wage employment / war / aid targeting

The report assesses the 1987 and 1988 drought in Red Sea Province, Sudan, putting it in the wider context of other droughts and floods, and the impact of food aid on the province.

There are three major coping strategies employed in times of drought, which are essentially intensification of activities already performed. The first of these involves food-consumption reduction, the consumption of bush foods, borrowing, the sale of livestock, and herd splitting. The medial responses involve further intensification of activities in the form of calling for loans, selling non-perishable assets, and borrowing from traders. Finally out-migration occurs, but generally only among the old, the women and the children, as working men will already have left the community with the livestock or will be seeking wage employment in towns. The ability to respond to drought depends on economic and social circumstances, as well as age, gender, family size and location. At the macro level, communities are constrained by the level of development, political instability, environmental variation, environmental degradation, and population growth.

In terms of recovery, those areas which did badly in 1988 did so for reasons other than those relating simply to drought or economic climate, for example the influx of refugees from the war in Eritrea. The environment in Red Sea Province is not susceptible to change, and the economy is fed by

pastoralism and smuggling. The report suggests that targeting vulnerable groups is of more importance in combating the effects of drought than blanket provision in what is essentially a resilient area. To understand drought in human terms in the province, pastoralism and agriculture have to be considered as options that change from year to year, rather than as absolutes. Drought can be measured as standard deviation below the mean, but stored grain from previous years means that the impact of the drought is alleviated. Drought is defined as: 'one year in which the flood is equal to or greater than 1 standard deviation below the mean, or equal to or less than 20% of the mean flood' (p. 76) and severe drought as 'two consecutive years where floods are equal to or more than 1 standard deviations below the mean, or equal to or less than 20% of the mean flood' (p. 76). There are floods and highly variable rainfall in Red Sea Province, and although there may be local trends, there are no general downwards trends. The *khor* is the major mechanism used against drought: 'Agriculture is not found outside the stream beds or alluvial fans, and pastoralism is reliant on perennial and annual vegetation produced and maintained by annual inundations of the *khors*. The watershed acts as an enormous catchment that makes the most of spatially dispersed rainfall by channelling it to human users near the central course of the *khors*' (p. 85). During the 1980s economic isolation and inflation also had a devastating effect, mainly on the vulnerable members of society.

48 Colville, G. and Shaw, T. (1950) 'Report of Nigerian Livestock Mission'. Report to the Colonial Office. London: HMSO.

49 Cooke, H. J. (1978) 'Botswana's Present Climate and the Evidence for Past Change'. In: Hinchey, M. T. (ed.) *Proceedings of the Symposium on Drought in Botswana.* National Museum, Gaborone, Botswana, June 5th to 8th, 1978. pp. 53–58. Botswana Society/Clark University Press.

Key words: Botswana / climate change / climate variability / land use / degradation / population pressure / government role

Botswana's climate is influenced by its position in the centre of southern Africa and its latitudinal position. Drought is most common in the drier parts of the country, occurring approximately 1 year in 20 in Kassane, and once in every 7 years in Ghanzi. The last 1000 years have shown great variability, fluctuating between extremes of aridity and humidity, but there has probably been no fundamental change in the pattern over the last 100 years. A 20-year cycle of good and bad years can be detected when annual amounts of rainfall are arranged in order of magnitude and divided into decile groups, the first decile being the amount of rainfall which is exceeded by 90% of the annual totals. The impact of human activity, particularly a growing intensity in land usage is unknown, but is believed to interfere with local climate, and exacerbate the effects of a periodic decline in annual rainfall. Denuded ground results in higher albedo, as reflectivity is increased, and there is a possibility that this may lead to a deterioration in climate. From this the tentative conclusions may be drawn that the earth is entering a period of greater variability, that southern Africa may experience below-average rainfall in the next decade, and that local rainfall deficiencies may be exacerbated by the increased land pressure and damage to the vegetative cover. There is a need for this material to be presented in a manner accessible to policy makers and politicians in order to inform decisions for direct action.

50 Copans, J. (1973) 'Sécheresses et famines du Sahel II'. *Paysans et nomads: Dossiers africains*. François Maspero. pp. 89–101.

Key words: Touareg / herd diversity / mobility / migration / government role / marginalisation

The chapter covers an account of the coping strategies of the Touareg in the face of drought. There are six principal elements. The first is diversification of the herd, between grazers and browsers, those with differing water needs, and those with differing gestation periods. Secondly, there is mobility: seasonal migration to dryland pastures and permanent long-distance migration are means of maintaining a high degree of mobility to escape invasion and family feuding, as well as drought. Food stocks are an important insurance against shortage, but problematical in a pastoralist economy where the chief surplus is of milk, which cannot be preserved. Milk or milk products can be sold in return for grain, and the accumulation of animals is also a strategy against food insecurity. The fourth means of protection is the giving and receiving of animals between clan members; past generosity is rewarded in times of need. Transactions of live animals are categorised under four headings depending on the status of the animal and what is expected in return. Fifth is the resort to hunting, particularly of gazelle, and the gathering of wild foods, and finally the raiding of wealthier neighbours, but this is seldom practised now, and has given way to the intensification of trading in merchandise such as blankets, tea and tobacco.

Since colonial times, the Touareg have been increasingly restricted in their movement, and are thus less able to protect themselves against drought and reconstitute their herds after a catastrophe. Children in formal education now spend long periods of time away from the camp and so are not equipped with the necessary traditional skills to survive drought in a pastoral environment. The trading posts for caravans are now in different countries making travel and ownership rights difficult. In terms of countering the uncertainty faced by nomadic communities the author recommends the introduction of technology appropriate to the system, the introduction of social security, and improved social organisation to protect common property resources such as land and water. Political solutions still have to be found especially in terms of the protection of minorities, and the chapter concludes with an appreciation of the ability of nomads to use the semi-arid regions of West Africa in a sustainable and productive way.

51 Cross, N. and Barker, R. (eds) ‘At the Desert’s Edge: Oral histories from the Sahel’. 248p. Panos/SOS Sahel. London: Panos.

Key words: oral history / climate change / social structure / local knowledge / education

The book is a collection of interviews conducted in 1989–90 with older members of Sahelian communities. Its purpose is to discover the perception of change in the Sahel through the oral histories given; it is asking questions about how life used to be, what factors have contributed to constructing present Sahelian life, and how and why communities continue. The accounts of history show common themes: the decreased tree cover and the increased population pressure which has resulted in the shortening or disappearance of the fallow season. Many interviewees talk about the changing role of children, the increase in formal education and the decline of the family and community in child rearing. Drought features repeatedly, sometimes as a new phenomenon, unknown in the time of the interviewees’ childhood. Hunting, farming and fishing are all deemed to have been easier and more productive in the past, and the resulting poverty is considered to be more severe and widespread. The major contribution of the book is to the understanding of oral history and the appreciation of the importance of the view from the ground. The book focuses on the experience of the individual, making the account both subjective and personal, and thus showing in human terms the impact of a changing environment.

52 Cullis, A. (1992) 'Taking the Bull by the Horns: NGOs and pastoralists in coalition'. *ODI Pastoral Development Network Papers 1991–1993, Network Paper* 33d, December 1992. London: Overseas Development Institute.

Key words: Africa / pastoralists' strategies / carrying capacity / local knowledge / advocacy / political representation / NGO

Five strategies are undertaken by the 20 million African pastoralists who derive the majority of their income from domestic livestock-keeping, namely mobile grazing, livestock and cereal exchanges, the establishment of diverse herds, herd splitting, and non-pastoral activities. There are constraints faced by the government in its attempt to deal with drought, for example the emphasis placed on the 'modernisation' of pastoralists, and the insecurity suffered by those living in marginal areas. This leads to a transfer of livestock from the subsistence farmers to the commercial sector, a practice which is particularly prevalent during time of drought. Added to these problems is the fact that pastoralists are under-represented politically and are consequently vulnerable to political action. These factors result in the breakdown of traditional exchanges, which leads to a weakening of indigenous barter systems and concomitant increased vulnerability, which culminates in an increasing number of pastoralists being forced to liquidate their herds or watch them die before joining the drift towards the city.

The article challenges the traditional northern view of pastoralism as ecologically and economically unproductive or destructive by rejecting the concept of a single optimum livestock-carrying capacity, and arguing that livestock–plant relationships must be taken within specific management systems. It asserts that subsistence pastoralism is more efficient when more animals maintained, even if the health of individual animals is compromised. The NGO role in future must be determined by the lessons learned from pastoralism, and must focus on advocacy as a means to development. There is a need to monitor and report on human and land abuses and projects that have a deleterious effect on pastoralists in order to create more effective and informed support to pastoralist communities.

53 Dahl, G. (1981) 'Production in Pastoral Societies'. In: Galaty, J., Aronson, D., Salzman, P. and Chouinard (eds) *The Future of Pastoral Peoples.* Proceedings of a conference held in Nairobi, Kenya, 4–8 August 1980. pp. 200–209. Ottawa, Canada: International Development Research Centre.

Key words: herd maximisation / mobility / sustainability / population pressure / social strata / seasonality

Pastoralism copes with large seasonal variations in rainfall as well as high inter-year variability. The principal strategies for security employed by pastoralists are mobility of stock, species diversification, herd dispersion, and herd maximisation, particularly the maximisation of the number of breeding females. Mobility is the basic condition for non-destructive pastoralism, but has been undermined by the establishment of game parks, ranches and irrigated farming. Overpopulation of animals has been widely blamed for ecological deterioration, but the analysis looks only at the relationship between the animals and the available forage; this leaves open the question of whether there are sufficient animals on the land to support the human population. Pastoralism is labour-intensive, needing many hands to perform the various chores, but the number of people required to tend a herd varies with the diversity of the herd rather than its size. Thus rich families can add to their herds at little labour cost. Migration offers itself as a solution to pastoral problems, but this serves also to drain the system of the most productive labour.

54 Dahl, G. and Hjort, A. (1976) 'Long Term Effects of Disaster to Pastoral Herds'. In: Dahl, G. and Hjort, A. (eds) *Having Herds: Pastoral herd growth and household economy.* pp. 114–129. Stockholm Studies in Social Anthropology 2. Sweden.

Key words: co-herding / herd splitting / drought / drought recovery / herd structure / herd maximisation

Precaution against drought is taken by moving animals to different ecological zones, through customs of co-herding and by sharing risks through gifts and exchange. There is a distinction to be made between local and regional disasters; during a local disaster, cattle are redistributed to other family members, but a regional disaster may hit all households. The droughts reducing sheep and goat populations by a half are not uncommon, and this results in slow regrowth; it can take 10 years for the growth rate to return to normal after drought. Fluctuations in the number of animals and in the yearly growth rates have long-term effects as accumulative low birth rates translate into small numbers of heifers. Recurrence of drought also has a devastating effect, and the chances of successfully rebuilding a herd after 3 years of drought are low. The fluctuations in numbers are most marked when the total reduction in herds is lowest. The findings are similar for cattle and camel herds. There is some discussion about the regularity of drought and the possibility of some cyclical pattern being detected. Such patterns as might exist are unlikely to be apparent or relevant to the individual pastoralist and the most basic strategy remains the maximisation of herd numbers within the constraints of the labour available and environmental conditions.

55 Dahl, G. and Hjort, A. (1976) 'What is a Herd? Primary and practical considerations'. In: Dahl G. and Hjort A. *Having Herds: Pastoral herd growth and household economy.* pp. 114–129. Stockholm Studies in Social Anthropology 2. Stockholm, Sweden.

Key words: herd structure / herd splitting / herd ownership / herd management

The structure of pastoral herds remains largely obscure on account of the paucity of information and social difficulties in enumerating animals. This is compounded by the existence of stock friendship, a means by which herders in trouble can 'borrow' animals from associates. Some animals belong to wives or brothers of herders or are set aside as marriage gifts, thus ownership is a relative issue. The limited grazing land near a compound may result in the herd being split, with most milk producers on the better grazing, and kept nearby whilst the rest are kept as reserve herds. Thus milk can be obtained from the subsistence herd, the surplus herd or from friends and relatives if the situation demands it. The distribution of herds within a family means that animals flow to where there is sufficient labour to look after them. Thus the term 'herd' can refer to the management unit or the ownership.

56 Dahl, G. and Hjort, A. (1979) 'Pastoral Change and the Role of Drought'. SAREC report R2 1979. Swedish Agency for Research Cooperation with Developing Countries, Sweden.

Key words: drought / herd structure / livestock sale / stock association / out-migration / economic integration

A major long-term effect of disaster such as drought on livestock is the change in herd composition which affects herd reproduction and growth. The structure fluctuates widely in relation to stochastic

shocks, management skills and transactions of stock. Towards the end of a drought, animals are sold in distress sales, often according to a perverse supply response, by which the higher the price which can be fetched, the fewer animals are sold. It is at such times that female cattle may be sold. Herd structure during a drought is affected by the nature of the preceding drought, as drought history is built into the distortions of the herd structure. Frequent drought leads pastoralists to the adoption of policies which prioritise the reduction of loss over the maximisation of profit. Larger herds mean that calves are born at intervals throughout the year and the impact from raiders and disease is less severe. Stock associations, comprising herders within an individual primary network of social ties, are formed in two patterns: a system of gifts or a system of loans. Following drought, it is common not to return immediately to cattle herding, but to build up the herd with sheep and goats. Generally speaking, large stock are herded primarily for their milk, small stock for their meat. Stock–client relationships involve only temporary transfer of the rights to use the products of a particular animal. If herds cannot be reconstituted, out-migration occurs. The first generation of migrants often consider themselves to be in a temporary position, but subsequent generations turn to other forms of income generation; amongst pastoralists there is a recognition that education is a good precautionary investment for the children. The interrelated problems of losses of land, labour and livestock threaten pastoral systems; herders who manage to survive these vicissitudes can take advantage of the animals sold from sub-economic herds. The restrictions faced by pastoralists are accentuated by periods of drought, and the forces towards integration into a wider economic context are for the most part beyond local control.

57 De Haan, C. (1994) 'Overview of the World Bank's Involvement in Pastoral Development'. *Pastoralist Development Network Paper* 36b, 1994–5. pp. 1–6. London: Overseas Development Institute.

Key words: World Bank / ranching / rangeland / natural resource management / drought contingency / funding

De Haan identifies four phases in the development of thinking surrounding pastoralism. The first was the ranching phase when Western ranching techniques were exported along with heavy capital investment. This proved disappointing because it resulted in the formation of parastatals and included no appreciation of traditional efficiency. The second phase saw the introduction of range and livestock projects and the development of communal areas through funding water, roads and markets. This was followed by the pastoral association phase when more attention was paid to the overall policy framework. These two phases produced mixed results: they relied on inappropriate incentive frameworks and over-rigid grazing- and land-rights. There were institutional weaknesses and the system of subsidies interfered with the natural equilibrium. The final phase is the Integrated Natural Resource Management Phase in which more attention is paid to natural resource management and all the stakeholders are involved in the process.

The author sees that the failure of the earlier projects is responsible for the fall in funding to arid areas, particularly in Sub Saharan Africa. He sees the problem of herder organisation after funding has been cut off as being crucial to the survival of the pastoralists, and examines some contingency measures. The institution of fodder banks keeps herds alive during a drought, but puts added strain on the range during post-drought recovery. Secondly there is the possibility of increasing market infrastructure, especially in cold storage capacity, in order to accommodate the supplies of animals in times of drought. This measure is expensive though, and is seriously undermined by the competition from cheap EU imports. He discusses the possibility of other forms of insurance, such as food-for-work schemes, but sees these as essentially unviable without continued external assistance.

The problems in the public sector stem largely from governments' apprehension over herder empowerment. There are also difficulties in dividing responsibility for decentralised control between the public and the private sectors. A sea change is needed in attitude, but this is difficult to describe in terms of project conditionality, and self-management inevitably gives rise to problems of accountability. The author concludes his evaluation with the prediction that World Bank funding will remain constant or slightly increase over the next 5 years.

58 Devitt, P. (1978) 'Drought and Poverty'. In: Hinchley, M. T. (ed.) *Proceedings of the Symposium on Drought in Botswana.* National Museum, Gaborone, Botswana, June 5th to 8th, 1978. pp. 121–127. Botswana Society/Clark University Press.

Key words: Botswana / social strata / critical herd size / concertina economy / commercialisation / poverty / reciprocity

Drought has different impacts on the rich and the poor as livestock are unevenly distributed in most pastoral and semi-pastoral communities. As a general rule, the most common strategy associated with reducing risk is to increase the herd size as fast as possible. The paper argues that during drought, the poor are hit hardest, and the concepts of 'critical herd size' and 'concertina economy', whilst being contentious, are both central to the argument. The principle of critical herd size is behind the strategy whereby brothers herd inherited livestock together until there are enough animals to make splitting viable. Larger herds to be more robust than smaller ones on account of a number of factors: drought reduces a small herd to its breeding nucleus quickly, and more pressure is put on lactating cows as tension arises between the needs of children and calves for milk. The labour intensive nature of traditional stock-keeping puts strain on the resources of small livestock owners; for the cattle-rich, surplus animals enable a man to marry several times, thus gaining employment for his sons. The poor livestock owner has few surplus animals, and cannot afford draught animals or enter into reciprocal arrangements, although he may be in a position to enter into a relationship of dependence with a wealthier producer. The frequent recurrence of drought means that poor pastoralists often have no time to recover before the onset of the next disaster. Even when the impact of drought seems drastic in terms of numbers, large herds are generally left with a nucleus of breeding animals and can be reconstituted reasonably quickly. The concept of a concertina economy centres around its tendency to collapse during bad years, but recover with rapidity in years of high rainfall. The most valued resources are the ones most immediately and most severely affected by drought, causing dramatic losses to those at the top of the scale at the onset of drought. The reality of the situation, though, is that the poor are more harshly affected by drought in the long and the short term. Milk and meat products which are generally liberally distributed by the wealthy dry up during shortage, forcing the poor into virtual total dependence on wild food, competition for which increases with decreasing supply. The concertina analogy holds as the economy extends to its fullest capacity during times of plenty, but has the effect of squeezing some of the poorest members out of the community altogether during periods of shortage, due to the added constraints of dependence and competition. The policy implications for the development of the pastoral economy are that, if the concept of critical herd size holds, there is little point in sustaining herds lower than a certain number, although the critical size is determined by environmental and social conditions. Effects of drought which fall only on the poor are likely to go unnoticed to government officials and project staff. During drought, the number of dependants on a lactating cow increases, which increases calf mortality. The importance of small stock should not be overlooked, as they are easier to manage and cheap to buy. Livestock economies are far from homogenous, and policy should not be based on the premise that problems facing households in pastoral communities are all the same.

59 **Devereux, S.** (1993). *Theories of Famine*. Harvester/Wheatsheaf.

60 **Devereux, S.** (1996). 'Fuzzy Entitlements and Common Property Resources: Struggles over communal land in Namibia'. *IDS Working Paper* 44. Institute for Development Studies, Sussex.

61 **Diarra, L., Hiernaux, P., and de Leeuw, P. N.** (1995), 'Foraging Behaviour of Cattle Grazing Semi-Arid Rangelands in the Sahel of Mali'. In: *Livestock and Sustainable Nutrient Cycling in Mixed Farming Systems of Sub-Saharan Africa.* Volume II: Technical Papers. Proceedings of an International Conference, International Livestock Centre for Africa (ILCA), Addis Ababa, Ethiopia, 22–26 November 1993. Edited by Powell, J. M., Fernández-Rivera, S., Williams, T. O. and Renard, C. pp. 99–113.

Key words: Mali / forage / vegetation / grazing

The chapter examines the efficiency of grazing cattle in gaining nutrients from the forage. Passive herding was studied according to the choice of grazing orbit, the choice of landscape units along the daily route, the selection of patch habitats as feeding stations within each landscape unit, and the selection for particular plant species in cattle bites. Forage was found to be highly seasonal, and there were significant seasonal shifts in the landscape unit in the annual grazing orbit. Herbage is decreased significantly if it is frequently defoliated during active growth. Cattle intake shows markedly higher nitrogen intake than the forage on offer, revealing selectivity in grazing. Early in the wet season high selectivity was observed between landscape units, but later in the season the selectivity was influenced more by herbage mass than by landscape unit. Early dry-season behaviour showed no selectivity, but as the season progressed and herbage mass and quality decreased, the remaining high-mass patches were increasingly selected. The conclusion is that selectivity depends on both the standing mass and protein content of the herbage on offer and the spatial distribution of the vegetation.

62 **Dietz, T.** (1991) 'Crisis Survival Strategies: A summary of concepts and an example from the semi-pastoral Pokot in Kenya/Uganda'. In: Stone, Jeffrey C. (ed.) *Pastoral Economies in Africa and Long-term Responses to Drought.* Proceedings of a colloquium at the University of Aberdeen 1990, Aberdeen University African Studies Group: UK. pp. 86–108.

Key words: survival strategies / preparedness / drought recovery / raiding

There are different interpretations crowding the concept of survival strategies. The first concerns the survival of the peasantry as a social category, the second evolves from 'seasonality' studies, and how to survive the various contributing factors of a bad season. The third group comprises 'household survival strategies', generally in response to a crisis caused by a natural disaster. This is related to the fourth category, the 'manoeuvring capacity' by which households are continuously adapting to changes. The fifth set of opinions can be found in the 'new household economics', whereby households livelihood strategies are not viewed in a social context as much as a means to improve the wealth and income situations of a family. Thus there are accumulation strategies, betterment strategies, sustenance or adaptive strategies, mechanisms to cope with seasonal stress and survival strategies to cope with exceptional crises. Crisis-survival strategies can be further divided into physical strategies, to get enough food; capital strategies, to rescue as much household wealth as possible; and recovery strategies, to rebuild a pre-calamity economic base. The third type is geared towards safeguarding pastoralism as a way of life. The chapter describes the survival tactics employed

by the Pokot, especially during the drought, animal and raid-induced crisis on 1979–81 and the crisis of 1984–6 induced by another drought, and loss of animals to the army.

63 Doornbos, M. and Markarkis, J. (1991) 'The Crisis of Pastoralism and the Role of the State: Trends and issues'. In: *Pastoral Economies in Africa and Long-term Responses to Drought.* Stone, Jeffrey C. (ed.) Proceedings of a colloquium at the University of Aberdeen 1990, Aberdeen University African Studies Group 1991. pp. 270–278.

Key words: Ethiopia / Sudan / Somalia / mechanised farming / export / consumption / food security / national economy

The development pattern offered to African countries has previously been the rapid intensification through mechanisation, irrigation, fertilisation and technology, ignoring the subsistence sector. Even when attention is directed towards pastoralists it has been with a view to boosting production for export rather than for consumption. Sedentarisation has been forced by poverty in some areas, elsewhere, in Sudan, Ethiopia and Somalia, wars have erupted between pastoralist and settled communities, which marginalises pastoralism further. The mobility inherent in pastoralism is perceived as a threat to political and economic imperatives, but the result of the extinction of pastoralism as a way of life would be greater food insecurity and considerable loss of revenue.

64 Dunbar, G. S. (1970) 'African Ranches Ltd, 1914–1931: An ill-fated stock-raising enterprise in Northern Nigeria'. *Annals of the Association of American Geographers* 60: 102–123.

65 Dyson, P. D. (1978) 'Southern African Rainfall: Past, present and future'. In: Hinchley, M. T. (ed.) *Proceedings of the Symposium on Drought in Botswana.* National Museum, Gaborone, Botswana, June 5th to 8th, 1978. pp. 45–52. Botswana Society/Clark University Press.

Key words: Southern Africa / rainfall variability / rainfall prediction

Rainfall variability over Southern Africa is highly seasonal, but data analysis of long-term records show that there have been no radical one-sided trends. Quasi-periodic fluctuations appear through meteorological records, with regional variability based on oscillations of between 3 and 20 years. In the absence of deterministic rainfall predictions, it is reasonable to expect that similar fluctuations will continue in the future, and a series of below average rainfall years can be expected during the 1980s.

66 Équipe Écologie et Anthropologie des Sociétés Pastorales (1979). 'Pastoral Production and Society/Production Pastorale et Société'. Proceedings of the international meeting on nomadic pastoralism/Actes du colloque international sur le pastoralisme nomade. Paris 1–3 Dec. 1976. Cambridge: Cambridge University Press.

67 FAO (1990) 'L'espace pastoral Mauritanien aprés les sécheresses des années 80: Adaptation ou exode'. Organisation des Nations Unies pour l'alimentation et l'agriculture. Cheikh Saad-Bouh Kamara (consultant). 70p. Rome, Italy: Food and Agriculture Organisation.

Key words: Mauritania / sedentarisation / drought / environmental stress / social division

There are environmental, economic and social crises facing Mauritania. There are unprecedented changes, including spontaneous and generalised sedentarisation, new social division and distribution of roles, the emergence of new social groups, and the changing status of women. The number of nomads decreased greatly between 1965 and 1988, while the number of rural settled farmers and urban dwellers increased. Livestock rearers can be divided into three groups: traditional rearers, less traditional rearers, and rearing 'managers'. The study examines the new pastoral economies and the distribution of producers, their characteristics, migration patterns, transhumance, other activities, revenues, and the composition of herds. The position of the woman in pastoral societies is studied, including her work and access to goods. There are various factors in Mauritania which impact positively on pastoralism, for example the well-known transhumance routes, the use of seasonal farming and the low incidence of epidemic diseases. Negative factors include the persistence of drought, desertification and desertisation, the degradation of environments surrounding water points, and the large areas of unusable land. Various recommendations for policy are made, which prioritise the need to explore further the advantage of the sector, and the need to bring this to the attention of livestock raisers as well as policy makers. An emphasis needs to be placed on human resources, and there is a need for decentralisation. There is a need for co-ordination between livestock producers and other sectors, such as water and agriculture users. More research into animal species is needed.

68 **FAO** (1996) 'Livestock: Recognising their role in sustainable agriculture'. Animal Production and Health Division, FAO. Rome, Italy: Food and Agriculture Organisation of the United Nations.

Key words: livestock / food security / sustainable agriculture / economy / employment / environment

A collection of leaflets outlining the importance of livestock in subsistence farming. Breeding animals is taken to be an ascendant industry on the basis that consumption is low and there is potential for greatly increased demand. To the subsistence farmer, the possession of livestock not only provides a more diverse and thus more secure food supply; it also provides traction power and manure, increasing the productivity of animal and the agricultural farming. By-products of agricultural production can be used as animal fodder. Livestock is a source of food all the year round, so storage is not a major difficulty, and the fat added to the diet through animal products contributes to what is frequently a deficient calorific intake. While small stock act as a cash buffer, large stock are treated as a capital reserve. The employment created by livestock production is significant to the rural economy and serves to stabilise communities, obviating the need to drift to urban centres in search of work. The leaflets propose that a sense of perspective is needed in reference to arguments concerning the detrimental effects of livestock farming on the environment. Small-stock producers and subsistence farmers cannot be held responsible for the commercially contracted destruction of forest; semi-arid areas often are incapable of sustaining any crop other than grass, and evidence is appealed to which suggests that productivity is increased by grazing such areas quite close to the ground. The emphasis is on *management* as the key to sustainable farming systems. In terms of the economy, livestock produce fetches a higher price than agricultural produce; the use of local traction and the sale of locally provided goods means that money is not leaving the economy to buy foreign goods. The myth that livestock consume grain that would otherwise feed the poor is challenged on the basis that although grain is used widely in developed grain-rich countries, in developing countries, livestock are used as a means of converting unutilised vegetation into high-value products. The leaflets end with a recognition of the necessity for development agencies to support livestock projects. They highlight the need for fair commodity prices, more appropriate laws governing land tenure and access, linking production and post-production components to infrastructure, and increased policy commitment as important features in the promotion of livestock production.

69 Farmer, G. and Wigley, T. M. L. (1985) 'Climatic Trends for Tropical Africa'. Research report for the Overseas Development Administration. Climatic Research Unit, School of Environmental Sciences, University of East Anglia, UK.

Key words: West Africa / drought / meteorological drought / hydrological drought / agriculture / aridity / rainfall prediction / El Niño

The report loosely defines drought as 'a water deficit that exists for a long enough period to cause hardship' and distinguishes between three types. Meteorological drought occurs when rain falls below the amount expected; hydrological drought is a deficit of water resources for consumption and industry; and agricultural drought occurs when supplies used directly by agriculture are short. Drought is not a new phenomenon, and the authors cite Nicholson's work (1981a The historical climatology of Africa. In: *Climate and History* Wigley, Ingram and Farmer eds. Cambridge University Press, pp. 249–270) which suggests that tropical Africa has been subject to a drying trend since the late 17th century. That said, drought is not an easy phenomenon to record, as the variability of West African rainfall is taken in itself to be one of the most important data characteristics.

Although aridity and drought are not taken to be identical, the factors responsible for aridity allow some understanding of the causes of meteorological drought. The authors propose that factors include 'an absence of available moisture in the atmosphere; large-scale subsidence; divergent airflow in the lower troposphere; and an absence of rain-bearing systems. All are linked to the general circulation of the atmosphere. Drought, therefore can be understood as an anomaly in the prevailing regional circulation which enhances such aridifying influences, thereby reducing the size, intensity or frequency of rain-bearing disturbances' (p. 81). Predictions of when drought will occur are difficult to make, and are based on one of four assumptions. Firstly there is the possibility of persistence—that the weather will continue as it now is. This is flawed in that weather is evidently changeable. Hence arises the temptation to look for trends or cycles, but this is fraught with difficulties over measurement and extraneous factors. A more reliable prediction comes from relating a relevant climate feature to other features of the climate system using correlation or regression methods. An example of this is given by the El Niño Southern Oscillation phenomenon in that 'ENSO indices, such as eastern equatorial Pacific SSTs and pressure- or rainfall- based on Southern Oscillation indices, show a strong persistence on the seasonal time scale, particularly at certain times of the year' (p. 101). The relationship is not necessarily one of causation, as 'ENSO does not have any marked effect on the climate of tropical Africa, but the principle of using (Atlantic rather than Pacific) SSTs as predictor variables in a statistical forecast can be applied in Africa' (p. 102).

Whereas climate forecasts cannot be made with any degree of certainty, agricultural and hydrological forecasts may be, on account of the in-built persistence of the systems. Overcoming drought of this kind is a question of resource management and preparedness. The present drought [writing in 1985] is of unprecedented duration, and the authors suggest tentatively that this signals a climate change, rather than simply a fluctuation, characterised by a very long time-scale downward trend in rainfall.

70 FEWS. 'Location of Rains across West Africa'. USAID Famine Early Warning System. <http://www.info.usaid.gov/fews/imagery/sat_itcz.htm>

The site gives satellite analysis of the rainfall across West Africa over the last year.

71 **FEWS**. ‘Sahel Satellite Imagery’. USAID Famine Early Warning System. <http://www.info.usaid.gov/fews/imagery/sat_sh.htm>

The site gives satellite rainfall analysis for the Sahel region over the last 2 years.

72 **FEWS** (1997) ‘The Sahel in Depth: Living on the edge’. In depth report 2—June 26, 1997. USAID Famine Early Warning System. <http://www.info.usaid.gov/fews/fb970626/fewsid2.html>

Key words: Sahel / Mali / food security / FAO / population growth / intensification / economic diversification / trade

The Sahel is an area of chronic vulnerability to food insecurity; about 80% of their needs are met by local production in conditions which are characterised by poor soil fertility, low rainfall, underdeveloped marketing channels and marginal land. Rainfall is uncertain and the 1970s and 1980s were particularly dry years, although there seems to be some increase in the rainfall levels recently. Many areas lack the phosphorous, nitrogen, organic matter and water retention necessary for cultivation; the FAO estimates that only 4% of the area covered by the Sahelian countries is suitable for crops, although another 32% is marginally suitable for rainfed agriculture. Over the last 25 years, human and animal populations have grown at an average annual rate of 2.6% and 1% respectively, and this has limited the mobility that was formerly enjoyed. Fallow periods have been reduced and marginal land cultivated. Institutional weaknesses and declining terms of trade have made for a sharp decline in the economic viability of Sahelian farmers. Sahelian farmers have responded to their environment by intensifying input where water is available, and by soil conservation and reclamation techniques. The adoption of yield-enhancing technologies for staple crops is more likely when there are important synergies with cash crops. Institutional changes such as the liberalisation of the cereal market in Mali also have effects on the priority placed on agricultural production. Meat production also responds to market conditions, such as the 1994 CFA franc devaluation, which boosted the competitiveness of Sahelian meat. Diversification, mobility and trade enable Sahelian farmers to purchase what they are not in a position to grow. This has contributed to urbanisation, and urban growth in Sahelian countries averages at 5.9%. Foreign assistance provides some buffer against food insecurity, particularly in the form of emergency food aid; it is likely that this will remain a necessary part of Sahelian food security, at least in the short term.

73 **FEWS** (1997) ‘Special Report’ 97–4. May 27, 1997. Lake Chad—Untapped potential. USAID Famine Early Warning System. <http://www.info.usaid.gov/fews/fb970527/fb97sr4.html>

Key words: Lake Chad / drought / irrigation / water resource / fishing / self-sufficiency

Drought in the 1970s and 1980s has combined with diversion for irrigation to reduce Lake Chad to one tenth of its size in the 1960s, but hydrological station readings suggest that the level of the lake is now slowly rising. 90% of Lake Chad is derived from the Logone–Chari river system, which delivers now only half the amount that it did in the 1930s–60s; this decreased flow has caused Lake Chad to divide into two, and the northern pool now seldom holds water. The population makes its living through farming recessional land, fishing, raising livestock and mining sodas; traditional and improved technologies, and mobility have been employed to adapt to the changing water levels. However, much of the fertile land is still unused, and estimates suggest that with improved management, national demand for wheat and rice could be met. Hitherto, attempts to further exploit

the lake's resources have faced problems of falling water levels, civil strife and poor management. The communal nature of the basin's resources means that regional co-operation must be promoted.

74 **FEWS** (1997) 'Special Report' 97–5. August 25, 1997. Responding to Sahel food shortages in 1996/7: What went wrong? USAID Famine Early Warning System. <http://www.info.usaid.gov/fews/fb970825/fb97sr5.html>

Key words: food security / hungry season / Chad / Mauritania / Niger / government role / NGO role

A particularly difficult hungry season in Chad, Mauritania and Niger has meant considerable food shortages and depleted cereal reserves despite the fact that early warning systems were in place and indicated the gravity of the situation in advance of the November 1996 harvest. The purpose of early warning is to allow households to implement their own strategies for dealing with shortage, and to give aid agencies the information they need in order to pre-empt and mitigate a disaster. The lesson from the Sahel is that co-ordinated and effective response does not necessarily follow early warning. One of the chief problems faced is that of communication of information. The size of the region covered meant that there were inconsistent reports on the scale or impact of the drought, and the slow onset of drought means that it is of little interest to the media. Once relevant information has been gathered there are political obstacles such as the orientation of donor and recipient countries development plans which may be interrupted by inefficient emergency food provision.

Food security is an internal political issue, and a normal harvest at national level does not guarantee the security of all households; similarly, national-level assessments may not be adequate monitoring mechanisms. The report concludes with an upbeat message of hope that there is no reason for loss of life due to food shortages resulting from drought, and that consensus amongst donors is an important part of ensuring food security.

75 **Frankenberger, T.** (1995) 'Indicators and Data Collection Methods'. In: Maxwell, S. and Frankenberger, T. (eds). *Household Food Security: Concepts, indicators, measurements. A technical review*. pp. 73–134. United Nations Children's Fund.

Key words: indicators / data collection / household food security

Greater understanding of the processes that lead to food insecurity at a household level has led to the development of indicators and data-collection methods. Household food security is dependent on food availability and food access, and stable access is determined by its means of procuring food, and social mechanisms. Indicators delineating household food security are divided into process indicators, and outcome indicators. Strategies used for meeting food security vary by region, community, social class, ethnic group, household, gender and season, and indicators used depend on the financial, human institutional and infrastructural resources available. Few information systems incorporate production and entitlement data in the same indicator set, and few donors or governments are in a position to obtain information on socio-economic indicators, and decentralised monitoring systems would be the best means of obtaining such information. Local governments, NGOs and local communities need location-specific information in order to make appropriate interventions.

76 Frantz, C. (1980) 'The Open Niche, Pastoralism, and Sedentarisation in the Mambila Grasslands of Nigeria'. In: *When Nomads Settle: Processes of sedentarisation as adaptation and response.* pp. 62–79. Praeger. J. F. Bergin.

Key words: Ful≡e / Mbororo / sedentarisation / population pressure / herd splitting

The chapter examines the case of the Ful≡e (Mbororo'en) who have become sedentary with relative success. A distinction is made between nomadism, entailing mobility, and pastoralism, a lifestyle incorporating primary reliance on domesticated animals for a major portion of subsistence. The term sedentarisation is used to describe distinct processes. There has been increased activity of Ful≡e in market systems, increased settlement in homes, and an increase in the number of marriage alliances with sedentary communities. Pastoral Ful≡e settlements lie along a continuum from the isolated family farmhouse to a hamlet inhabited by extended family. Population increase amongst livestock has followed sedentarisation, forcing a change in the relationship between the Mbororo and their cattle; larger herds have to be split and cattle are often kept away from the compound to protect the gardens, with sufficient kept inside to provide milk. The cultivation of gardens means that the Mbororo have less need of barter or market transactions with farmers. Marked changes have been noted within families, especially an increase in divorce and an increase in the tendency for children to leave their parents. The success of this story of sedentarisation is attributable to the 'open niche' of relatively sparsely settled grasslands, and the absence of external pressure on the Mbororo to become settled.

77 Frantz, C. (1983) 'Settlement and Migration among Pastoral Fulbe in Nigeria and Cameroun'. *Contemporary Nomadic and Pastoral Peoples: Africa and Latin America.* Studies in Third World Societies 17. pp. 57–92.

Key words: Mbororo / Nigeria / Cameroon / sedentarisation / herd structure / mobility

Pastoral production is conceptually distinct from the question of stability of instability of residence, as pastoralists range from being totally mobile to being permanently settled. Changes in the pastoralists' environment have led to the Mbororo becoming more sedentary during the wet season, whereas herds have become more dispersed and make short-distance movements, and on account of government restrictions imposed in 1940 on the grazing of cattle, many pastoralists remain the year round in their wet-season homesteads rather than setting up temporary residence in the dry season. The subspecies composition and the age and sex structures vary between wet- and dry-season herds. The changes that have taken place within the last half-century have stabilised Mbororo pastoralists in wet-season locations, with the effect that social organisation is now predominantly centred around geographical proximity rather than around kinship groups; hired herders move around with the animals. Wet-season movements are shorter and more frequent than those undertaken in previous decades, whereas dry-season movements involve longer distances. The location of the pastoralists has been a combination of two complementary process of adaptation, creative/active and responsive/passive, as actions have been planned and unplanned by Fulbe and other agents. In Nigeria and Cameroon extending northward from the Atlantic coast half-way to the Sahara, there is a diminution of rainfall, air humidity, tsetse flies, trees, grass and root crops. The areas to which the Mbororo are moving are less densely populated than the areas from which they come, on account of the higher incidence of human and animal diseases. Animal populations have increased greatly, the growth being largely outside the herds owned by the Fulbe, with urban dwellers investing in livestock which is then kept by a hired herder. Livestock rearing is increasing in sub-Saharan Africa, and this is accompanied by predominantly unidirectional movement towards sedentarisation.

78 Fratkin, E. (1997) 'Pastoralism: Governance and development issues'. *Annual Review of Anthropology* 1997. 26:235–61. Annual Reviews Inc.

Key words: tragedy of the commons / common property / sedentarisation / development

The paper suggests that there has been a 'shift in theoretical understanding of development that has moved from a *cultural* ecology to a *political* ecology' citing the fact that 'human–livestock–land interactions are explained less in terms of loss of 'carrying capacity' or 'desertification' and more in terms of common property rights, increased economic differentiation and social stratification, and incorporation and domination of tribal pastoral groups by larger state systems' (p. 236).

Fratkin makes a critical evaluation of the theory of Hardin's 'tragedy of the commons' as applied to pastoralism. He shows that although development thinking and policy has been based on the assumption that common property resources will be abused by rational people, leading to a widespread endorsement of the increase in private ownership and land tenure, the premises on which such beliefs have been based demand radical re-examination. He traces two critiques of the tragedy of the commons as applied to pastoralists. The first is from the social scientists whose challenge is directed towards the assumption that communally held resources meant no restriction on use. According to this argument, degradation occurs not through overpopulation, but through uneven population distribution, and the problem lies not with the fact that resources are held in common, but with the fact that there are no rules governing their usage. As a result of the literature on the tragedy of the commons Galaty (1993b The pastoralist's dilemma: common property and enclosure in Kenya's rangeland. In: *Food systems under stress in Africa*, ed. Vernooy, p. 110, Ottawa: International Development Research Centre) proposes the concept of the 'pastoralist's dilemma', which occurs when the pastoralist demands to own his share of the common land, seeing that the land is not controlled by communities, but more importantly, the community is undermined by state or private interests. The second line of attack is mounted by natural scientists who see climatic disruptions as due to larger phenomena such as the El Niño/Southern Oscillation.

Fratkin reports two strands of sedentarisation, firstly as a response to the lure of the market and wage labour, and secondly involuntarily as a result of loss of land through construction work, war or famine. He cites reports of the negative social and economic consequences of sedentarisation, for example poorer nutritional status and higher incidence of disease among the settled Rendille children in Kenya than amongst their nomadic neighbours. He proposes that there are two responses to the crisis facing pastoralism, either it could be abandoned altogether, and the populations brought into a sedentarised society, or it could be restored and protected, with access being granted to fair prices, water, and autonomy.

Fratkin describes some pastoralist movements in the Sahel, but proposes that access to credit and a monetary economy are prerequisites for the security of pastoralist families to enable pastoralists to pay for veterinary medicine, schooling and other essentials. For the future, pasture and water must be granted as rights, which may be communal or village-based, but guaranteed by law nonetheless; he sees the recognition of customary land tenure as essential for the continuation of pastoralism. Further, he highlights the need to co-ordinate pastoralist needs with wildlife needs, so as to break the conflict between them, and to promote both.

79 Fricke, W. (1979) ‘Cattle husbandry in Nigeria: a study of its ecological conditions and social-geographical differentiations’. *Heidelberger Geographischen Arbeiten* 52, Geographisches Institut der Universität Heidelberg, West Germany.

80 Friis-Hansen, E. (1990) ‘A Case Study of Peasants’ Adaptation to Hybrid Maize in Semi-arid Tanzania’. In: Bovin, M. and Manger, L. (eds) *Adaptive Strategies in African Arid Lands.* Proceedings of a seminar at the Scandinavian Institute of African Studies, Uppsala, Sweden, April 1989. pp. 147–161. Sweden: SIAS.

Key words: Tanzania / carrying capacity / soil degradation / fertiliser / hybrid grains / grain yield

The chapter opens by drawing attention to the fact that the concept of a fixed carrying capacity was of use only in given stable ecosystems, and was inflexible to the possibility of differing management techniques and crops. The challenge is to find a means of protecting the environment from further degradation whilst not undermining the resource base for production.

The use of hybrid grains brings with it some advantages, particularly with regard to yield, which can exceed local varieties by two to four times. However, farmers reported significant loss due to lack of rain, whereas the local types were unaffected; the hybrids also proved less resilient to pests. Maize is the dominant crop in most of Njombe and has been cultivated without rotation for the past decade and a half, leading to a deterioration of the soil structure as mineral fertilisers have not been replaced. The author recommends crop rotation along with the incorporation of crop residues into the soil, as mineral fertiliser alone is not sufficient to rejuvenate the soil.

81 Gado, B. A. (1993) ‘Une histoire des famines au Sahel’. *Étude des grandes crises alimentaires (XIXe-XX siecles).* Éditions L’Harmattan, France.

Key words: historical context / drought / famine / epidemic / Sahel / climate variability

The book gives a comprehensive account of the famines and epidemics which have afflicted the Sahel through the pre-colonial, colonial and post-colonial era. It sees the process of desertification as dating from between 5 and 7 millennia ago. The extent of the time scale involved means that there are evidently lacuna and pieces of inconsistent information, along with extremely localised accounts, all of which make the greater picture harder to put together, and makes detection of cycles or trends extremely difficult. The relatively large amount of information available from the nineteenth century does not allow us to compare this with other eras. Since the late nineteenth century, there is information chronicled by colonial Europeans and the collective native memory. This is used to give an account of some of the less well known epidemics and periods of food crisis in the Sahel. the conclusion drawn is the history of the Sahel has been an alternation between periods of abundance and periods of crisis. The author proposes that the periods of crisis have been longer than the periods of prosperity and offers the following formula for the relationship between hardship and recovery: 1870/85/8: good period; 1888–1906: bad period; 1906–1912: good period; 1912–1945: very bad period; 1945–1968: very good period; 1968–1986: bad period.

82 Galaty, J., Aronson, D., Salzman, P. and Chouinard (eds) (1981) ‘The Future of Pastoral Peoples’. Proceedings of a conference held in Nairobi, Kenya, 4–8 August 1980. 396p. International Development Research Centre, Ottawa, Canada.

Key words: West Africa / Nigeria / NGO role / local knowledge / economic integration / land rights / settlement

Pastoralist communities have defended themselves against various pressures by labour migration, increasing herd size, diversification of craft production and the pursuit of education. The result has been in some areas that pastoralism is being relegated to people too old or unskilled to change, living well in the margins of the political agenda. Direct pressures on pastoralism are mounting in Nigeria, and indirect pressures elsewhere in West Africa; the more intense the capitalisation of production in other sectors, the more marginal is the role of the pastoral sector. The conference addressed the difficulties of agencies and pastoralists in endeavouring to participate in development whilst maintaining a critical posture towards it. It was proposed that a local systems approach is appropriate for pastoral development, with local people as the subjects rather than the objects of development, and development needs to anticipate diversity within communities. Settlement should never be an end in itself, as this may lead to environmental degradation and further disrupt pastoral systems which are part of wider production systems. Land rights of pastoralists need to be respected, and quick-fix solutions which have been applied in the past need to come under re-examination. The meat market is not a good indicator of the needs of the pastoral sector, and the urban demand should not be the key for deciding on intervention in the livestock sector. The conference brings together anthropologists, development agencies and pastoralists in an effort to create a new understanding of the problems facing pastoralism, and with the knowledge that ultimately the future of pastoralism lies in the hands of the pastoralists.

83 Gallais, J. (1977) ‘Traveaux et documents de géographie tropicale: Strategies pastorales et agricoles des saheliens durant la sécheresse 1969–1974’. Sous la direction de Jean Gallois. Centre d’etudes de géographie tropicale. Centre national de la recherche scientifique. No. 30.

Key words: Kel Tamasheq / population growth / ecological degradation / sedentarisation / mobility

This collection of articles outlines the way in which various of pastoralists have been marginalised by political and ecological forces. They highlight variously demographic pressure, reduction in pastoralists’ mobility and environmental damage as reasons for the deterioration of nomads’ quality of life, and the erosion of their means of coping with adverse conditions. In view of these conditions, pastoralists have been faced by a range of alternatives, including sedentarisation and the adoption of food crops, or migration to marginal land, urban centres or relief camps. There have been some successes, particularly in the adoption of crop fertilisers during drought, and in some cases the provision of short-term emergency food relief. Other successes were achieved through the pastoralists’ own means of survival, for example the Kel Tamasheq, who remained on their land despite the onset of drought using traditional contingency methods, rather than passively waiting for emergency aid. Among the Kreda and the Kecherda, it was those groups who had retained a level of mobility who suffered lighter losses during the drought, to the effect that those who had lost some of their mobility returned to a more nomadic existence by purchasing camels. The mobility of communities is also dependent on their relationship with others, and on the strength of leadership, and physical and psychological losses from the drought will alter decisions made in the future.

84 Garine, I. de and Koppert, G. (1988) ‘Coping with Seasonal Fluctuations in Food Supply among Savanna Populations: The Massa and Mussey of Chad and Cameroon’. In: Garine, I. de and Harrison, G. A. (eds) *Coping with Uncertainty in Food Supply*. Oxford: Clarendon Press.

Key words: Cameroon / Chad / Massa / Mussey / food security / bride wealth / livestock sale

The authors take as their subject the Massa and Mussey from northern Cameroon and Chad, populations who subsist through the practice of cultivation, herding, fishing and, to a lesser extent, gathering. The various groups formulate their own strategies and are aware of, and technically able to pursue, the practices of neighbouring populations. Food security is of fundamental importance, and the Massa and Mussey differentiate between levels of hunger. Food trade is one of the primary means of coping with uncertainty, and has been accompanied in the last 10 years by new trends in production which include the production of cash crops such as rice. Money is considered a rare commodity and is not generally used for food, which is traditionally grown at the family level. There is a small trade in ingredients for relish, and much of the sorghum is made into beer, which allows high returns but has little nutritional benefit. During times of shortage, though, food does not rank as highly as prestige, and there is a tendency to go relatively hungry rather than selling off cattle, which would interrupt the men's marriage strategies. Migration in search of food is practised on a seasonal basis, and about quarter of the young men become involved in agricultural work away from home.

The groups of the Massa and Mussey are in a transitory period as many of the traditional means of defending against food security have become obsolete and have not been replaced by new rules. The former egalitarian system has given way to an economic environment in which it is possible for individuals to accumulate wealth, both in terms of money and land. There have been substantial problems with food security in the past, stemming mainly from socio-political causes, and it is unlikely that technical improvement now will be sufficient to ameliorate significantly the nutritional status of the Massa and Mussey. Education and the church have effected a tendency away from agriculture, causing a downturn in the social status of farmers, and a decrease in their income. The conclusion drawn is that a low priority is put on food, and the hunger suffered is the result of decision-making, which favours cultural demands for prestige over nutritional comfort. This is a different level of rationality, and the authors conclude that 'The Massa and Mussey could cope much more easily with uncertainty in food supply if they did away with their over-demanding bride-wealth system, which bears heavily on their economic resources, but which is the only institution preventing their culture from falling apart and disappearing. Savanna may appear as a rather constraining environment, but cultural factors, which have little to do with ecology, bear heavily on the living strategy of the people' (p. 253).

85 **GCCIP** (Feb 1999). 'Climate Change and its Impact on World Agriculture'. Global Climate Change Information Programme. <http://www.doc.mmu.ac.uk/aric/agricult.html>

86 **Gefu, J. O.** (1989) 'The Dynamics of Nigerian Pastoralism: An overview'. In: *Pastoralism in Nigeria: Past, Present and Future.* Proceedings of National Conference on Pastoralism in Nigeria 26–29 June 1988. Gefu, J. O., Adu, I. F., Lufadeju, E. A., Kallah, M. S., Abatan, A. A., Awogbade, M. O. (eds) Published by National Animal Production Research Institute, Ahmadu Bello University Zaria Nigeria. pp. 17–37.

Key words: Nigeria / sedentarisation / World Bank / environmental degradation / carrying capacity

Pastoralism provides food, income and employment for the majority of Nigeria's farmers as well as accounting for 40% of the country's national income. The idea of sedentarising pastoralists was first mooted in 1900 but it was not until 1942 that the plan was put into action by allocating 4 hectares of land to each pastoralist group. This was based on the conventional wisdom that pastoralism is wasteful and counter-productive. The World Bank's line between 1949 and 1954 was that the sedentarisation of pastoralists would make the provision of social infrastructure and the control of

bovine diseases more straightforward, and consequently the creation of marketing channels, water points, veterinary posts and grazing reserves was advocated. Antagonists of the nomadic pastoralist system hold that it is inherently self-destructive. This is countered by arguments that nomadism has the advantages of responding to seasonal variations, being directed by the cumulative expertise of pastoralists. These two positions come into conflict on account of the assumption that nomadic pastoralism is incompatible with modern forms of agriculture. Development of the pastoral sector is politically charged in that nomads are seen as an ecological, economic and military liability as well as being ungovernable and uncooperative. There is a need for the focus to change in development thinking to place pastoralists at the centre. Schemes so far have been unsuccessful on account of the fact that they have attempted to impose foreign systems of production. Where sedentarisation has taken place in Nigeria, it has generally taken place spontaneously; the result has been marginal output of livestock and agriculture. Sedentarisation usually is undertaken for other reasons other than for increasing production, and can result in environmental degradation as livestock are concentrated around water points. The attention given to modern theories about carrying capacities ignore traditional methods of regulation through animal mobility.

87 Gillet, H. (1975) 'Plant Cover and Pastures in the Sahel'. *In: MAB (Man and the Biosphere) Technical Notes. The Sahel: Ecological approaches to land use.* pp. 21–27. Paris, France: UNESCO.

Key words: Sahel / rainfall / vegetation / adaptation / livestock needs / camel herding / horse / wildlife farming

The shortage of water in the Sahel is the major constraint to plant life and has given rise to various adaptations and competition between plants is intense. In the northern Sahel, vegetation forms in tufts, and covers around 30% of the surface area. In the southern Sahel, trees are concentrated along the edges of watercourses and merge into a bush; the annual herbaceous stratum forms a continuous cover during the rainy season. Recent droughts have resulted in significant thinning of the Sahelian pastures on account of the fact that most Sahelian annual species are hygrophytes, requiring permanent water and unable to withstand drought. Herbaceous plants survive better on account of their extended root system. Trees are a vital source of food during the dry season, but were reduced by about 50% in the prolonged drought from 1971 onwards. The survival of animals is dependent on vegetation, although animal species have varying resilience to adverse conditions. Camels and goats withstand lack of food and make use of plants ignored by sheep and cattle. Horses are the most delicate, but also the best-tended domestic animals. Wildlife are, generally speaking, better adapted to the conditions, but wildlife farming does not show promise of great profitability.

88 Glantz, M. H. (1987) 'Drought and Economic Development in Sub-Saharan Africa'. In Glantz, Michael H (ed.) *Drought and Hunger in Africa: Denying famine a future.* Cambridge, UK: Cambridge University Press.

Key words: drought / drought recurrence / development / Sahel / urban migration / urbanisation

Although drought is important to development in sub-Saharan Africa, interest in it can be short lived, lasting only for as long as dramatic images appear on television screens. Reporting on drought tends to treat it as a temporary aberration instead of a recurring, aperiodic phenomenon. This way of looking at drought means that it is no longer considered to be a problem once the rains have returned.

A narrow view of drought also complicates the problem of identifying the second- and third-order impacts of drought, such as price increases and increased urban migration.

There is no simple correlation between meteorological drought and declines in agricultural production, but drought conditions are a contributing factor. Drought should 'be seen not only for its direct societal and environmental impacts but for the varying degrees to which it exacerbates other related problems in Africa such as balance of payments, debt repayment, food imports and urbanisation' (p. 39). Urbanisation has the result of exacerbating the effect of the drought to the extent that it reduces the labour supply in rural drought affected regions; many do not return to the countryside after the drought, and the result is a population displacement, which places added stress on food supplies to urban centres.

89 Goldschmidt, W. (1975) 'A National Livestock Bank: An institutional device for rationalising the economy of tribal pastoralists'. *International Development Review,* 17(2): 2–6.

Key words: livestock bank / carrying capacity / herd structure / conflict / seasonality

The paper proposes that the hostility often obtaining between pastoralists and settled communities is born out of a misunderstanding, which is also responsible for the failure of sedentary populations to 'rationalise' pastoralists. Tensions centre generally around the size of herds, and attempts to sedentarise, force stock reduction, and establish fallow land through block systems of fence ranches have led to failure. The purpose of the National Livestock Bank is to reduce overgrazing whilst serving the national economies and urban populations. Its function would be to provide the security to pastoralists which presently resides in the size of the herd. The herder would 'bank' his animal instead of selling it, and receive in return a token that could be redeemed at any stage for an animal of the same class; thus fluctuation of the market value of stock becomes irrelevant. The tokens would inevitably acquire a cash value, and it would be in the nation's interest to redeem the tokens for cash rather than animals. The author predicts that stockers will bring in mainly young males or old animals so as to reduce their herds by 20%. This will alter the herd structure and result in a higher ratio of young produced, and milk production will probably rise. When an optimum herd structure is reached, 50%–80% of males will be banked, and the majority of tokens will not be redeemed. The major costs to the bank would be the operating costs of the feeding lots, and profits would accrue from the difference in price between the urban and rural markets, the value added to the animals by being fattened at the feeding lots, and the interest on the value of the stock converted into cash. Regulations are necessary to prevent the scheme suffering from too much seasonal fluctuation.

90 Gorman, M. and Boosh, A. (1990) 'A Study of East Atbara Lahawin Pastoral Society and Economy: An investigation of potential for improvement of food production in a drought-affected environment'. CONCERN Sudan, UK.

Key words: Sudan / Lahawin / seasonal migration / livestock sale / cultivation

The semi-nomadic pastoral populations of Lahawin divide their year into migration and settlement stages. Their economic strategy is characterised by the autonomy of individual producers. Families with large herds tend to migrate en masse at the beginning of the rainy season; families with smaller herds stay around the base camp for most of the year, although they may move their herd for grazing; those with only a few animals stay mostly at base camp, but are sometimes forced to migrate in search of work. The value of livestock is given by its importance in terms of security and bridewealth.

Rainfed cropping is a second important part of economic life, and is carried out between July and January. Sorghum is the only crop, and there is no fallow system. Generally speaking, families do not get a sufficient crop to support themselves, so either seek wage labour or sell small stock to buy in supplementary grain. Vegetable production is also practised by some. Other economic activities are practised on an individual basis, including weaving mats, and poultry keeping.

The paper concludes with an overview of the development options arising from the difficulties faced in the region. In terms of cultivation, the major problems surround the fact that insufficient is produced and that produce is threatened by pests and thieves. In terms of livestock, the major problems are caused by the encroachment of mechanised farming onto traditionally pastoral territory, and this is compounded by a lack of any means of redress. In view of these problems the challenge for development is not to assume the viability of either a pastoral or a sedentary life. There are possibilities of increasing yield through diversification of cultivation and experimentation with non-chemical pest control. Environmental protection is a priority, but reforestation is considered futile in the presence of a large refugee community which is in need of firewood. Overall there is a need for confidence building and the inclusion of the Lahawin in problem-solving.

91 Grainger, A. (1991) 'Characterisation and Assessment of Desertification Processes'. In: *Desertified Grasslands: Their biology and management.* Chapman, G. P. (ed.) Linnean Society Symposium Series 13. pp. 17–33. Academic Press, UK.

Key words: desertification / vegetation degradation / soil degradation / erosion / carrying capacity / government role / climate change

Desertification refers to long-term changes in the physical properties of land due to soil and vegetation degradation; it is a gradual process rather than a distinct switch, and is reversible up to a certain point. Vegetation degradation occurs in the early stages of desertification when deforested land is made more susceptible to wind and water erosion. Two other forms of vegetation erosion occur through compaction and waterlogging or salinisation. The rate of soil degradation is dependent on the rate of vegetation degradation, which is influenced by the intensity of land use and climate. As vegetation quality declines, land use is intensified to maintain food production. Estimates for the extent or rate of desertification are unreliable and rely heavily on subjective assessments, as data are sparse and there are few meteorological centres in dryland areas; lack of consensus on the issue will continue until there is a global monitoring system. It is easier to monitor vegetation degradation than desertification, and it is dangerous to assume that vegetation degradation can be used as a proxy for desertification. Climatic variability is another factor: the lower the rainfall, the greater the inter-year variability, and the higher the uncertainty about when that rain will fall. Some attempts have been made to reduce the pressure on the land through herd reduction, but these have been largely unsuccessful, and are unsatisfactory as a specific carrying capacity remains a controversial and academic concept. Government moves to restrict nomad access to land have also met with little success, and aroused antagonism in the process; the priority for the herder is the sustainability of the herd rather than the sustainability of the rangeland. However the urgency of the need to rehabilitate degraded rangelands stems from the fact that the reduction of biomass incurs a net transfer of carbon dioxide into the atmosphere, affecting local and global climate.

92 Grandin, B. and Lembuya, P. (1987) 'The Impact of the 1984 Drought on Olkarkar Group Ranch, Kajiado, Kenya'. *Pastoralist Development Network Paper* 23e March 1987. pp. 114. London: Overseas Development Institute.

Key words: Maasai / Olkarkar / herd splitting / fallback area / off-take / early warning / rainfall prediction / mobility

The article traces the strategies employed by the Maasai on the Olkarkar ranch during the 1984. Firstly the cattle were sent away, along with as many people as were necessary for their upkeep; use was made of family, clan and age-group ties, relieving the pressure of the initial stages of the drought. The failure of the April rains was a much more serious problem. Many herds were split, with the majority being taken to better pasture, whilst a few, preferably lactating cows and small stock, were retained at home where a few of the household members remained. In the fallback areas, there was continuing movement due to heavy grazing pressure, then disease and starvation amongst the animals. Attacks by wild animals were also feared.

Over the period 1983–1984, a 40% drop in the number of livestock was recorded; factors governing the significant variation between families were access to market outlets, the wealth of the producer, and the fallback area chosen. Larger traders and commercial farmers proved more successful at divesting themselves of their livestock in the early stages of the drought, and then buying back after the rains. Wealthier households also gained through the fact that their animals were healthier before the drought, and that even during the shortage they could water their cattle once in 2 days. They could also better afford drugs and acaricide, and were able to avoid site-specific risks by splitting their herds.

In terms of further research, the authors advocate greater exploitation of fallback areas, along with more awareness of the impending drought. There is a need for animals to be slaughtered whilst still in good condition, and this necessitates the availability of reliable information about weather patterns. The provision of relief food could be reduced if a nucleus of breeding females was maintained throughout. The article concludes with the assertion that the mobility of nomads is the single most important factor in their survival, and one that must be protected and encouraged.

93 Grove, A. T. (1978) ‘Desertification: Natural or man-induced?’ In: Hinchley, M. T. (ed.) *Proceedings of the Symposium on Drought in Botswana.* National Museum, Gaborone, Botswana, June 5th to 8th, 1978. pp. 71–74. Botswana Society/Clark University Press.

Key words: desertification / population growth / degradation / industrialisation / fossil fuel / linkages / government role / subsistence

The growth in population is the factor which makes desertification now more potentially serious than it has been in the past. Population increase has been accompanied by an increase in the consumption of fossil fuels, resulting in a doubling in pressure on resources every 15 years. The rate of degradation is unknown, although it is clear that the desert does not march forward over a broad front; damage begins in areas such as around borewells and spreads outwards. Generally speaking there has been little appreciable climate variations in low latitudes over the last 5000 years, and will probably remain unchanged for the next 20–30 years, although semi-arid countries will experience severe drought. Decisions over the flow of funds for investments, and decisions made by individual cultivators regarding the usage of soil and water are connected by lengthy linkages; the concentration of information and power makes large populations dependent on central government and decisions taken by them. There are large structural factors underlying the problems of environmental degradation, and there is reason to believe that the present order is essentially unstable. Given the implications of this for inhabitants of semi-arid areas, and the probability that such imbalance will probably remain for at least one lifetime, the necessity to conserve the natural biological resources is apparent.

94 Halderman, J. M. (1972) 'The Kaputei Group Ranch Development Program'. Position paper. Source unknown; copy at ODI library. 5p.

Key words: Maasai / settlement / group ranch / common property / private ownership / opportunism / technical inputs / water

The paper proposes that the 'settlement' or restriction of movement of nomads, such as the Maasai, will be possible only if the settlement area is capable of supporting grazing; if not, the pastoralists will revert to their traditional mobility. The Maasai have adapted strategies to cope with uneven water distribution and fluctuating forage conditions; water development can result in greater utilisation of rangeland, but it cannot irrigate pastureland or make rain. On the premises that livestock are privately owned and natural resources held in common, the author proposes that the way to avoid degradation is for the land to be divided in order to force the holder of each strip to take responsibility for its management. This is only possible, though, if the nomads, who behave opportunistically, view their sedentarisation as beneficial. The provision of technical inputs, such as cattle dips and wells, is not sufficient to persuade the Maasai to settle, as their livelihood depends on the types of grasses and quality of forage as well as access to water.

95 Hama, A. (1981) 'Consumption and Marketing of Pastoral Products among the Kal Tamacheq in the Niger Bend, Mali'. In: *The Future of Pastoral Peoples.* Galaty, J., Aronson, D., Salzman, P. and Chouinard (eds). Proceedings of a conference held in Nairobi, Kenya, 4–8 August 1980. pp. 244–250. International Development Research Centre, Ottawa, Canada.

Key words: Kal Tamacheq / Fulani / Songhai / Mali / slaughter / consumption / herd reconstitution

The Kal Tamacheq occupy northern and western Mali and have large enough herds to be self-sufficient; the Fulani and Songhai communities are semi-pastoral or sedentary. Slaughtering occurs mainly for hospitality and entertaining relatives, or if the animal is sick. Moslem religious festivals and quotidian food needs are less often cited as a reason for slaughtering. Meat consumption is particularly high at the end of the rainy season as the animals are fat, and the hides are used for making goatskin bottles for the coming dry season. Cattle are sold for a variety of reasons: dietary needs, clothing, taxes, purchase of female animals to reconstitute the herd, and labour for artesian wells.

96 Hammel, R. (1995) 'SECADEV Working Agro-pastoralists in Chad'. *Arid Lands Information Network* 7. Dakar: ALIN.

97 Harvey, P. (1997) 'Rehabilitation: An annotated bibliography for the CARE Rehabilitation and the Greater Horn Project'. *IDS Development Bibliography* 16. Sussex: IDS.

Key words: rehabilitation / conflict / civil society / agriculture / coping strategies / food security / drought / famine prevention

The document summarises the literature on rehabilitation after drought and conflict in the Horn of Africa. Its coverage of the literature includes that produced by non-governmental institutes and research institutions.

98 Harvey, P. (1997) 'Rehabilitation in Complex Political Emergencies: Is rebuilding civil society the answer?' *IDS Working Paper* 60, December 1997. Sussex: IDS.

Key words: political emergency / civil society / conflict / conflict resolution / accountability / development / democracy / governance / sustainable development

The impact of conflict in sub-Saharan Africa is such that it cannot be considered to be a temporary aberration outside the mainstream development agenda. Intervention into complex political emergencies (CPEs) is aimed at increasing the capacity of structures in order to counteract the erosion of civil society, and thus form the basis of rehabilitation. CPEs have the effect of severely weakening both civil society and governments, and political capacity should be built from the bottom up, so as to marginalise predatory authorities. Rebuilding civil society can start even during a CPE, and is aims at moving from relief towards more developmental planning, whilst contributing to peace. Civil society is held to counterbalance the weight of state power and thus contribute towards democracy through the political accountability it affords. CPEs are understood to be essentially political events arising out of socio-economic marginalisation, and often result in significant benefits for powerful groups. The discourse on rehabilitation through civil society draws on academic literature and practical experience in different CPEs, which characterises CPEs as frequently undermining civil society; it is attacked by warring parties which emerge as traditional structures take the place of failing authoritarian structures. The complexity of the resulting situation should warn external agents against complacency in their ability to intervene. Developing a minimum of project planning, management capacity and accountability involves large time and resource investments, and the role for development assistance is in supporting initiatives, but it cannot make them happen. Genuine community participation, sustainability, and accountability are goals towards which progress can be made, whilst moving beyond the culture of service delivery. The development of civil society holds out the possibility that non-military parties may have a stronger voice, but it must take place alongside the broader political processes rather than instead of them, whilst offering the possibility of greater accountability and good governance, both of which would be useful tools in dealing with conflict.

99 Harvey, P., Campbell, W. and Maxwell, S. (1997) 'Rehabilitation in the Greater Horn : A report to CARE'. November 1997. Sussex: IDS.

Key words: rehabilitation / civil society / social capital / government role / CARE / political emergency / relief-development continuum / gender / local institutions

Rehabilitation takes place following complex political emergencies, and has traditionally been assumed to be part of the relief–development continuum, which has led to development agencies finding themselves engaged simultaneously in livelihood promotion, protection and provisioning. The danger of compromising the neutrality of relief assistance by conferring legitimacy on predatory regimes is ever present in rehabilitation work. Rehabilitation is attractive from the perspective of the donor as it gives a focus for the building of social capital, through local participation and sustainable long-term sustainability; for this reason it is also central to governmental planning. CARE's concern in emergency and post-emergency work centres on household livelihood security, and the need to strengthen household systems to meet basic needs on a sustainable basis. The rehabilitation process can be initiated even during the emergency, but flexibility is essential and reversals inevitable; an appreciation of the possibility of increasing conflict over resources by large-scale interventions is useful. The concept of rehabilitation is relatively new and difficult to define, and its usefulness is undermined by the fact that it is co-opted by projects as a money-trap. In essence it should provide a

transition through institutional capacity building from relief to development, as attempts are made to protect and promote livelihoods during and after emergencies. It allows a wide range of political, social and economic interventions, with the aim of reinforcing development objectives, particularly livelihood security, participation, sustainability, gender equity and local institutional capacity.

100 Heffernan, C. (1995) 'Restocking Pastoralists: A review of the literature'. MSc dissertation, Veterinary Epidemiology and Economics Research Unit, University of Reading. December 1995.

Key words: restocking / overgrazing / range management / herd management / carrying capacity / development / famine relief

Herders' economic viability is undercut by a combination of factors including drought, livestock disease and civil war. Restocking is sometimes promoted as a response to drought on the basis of supposed environmental, economic and cultural advantages, but these are not borne out by the literature. The quantification of environmental consequences of intervention is crucial, given mounting population pressure, as is an assessment of economic impacts. Alternative strategies such as food aid and supplementary fodder provision are explored, with the conclusion that restocking is an effective means of assisting the destitute, but should be seen as a last resort. Restocking programmes are controversial as they can be seen as a postponement of the inevitable decline of the pastoral sector; there is a possibility that restocking early in the famine cycle inhibits indigenous recovery systems, as pastoralists are encouraged to wait for assistance, rather than taking the initiative, and may sell on distributed animals. Conditions on loans are problematic and may jeopardise the economic viability of herds.

'Green desertification' is the process by which land which is underused, generally on account of a poor security situation, is taken over by bush, making it less productive for livestock grazing. Restocking is a means of combating this bush encroachment; however, in some systems, woody plants may be suitable for halting degradation as they have deeper roots than savannah grasses, and may serve to revitalise rangeland. The concept of a fixed carrying capacity is challenged by the fact that variability of species, mobility, and the production goals of producers affect the number of animals that can be profitably grazed on a piece of land. The paper concludes that the benefit of restocking is in using it as a means of rehabilitation in conjunction with other forms of assistance, rather than seeing it as a complete answer.

101 Herren, U. J. (1991) 'Droughts have different tails: The impact of and response to crises in Mukogodo division, Laikipia District, Kenya'. In: *Pastoral Economies in Africa and Long-term Responses to Drought.* Stone, Jeffrey C. (ed.). Proceedings of a colloquium at the University of Aberdeen 1990, Aberdeen University African Studies Group 1991, UK. pp. 69–85.

Key words: social strata / desertification / Maasai / livestock population growth / population pressure / economic integration / economic diversification

The author opens by expressing the preference for a term such as 'crisis' as opposed to 'drought' as the Maasai 'olamei' refers to any situation of want, of which meteorological drought is only one possible cause. The crises of 1981 and 1984 have had the effect of stratifying society to the extent that the poorer sections have become a reserve labour source, and have little chance of recovering to any level of autonomy. The evidence is that although there have been a number of drier years since the 1960s, these have remained within long-term statistical expectations; identification of desertification

is equivocal, although the human cost of drought does seem to have risen, and recovery has become more fraught. Water shortages in the 1930s and 1940s did not have a major impact, but it appears that populations of Maasai are now in a position of greater vulnerability; this is a result of the change in the livestock-to-people ratio within individual households, and the livestock-to-land ratio within the whole system. The inability of sections of the population to recover from drought leads to a stratification of the society. About 2% of the population, the very rich, owns more than a third of the stock, and these people are well connected with the external market; they pay little attention to their communal responsibilities. The rich have also increased their cattle-holding significantly since the 1984 crisis. They have a high off-take for sale and for food, and also invest highly in traditional security mechanisms. Further down the social strata attempts to rebuild herds become more difficult as off-take is lower; this results in more family members being put into wage employment. Sales are made only in emergencies, meaning that prices are low; there is diversification of income and reliance on rich patrons. For the very poor, pastoralism becomes a sedentary and extensive and may prove to be ecologically disruptive.

102 Hidore, and Amin El-Tom (1975) 'Climatic Change and Economic Development. In: *African Environment: Problems and perspectives,* Richards, Paul (ed.) African Environment Special Report, International African Institute, London, UK. pp. 25–30.

Key words: climate / seasonal drought / carrying capacity / degradation / water retention

The authors establish in this chapter that any change in the climate seems to have an almost immediate effect on the carrying capacity of the land. In the context of this, they distinguish between perennial, seasonal and intermittent drought. A decline in precipitation can change areas of seasonal drought to areas of permanent drought. The decline in rainfall effects the capacity of the soil to retain water, and with the reduction of surface pondage, the soil temperature rises. The authors grant the possibility of allowing animal populations to be controlled by drought but declare this an unacceptable strategy for human populations. The authors see a climatic process taking place, and explore the ways in which humans can pre-empt disaster and loss by controlling their environment instead of being victims of it.

103 Hiernaux, P. (1996) 'The Crisis of Sahelian Pastoralism: Ecological or economic'. *ODI Pastoral Development Network Paper* 39a, 1994–1996. pp. 1–20. London: Overseas Development Institute.

Key words: floristic composition / grazing / overgrazing / livestock mobility / seasonality / annual plants

The changes in floristic composition are similar in the case of drought and in response to grazing pressure, and this may be responsible for the general belief in the connection between overgrazing and desertification, processes which are in reality distinct. The impact of the grazing and browsing of animals is a function not only of intensity, but also of seasonality, most Sahelian rangelands being dominated by annual plants. From this the conclusion is drawn that policies restricting the mobility of livestock may have a greater deleterious effect than would be expected if it were simply the *number* of animals which was relevant.

104 Hill, A. G. (ed.) (1985) 'Population, Health and Nutrition in the Sahel: Issues in the welfare of selected West African communities'. 399p. KPI Limited, Routledge & Kegan Paul.

Key words: demography / livestock fertility / livestock mortality / specialisation / sedentarisation / census / NGO role

One of the striking aspects of the Sahel region is that in all but the most catastrophic circumstances, traditional systems of production and social organisation are adequate for human survival. A second aspect is the specialisation by different ethnic groups which allows herders, fishermen and farmers to live together, exploiting different parts of the environment. A firm distinction between nomads and settled populations is a false dichotomy to draw and has led to confusion, not least because the two groups form a single community rather than existing separately. Farmers and pastoralists are part of the same economy affected by similar market and non-market forces; pastoralists are decision-makers within this system, rather than objects of a culturally and environmentally determined existence. Most pastoral land is not overgrazed, and even pastures around wells which are heavily used in the dry season can generally recover if there is temporary alleviation of pressure and adequate rainfall. Moving beyond the view that herder behaviour is determined, the shortcomings of the ecologically based models become clear. Choice plays the greater part in herd composition and resource management. Development plans are based on basic demographic data on a region, but the mobility of pastoralists means that they are often left out of census data, resulting in discrimination against them in the evaluation of their educational and health needs. At the planning stage of development work it is relevant to ask the investigators about their predilections: do they believe that ecological circumstances, the level of technology or socio-cultural norms have the chief impact on fertility and mortality variables?

105 Hitchcock, R. K. (1978) 'The Traditional Response to Drought in Botswana'. *Proceedings of the Symposium on Drought in Botswana.* Hinchley, M. T. (ed.). National Museum, Gaborone, Botswana, June 5th to 8th, 1978. pp. 91–97. Botswana Society/Clark University Press.

Key words: Botswana / drought / traditional systems / food security / social cohesion

Details of the effect of drought on human populations are available from oral histories and written diaries; traditional rain-making ceremonies and practices accompany local mobility and severe changes of diet. Such ethno-historical accounts make it clear that drought has been a common occurrence in Botswana. The majority of the Tswana and Bantu peoples have a mixed economy supplementing pastoralism and agriculture with hunting, gathering and wage labour. Water is obtained by means of sip-wells, and when these dry up there is significant out-migration from an area. Marriage, trading and regulation of meat distribution are methods by which food security is increased; the opportunism characteristic of the hunter-gatherers allows them to experiment with new techniques for risk minimisation during hardship. The priority during drought is for livestock owners to retain as much of their breeding stock as possible in order to facilitate post-drought recovery. During drought, traditional tribal rules regarding grain storage and tribute-taking come into play as a strategy against hunger and profiteering. Poorer families are cared for by their wealthier relations, and a tradition of hospitality governs the accommodation of visitors. The role of tradition, and especially the rain-making ceremonies has played an important social role in increasing the feeling of security during drought. Some tribal customs were adopted at the level of government administration, especially during the Second World War, and many contingency measures are rational and significant in terms of society adjusting itself to drought, and thus alleviating the social stress caused by drought.

106 Hitchcock, R. (1995) 'Indigenous Peoples, Resource Management, and Traditional Tenure Systems in African Dryland Environments'. In: Stiles, Daniel (ed.) *Social Aspects of Sustainable Dryland Management.* pp. 153–175. Geneva: UNEP/John Wiley.

Key words: participatory development / common property / local management

The growing use made of natural resources in rural Africa, in game cropping, tourism, and rural income generation has shown that local participation is an important element, and can lead to rural development. This has resulted in a concept of 'participatory development', involving community consultation, mobilisation and organisation, which entails the need for communities to maintain control over their human and natural resources. Consultation with local leaders gives donor agencies important information, as well as making local support for development projects more likely. Common property resource management is one avenue being explored as a means to sustainable development; the chapter cites the example from Namibia where a group of Himba and Herero semi-nomadic pastoralist, who can be described as 'multi-use strategists' were employed to control elephant and rhinoceros poaching. The success resulted not only from the ability of the Himba and Herero to patrol the area, but the social realisation of the need to conserve resources. That benefits should accrue to different parts of the population is also important as far as co-operation is concerned, and just means of conflict resolution are needed, as well as sanctions to enforce community decisions.

107 Hodgkinson, K. C. (1992) 'Elements of Grazing Strategies for Perennial Grass Management in Rangelands. *Desertified Grasslands: Their biology and management.* Chapman, G. P. (ed.), Linnean Society Symposium Series 13. pp. 77–94. London: Linnean Society of London/Academic Press.

Key words: grazing / carrying capacity / sustainability / range management / productivity

The grazing and trampling of domestic and wild animals on semi-arid lands affects the composition and abundance of pasture. This includes the increase in woody plants, the invasion of low palatability grasses, and the diminution of palatable grasses from runoff areas resulting in increased soil erosion. If such areas are to be rehabilitated, there is a need to consider different management techniques. A prime factor affecting productivity and stability of rangeland is the number of herbivores grazing it; the Jones-Sandland model describes a relationship between productivity and stocking level whereby the productivity per animal declines as stocking intensity increases, and productivity per unit area of land rises to a maximum before it subsequently declines. Stocking intensity is the most important factor affecting rangeland profitability and stability. Herbivores graze selectively, so quantity rather than quality limits the animal productivity on rangelands; productivity is higher than if they grazed non-selectively, but preferred species are heavily grazed. Species differ in their resilience to heavy grazing; grass mortality from grazing is low, but reproductive structures may be destroyed, whilst plants generally suffer more from defoliation.

108 Hopkinson, N. (1989) 'Desertification, Debt and Structural Adjustment in Sub-Saharan Africa'. June 1989, Wilton Park Papers 18. Conference report based on Wilton Park conference 339. pp. 26–30. London: HMSO.

Key words: desertification / population pressure / carrying capacity / IGAAD / food security / structural adjustment

The increasing frequency of famine can be explained by the fact that increasing desertification leads to a decrease in the amount of available land, while population increase leads to an increase in the amount of land needed. In combating desertification there is a tension between investing in increasing output from marginal land and investing in more productive wetter areas. The Inter-Governmental Authority on Drought and Development (IGADD) was set up by Djibouti, Ethiopia, Kenya, Somalia, Sudan and Uganda with the aim of identifying small projects to combat desertification and bolster food security. The conclusions of the conference were that war, population, desertification and famine were the major problems in sub-Saharan Africa. Lack of social and agricultural infrastructure to support population growth contribute to the problem. The elimination of the debt crisis would have only marginal impact on alleviating problems, as most development challenges would still remain; adjustment has failed in the past because it has not prioritised social elements, in particular reducing access to food. If external donors are to be kept on side, there is an urgent need for African governments to rectify factors which are within their control.

109 Horowitz, M. M. and Little, P. D. (1987) 'African Pastoralism and Poverty: Some implications for drought and famine'. In: Glantz, Michael H. (ed.) *Drought and Hunger in Africa: Denying famine a future.* pp. 59–82. Cambridge University Press, 1987.

Key words: desertification / drought / marginalisation / social differentiation / tragedy of the commons / carrying capacity / sedentarisation / restocking

There is a difference between desertification and the effects of long-term drought. Despite vast amounts of money directed towards the pastoralist economy in recent years, productivity and standard of living have not increased. There is increasing marginalisation and differentiation occurring in societies dependent on pastoral production systems; as pastoralists are forced by increased commercialisation onto more and more marginal land, the inequality between them and other sectors of the community increases. Despite the negative consequences of unchecked expansion of cultivation, agriculture in preferred to pastoralism by governments and financial institutions. This results from confidence in the technology given to farmers, and also frequently from ethnic ties, as administrators come more often from farming rather than herding backgrounds, and often share in an anti-pastoralist prejudice which provides some sort of a rationale for restricting herding activities.

The notion of overgrazing, leading either to death or sale of livestock to restore the equilibrium, or to degradation of the land is central to Hardin's 'tragedy of the commons'. However the resiliency model, as outlined by Hjort (1981, A critique of 'ecological' models of pastoral land use. *Ethnos* 46(3–4) pp. 173–4) sees an association between the carrying capacity and the stocking rate, which allows for recovery when pressure is reduced. Sandford (1982, Pastoral strategies and desertification: Opportunism and conservatism in dry lands. In: *Desertification and Development: Dryland Ecology in Social Perspective.* Eds B. Spooner and H.S. Mann p. 62. London and New York: Academic Press) distinguishes between an *opportunistic* pastoral strategy which 'varies the number of livestock in accordance with the current availability of forage', and a *conservative* pastoral strategy which maintains the number of animals at a relatively constant level below a constantly defined carrying capacity.

The success of various farming methods depends on the criteria used for measurement. Cossins (The productivity and potential of pastoral systems, *International Livestock Centre for Africa* (ILCA) Bulletin, 21:10. 1985) finds that the pastoral Borana system in Ethiopia is very productive in comparison to the ranches of Australia; but instead of measuring productivity per animal, which is used for commercial farming, he measures productivity per unit area, a measurement more significant to pastoralists.

The involvement of pastoralists in non-pastoral activity can be a response to poverty, but wage employment is generally unskilled and provides few surplus returns that can be used for restocking. Diversification has also taken place among the wealthy pastoralists, but is of a different nature: they have invested in educating their children for higher paid employment, and in irrigation schemes, or business.

There are three areas of policy reform. Firstly there is a need of better informed policy regarding land tenure and use; this includes the involvement of pastoralists in decision-making procedures, with government recognition, and the encouragement of herder organisation. Secondly there is constructive work to be done regarding marketing policy. This involves establishing regional and district grain stores in order to facilitate herder access to supplies, and cut down transportation costs. In some countries there is scope for governments to increase regional trading by less restrictive licensing laws. The third area for reform concerns programmes for returning herders to livestock production; governments have assumed that the risks of drought can be reduced by encouraging sedentarisation, and have installed irrigation and fishing schemes in pastoral areas. The returns, though, have been poor and have not offered a chance of rebuilding a herd. Strengthening pastoralist activities should be prioritised over replacing them as alternatives to pastoralism are not likely to be economically, socially or ecologically as effective in the short to medium term.

110 Hulme, M. (1994) 'Using Climate Information in Africa: Some examples related to drought, rainfall forecasting and global warming'. In: 'Knowledge is power? The use and abuse of information in development'. *IDS Bulletin* 25(2) April 1994. pp. 59–69. Sussex: Institute of Development Studies.

Key words: climate change / rainfall prediction / water management / early warning / information networks / government role / NGO role / climate variability

About 50% of the African continent has a dryland climate, which makes the probability of drought lasting two of three years substantial. The Lake Chad catchment area has suffered from severe desiccation over the last 20 years, with water levels falling significantly below those predicted. Southern Africa has not experienced a water shortage of similar proportions, but was affected by a regional drought in 1991/2. The drought was severe, but not abnormally so, and whilst interested parties were keen to find fault with the weather, little blame was apportioned to the lack of drought-preparedness. The greatest use of forecasting is at a national and international level for decision-making about crop production, hydrological drought prediction and early warning systems. There are improvements to be made as far as institution building and forecast acceptance is concerned before the full potential of the technology is realised. Demonstrable reliability of forecasting is necessary if government institutions and food agencies are to react to information, and direct contact with the user groups is difficult as rural communities have little access to forecast information, and because of the coarse space- and time-scales of forecasting and the complexity of decision-making processes associated with it. Whereas informal information networks in rural areas are strong, formal networks are weak, and it is the wealthier farmers with closer links with urban centres who are more likely to benefit from forecasting. The reactions of groups to forecast information differs according to their role. Whereas those with industrial interests see the uncertainty over, for example, the effects of global warming as reason to delay action, non-governmental organisations with mandates to protect the earth see the uncertainty as cause for immediate intervention. Meanwhile, governments are unwilling to cut back on greenhouse-gas emissions until there is more substantial and scientific evidence of the damage caused. Decisions about intervention are usually based on whether regional climate change is significant enough within current climate variability to cause concern. There is evident imbalance in that the vast majority of predictions of climate change caused by greenhouse

gases are based on ‘general circulation models’, which makes African scientists and policy makers dependent on the interpretation of northern scientists. As far as African planning is concerned, and the need to invest heavily with short-term development needs, benefit/cost analysis does not make reduction of emissions cost effective for the future. In conclusion, exaggerating the climate sensitivity, or under-representing the role of natural climate variability can act as a smoke-screen for inadequate government planning.

111 Hulme, M. (ed.) (1996) ‘Climate Change and Southern Africa: An exploration of some potential impacts and implications in the SADC region’. WWF International and Climatic Research Unit, University of East Anglia, Norwich, UK.

Key words: SADC / desertification / degradation / erosion / pollution / runoff / agricultural policy / biodiversity / climate change / political environment / economy / land distribution

The report outlines the SADC priority areas for environmental policy as being: a sustainable water supply, the prevention and reversal of desertification, the combating of coastal erosion and pollution, making use of natural resources, and food security alongside demographic change. The report considers the possibility of a warming of 1.5 degrees over the next 60 years. Anthropogenic emissions of greenhouse gases leading to increased temperatures has led to the formation of the Intergovernmental Panel on Climate Change. The last 20 years have seen a trend towards reduced rainfall, with the decade of 1986–95 being the warmest on record, although 1995–6 has returned to wetter weather. Possibilities for changes in global and regional climate, and the impact that this is likely to have on natural vegetation and nature reserves. Climatic changes impact on the environment, particularly on such variables as runoff; hence agricultural policy prioritises reducing vulnerability by developing monitoring capabilities and enhancing the responsiveness of the agricultural sector to prediction of impending food crises. The greatest negative impacts are on ungulate habitats, resulting in the decline in species richness; the impacts of climate change will accelerate existing processes of environmental change, especially bush encroachment. This will result in a switch from cattle to small stock, and may have other impacts on human activities. This may include a reduction in overall development potential, a loss of biodiversity, changes in suitability, profitability and attractiveness of different sectoral activities, lower overall incomes and reduced livelihood security coupled with increased income inequalities. The resilience of populations and the coping strategies employed by each group are partially dependent on the political and economic environment. Policy re-assessment in favour of small stock, wildlife and gathering products, along with diversification into multi-species systems may be important. Namibia and Zimbabwe may need land reforms. Climate change is a constraint on environmental policy, but is not the only one; it adds further stress on ecosystems under pressure from population growth, increasing subsistence needs, droughts and unequal land distribution.

112 Hutchison, R. A. (1991) ‘Fighting for Survival: Insecurity, people and the environment in the Horn of Africa’. Hutchison, Robert A. (ed.), based on original research and compilation by Bryan Spooner and Nigel Walsh. 181p. IUCN Sahel Program Study. Gland, Switzerland: World Conservation Union (IUCN) 1991.

Key words: environmental degradation / albedo / rainfall variability / sustainability / regional co-operation / terms of trade

Land degradation in the form of soil erosion, deforestation, and overgrazing are threats to security in the Horn of Africa which accompany cultivation. Progress can take place in the Sahel only if alternatives are offered, and the example is given that, until other sources of fuel are available, populations will cut trees for firewood. These land problems have been compounded by the occurrence of longer and more frequent droughts in the second half of the century. The removal of topsoil results in lighter soil being exposed, and this increases the earth's albedo, the proportion of sunlight which is reflected back into space, resulting in the soil retaining less heat and gradually cooling down. This in turn affects the amount of rainfall, as rain is caused by the rising of warm, moist air.

Econometric models of famine analysis relate to the 'average' farmer under 'normal' conditions, and take no account of rainfall variability or economic, social or political decisions. Famine-response models focus on examples and use causal links and abstractions. These famine-response models suggest that there is little evidence for a phased and sequential response for all communities and conditions of environmental change. Reflecting this, traditional strategies are locally specific in environmental and socio-political terms, and tend towards the protection against the worst drought rather than necessarily the maximisation of marketable surplus. Accumulation during good years, particularly of livestock, is considered the best insurance against times of shortage. Non-pastoralists view this as hoarding, but the protection offered by market mechanisms depends on the situation elsewhere rather than on local initiatives. However, out-migration due to urban drift has caused depopulation in rural areas, resulting in a weakened community base and a lack of manpower to respond to a changing environment. There is no option of returning to a purely pastoral economy, and the challenge is to find means of allowing communities to survive in the presence of the cash economy; this could be by ensuring greater access to markets, and improved transportation. This requires effective management of the resource base at a local level, and the integration of communities into the regional economy.

113 IDS (1995) 'Confronting Famine in Africa'. Policy Briefing, Issue 3: April 1995. Sussex: Institute of Development Studies.

Key words: famine / early warning / relief / development / conflict

Famine poses a continuing threat to many of the poorest countries in Africa. There is much that can be done, however, to reduce the risk of famine, and limit the damage done. Speeding up the response to famine early warning signals is vital. Even when famine has gained hold, measures can be taken to help people survive the crisis, and rebuild their lives afterwards. Relief operations need to be much better integrated with long-term development. But with war now a major factor behind famine in Africa, more concerted peace-making efforts are also essential if the spectre of famine is to be confronted. [Author]

114 ILCA (1980) 'Changes in Land Use and Vegetation in the ILCA/Mali Sudano-Sahelian Project Zone'. Working document 3, based on the work of Mark Haywood. International Livestock Centre for Africa Headquarters, Addis Ababa, Ethiopia.

Key words: Mali / degradation / rainfall / population distribution / population pressure / millet

The study aims to quantify the land degradation in the Malian Sahel by comparing two panchromatic photo coverages taken in 1953 and 1975. The study focuses on the rates of expansion of the different

crop types, and evaluates the changes in state of the rangeland and vegetation cover. Drought is accepted as a recurrent event rather than a freak phenomenon. Qualitative replacement, where inferior plants have taken over from productive ones, has not been counted as degradation. Degradation in 1952 covered 190,400 hectares, 4.14% of the study area; in 1975 this had risen to 1,206,800 ha, 26.23% of the area. The increase in degradation from the south towards the north may be correlated with increasingly erratic and lighter rainfall. The most intensive cattle-rearing zones overlap with cropping areas where there is a large risk of rain failure, resulting in soil trampling by livestock. Long dry periods result in further damage as small roots are broken through soil shrinkage, the light rain is inadequate for penetrating the cracks, and runoff results from heavier rain. Grasses and shrubs have suffered more than trees. Adverse population distribution can lead to severe damage as degradation is more or less proportional to the level of human and livestock usage. Millet cropping has extended northward and the fallow time appears to be diminishing. State-controlled irrigated cropping has increased, and with it the settlement of villages, resulting in local inhabitants being expelled from their land. The financial surplus created has been invested in livestock; during drought these can be fed on rice stubble, and so have the advantage over pastoralists' stock. An increased exploitation of trees for firewood, and the degradation of other vegetation has accompanied the formation of villages, and it is this degradation which is the most outstanding feature of the report. In response it is recommended that forms of territorial and social organisation are developed to give exclusive rights to vegetation to those using it within the production system, entailing the reduced importance of livestock. Research should be put into raising forage productivity and the introduction of firewood species.

115 ILEIA (1995) 'Farmers facing change'. *ILEIA Newsletter for Low External Input and Sustainable Agriculture* 11(4), December 1995. PO Box 64 NL–3830 AB Leusden, Netherlands.

Key words: Nigeria / Ghana / nutrient dynamics / education / local knowledge

The edition outlines the problems facing various subsistence farming communities, including nomadic populations of the dryland savannah and the nutrient dynamics and agricultural intensification of the Kano close-settled zone in Nigeria. These are followed by a description of farming conditions in Ghana and a report of collaboration for sustainable agriculture. The articles deal with familiar themes such as environmental degradation, population growth and the introduction of new technology, but present their arguments in the context of specific areas or the experience of specific farmers. There is also a less familiar theme of education. This constitutes learning through communication between farmers in different regions, and the education of the young in both the necessary traditional skills for coping with risk, and in more modern schooling. The two-way education between pastoralists and aid agencies so that local knowledge can impact policy is also addressed.

116 Inter-réseaux 1995. 'Hommes et animaux: Élevages en Afrique sub-saharienne'. Inter-réseaux s/c CFSI. 32 rue Le Peletier, 75009 Paris, France.

Key words: livestock / herd management / pastoralism / desertification / Sahel / pastoralist associations / veterinary services / privatisation

The magazine aims at providing a means of exchanging information of experiences of those in rural development in Africa with interested parties in France. It brings together the networks of Réseau GAO, Réseau Recherche-développement and Réseau Stratégies alimentaires. It tackles issues central

to the study of the Sahel; land management, pastoralism, the fight against desertification in the Sahel and institutional issues such as the provision of veterinary care.

117 Johnson, D. L. (1969) 'The Nature of Nomadism: A comparative study of pastoral migrations in southwestern Asia and northern Africa'. University of Chicago Department of Geography, Research Paper 118. *Aspects of Pastoral Nomadism*. pp. 1–19. Chicago: University of Chicago.

Key words: mobility / food security / optimal herd size / agropastoralism / herd diversity / herd maximisation

Pastoral nomads utilise marginal land which is unsuitable for any other sort of production, and has developed chiefly along the edges of rainfed cultivation; a series of good years often leads to the expansion of agriculture, whereas dry years see an increase in pastoral nomadism. Movement of pastoral herders is not random, as water often falls in a particular seasonal pattern of climate, and communities stay within traditionally defined areas in which they have usufruct rights. During good grazing years the herd expands as it is axiomatic that the herder will achieve the largest herd possible, but during poor years the herds suffer; the result is not a stable equilibrium as the number of animals is always fluctuating, but a dynamic equilibrium between the nomad and the environment. The nomad's primary concern is to build up capital stock in terms of numbers of animals, in favour of return, as insurance against vicissitudes; alternative adaptive strategies include devoting more time to agriculture, and diversifying the species within the herd. There is debate about the number of animals needed to support a nomadic life, estimations varying between 20 and 65 for sheep and goats, and 10 to 25 camels, and falling below these figures is likely to necessitate at least a temporary recourse to settlement. Nomadism takes the form of a range of life patterns along a continuum between sedentary life and 'pure' nomadism which would have no contact with agriculture. The amount of movement undertaken depends on '(1) the combination of animals herded, (2) the role that agriculture assumes in the group's economy, (3) the amplitude of the yearly displacements, (4) the seasonality of the natural regime, (5) the physiography of the tribal area, and (6) the quantity and quality, viewed both spatially and temporally, of grazing and water.'

118 Johnson, D. L. (1975) 'The State of Pastoral Nomadism in the Sahelian Zone'. In: *MAB (Man and the Biosphere) Technical Notes The Sahel: Ecological approaches to land use.* pp. 75–87. Paris, France: UNESCO.

Key words: adaptation / local knowledge / modernisation / sedentarisation / role of government

The two key factors affecting the status of pastoral nomadism are the traditional adaptive culture complexes that support the nomadic lifestyle and modernisation. During the drought in the Sahel, ecological adaptation, exploitation of marginal resources and the dependence of nomads on settled communities are important features. Sedentarisation is an element of nomadic life, and takes place when herds fall beneath the size required to sustain a family. It is not irreversible, but occurs constantly and is rapidly increased by drought. Temporary sedentarisation takes place if rains fail, as nomads concentrate on using what water resources remain in an area that they know well rather than risking a journey to an unknown territory. The decision is crucial as the number of animals that might die in migration has to be weighed against the number that might die if the family settles. Many nomads settle temporarily or send family members to find employment in urban centres and never return to nomadic life. With regard to government policy in assistance to nomadic communities, non-

intervention is unacceptable on account of its high political cost; nomads would congregate around cities with few employment opportunities, whilst the national economies suffer from reduced revenue from the pastoralist sector. Backing sedentarisation by the government is an option, but whilst it may reduce future drought losses, it suffers from the same problems as benign neglect. A comprehensive national land-use policy is vital for future development, with detailed resource-use plans being assigned to the local or regional level.

119 Jost, C. (1994) 'The Karimojong CAHW Program: Impact Assessment Mission Report'. TRVTT/PARC/EMVT/TUSVM Project, Tufts University, Boston.

120 Kamrany, N. M. (1975) 'The Three Vicious Circles of Underdevelopment: The Sahel-Sudan case of West Africa'. *Socio-Econ. Plan. Sci.* 9. pp. 137–145. UK: Pergamon Press.

Key words: drought / emergency relief / security / climate / marginal land / rainfall / productivity / import substitution

The Sudano-Sahelian drought of 1973 was the harshest of the last 50 years, and provoked a three-pronged response: immediate relief in the famine areas, short-term measures to revitalise the economies, and the identification of long-term options for the region. Failures in the past have resulted from single-sector project approaches and have highlighted the need for comprehensive and integrated evaluation. The systems approach advocated takes into account the interconnectedness of the system, without losing sight of the limitations placed by technologies, resources and the socio-cultural, political and value factors. In economic terms, the countries of the Sahel suffer from fragmented markets that provide insufficient demand, and insufficient import substitutes which fail to improve the balance of payments, coupled with being generally ignored by multinationals. The effect is widespread poverty and moderate malnutrition which is exacerbated by the incidence of drought. The major aspects of rainfall variability are described as '(1) a north–south gradient, (2) a multi-annual range of variability within a given zone, with extremely high variability in the north and a moderate degree in the south and (3) an east-west micrographic variability within a given year, especially in the northern zone' (p. 139). Of the two hypotheses relating to this variability, namely that large variations exist versus the proposition that a major change in the weather pattern has occurred, the evidence over the last 50 years supports the former. A World Meteorological Organisation (WMO) investigation in 1970 found no upward or downward trend in rainfall since the beginning of the century. A bimodal distribution over the Senegal sector of the Sahel–Sudan zone has been detected, the first mode of which is larger indicating a preponderance of dry years over wetter years; this is explained by the features of general atmospheric radiation.

The rate of growth of the population has meant in many cases a decline in per capita wealth, along with increased urban unemployment and migration further afield. In the rural sector, low productivity is attributed to overworked soils, high transport costs, rainfall variability, outmigration and a lack of investment by donors. Many of the problems of the Sahel are not particular to this region, but are accentuated by the recurrence of drought and the lack of infrastructure to deal with it. The 1968–73 drought revealed a vicious circle of successively deteriorating ecological conditions. The fertility of soil in marginal areas is dependent on periods of recovery, but faced with lower all-round productivity, more marginal land has been used for agriculture, and fallow periods have been reduced. The paper also outlines the human opportunity circle, and the traditional-modern sector circle (p. 142–3), and concludes by proposing some policy implications which are designed to increase productivity while maintaining ecological viability. These involve adapting methods of farming to make use of the capability of the region, for instance by focusing on cow–calf livestock operations in non-arable areas, and concentrating non-productive animals onto better range in order to prepare them for the market.

The emphasis is on a move towards more productive land, not as a means of migration, but as an adaptation to local potentialities.

121 Kay, R. N. B. (1991) 'Responses of Livestock and Wild Herbivores to Drought'. In: *Pastoral Economies in Africa and Long-term Responses to Drought.* Stone, Jeffrey C. (ed.). Proceedings of a colloquium at the University of Aberdeen 1990, Aberdeen University African Studies Group 1991.

Key words: livestock / livestock adaptation / water retention / camel herding

Cattle account for about two-thirds of the biomass of the domestic stock in Africa but, not being native to Africa, they are not ideally suited to withstand drought. At the onset of dry weather the animals have to cope not only with reduced water availability, but also with high air temperature and strong solar radiation. Animals with white coats survive such conditions better than animals with dark coats. Heat storage is particularly effective in large animals, on account of their large weight-to-surface ratio; animals warm up during the day and cool off at night, meaning that the heat load does not have to be dissipated immediately by evaporation. The fluctuation of body temperature further lowers water and energy requirements by its effect on the temperature gradient between skin and air. Other features adapted to temperature regulation in various species include humps, dewlaps, nasal passages and ears; their effectiveness is complemented by methods of water retention. Biologically speaking, cattle are not well adapted to drought conditions as they cannot withstand dehydration, and do not conserve water so have to be kept near bore holes, risking overgrazing of these regions. Despite the preponderance of cattle herding, there is some movement towards stocking camels in many areas, a development in response to the pastoral realities of Africa.

122 Kenworth, J. (1990) 'The Recognition and Interpretation of Recurrent Drought in Africa'. Paper contributed to the Aberdeen University African Studies Group. *Pastoral Economies in Africa and Long-term Responses to Drought: Program of a colloquium* 9/4/90–10/4/90. Aberdeen University African Studies Group 1991. UK.

Key words: climate change / drought / food security / environmental degradation / trade / seasonal variability

Fears of increasing intensity and frequency of drought have been aired by many writers on Africa over the last century. These were compounded by concerns over food security following the Second World War as Africa's dependence on colonial economies and trade increased, although there is little consensus over whether environmental or human factors were to blame for the ecological deterioration. Research into the patterns of the seasons has given way to an appreciation that seasons are highly variable, and that rainfall is less predictable than was originally assumed.

123 Kerven, C. (1992) 'Customary Commerce: A historical reassessment of pastoral livestock marketing in Africa'. *ODI Agricultural Occasional Paper* 15. London: Overseas Development Institute.

Key words: marginal land / livestock marketing / herd composition / exchange value / land rights / taxation / off-take / drought / herd diversity

The two internal factors which routinely lead African pastoralists to exchange goods are the reproductive capacity of their capital goods, and their specialisation through the exploitation of areas unsuitable for agriculture. Livestock is a viable means of storing capital and labour, and can be exchanged for grain in times of shortage. Drought has the short-term effect of causing stress sales of livestock; in the post-drought period when pastoralists are trying to rebuild their herds, demand outstrips supply and the prices rise. Livestock disease, government taxation and infrastructure impact on the market system and pastoralists' propensity to sell. In Kenya, overgrazing and livestock off-take rates are determined in part by the political agenda relating to land rights; increased off-take was encouraged as a means of cutting down on overgrazing, but implicit to this was the prioritisation of settled cultivation over the growth of herds through pastoralism. For the pastoralists, sale is a rational move only where the return will be greater than simply eating or using the animal, so increased voluntary sales of livestock can be achieved by increasing the exchange value of livestock and livestock products in relation to their use value. The livestock industry in Nigeria is a large-scale indigenous market structure; induced by cattle tax, the Fulani pastoralists market all the animals which were not needed for private consumption. The market is heavily dependent on interaction with non-Fulani livestock traders, and has responded to prices elsewhere in the economy, such as the 1980s oil boom. The market-system has been demand led, and shows the government acting in a positive way. In Niger increased market orientation among the Fulani pastoralists is the result of seasonality of livestock sales, including the types and ages of animals sold, leading to changes in herd composition. In response to the market, herds have been diversified to include goats, sheep and camels as well as different breeds of cattle. One interpretation of the 1968–74 drought was to increase the number of livestock sales, and this, along with increased animal casualties, reduced the amount of available milk and increased dependence on cereal, and consequently on the market. However, after the drought, cereal production increased with herd size; herds characteristically had fewer lactating animals, and young were weaned earlier, resulting in larger herds and less milk. The upthrust of this would be that the pastoralists had found reason to diversify their output, rather than simply being driven to distress sales as the first interpretation would suggest.

124 Konczacki, Z. A. (1978), 'Livestock-capital, Range, and the People'. In: Konczacki, Z. A. *The Economics of Pastoralism: A case study of sub-Saharan Africa.* pp. 40–69. UK: Frank Cass.

Key words: livestock as capital / consumption / population growth / open access / overgrazing / degradation / urban migration

Livestock is regarded as a capital good on the basis of its ability to reproduce itself and thus create an income for its owner, this being in the form of animals and consumption goods. The system of herding practised particularly in East Africa is subjected to economic analysis, with the result that the prestige factor of hoarding cattle is considered secondary to the economic motivation. Growing human and animal populations have not been accompanied by an increase in rangeland, precipitating, it is conjectured, a 'boom' and 'crash' sequence depending on the vagaries of the weather. The problem stems, in the author's eyes, from the unrestricted access to pasture. This is to be tackled by the increased off-take from herds and the institution of property rights which protect the land from overgrazing. The possibility of forced sedentarisation is rejected, as this has proved counterproductive in the past. However, it is understood that making nomads contribute through taxes is problematic; taxes on selling and exporting cattle are understood to be regressive, and do not include those who do not sell animals. However, the contribution of the pastoralists to the national income is greater than it would be if the nomads were settled as labourers or unemployed in the city; furthermore, the health of pastoral nomads is almost invariably better than that of city or village dwellers. Sedentarisation is also connected with increased birth rate, which puts further pressure on the soil as the demand for carbohydrate production increases, leading in some cases to greater degradation of the land.

125 Konczacki, Z. A. (1978) ‘The Sahelian Drought’. In: *The Economics of Pastoralism. A case study of sub-Saharan Africa.* Konczacki, Z. A. pp. 108–125. UK: Frank Cass.

Key words: carrying capacity / population control / out-migration / rainfall / desertification / local knowledge / regional co-operation / ECOWAS

The chapter compares Caldwell’s ‘The Sahelian drought and its demographic implications’ (1975) and Picardi’s ‘A systems analysis of pastoralism in the West African Sahel’. The Sahel is considered to be characterised by ‘chronic susceptibility to ecological destruction, an absence of human development and the lack of indigenous skilled and professional labour force, as well as a poor natural resource endowment’ (p. 108–9). Estimates of animal losses during the 1973 drought vary widely as many animals were moved, sold or died, and many were untaxed. During drought the reproductive rate also goes down, resulting in further fall in population; however Caldwell adds the caution that we should not measure losses blind to the fact that a particularly good period, and a growth in population, may have preceded the onset of drought. Death rates among nomads must have increased, but there is scepticism over the accuracy of publicly reported figures. There is little reliable demographic data, and migration figures are unknown. Disregard for the local ecology was responsible for the extent of the losses; animal populations had grown on account of veterinary services and the provision of water holes, but nothing was done to preserve the grazing land. Caldwell goes on to suggest that a growth in human numbers will lead to the same type of calamity. Sedentarisation is not a panacea as much of the land is unsuitable for anything except cattle herding, and the removal of pastoralists from the area will result in a net loss. Organised resettlement schemes in urban areas are proposed as being more culturally acceptable to pastoralists than agricultural farming. Picardi claims that interventions such as restocking could lead to desertification despite reforestation and reseeding, and proposes seven alternative policy methods. Picardi proposes that a successful approach would be one by which pastoralists assign priority to range conservation. He envisages a gradual destocking, and a transition to a monetary economy alongside a change in attitudes surrounding animals; however, the implementation of such a policy would involve expensive incentives, and the question of changing pastoralist values remains open.

Caldwell focuses on the irregularities of the weather, whilst rejecting the hypothesis of permanent climate change, but Picardi centres on the changes of human activity. He sees the decrease in the cultivatable land combined with the water shortage of the last drought as the important factor to have changed since the 1960s. Both see a population policy as integral to the solution, through out-migration and family planning. The upthrust of the ‘International Development Strategies for the Sahel’ conference in Bellagio 1974 was that solutions could be found only through the inclusion of the pastoralists in the development process. In addition, a holistic approach was advocated, involving all sectors and all countries affected. The chapter concludes that the re-establishment of the freedom of nomadic movement is a prerequisite for development in the Sahel and the formation of the Economic Community of West African States (ECOWAS) is seen as a positive movement towards regional co-operation.

126 Konczacki, Z. A. (1978) ‘Some Speculations on the Prospects of the Pastoral Mode of Production’. *The Economics of Pastoralism: A case study of sub-Saharan Africa.* Konczacki, Z. A. pp. 150–171. UK: Frank Cass.

Key words: veterinary medicine / sedentarisation / food security / pastoral economy / development / economy

Planning methods such as the introduction of veterinary medicine and water projects aggravate the tendency towards the overstocking of animals. Historically solutions offered for the Sahel have centred around proposals to settle nomads, but more recent thinking sees the problems as not confined to the pastoral economy, but indicative of the wider level and priorities of development. There are approximately 2.5 million pastoral nomads in the Sahel, and the money spent in sedentarisation could more usefully be channelled into developing the pastoral economy. The author prioritises the growing of animal fodder, for fattening and as an emergency supply, on arable land over the establishment of mixed farms. Under-utilised pastoral land can be used for commercial ranching; marginal land should be considered for use as wild ranches. The emphasis is on using land appropriately according to its different features. The vulnerability of the pastoral sector in rainfall-deficient regions prompts the suggestion that protection against natural calamities and a viable insurance scheme should be central to planning. There exist more than two courses of action, and the chapter concludes that a modification of pastoralism is what is needed rather than a maintenance of the status quo or a forced sedentarisation. Pastoralism is the most efficient means of livestock raising, and therefore it should be encouraged as an integral part of national economies.

127 Krings, T. (1993) 'Structural Causes of Famine in the Republic of Mali'. In: Bohle, H. G., Downing, T. E., Field, J. O., and Ibrahim, N. (eds) *Coping with Vulnerability and Criticality*. pp. 129–144. Freiburg Studies in Development Geography, Verlag Breitenbach.

128 Lee Gilles, J. and Jamtgaard, K. (1982) 'Overgrazing in Pastoral Areas: The commons reconsidered'. In: *Nomadic Peoples* 10, April 1982. Commission on Nomadic Peoples, International Union of Anthropological and Ethnological Sciences. pp. 1–10. Oxford, UK: Berghahn Books.

Key words: common property / tragedy of the commons / overgrazing / drought / private ownership / water points

There is tension between the obvious need for livestock producers to maintain the productivity of their land and the tendency to overgraze it. Common ownership of land results in incompatible individual and group goals, but private ownership does not solve the problem of overgrazing. Traditionally African range-management strategies have two components: mobility and control over water or dry-season pasture. The need to travel large distances during drought is satisfied by commonly held land. Water points are not held in common, but may be attached to groups of families who have rights to their use. The settlement of nomads and the increasing population have led to an increased possibility of overgrazing. The tragedy of the commons is not a treatise on range management, and is based on two questionable assumptions, firstly that the benefits derived from converting common range into private pasture will exceed the costs, and secondly that people whose survival is dependent on the maintenance of a resource are incapable of preserving it. A literal acceptance of Hardin's tragedy of the commons may have delayed a solution to the stocking problem.

129 Le Houérou, H. N. and Hoste, C. H. (1975) 'Relationships between Rangeland Production and Average Annual Rainfall. Part II: The Sahelian and Sudanian zones of Africa'. 20p. Mimeo from International Livestock Centre for Africa, Addis Ababa, Ethiopia.

Key words: livestock / rainfall / productivity / plant growth / climate

The Sahel, after East Africa, is the second main livestock production ground in Africa, supporting around 75 million animals. The human population is around 20 to 30 million, constituting a

population density of 7–10 inhabitants per km². The Sahel is subdivided into the Saharo–Sahelian rangelands which support only pastoral nomadism, the Sahelian areas of rangeland and some cultivation, and the Sudano-Sahelian area of rangelands and millet and sorghum production. Rainfall is correlated with other climatic parameters in north–south gradients, increasing from north to south as does the rainy season. As rainfall is correlated to potential evapotranspiration, it appears that it would be a good climatic parameter to represent water availability for plant growth. The paper finds that, roughly speaking, each mm of rain in the Sahel produces 2.5kg of above-ground phytomass, although it is suspected that production could not rise indefinitely.

130 Leisinger, K. M. and Schmitt, K. (eds) (1995) 'Survival in the Sahel: An ecological and developmental challenge'. Hague, the Netherlands: International Service for National Agricultural Research (ISNAR)/CIBA-GEIGY.

Key words: rainfall / food security / government role / erosion / water development / range management

Years of above average rainfall and years of below average rainfall tend to come in clusters in the Sahel. Populations can survive one year of bad rainfall without too much difficulty, provided that there are grain reserves, but they cannot survive consecutive years of harvest failure such as the 1968–1973 drought. The area has seen vast variations in its climate over the last 18 000 years, with a wet period 8000 years ago and a gradual drying up over the last 2000 years. Sixteen countries were affected by the 1968–73 drought, and 14 more by the 1980–82 drought, resulting in human suffering, a weakened environmental equilibrium and a devastating effect on agriculture and livestock production. Drought-related problems were compounded by high growth rates, inadequate use of scarce resources, inappropriate political priorities, including government inability to make preparations for drought recurrence. Soils in the Sahel are bad water retainers, and are subject to erosion; they have low natural yield potential on account of their poor nutrient fixation and a shortage of minerals that contain nutrients. Erosion is combated by preserving and replanting hedgerows and shrubs, using no-till or minimum-till agriculture and the stabilisation of sand dunes. Trees are threatened by increasing firewood needs. There is more to the story of loss of cropland and forests, the depletion of ranges than simply a decrease in rainfall. Biological diversity is threatened by the needs of poverty stricken people to exploit natural resources. The creation of parks can preserve animal and plant species only with the co-operation of local populations. Desertification is a word in common usage since the drought of 1968–73, and refers to the creation of desert-like conditions in an area which, given the climate, would not normally be a desert, although poor rainfall may exacerbate the problems caused by mismanagement. The extent of desertification is unknown, as is its permanence. The World Bank estimates that under current land use practices, the carrying capacity of the Sahel region is around 15 people per square km, while current population density is in the region of 20 people per square km. The concentration of population around wells results in the overuse of the surrounding land, particularly in the dry season.

131 Leonard, D. K. (1993) 'Structural Reform of the Veterinary Profession in Africa and the New Institutional Economics'. *Development and Change*, 24(2): 227–267.

132 Leyland, T. (1997) 'Delivery of Animal Health Services to Pastoral Areas: The case for a community-based and privatised approach'. Paper presented at the 5th OAU Ministers of Livestock Meeting, Swaziland, August 1997. OAU/IBAR, Nairobi.

133 Little, P. D. (1981) 'Issue paper for USAID and Institute for Development Anthropology workshop on African Pastoral/Livestock Development held in Marriottsville, Maryland, USA 17–19 November 1981'. Contract no. AID/AFR-0085-C-00-1033. 20p.

Key words: government role / NGO role / local knowledge / economic diversification / mobility

The paper aims at highlighting the indicators which can be used to inform policy makers about development options. It found that management units for development intervention should be small-scale and based on existing systems, and that systems could experience heavy stress without resulting in long-term degradation. Assumptions such as the inherently destructive nature of pastoralism are rejected in the face of the fact that very little is known about African range management. The study starts with reliability of rainfall and environment on the basis that this influences other factors, such as mobility and diversification of the local economy; mobility in turn affects other development interventions, for example veterinary, institutional and marketing services. Other factors include the degree of dependence on pastoral products, the limitations of grazing ability, diversification of the regional and household economy, and institutional capacity.

The paper reviews the criticism that development projects have rarely been based on sound ecological and socio-economic understandings of the pastoral system. Thus a project objective may be described as aiming to retard degradation and improving livestock-management practices; this requires not a general prescription, but a knowledge of the variables of the region, the present grazing patterns and seasonal movements. It is important also to highlight where the stated objectives conflict with the well-being of the herder. Considerable improvement may be achieved on both of these counts by increasing local participation in all stages of the project, and making monitoring integral to the operation. On account of this, pastoral projects must often be experimental in nature. Problems are faced when priorities identified by donor agencies are politically abhorrent to the host government, and pressure may be brought to bear to at least achieve *something*, even if it is not in line with donor philosophy.

134 Loiske, V. M. (1990) 'Political Adaptation: The case of the Wabarabaig in Hanang District, Tanzania'. In: Bovin, M. and Manger, L. (eds) *Adaptive Strategies in African Arid Lands.* Proceedings of a seminar at the Scandinavian Institute of African Studies, Uppsala, Sweden, April 1989. pp. 77–90. Sweden: SIAS.

Key words: marginalisation / Wabarabaig / traditional strategies / assimilation / migration / modern strategies / participation / political involvement / government role

The article traces the responses of the Wabarabaig in the northern highlands of Tanzania to the political changes. The author distinguishes between traditional and modern strategies. Amongst the traditional strategies he identifies firstly assimilation as subgroups of the Datoga were assimilated into the larger tribe. The second strategy is that of migration which can either have the effect of keeping a clan group close together geographically and politically, or can result in diffuse settlement. Conflict can lead to the establishment of new opportunistic relationships between tribes, or conversely to an increase in cattle raiding and murders in the arena of ethnic warfare. Primary amongst the modern strategies is the participation in the planning of imposed changes. This may involve the further strategies of negotiation, peaceful demonstration, and political involvement. The Wabarabaig achieved the creation of a new district and positions of responsibility in it in 1985. In conclusion the author recognises the political dualism and the fact that this renders traditional strategies as relevant when dealing with rival ethnic groups as modern strategies when addressing the state.

135 Mace, R. (1989) 'Gambling with Goats'. *Pastoral Development Network Papers* 28a, 1988–90. 16p. London: Overseas Development Institute.

Key words: restocking / herd growth / livestock mortality / income generation / social restructuring

Mace examines the rate and extent of herd growth in restocked families, and finds significant between-year variations but no constant between-family variations. That is to say, that families that did well one year were no more or less likely to do better or worse than other families in other years. He stresses that animal mortality must be taken into account when designing restocking schemes as this is integral rather than extraneous to the restocking procedure. Regarding herd size, Mace reports that families with 100 goats are dependent on some additional source of income for 50% or more of the year. The restocking programme started in 1983, when families were restocked according to their needs and their ability to return to pastoralism. Mace reports a link between the number of stock owned and other income generating activities. Long-term survival is not possible by goat herding alone, and so it is important to exploit other sources of income. As the goat herds grow, some animals may be exchanged for cattle or camels. Other sources of income include the cutting and selling of firewood, but this restricts families to living within about 5 miles of a town. To conclude, both the communities studied welcomed the restocking process, and the standard of living went up. In terms of social restructuring, widows who had received animals through the restocking programme became more attractive as marriage partners, and many of those who had become dependent on aid were able to re-enter the pastoral system.

136 Mainguet, M. (1995) 'L'homme et la sécheresse'. Collection géographie. Masson: Paris.

Key words: drought / meteorological drought / hydrological drought / agricultural drought / desertification / soil degradation

In a full account of drought around the world, the book examines what is meant by drought and what are the differences in various conditions. It examines the differences between a fall in rain, and an increase in water usage as two poles of different aspects of drought. The effect of the 1974 drought in the Sahel was to create a situation of food poverty in which cattle raisers were deprived of both their immediate food needs of milk, as well as meat and money from animal sales. Animals numbers fell by about 40–50%, and a similar loss was experienced in crops; however the question remains open as to whether this was a result of the drought of mismanagement of resources or misguided development. Following the drought, the World Bank issued a report tracing the social factors of change which had affected the drought, citing the rapid pace of change since the colonial era, the social restructuring that this had entailed, and the increase in veterinary medicines leading to overgrazing as contributors to the situation in the Sahel. Intensification of agriculture has led to a decrease in the length of time that fields are left fallow, causing detriment to the nutrient levels in the soil; trees similarly suffer from overuse as forage and firewood. Increased urban population and increased demand for grain causes the land further stress. What remains unknown is the nature of drought in the Sahel in the long run, whether we are seeing fluctuations in the climate or a long period of aridisation; droughts have occurred in the past, but the recovery time for the soil is unknown.

137 Manger, L. (1990) 'Agro-pastoral Production Systems and the Problem of Resource Management'. In: Bovin, M. and Manger, L. (eds) *Adaptive Strategies in African Arid Lands.*

Proceedings of a seminar at the Scandinavian Institute of African Studies, Uppsala, Sweden, April 1989. pp. 163–180. Sweden: SIAS.

Key words: agriculture / carrying capacity / soil degradation / population pressure / local knowledge

The natural environment, the political environment and the economic environment present different criteria for the viability of any form of livelihood. Pastoralist groups which were militarily pre-eminent in the past have become sedentary cultivators in response to the interplay between political and economic development in the area. Relationships between different members of a wide community can take the form of '*ecological integration*' (p. 169) for example when cultivators allow nomads access to land, which then benefits from the animals manuring the fields, or '*resource competition*' (p. 169) in which the stronger party alone has access to the land. A third relationship is that of '*exchange linkage*' (p. 169) which benefits both parties through the exchange of goods on local or national markets and develops in the context of the other two types of relationship.

The prospect of intensification of the Sudano-Sahelian belt is rejected as the zone is already over-utilised with its present population, and population pressure is increasing. Intensification through shortening the fallow cycle or increasing yield will lead to further degradation of the soil, with no mechanism for replacing lost fertilisers. The zone is in a process of '*involution*' (p. 172) as the increasing population has to work harder for survival. The question posed is 'how can production systems be organised in such a way that they provide people with the possibility of reproducing themselves, at the same time being sensitive enough to react to declining yields in a way that leaves the productive base intact?' (p. 173). Progress involves organisational changes alongside the development of markets for new inputs as well as old inputs which are now becoming scarce. In developing new systems, it seems that there is some inertia, as there are usually transaction costs involved in moving between one system and another. As a result, people do not generally move between one system and the next without some form of pressure being brought to bear; population pressure has been a moving force in the past. Simple technology-transfer has not been sufficient to solve problems, and local knowledge, practice and institutions must be involved in the search for solutions to the problems hindering development.

138 Markakis, J. (ed.) (1993) 'Conflict and the Decline of Pastoralism in The Horn of Africa'. Institute of Social Studies. 165p. Basingstoke: Macmillan.

Key words: politics / historical context / conflict / government role / sedentarisation / population pressure

In this collection of essays the contributors examine the political factors which have contributed to the decline of pastoralism in the Sahel. Frequent themes are the interaction between a pastoralist livelihood and colonial, and then capitalist development, tension between a nomadic and a sedentary existence, and conflict over access to resources.

Dyson-Hudson's (1985:169) concept of 'low investment politics' is introduced 'as a form of organisational flexibility in East African pastoralist societies, appropriate to highly dynamic, poorly predictable external situations' (p. 3). Despite the creation of colonial states, pastoralists proved resistant to such political organisation. Many previously nomadic people have become sedentary, but this has frequently been through impoverishment resulting from drought or from protracted violent conflict.

Mohammed Salih, in his chapter on Sudan, writes that 'the precarious situation of the Ngok Dinka and the Humr pastoralists has been the result of a long history of competition for pasture, state office, and supremacy of one community over the other' (p. 27). Despite this historical view, he notes three more recent developments: the shift from ethnic to regional politics, followed by the shift from regional to national politics, and thirdly the shift from tribal warfare to state funded tribal militia activity

139 Maxwell, S. and Frankenberger, T. (1993) 'Household Food Security: Concepts, indicators, measurements. A technical review'. United Nations Children's Fund. 274 p. International Fund for Agricultural Development. New York: UNICEF/IFAD.

Key words: food security

The paper gives an overview of the various indicators and data collection methods for assessing household food security. Factors affecting food availability and access to food are critical in determining food security. Direct indicators are those that are closest to the actual food consumption; indirect indicators are used when direct indicators are unavailable or too costly.

140 Meir, A. (1987) 'Comparative Vital Statistics along the Pastoral Nomadism–Sedentarism Continuum'. *Human Ecology*, 15(1) pp. 91–105

Key words: birth rate / death rate / demography / population growth / nomadism / sedentarisation / veterinary medicine

There are three reasons for collecting demographic data on pastoral nomads: firstly, studies in the past have frequently focused more on animal numbers than human numbers. Secondly, the current phase of crisis has led to the forced or voluntary sedentarisation of many pastoralists, and thirdly, the economic factors which have forced sedentarisation may generate demographic changes as well. The general pattern that emerges from a review of crude birth rates of different communities is that 'pastoral nomadic populations have lower birth and natural increase rates than semi-nomads and sedentarised nomads' (p. 100). Furthermore there is a general trend by which crude birth rates increase as pastoralists move along the nomadism–sedentarism continuum. This may be accompanied by a temporary increase in death rate, but the eventual rise in fertility and decrease in mortality effected by sedentarisation entails a natural increase.

The first policy implication from these findings is that pastoral populations may have significantly different demographic patterns to other parts of the rural population, and accordingly separate data on them should be gathered. Secondly, in areas of rapid sedentarisation, policy should take into account the fact that population growth is likely to occur. Thirdly, many nomads do not give up livestock farming entirely when they become sedentary, and veterinary services should be an important element in sedentarisation schemes. The problem of land allocation is aggravated, rather than solved by the sedentarisation of pastoralists as they are generally allotted smaller plots, despite their increasing numbers.

141 Migot-Adholla, S. E. and Galaty, J. (1984). 'Kenya Workshop Discussion: Prospects and research priorities for camel pastoralism'. In: *Nomadic Peoples* 16, October 1984. Theoretical approaches in the study of nomadic and pastoral peoples. Oxford, UK: Berghahn Books.

Key words: Kenya / camels / livestock / pastoralism / sedentarisation / labour / market

The development of livestock production is seen to require devolution in the system of production, through the sedentarisation of pastoralists, decreased mobilisation of herds, destocking and marketing at non-economic rates. Rangeland policy involves two contradictory perceptions and responses: herds are decreased through active destocking, increased marketing or land pressure, but restocked in response to drought, animal disease or labour shortage. A second paradox exists as interventions are carried out on the basis that herders are perceived to have low productivity, health and nutrition, but interventions generally lead to lower productivity, greater income disparity and greater dependence. The workshop drew out some themes on animal sciences and husbandry, range ecology and resource allocation, labour allocation and household economy and livestock marketing. Research needs to have effective information channels, if it is to be useful to farmers. Sedentarisation and educational participation risk weakening the labour force, diminishing household autonomy, undermining camel culture and increasing competition for land rather than easing it. Calls for increased marketing should not be made in isolation of a good knowledge of regional and national markets for camel produce.

142 Moris, J. R. (1988) 'Oxfam's Kenya Restocking Projects'. *ODI Pastoral Development Network Paper* 26c. 21p. London, UK: Agricultural Administration Unit, Overseas Development Institute.

Key words: restocking / Kenya / NGO / drought recovery / household economics / dependence / semi-nomadism

The paper is a critical appraisal of the restocking projects undertaken in Kenya after drought. Households were restocked with a nucleus herd of small stock under various conditions ranging from gifts with strings attached, to loans. The conditions were along the lines that no sales or slaughters should take place in the first year, animals should be available for monitoring, etc. Families were also provided with a pack animal, a jerrycan and an axe or panga.

Restocking is expensive in comparison to smaller-scale programmes of farmer training, digging shallow wells etc., especially given the other costs of technical support and maintenance of animal welfare through medical provision. Nonetheless, it has the advantage of breaking the household's dependence on external food aid. Whether the family manages to gain this independence is one of the chief indicators of success, others being the gross size of the herd or flock and the ability to resume a semi-nomadic existence, the first step of which is to move away from the restocking base. There are a number of areas for concern about the local politics involved in restocking projects, advocating the necessity to work with existing pastoral and administrative mechanisms. The author questions whether interventions *should* encourage the effective operations of larger social groupings in a community where clan ties are perceived as being corrupting, and residence in compact villages is uncommon.

Since 1984 many restocking programmes have more resembled immediate relief efforts than attempts to reintroduce households to semi-nomadic pastoralism. Oxfam, conversely, provided sufficient small stock for a viable semi-pastoral life to be resumed within a couple of years.

143 Mortimore, M. (1991) 'A Review of Mixed Farming Systems in the Semi-arid Systems in the Semi-Arid Zone of Sub-Saharan Africa'. Working document 17. International Livestock Centre for Africa, Addis Ababa, Ethiopia.

Key words: mixed farming / rainfall variability / population pressure / intensification / sustainability / competition / Malthus

The study was undertaken in response to the growing importance of mixed farming, the belief in accelerating environmental degradation, the economic decline at household level, and the high potential for improved livestock technology. Arising from these circumstances are three economic relationships: the resource competition between crop and livestock production, the complementarily between the two, and the circumstances promoting the evolution of mixed farming. The study aims to promote productivity and sustainability.

The advantages of the livestock component in mixed farming is its value as investment capital, its creation of individual wealth, the recurrent income it provides, manure, traction and transport, and its productive use of farm residuals. The study suggests that mixed farming can offer solutions to the perceived Malthusian crisis of pastoralism and the problem of environmental degradation resulting from crop intensification. The study reviews the various classifications given by authors to farmers with respect to the amount of their income derived from which source, the extent of their mobility and their integration in the external economy. The author stresses that it is not a question of branding *types* of farming as being destructive, but identifying the factors which affect the sustainability of the land. These include the nature of the cropping system, the level of stocking, the management of localised pressure points, and the annual variability of rainfall and vegetation cover.

The study differentiates between functional and ecological degradation, noting that nutrient content in the soil is a function of how the land is managed, and this can be changed given different incentives. The loss of primary potential productivity is thus differentiated from the remedial degradation that reflects the capital, land or labour constraints of a particular management system. Ecological degradation is still far from fully comprehended, and air photography tends to emphasise the impact of rainfall fluctuations. Overstocking is a transitory phenomenon, as its definition involves degradation of the land, starvation of livestock, or both, as its effects. Continually high stocking must therefore be otherwise explained. The author airs the possibility that high population density will increase land scarcity, then individual rights claims to it and ultimately its market value, which leads to labour and capital investment to raise its productivity. Thus sustainable environmental management is linked to high human and livestock densities. The report is inconclusive as direct and unambiguous linkages had not been discovered between system characteristics and trends of environmental degradation.

144 Mortimore, M. and Turner, B. (1993) 'Crop–Livestock Farming Systems in the Semi-arid Zone of Sub-Saharan Africa: Ordering diversity and understanding change'. *ODI Agricultural Administration (Research and Extension) Network Paper* 46. December 1993. 33pp. London: Overseas Development Institute.

Key words: mixed farming / development / economic change / environmental change / degradation

A typology of mixed farming systems in the semi-arid zone of sub-Saharan Africa is needed to (1) order diversity, (2) assist development interventions and technical recommendations, and (3) provide a framework for monitoring change, both economic and environmental. A review of the available typological principles suggests that a scheme based on intensification and crop-livestock integration

has both theoretical and practical value. The scheme is applied to a sample (p. 43) of farming systems, for which published characterisations are available. Measures of association between population densities, intensity ratings and crop–livestock integration ratings support the hypothesis that these variables are functionally and consistently related, though not all associations are statistically significant. The scheme proposed cannot be used to predict environmental degradation, which is determined in part by interactions with exogenous variables. But it does provide a robust framework for understanding the time-trajectories of farming systems along degradational or conservationary pathways. [Author]

145 Musa, B. E., Köhler-Rollefson, I., and Achmed, M. F. (1990) 'Camel Production among the Rashaida of Eastern Sudan: Problems and potential. Pilot study of camel production techniques and constraints in Kassala Province'. *Nomadic Peoples* 29 (1991). Commission on Nomadic Peoples, International Union of Anthropological and Ethnological Sciences. pp. 68–76. Oxford, UK: Berghahn Books.

Key words: camels / Sudan / seasonal migration / mechanised farming / sustainability / cultivation / monoculture

This study of camel husbandry aims to determine the socio-economic role of camels for the Rashaida peasants and its articulation with other land-use systems, and to collect information about herding patterns and traditional knowledge in the light of constraints on camel productivity.

The southern Rashaida employ seasonal migration, moving south during the dry season to make use of the aftermath of the sorghum fields in the mechanised farming areas around Showak. The extent of their migration is governed by the amount of rainfall, unusually wet years as well as dry years resulting in movement further afield. The Rashaida are losing grazing land to mechanised farming, but they buy access to the fields after harvest for the crop residues. Droughts compound the problem of crop destruction, as the camels feeding on crop residue are more inclined to stroll onto unharvested land. Added to this, the spread of cultivation means that pasture is hemmed in by crops and is rendered inaccessible. The pursuit of monoculture also seems to result in rapid depletion of soil nutrients, making it useless for agriculture and pasture after a few years. The camel is central to the culture of the Rashaida, and herding is essentially a family business; the objective benefit of the camel, though is demonstrated by the fact that many landowners and owners of mechanised farms invest their profits in camels. For camel herders, the export of camel meat and racing provides foreign currency, and the economic viability of the camel husbandry has increased despite growing pressure on the land from other activities. The authors conclude that camel husbandry should be encouraged, as it provides a sustainable means of farming, but add that more has to be achieved in terms of raising productivity if it is to be recognised as an attractive economic option.

146 Ndagala, D. K. (1992) 'Production Diversification and Community Development in African Pastoral Areas'. Ornäs, A. H. (ed.) *Security in African Drylands: Research, development and policy*. Research program on environmental and international security, Departments of Human and Physical Geography, Uppsala University, Sweden. pp. 81–90.

Key words: land use / population pressure / labour scarcity / agropastoralism / food security

In response to population pressure and the use of pastoral land by non-pastoralists, many pastoralists have taken to agriculture and trade, making production diversification and community development

important factors in attempting to contain the worsening situation in dryland Africa. The increase in population is due partly to natural population growth, but is due also to the influx of people fleeing population pressure in agricultural areas. The creation of national parks and game parks has diminished grazing land, and the increase in wildlife has led to more disease, meaning that pastoralists are forced to steer clear. Pastoralists have often been considered resistant to change, hostile and backward by official administration in Africa. Increased water inputs, along with cultivation and settlement have been assumed to be the answer to food security, but pastoralists have been excluded from the planning process, along with the local energy of pastoralism, causing frustration. The diversification of many pastoralists to agropastoralism results in new resource combinations. Agriculture is undertaken mainly by women, while men herd, making both land and labour scarce resources; the move towards agropastoralism has created greater stratification between rich and poor pastoralists.

147 Niamir, M. (1991) 'Traditional African Range Management Techniques: Implications for rangeland development'. *ODI Pastoral Development Network Papers 1991–1993*. Network Paper 31d, July 1991. 11p. London: Overseas Development Institute, UK.

Key words: agriculture / water development / sedentarisation / production objectives / social controls / well management

Changes to the pastoralists' environment have taken the form of encroachment by agricultural farming and national park development, increased population, sedentarisation and indiscriminate water development leading to some diversification of production. For those who remain in the pastoral sector four production objectives exist: (i) increase of herd size, (ii) increase of milk yield, (iii) maintenance of appropriate herd structure, and (iv) disease resistance by selective breeding (Monod (1975) Intro. *Pastoralism in Tropical Africa*, International African Institute. London: Oxford University Press, p. 75). Large livestock in particular act as an economic security, whilst sheep and goats are kept principally for their meat. Out-migration by the young is responsible for labour shortages and a lack of expertise; this can be combated only by encouraging pastoralists to remain on their land through the development of the sector using a combination of traditional and modern techniques. Labour shortages have resulted in a greater role for women in pastoralism, and it remains to be seen what long-term effect this will have. Management of resources involves labour, land and water supplies; the institution of pastoralism is sustained by the formal and informal social controls, dictating access to land and how long should be left between grazing the same piece of land, and these measures avoid the 'tragedy of the commons'. Historically such practices have been enforceable through traditional leadership, the need for social acceptance and the need for reciprocity. A threat is now posed by resource scarcity, the destruction of the local political authorities, urban drift and income disparities. In the past the majority of research into this area has been carried out by social scientists; there is a need for more involvement in the work by physical and biological scientists.

148 Oba, G. (1985) 'Perception of Environment among Kenyan Pastoralists: Implications for development'. In: *Nomadic Peoples* 19, September. Commission on Nomadic Peoples, International Union of Anthropological and Ethnological Sciences. pp. 33–58. Oxford, UK: Berghahn Books.

Key words: Kenya / pastoralism / land use / sedentarisation / drought / raiding / erosion / systems approach

Pastoral people of northern Kenya categorise some areas of their environment as ‘cattle country’ some parts as ‘sheep and goat country’ and some as ‘camel country’; the division of use of this country is more evident in good seasons as land use is correlated with vegetation types and soil conditions of these areas. The perception is that some resources, such as trees, are unlimited, and there seems to be little appreciation of the damage that destruction of pasture and trees does to the soil. Despite this, pastoralists’ flexibility has allowed them to exploit their environment, but this is becoming more difficult as a result of frequent drought, poor security against raiding, administrative pressure to settle, voluntary sedentarisation and the attraction of farming. Nonetheless, for the majority, sedentarisation is a necessity rather than a positive choice. Development work should adopt a systems approach in order to take account of the social and environmental constraints that the pastoralists face.

149 Oba, G. (1992) ‘Ecological Factors in Land Use Conflicts, Land Administration and Food Insecurity in Turkana, Kenya’. *ODI Pastoral Network Paper* 33a. 23p. London: Overseas Development Institute.

Key words: Turkana / conflict / state boundaries / rainfall variability / regional policy / food security / restocking

The extremities of variability of rainfall in both space and time have given rise to the practice of pastoralism in Turkana. Its viability, however, is threatened by the colonial restrictions put on the crossing of national boundaries as an attempt to control or at least contain fighting. The chief lesson to be learned from experience in this area must take into account the need for flexibility, as the imposition of rigid legislation has failed to address constructively the problems of the region in the past. The traditional Turkana grazing movements demonstrate the need to co-operate with neighbours in Uganda, Sudan and Ethiopia, rather than treating the countries as wholly separate entities. Any policy must cope with the possibility of low rainfall, and this demands regional policy governed by geographical location rather than politics.

Various measures undertaken in the past have proved unsuccessful, and fishing and irrigation schemes are possible long-term solutions. Restocking has not ensured food security because the herder relies on the diversity of the herd, and the provision of only small stock is inadequate to support a pastoralist livelihood.

150 Oba, G. and Lusigi, W. (1987) ‘An Overview of Drought Strategies and Land Use in African Pastoral Systems’. *ODI Pastoral Development Network Paper* 23a, 1986–7, Agricultural Administration Unit. 33p. London: Overseas Development Institute.

Key words: mobility / drought contingency / overstocking / NGO / environmental change / conflict / local knowledge / post-drought recovery

Contributors to the degradation of African rangelands include ‘overgrazing, sedentarisation of formerly nomadic communities, water development without sound ecological considerations, exclusion of the nomads from vital drought reserves and their compression onto smaller and more fragile land’ (p. 1). It is therefore not the drought *per se* that is causing distress to the region, but rather the fact that traditional drought strategies are breaking down, and nomads are seeking external assistance. Nomadic territory is often divided into wet-season land and dry-season land. The impact of a drought depends on whether it is ‘local’ or ‘regional’, and ‘in a general sense, the entire concept of nomadism may be considered as a means of coping with and exploiting highly variable resources’ (p.

4). There is frequent criticism of nomads for keeping too many animals, a practice which leads to heavy losses during drought years. Hidore and El-Tom (1975 Climatic change and economic development. In: Richards ed. *African environment: problems and perspectives.* London: IAI) hypothesise that, for the Maasai of Kenya and Tanzania, a large number of animals can be an insurance against loss as well as acting as currency in a non-monetary economy.

Mobility is important to two forms of strategy: pastoralists must be able to exploit the maximum number of resources, and also to escape drought conditions in one area by migration to another. The survival of the community takes priority in the collective decision-making to considerations of security when moving into an area occupied by hostile nomads. Non-pastoralist responses to drought include the diversification of resources through hunting, gathering wild foods, farming or wage employment, either as a long-term or a short-term project. The acquisition of relief food also has become an economic activity amongst the Turkana, allowing them to minimise off-take from their herds. Loss due to drought cannot be considered only in terms of human mortality, but also of animal deaths as this constitutes a breakdown of the resource base—their food, currency and social security. Even if animals are sold, the sale of livestock out of the pastoral system has a serious impact on a region's post-drought recovery capacity.

The recent change of pastoralist behaviour is the effect of the changing environment rather than, as previously claimed, the cause. This is based on the premise that the major cause of the current problems faced by pastoralists is the spread of cultivation onto land formerly held by nomads. Apart from the environmental effects, the concentration of nomads onto smaller areas has led to an increase in the militarisation of ethnic conflicts, leading to the abandonment of some grazing land on account of the poor security situation.

Government responses in the past have consisted of relief food, resettlement and some livestock salvage operations, but this has been on an ad hoc basis with no consistent long-term strategy, which has proved expensive and has in some cases created dependence on relief aid. Proposals for future development to build on the experience of pastoralists, and strengthen existing institutions.

151 OED Précis (1994) 'Livestocks in Africa: Support for pastoralists'. Operations Evaluation Department, no. 65, May 1994.
<http://www.worldbank.org/html/oed/pr065.htm>

Key words: Niger / Central African Republic / Senegal / government role / NGO role / funding / local knowledge

The paper audits livestock projects in Niger, the Central African Republic and Senegal which aimed at transferring technology to herders' associations. Problems faced included the transfer of responsibility, the instability of prices and the poor rainfall. The paper concludes that there should be a shift away from sector-wide projects towards a national programme of resource management, and the roles of the state and private sectors need planning. There needs to be greater emphasis on the development of herder associations, ensuring that members have real common interests; with planning, these can take over some governmental functions. In terms of resource conservation, rational range management is essential, based on a system of negotiated rights of access and use. Differing views on how alternative forms of management affect the ecosystem and what the goals of management are impact on the interpretation of the carrying capacity, and whether opportunistic farming has been responsible for degradation in the Sahel. Projects suffer from insecurity of funding and the fact that continuity cannot be guaranteed after the withdrawal of donor involvement, and 5 years has not proved to be enough time for self-sustaining local institutions to be established.

152 O'Keefe, P. and Wisner, B. (1975) 'African Drought: The state of the game'. Chapter 4 in Richards, Paul (ed.) *African Environment: Problems and perspectives*. pp. 31–39. African Environment Special Report, International African Institute, London, UK.

Key words: desertification / colonialism / capitalism / rationality / migration / local knowledge / government role / NGO role

In Africa, nomadic pastoralism and dry farming is a functional human response to drought, and the only area of real downgrading desertification is between the areas where grasses are predominantly annuals and the area where they are perennials.

The chief event affecting the severity of the impact of drought in recent history is that the game has changed from a struggle for humans to survive in a relatively hostile environment, to a game of 'man-against-man-against-nature' (p. 33). Functional adaptation was rendered inappropriate by the land tenure organisation imposed by colonial legislation. A second blow for traditional patterns was dealt by assimilation into the market, and the resulting erosion of resource bases. The author identifies three major constraints applied by colonialism and the capitalist mode of production. The first is the direct capital penetration into more arid areas, resulting in a decrease in the land base of the livelihood systems of peasants. Connected to this is the orientation of national economies away from small farmers. This has repercussions in terms of access of farmers to credit, a resource of particular importance during drought. As a result of this, governmental and non-governmental activities towards small farmers have tended to be patchy and short-termist, such as the introduction of new seed varieties or the provision of boreholes, rather than an integrated and comprehensive strategy for coping with, and preparing for, drought.

The increased vulnerability of the peasantry leads to 'decision pathology', the simplified and sub-optimal decision-making which results from stress. This is a greater challenge to long-term development in the Sahel than even the overt economic dislocation, and yet social scientists misidentify this decision making under stress as irrationality. The most notable change in pastoral behaviour is in the patterns of migration and the reasons for it. During drought it is not just the herders migrating in search of pasture and water, but whole families drifting towards aid distribution points, or to permanent residence in urban areas. Thus drought is essentially a problem of poverty and the vulnerability of the poor. Many large-scale reconstruction initiatives risk proletarianising both sedentary peasants and nomadic peoples, and there is more mileage in acknowledging the expertise of the peasant, and working with this, through different means of organisation to produce a political and climatic environment which is viable for the poor.

153 Ornäs, A. H. (1990) 'Production versus Environment? Planning resource management and ecological adaptation in Kenyan drylands'. In: *Adaptive Strategies in African Arid Lands.* Bovin, M. and Manger, L. (eds). Proceedings of a seminar at the Scandinavian Institute of African Studies, Uppsala, Sweden, April 1989. pp. 91–107. Sweden: SIAS.

Key words: food security / livestock sale / grain sales / government role / participation / agropastoralism

'An environmentally balanced development can only occur if food production is such that people experience a secure situation. Security should then be seen in food-production terms rather than military strategic ones' (p. 91). By treating food security in this way, it is kept in the centre of

development thinking instead of being subordinated to some extraneously defined carrying capacity. Pastoralism needs to be seen in a regional context, as pastoralist farmers are no longer in an isolated economy. Grain is an important part of nomadic pastoralists' lives in Kenya, either as a substitute for milk, or to provide supplementary protein during meat shortages. Grain can be cultivated in an ad hoc manner by riverbed or rain-based cultivation, but it may also be acquired through barter between pastoralists or it may be bought. Farm surplus, which was previously bartered with pastoralists is now more likely to be sold on the national or international market; frequent shortages mean that there is often not enough grain, independent of the pastoralists' ability to pay for it. This has led to a restructuring of the economy away from subsistence crops and towards international cash products such as coffee and tobacco.

Pastoralists have been accused of failing to sell their stock at the outset of a drought and waiting until it has depreciated before taking it to the market place. They find they are in a dilemma, with the possibility of selling a weak animal balanced against the possibility of it surviving the drought. After a drought there are typically few older animals as these have been sold or slaughtered, and few young males as breeding is interrupted by drought, and those animals which are born have a low chance of survival. This gives rise to what has been termed a 'perverse-supply-response' (p. 96) as pastoralists have invested so much time in their animals that they are reluctant to sell before the animals are full grown and fattened.

The falling availability of grain and the increasing need of it has led to the increase in agropastoralism, a practice which 'may be an implicitly expansive and eco-destructive system, because it encourages a husbandry oriented toward a maximisation of numbers rather than of quality as is necessary in milk-based, pure pastoralism' (p. 97). This fundamentally changes the production system, and, once they are integrated into the growth-oriented economy, their activities serve to further impoverish the nomadic pastoralists who face competition for pasture and can no longer afford to buy food. Recent trends have seen an increase in privatisation as the only means of land tenure; this is accompanied by an expanded crop production, particularly by the very poor. Uneven livestock distribution continues with particular concentration around water points, and the issue of overstocking is extended to include wild animals and game. There are five possible conclusions for soil and water conservation, namely, '(a) land rehabilitation of specially frequented sites…; (b) proper water-conservation measures; (c) production of building-shrubs, etc., for mobile 'manyattas'; (d) management of free range through reseeding, tree planting or the like; (e) partial change to appropriate domestic stock…as a soil-conservation measure' (p. 101). All these activities require popular participation. Fundamental to the success of any dryland project is government involvement; alongside this is a role for sectoral inputs, and small-scale studies monitoring the production, management and social elements.

The chapter makes two conclusions; firstly that for private consumption, a combination of herding and farming is the most efficient food production, and secondly that soil and water inputs should consist of supportive measures towards sustainable pastoral of agropastoral production. The priority lies with food security at the household level, which should be attained through an integrated approach.

154 Ornäs, A. H. (1991) 'The Logic of Long-term Development Thinking Seen through the Eyes of Pastoralists and Planners'. In: Stone, Jeffrey C. (ed.) *Pastoral Economies in Africa and Long-term Responses to Drought.* Proceedings of a colloquium at the University of Aberdeen 1990, Aberdeen University African Studies Group 1991.

Key words: top-down development / integrated approach / agropastoralism / development failures / agenda setting / conflict

Outlining the problems of top-down development, the author likens development projects to rains in that nobody knows where or when they will fall, or has any control over them. Sophistication in planners' thinking has led to an increasing methodological competence and an improved awareness of the complexity of the issue. This has been accompanied by specialisation of methods and development models resulting in increased sectorisation. The need for an integrated approach has led to more people-centred planning processes through popular participation. Environmental issues allow for various interpretations of non-causal links, many of which may be valid. Given the suitability of drylands for livestock-based systems, the author proposes that a combination of farming and herding is the most efficient form of food production in nutritional terms, and that soil and water conservation should support pastoral and agro-pastoral production. The author reports a catalogue of development failures, despite the available knowledge, many of which can be blamed on the fact that the wrong goals are set and official expectations do not meet unofficial ones. There can be clashes between agendas, for example between the promotion of women's health and water and soil conservation. It is a mistake to regard livestock rearing as a 'timeless' activity, as large and rapid changes have taken place, particularly following the droughts of the 1970s and 1980s, and changes in parts of the population can lead to conflict with others, as when livestock raisers who have lost herds turn to farming and replace high-quality pasture with low-quality crops. Changes occur within the pastoralist economy; initiatives which view pastoralism as static, underdeveloped and outside the state advocate leaving pastoralists 'alone' to solve the local consequences of misguided development policy. The author proposes that political and social issues should be top priority, as this ensures some continuity on the development agenda. Pastoralists are in many areas becoming second-class citizens as production systems become stratified; urban opportunities are opening up for some, but may be destructive as well as constructive. In response to drought, the emphasis must be placed on long-term planning rather than waiting until the drought is well under way before giving what will inevitably be a crisis-driven short-term response.

155 Ornäs, A. H. (1992) 'Environment and Secure Livelihoods: Research and development issues for African drylands'. In: Anders Hjort af Ornäs (ed.) *Security in African drylands. Research, development and policy.* Research program on environmental and international security, Departments of Human and Physical Geography. Sweden: Uppsala University.

Key words: food security / intensification / social organisation / environmental management / security / local knowledge

Key notions in considering living conditions in African drylands are: food production (including water and soil conservation), competence and decision making, environmental degradation, marketing, stratified production systems, agropastoralism, livestock-based systems, and the politics of green conditionality. The issue of the environment is best understood in terms of food security, and the use of violence to secure food resources is an expression of political conflict. In considering dryland development, it is important that conflicting strategies are dealt with at a community level, and that the direction of resources away from production during adaptation could be destructive. Intensive production is not a viable development strategy as it leads to ecological degradation, and community decision making is hampered by factors at national and supra-national level. Decision-making processes are fundamental to the way in which pastoralists influence their own reality. The challenge is to address the problem of social stress within the constraints of the environment; social systems such as lineages have a security role to play. Environmental management is a security issue, and leads also to production issues and environmental security, and politically and culturally

decentralised pastoral communities may have problems with arriving at alternatives to central planning by the government. Given the blunders of the past, it would seem that risk reduction was as relevant to external development assistance as to indigenous strategies.

156 OXFAM (1995). 'Food Distribution in Turkana'. Oxfam Report, January 1995. OXFAM UK.

Key words: Turkana / Kenya / Uganda / food distribution / dependence / food aid

This book describes a programme of food distribution carried out by Oxfam in Turkana district, north-west Kenya, between late 1992 and early 1995. It has been written for two reasons: to share practical field experience of one particular way in which food aid has been targeted to pastoralists, and to explain the lessons learnt by those involved, as a contribution to debate within government, donor and NGO circles on the subject of food aid and its use in pastoral areas.

There are three main sections. The first sets the programme in context, explaining its objectives, outlining the principles upon which it was built and summarising the distribution system which was used.

The second looks at the system in practical detail, focusing on four key areas: community involvement, registration and screening, distribution, and monitoring. Each of these uses the words of those involved to describe what happened and to highlight problems and achievements.

The third section discusses broader issues. It illustrates the different effects of food distribution on the lives of beneficiaries. It questions the assumption that dependence is a necessary consequence of food aid. And it suggests that the dividing line between emergency and development situations is in reality often blurred, and that the response of aid agencies to need and to suffering should reflect this reality in a more accurate and cohesive way.

The report concludes with a summary of the various dilemmas which were faced in the course of the work and an appendix of background information. A fuller, annotated version of the appendix will shortly be available which will contain examples of the documentation and other practical tools used in the course of the work in Turkana. It is hoped that this may be a useful point of reference for other field staff planning similar interventions.

External reports on the programme have also been published, principally an evaluation in 1993 and an economic impact assessment in 1994. Details of these and other associated literature are in the appendix.

This programme began in October 1992. Some areas were phased out in September 1994, and the gradual phasing out will continue until it ends in early 1995. It owes many of its ideas to the imagination and dedication of Oxfam's staff in Uganda and in Samburu, Kenya, upon whose original work much of it was based. [Author]

157 PANOS (1991) 'Greenwar: Environment and conflict'. Rahim, N. A., Hailu, T., Ouédraogo, B., Touré, B., Hissène, M., Woldegabriel, B., Fre, Z., Aken, N. B., Ba, B., Mohammed, O. and Maïga, C. K. Edited by Olivia Bennet. 156p. London: Panos.

Key words: conflict / mines / government role / international agencies / World Bank / democracy

The book is written by residents of the Sahel; it gives personal experiences of conflict within the Sahel, holding that environmental deterioration is a contributing factor to increased conflict. Ecological interdependence is indisputable, and problems over resource allocation cannot be solved by states in isolation. There has been a gradual drying process over the last 4000 years, and there have been several severe droughts in the twentieth century. These are not socially uniform, but have the effect of exacerbating differences between groups; the effects of drought and ecological degradation, the falling biological productivity reinforce each other in adding to conflict. In many areas, mutually accommodating relationships between pastoralists and farmers have been strained by the lack of resources which leads to livestock wandering onto cultivated land. Symbiotic relationships which used to exist between nomads and settled farmers are further eroded by government intervention. In Senegal the government decreed in 1964 that the land should belong to those who 'put it to profitable use', which was taken to mean farmers rather than pastoralists. Relationships between settled farmers and pastoralists rarely result in large numbers of deaths, but are the cause of continual casualties and a feeling of insecurity. This gives rise to permanent and involuntary migration; in Ethiopia the government resettled 600 000 people to relieve the pressure of their land, but it is questionable whether such use of force is the best means of problem-solving. War contributes to the ecological problems causing more political upheaval; the use of land mines means that farmers are afraid to farm their land and so move to another area. The war was considered to be the most important feature of land degradation in Eritrea during the fighting. Conflict over resources has always been part of life in the Sahel, but the intensity and the desperation have reached new levels. There is a need for governments and international agencies to learn from the mistakes of the past; national sovereignty has been discussed by the World Bank as it insufficient to cope with the complexity of ecological damage. Greater participation at the local level is needed, particularly as regards the distribution of resources, but this involves a commitment to processes of democratisation.

158 PARC-Ethiopia (1996) 'Report on Community-based Animal Health Activities 1995–1996'. PARC Kombulcha Branch Coordination Office, Kombulcha.

159 Peters, H. (1992) 'Paravet Programme of the Ishtirak Project, Chad'. In*:* Young, J. *A Report on a Village Animal Health Care Workshop, Kenya*. February 1992. Rugby: Intermediate Technology Development Group.

160 Pratt, D. J. (1971) 'The Ecological Management of Arid and Semi-arid Rangeland in Africa and the Near East: The concept of 'discrete development areas' as applied to range development'. 11p. Mimeo. FAO, Rome.

Key words: discrete development areas / government role / participation / social organisation

The paper defines a discrete development area as 'a tract of land which, on criteria of ecology, population pressure and relative social and economic feasibility, is delineated from neighbouring tracts as having distinct development opportunities or requirements' (p. 1), which was born, essentially, when the first pastoralist defined his boundaries. The concept is used for limiting the area of application of development initiatives, whilst guarding against the problems of open access; the majority of inputs either require or are facilitated by the security of known parameters. This does not imply the necessity of sub-dividing land into small ranches; an area containing three distinct nomadic groups which intermingle at certain times of the year could be designated as a discrete development area. Ecological land units are 'units of land which, for the purpose in hand, are judged to be uniform in climate, land form and soil' (p. 5). The optimum pattern for land use and productivity are given by

the immutable factors of the environment. Water resources and vegetation and range conditions are shown separately; the value of the discrete development areas is to create order out of chaos. When defined, development areas can be used by the state, but more often they can be put to the use of pastoralist communities. These are likely to be communities with a high degree of social cohesion, so participation in development is likely to follow. The creation of alternative levels of organisation allows these communities to mobilise more effectively against the political or economic encroachments which they may be facing. The development of corporate bodies not only strengthens communities' representation politically, it also offers a channel for governments to transfer responsibility for the area. The major types of organisation appropriate to range development are commercial ranching organisations, communal ranching co-operatives, group ranches, grazing associations, marketing co-operatives and grazing schemes. Group ranches and communal ranching co-operatives have a strong motivation to sell if they have loans to service. Grazing schemes should, in theory, be effective as the government has sanction to guard against overgrazing within the designated area, but in practice this leads to forcing the excess cattle away, resulting in the accentuation of overgrazing elsewhere. Grazing associations probably have the widest application in the arid zone; group ranching could provide an attractive alternative to this where specific groups have exclusive territorial rights.

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

162 Rahmato, D. (1991) 'Famine and Survival Strategies: A case study from Northeast Ethiopia', Chapters 7–10. Nordiska Afrikaininstitutet, Uppsala, 1991. Scandinavian Institute of African Studies, Sweden.

Key words: Wollo / Ethiopia / crisis / emergency relief / early warning / local knowledge / subsistence economy / market system / migration

There are three phases in famine response: crisis anticipation, crisis management and exhaustion and dispersal. Anticipation involves a range of techniques including folklore and evaluation of shortages on the market, weather impact and nutritional status. Both traditional and modern early warning systems have been defensive rather than predictive, but peasant understanding of weather patterns is the result of generations observing the weather and looking for regular seasonal variations. The attempt to survive a crisis brings sudden and dramatic changes to the peasants' economic thinking. During a crisis the peasant tries to exit the subsistence system and enter into the cash economy; the food deficit peasant is in the worst situation as food is in high demand and the prices are inflated accordingly. Communities with a well-developed market system have a better chance of survival. The option of migration in Wollo is postponed until the last minute on account of the inadequate early warning systems, and the general belief that disaster is a manifestation of God's will. External assistance came to the people of Wollo after traditional coping mechanisms had proved inadequate. The decision then was not between coping by themselves or receiving assistance; people went in search of emergency relief as there was nothing left to be done.

The important tools used by the rural population of northeast Ethiopia to survive disasters are 'ingenuity, strength of character, effective use of natural resources and communalism' (Ch. 8). There are four sequential stages in drought: firstly that of austerity and reduced consumption during January to April. This is followed by a period of temporary migration, mostly in the spring; divestment comes in May to August, and the final stage is cross migration from August to October. Resource management takes the form of sharply altering the mix of food items and reducing their quality and

variety. When conditions deteriorate further, food is bartered for in return for assets such as a goat or a hand weapon; the pawning of assets is also a possibility. These processes, though, are carried out entirely between relatives and close friends.

An increased awareness and engagement in the market also results during times of distress. Live assets decrease in quality and therefore in price during a famine. Other assets, such as houses, are also sold, along with women's jewellery, as part of the rational divestment of the family wealth. During the drought there was no government involvement in purchasing livestock from the peasantry, but buying from the peasants during distress and selling back afterwards should be considered at a local and national level as a response to drought. The author explodes the myths of increased prostitution, the selling of oneself or others into slavery, cannibalism and the malicious abandonment of dependants. In the case of child labour, this is probably seen to *decline* during drought as there is less work to be done, and people are less able to afford to contract in another pair of hands to help.

During post-famine recovery considerable social restructuring has to take place. This is a matter of particular urgency for the men who are dependent on women for domestic labour. Peasants claim that the most serious constraints to recovery are shortage of draught animals, of seeds and poor health. Recovery involves the sharing of resources and animals, sharecropping, leasing land, and communal assistance. The long-term losers from the famine were those who had been forced to liquidate their assets, whereas those who had moderate means beforehand, those who had taken advantage of the market, those with sufficient wealth to weather the crisis, and those with relations outside the area escaped devastation.

In terms of post-famine recovery, while a third of loans made after the famine were for seeds, nearly the same outlay was given to food purchase even while food aid was still available. The food rations were probably not of a preferred variety, were sold on, and the money gained used to buy livestock. The food-grain price system, along with the system of forced requisitioning should be replaced by an *incentive price* system. An improvement in the reliability of the early warning systems, and the mechanisms for coping with disaster such as an emergency seed bank, access to rural credit, and strategic food and livestock preserves would combine to offer reasonable prices to peasants during times of distress, thus saving livestock from starvation.

163 Rasmusson, E. (1987) 'Global Climate Change and Variability: Effects on drought and desertification in Africa'. In: Glantz, Michael H. (ed.) *Drought and Hunger in Africa: Denying famine a future*. pp. 3–22. Cambridge University Press: UK.

Key words: global climate / El Niño / rainfall variability / climate variability

The drought of 1982–4 was of such proportions of intensity and size, in terms of the region affected, as to make it on of the most significant climatic events of modern times. Allowing for some regional variation African rainfall is largely a function of latitude. Nicholson (1986) has identified six anomaly patterns which fall into two major groups: (a) departures of similar sign over most of the continent; (b) departures over the equatorial belt which are of opposite sign from those in the subtropics of both hemispheres. The Sahel is accustomed to much longer periods of wet or dry than Southern Africa, but it is the temporal distribution in relation to the planting and maturing of crops which is more important to productivity than total rainfall. Given these factors, there are many definitions of drought, and 'drought implies an extended and significant negative departure in rainfall, relative to the regime around which society has stabilised,' (p. 8) thus taking into account the social dimension of drought definition, which is given by the population's capacity to deal with low rainfall. There are two time scales of drought (which are not mutually exclusive): a relatively short, intense episode of 1–

3 years, and a long dry 'regime' of 10 years or more of predominantly subnormal rainfall. The short-term mode of variability is linked to global-scale fluctuations in the atmosphere, and in particular the pattern of alternating wet and dry years has been linked to the global El Niño/Southern Oscillation. There are difficulties involved in attempting to discover patterns, especially in extratropical oceans where the response is relatively slow. It is in the deep tropics that effective dynamic coupling of the ocean and atmosphere on relatively short interannual time scales can take place.

164 RIM (1992) 'Nigerian National Livestock Resource Survey'. (6 vols). Report by Resource Inventory and Management Limited (RIM) to FDLPCS, Abuja, Nigeria.

165 Runge, C. F. (1981) 'Common Property Externalities: Isolation, assurance, and resource depletion in a traditional grazing context'. pp. 595–606. American Agricultural Economics Association.

Key words: common property / open access / overgrazing / institutional rules / nonseparabilities / prisoners' dilemma / accountability

Common property rights are distinct from open access, where there are no laws regulating individual grazing; it is the breakdown of common property rights which has resulted in overgrazing in the Sahel, which in turn has given rise to call for land to be privatised. Others have argued that the solution to overgrazing is to internalise its costs by making the public aspects of the range private, thus creating a market in private grazing rights. By failing to differentiate between common property and open access, this assumes the inevitability of overgrazing, and also takes it for granted that each individual's choices are independent of the rest of the group's; it also ignores each person's uncertainty about how the rest of the group will behave. Problems of unrestricted entry are not identical to problems of common property which pertain to the use-rights by a group of a given size. Comparing grazing opportunities to the prisoners' dilemma, each individual herder finds it rational to defect on any agreement made, although this ends in ruin for all. This means that all are led to a non-co-operative equilibrium, not least because there is no external enforcement of agreements. However, allowing no possibility of co-operatively enforced rules undermines the credibility of this argument. The implied 'separability' further weakens it; dropping separability implies the interdependence of individual choice, as each herder's grazing decisions are based on the expectation of the actions of others. This will have the effect of changing the marginal cost to each individual caused by the actions of others, and the game structure of the prisoners' dilemma is no longer appropriate. The assurance problem (Sen) throws a different light, as it is essentially co-operative; still strategic in nature, it has two equilibrium points as there is no incentive to defect once an agreement has been made. Thus institutional rules providing complete assurance are self-reinforcing. Sub-optimal outcomes such as overgrazing do not arise from the dominance of individual strategy but because from the inability of interdependent individuals to co-ordinate their actions. Co-operative solutions are most likely to succeed in small cohesive groups as assurance is largely a matter of information and communication.

166 Salih, M. A. M. (1990) 'Agro-pastoralists Response to Agricultural Policies: The predicament of the Baggara, Western Sudan'. In: Bovin, M. and Manger, L. (eds) *Adaptive Strategies in African Arid Lands.* Proceedings of a seminar at the Scandinavian Institute of African Studies, Uppsala, Sweden, April 1989. pp. 59–75. Sweden: SIAS.

Key words: Sudan / Baggara / political environment / food security / agriculture / mechanised farming / social organisation

The problem facing pastoralists in Sudan stems from the fact that despite being a significant proportion of the population and important to Sudan's economy, they have received little attention from the colonial rulers or the post-independence government. As a result, large amounts of land have been appropriated from the pastoralists and small cultivators. The increase of agricultural schemes has meant that pastoralists are forced into smaller corridors between grazing land, and the fines for animals straying onto the agricultural schemes are heavy. The result is that the time taken for the north–south movement has been shortened, and more labour is required to tend the herds. The Baggara have partially commercialised their economy, but the competition from the mechanised farms is too great for them to make any significant headway. Money is used generally in the sale of small ruminants in preparation for the purchase of larger animals. There has been some restructuring in terms of social organisation: whereas groups of six to nine extended families traditionally moved together, now as few as two families move together, signifying a significant break down of co-operation, and an increase in individualistic values. This has been accompanied by a decrease in women owning livestock.

The dilemma that faces the Sudanese is that the introduction of mechanised farming has seen an impressive increase in production, and also in export, but that this coincides with immense food shortage in the south. The survival of pastoralism is, nonetheless, dependent on mechanised farming opening up new possibilities. This would include the provision of fodder and employment for the growing number of sedentary pastoralists. Meanwhile the nature of pastoralism is changing with the role of cattle moving from a status symbol and social capital to an exchange capital in a partially monetarised economy. A further factor of this is that some Baggara are willing to migrate to urban centres as the declining value of livestock has made pure pastoralism unviable as a livelihood. These people will place a strain on the urban economy; until they are heard and responded to as a political force, the problems for pastoralists will persist.

167 Salzman, P. C. and contributors (1980). 'Introduction: Processes of sedentarisation as adaptation and response'. In: *When Nomads Settle: Processes of sedentarisation as adaptation and response*. pp. 1–20. Praeger. J.F. Bergin: New York, USA.

Key words: Bedouin / adaptation / sedentarisation / nomadism

The reader is encouraged to think of society as being 'loosely integrated, flexible and adaptable' (p. 4). Within a society a group can form a deviant minority, or operate within a generalisation, or assert an ideology. Among the Bedouin, caravaneering has given way to smuggling and wage labour, but many of the skills used are the same, as well as multiplicity and multiformity. Many consider, or claim to consider, the change to be temporary. Forces which lead to sedentarisation are not irreversible and in the short and the long-term nomads appear to return to pastoralism, suggesting that the nomadic and sedentary worlds are not linear opposites, and that pastoralists can cross between the two. The adaptation and response model offers voluntary shifts between socially constructed alternatives.

168 Sandford, S. (1983) *Management of Pastoral Development in the Third World.* pp. 20–44. London: Wiley/Overseas Development Institute.

There is a distinction between opportunistic stocking, whereby the maximum number of animals which can be sustained on the available forage at any one time are herded, and conservative stocking, involving a constant number, which can be maintained through periods of shortage. Physical factors

are important in deciding whether an opportunistic or a conservative strategy will be pursued; greater variability of rainfall results in higher opportunity costs of conservatism. Physical, environmental and social factors will influence the animals which herders keep; camels are difficult to farm opportunistically as their population growth rate is low and the herd cannot be built up rapidly. Goats and sheep multiply much faster, but graze more efficiently, thus recreating the circumstances which led to the need for opportunistic farming in the first place. A strategy for survival at all costs will lead to the adoption of a conservative policy of management, but in an environment of competition and performance in terms of wealth and status, opportunism is more likely to predominate.

169 Sandford, S. (1983) 'The Physical and Analytic Framework'. In: Sandford, S. *Management of Pastoral Development in the Third World.* pp. 1–18. London: Wiley/Overseas Development Institute.

Key words: development / desertification / degradation / local knowledge

The two factors affecting pastoralists' movements are the extreme variability of rainfall, and therefore grazing between years, and secondly the intra-year seasonal differences in regional productivity. Development in pastoral areas can be loosely defined as the conscious pursuit of certain objectives with a view to increasing welfare, and whilst involving some change, this can also refer to the deliberate conservation of desirable features. The design of management systems has to take into account the existing framework. The important physical characteristics of pastoralism are 'timing, scarcity, and unreliability of rainfall and temperature; the susceptibility of the soil to erosion; the accessibility of the area to modern forms of transport; the physical potential for the development of irrigated or rain-fed agriculture' (p. 10). Social and economic characteristics include 'the density of the human pastoral population; the degree of dependence of this population on its livestock both for income and for basic consumption goods; the ease and terms of trade with which livestock can be exchanged for other goods; the degree of mobility of the human population and their livestock; and the nature of the social and economic system' (p. 10). The author distances himself from what he refers to as the 'mainstream view', that the world's rangelands are suffering severe and rapid desertification due mainly to overgrazing by domestic animals. There is little agreement on what constitutes desertification or its causes; estimates of sustainable stocking rates vary by factors of five, and are frequently absurd in the propensity to calculate that animals should be dying of starvation whilst simultaneously bemoaning their growing numbers. There is a view that livestock numbers exceed anything that went before, derived from official statistics, but also from the belief that the increase in veterinary medicine has meant that animal numbers are controlled only by starvation. Rinderpest, which has had a huge impact since the mid-nineteenth century but not before, is the only disease which has been significantly defeated in dryland areas; this raises the question of how cattle populations were kept in check before the onset of the disease. The chapter does not hope to prove that desertification does not occur, but that evidence for it is inconclusive; the mainstream view has led to urgent action, and an unwarranted faith in private ownership in the absence of any firm evidence of pastoralist ignorance or inefficiency.

170 Schneider, H. K. (1981) 'Livestock as Food and Money'. In: Galaty, J., Aronson, D., Salzman, P. and Chouinard (eds) *The Future of Pastoral Peoples.* Proceedings of a conference held in Nairobi, Kenya, 4–8 August 1980. pp. 210–223. International Development Research Centre, Ottawa, Canada.

Key words: consumption / off-take / herd maximisation / monetary economy

Virtually all pastoral animals end up in the pot and 'pure' pastoralism prioritises milk consumption over meat consumption, but all except the wealthiest pastoralists are dependent on other forms of food. Off-take from pastoralist herds is around 3% as compared to 35–40 % from North American ranches; one of the reasons for this lies in the use of livestock as repositories of value for exchange, capital and social cohesion. According to monetary theory, production is encouraged by a growth in money supply, thus a conversion to the beef trade is a fundamental change of direction from pastoral herding; livestock can no longer be treated as money because the quality and type of animal is more important than the number, so inferior animals no longer drive out superior animals. Testing hypotheses about the pastoralist market involves better information on the number of livestock owned and the amount of other produce on the market and what prices it commands.

171 Scholz, F. (1982). 'Bedouin and the Oil Economy'. In: *Nomadic Peoples* 10, April. pp 51-58. Commission on Nomadic Peoples, International Union of Anthropological and Ethnological Sciences. Oxford, UK: Berghahn Books.

Key words: nomadism / oil drilling / development

The paper considers the development of nomads' environment in Gulf States; the conclusions drawn are that modern development leaves little space or understanding for tribally organised nomadic life. However the Bedouin in the Gulf States have, in principle, reasonable opportunities to share in the economy. If the Bedouin are not involved in formal education and other responsibilities, the long-term effects will be negative for them; their only possibility is to adapt to the supra-local elites.

Disparities persist between the level of development of the semi-nomadic peoples of Dhofar and the coastal settlements of South Dhofar, and governmental assistance should include modernising production methods, markets, training and veterinary activities, in order to avoid marginalisation of the nomads.

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

173 Seifert, H. S. H. (1975) 'Animal Production and Health in the Sahelian Zone'. In: *MAB (Man and the Biosphere) Technical Notes. The Sahel: Ecological approaches to land use.* pp. 55–66. Paris: UNESCO.

Key words: zebu / cattle / disease / malnutrition / transhumance / sedentarisation / milk marketing

All cattle in the Sahel are *Bos indicus* (zebu), although within this type many local breeds can be identified. These are particularly well adapted to the region, although they are not, according to this author, exploited to the greatest extent of their economic advantage. One of the major threats to animal populations which has not been adequately tackled is disease. Disease may be endemic, and takes three forms: infectious diseases, internal and external parasitism, and nutritional diseases. Infectious diseases are classified as vector-borne, contact infections and soil borne infections. Some natural immunity may be built up against these diseases through exposure. Malnutrition and deficiency of minerals and vitamins is considered a disease complex due to lack of fodder or unbalanced feed. Traditional nomadic or transhumant routes included places with natural salt deposits, generally at the sides of lakes or rivers; sedentarisation around a borewell results in animals

being confined to one type of soil, which introduces a deficiency in their diet. Milk marketing has led to the reduction of milk available to the calf, and this is another reason for malnutrition.

174 Silberbauer, G. B. (1978) 'Social Hibernation: The response of the G/wi band to seasonal drought'. In: Hinchley, M. T. (ed.) *Proceedings of the symposium on drought in Botswana.* National Museum, Gaborone, Botswana, June 5th to 8th, 1978. pp. 112–120. Gaborone: Botswana Society/Clark University Press.

Key words: Botswana / seasonal drought / G/wi / social organisation / social hibernation / food security / group cohesion

Drought is subjectively defined by its sufferer in terms of disappointed expectations of rain, and perceived discomfort and danger. For the G/wi, drought is identified with thirst, the absence of rain and food scarcity. For the hunter-gatherers of the Kalahari, the aims of life include, ensuring food security, saving energy and remaining within the largest possible residential group. The conflict which exists between these aims, for example between the search for resources and energy saving, is most acute during times of scarcity. For maximum security, the G/wi need a variety of number and density of plants, a sufficiency of grazing and browsing, trees, rainwater drainages, and adequate space. The social grouping is manipulated to suit the habitat, and resource allocation within groups is undertaken on the basis that each group needs access to sufficient range to meet their needs during the period of isolation. Seasonal dispersal of the band is analogous to animal hibernation as normal activities are suspended during periods of abnormal heat-induced stress. Adaptation of the band to this form of behaviour involves specialisation and the ability of the band to divide itself without self-destructing. This potential to survive dispersal but maintain enough social cohesion to regroup after the danger has passed is fundamental to the organisation of the group, and their adaptation to 'social drought avoidance.' Cohesion is maintained through social systems of the exchange of goods and services; the G/wi systems demands reciprocation, in a manner which repays the debt, whilst putting the recipient in a position of further responsibility in the future. The more an individual possesses, the more is demanded in order to maintain parity of reciprocity. The combination of these tactics mean that desperation can be channelled in an orderly manner, making social hibernation through dispersal possible, but this does not entail that it will be easy.

175 Sivakumar, M. V. K. (1991) 'Drought Spells and Drought Frequencies in West Africa'. (Durée et fréquence des périodes sèches en Afrique de l'Ouest). *Research Bulletin* 13/Bulletin de recherche n° 13. International Crops Research Institute for the Semi-Arid Tropics, Patancheru, Andhra Pradesh 502 324, India. 181p.

Key words: West Africa / Burkina Faso / Mali / Niger / Senegal / drought length / agriculture / dry spell analysis / irrigation

Recurring droughts and decreased agricultural productivity during the last two decades in West Africa point to the need for a clearer understanding of the length of dry spells, their frequencies and probabilities. A comprehensive review of various definitions of droughts has been presented to develop the basis for analysis of droughts. Using the specific definition of onset of rains in each year as the sowing date, the length of dry spells were calculated from the historical rainfall data for 150 stations located in Burkina Faso, Mali, Niger, and Senegal. Probability distribution of time to the next wet day and the percentage frequencies of dry spells were computed for successive days after sowing (DAS) a crop. Dry spell analysis showed a pronounced drop in the drought risk for cereal crops from

the panicle-initiation phase (20 DAS) to the flowering phase (60 DAS). The relationships between mean annual rainfall and average frequency of dry spells for the selected locations in West Africa showed distinct patterns and permit the prediction of the frequency of dry spells from annual rainfall totals. Applications of the dry spell analysis for the choice of a crop/variety, supplemental irrigation and crop water requirements have been described with examples. [Author]

176 Sollod, A. E. (1991), 'Climate-driven Development Policy for Sahelian Pastoralists'. In: *Pastoral Economies in Africa and Long-term Responses to Drought.* Stone, Jeffrey C. (ed.). Proceedings of a colloquium at the University of Aberdeen 1990. pp. 227–238. Aberdeen University African Studies Group 1991, UK.

Key words: degradation / carrying capacity / opportunism / top-down development / drought resistance / sedentarisation / development

Whereas proof of permanent man-made degradation is difficult to establish, recurrent drought is responsible for changes in the dominant vegetation in the Sahel, and development policy should aim at encouraging pastoral exploitation through the preservation of drought-resistant habitats. Pastoral systems are opportunistic, the components of livestock, grazing, land, labour and capital being adjusted according to transient environmental conditions. The concept of carrying capacity has been replaced by the appreciation of a variety of vegetational states resulting from different forms of management.

Drought is a near certain but unpredictable visitor to the Sahel, but its occurrence is often dealt with in the atmosphere of a crisis, and top-down development plans leave nomads and pastoralism uncatered for. The variability of the weather is frequently left out of development plans, and lack of rainfall should prompt an appropriate response to the possibility of impending drought. There are four responses made by nomads to drought in the Sahel: (1) keeping to drought-resistant microhabitats, (2) temporary migration, (3) settling in relief camps, and (4) depleting family capital. Sheep and cattle are sold before donkeys and goats. There are three major development strategies: sedentarisation, which attempts radical modification of social systems, cooperativisation, which attempts to reinforce existing social systems, and modernisation, which ignores social systems. The preservation of drought-resistant microhabitats, the consideration of pastoralists' responses to drought, and the inclusion of drought impact assessment in development strategy are areas towards which development can be directed. Systems analyses of pastoralism have failed to grasp the fact that pastoralism is information intensive—at both the micro and macro levels nomadic families are constantly making decisions—and it is this which makes pastoral input so important to the development discussion.

177 Sperling, L. (1987). 'The Adoption of Camels by Samburu Cattle Herders'. *Nomadic Peoples* 23, 1987. pp. 1–18. Oxford, UK: Berghahn Books.

Key words: Kenya / Samburu / camels / cattle / epizootic

The Samburu of northern Kenya have a long and close association with several camel-keeping neighbours, yet only recently have begun to adopt camels for use in their own home settlements. This spread seems to be related to a 25-year decline in their cattle economy: since 1960, five droughts, raiding, and several epizootics have halved their aggregate cattle holdings. While this acquisition of camels has been initially described (Stiles, 1983), the reasons for this particular adoption and the roles camels play in the Samburu economy regime remain unclear. This essay examines the relationship of

Samburu herders to camel-keeping peoples, and reconstructs the history of camels actually managed by the Samburu. Several facets of the current phenomenon are considered: who owns camels? How large are their herds? What might be the concerns of the new camel owner? Conclusions suggest some of the ramifications of camel-keeping—for the Samburu, their land, and their cattle. [Author]

178 Stiles, D. (1995) 'An Overview of Desertification as Dryland Degradation'. In: Stiles, Daniel (ed.) *Social Aspects of Sustainable Dryland Management.* pp. 3–20. UNEP/John Wiley.

Key words: degradation / desertification as political statement / United Nations

The chapter presents definitions of desertification, considering the relevance of such factors as permanence, human activity, climate and productivity. Variation on the definition of the concept has led to confusion over the existence and extent of desertification. It examines the Lamprey report and Lund study of degradation and desertification and finds them unsatisfactory and unscientific. Studies into degradation are frequently conducted over 30 years, but the phenomenon has been around for centuries. Insufficient is known about the rate of recovery to be able to pronounce damage permanent within a few decades, but obviously there is no data on natural productivity and vegetation cover before land was exploited. The chapter concludes that the term 'desertification' is better viewed as a political statement than a scientific expression in that it has raised awareness of a problem, but is not useful without consideration of other forms of land degradation. In defence of the figures published by the United Nations, it is proposed that they are no more or less alarming than other accounts, and serve to bring attention to the seriousness of the problem of land degradation.

179 Swift, J. 'An Ecosystem Model of Pastoral Land-Use'. Source incomplete. Copy in ODI library.

Key words: desertification / disequilibrium / environmental fluctuations / economic fluctuations

There are three major components of pastoral land-use systems: people, domestic animals and the land (vegetation and water). 'Desertification happens when there is a major and continuing imbalance between animals and the land' (p. 1); this is only one form of disequilibrium which can occur, and leaves open the possibility of pastoralists responding in various ways. Swift proposes other forms of imbalance: when the number of people exceeds the ability of animals to provide food, when the number of animals exceeds the available labour force, when the animals exceed the carrying capacity and when the amount produced by the land exceeds the number of animals held on it; all of these can be described in terms of the amount of energy flowing through the system, and this is the key to his model. He outlines the household economics of an 'average' year, but acknowledges that pastoralism does not often deliver 'average' years, fluctuations being mainly due to changes in the annual rainfall or changes in the relative prices of animals and other products. Within the usual range of rainfall, the number of cattle that can graze an area in a good year is double the number that can be sustained in a bad year. The adaptations that need to be made to accommodate such change can be made by sharing labour and animals during seasonal shortages, and by recourse to hunting and gathering, but result in the emigration from the pastoral ecosystem by family members during longer periods of drought. Longer-term strategies include a low birth rate in comparison to neighbouring sedentary farmers, leading to a slow natural increase. Swift cites Holling's distinction (1973. Resilience and stability of ecological systems. *Ann. Rev. Ecol. & Syst.* 4 1–24) between the land being unstable, with large variations in growth, and resilient, with high productivity from a good year's rainfall. In conclusion, the most important outcome is the necessity to use all the available energy in good years, banking

some of it as insurance against bad years. Secondly, terms of trade between livestock and grain should be stabilised; labour that is not needed during parts of the year should be channelled into land and water conservation work. Finally, monitoring of environmental and economic changes is important so plans can be made.

180 Swift, J. (1978) 'The Role of Seasonality in a West African Pastoral Economy: Seasonal dimensions to rural poverty'. Conference organised by the Institute of Development Studies and the Ross Institute of Tropical Hygiene, 3–6 July 1978. Sussex: IDS.

Key words: Mali / seasonality / herd diversity / milk production / sedentarisation / differentiation

The nomadic pastoralist Kel Adrar Twareg of northern Mali divide their year into three approximately equal seasons: a hot rainy season, a cold dry season, and a hot dry season. The rainfall, which is highly variable, is the product of the West African monsoons, the pastoral environments being at the extremity of the monsoon range. Plant production is more or less directly related to total annual rainfall.

The effects of climatic seasonality are modified by animal-breeding cycles. Camels, which have a gestation period of one year, are given a calving interval of 24 months, which increases the period of lactation, and enhances the chance of the calf's survival. The breeding of other animals is also manipulated. Among sheep this involves ensuring that young are born when there is adequate pasture available, so generally there is only one lambing season in the year. Goats have different requirements and are sometimes born after the end of the rainy season when the tree and shrub growth is still sufficient, and this allows for two kid crops a year. The arrangement of breeding periods allows for lactation to be spread reasonably evenly through the year, apart from during the hot dry season. Camels and goats are superior to sheep and cattle for subsistence purposes, as their lactation period is longer. This should be borne in mind by development agencies. Millet is bought or bartered using animals or salt carried from the Tawdenni mines. Grain storage problems means that it is not necessarily possible for them to buy and sell when the prices are in their favour; generally they have to buy millet in the hot dry season when the price is highest.

Pastoralism is more vulnerable to seasonality that sedentary agriculture, and, in order to mitigate this, pastoralists adjust their demographic regulation, their meat consumption and their practice of alternative activities. Rich pastoralists are better able to cope with drought than the poor, as they can raise different livestock species, and have more contacts for assistance. During times of shortage, they are also in a position to loan a lactating animal or to make other gifts; this serves a redistributive purpose in minor seasonal crises, but when the situation worsens they have a lot of favours to call in. Seasonal variations have always been an aspect of pastoral life, and the crisis in the Sahel cannot be attributed to them. The problem facing pastoralists is the external economy, on which they are increasingly dependent, and which acts as a drain on the resources and services of the pastoral system. Seasonality may compound this in that economic differentiation is hastened, and an increasing number of pastoralists are put in the position, during severe dry spells, of having to sell their animals and access rights, and seek wage employment. Accordingly, development policy should target fundamental variables such as control of land and water, in that it is through such management that productivity can be increased and benefits distributed over the year. Sedentarisation will accentuate the effects of seasonality unless it is accompanied by irrigation and/or fodder storage. The provision of banking or credit schemes or grain storage facilities would allow pastoralists to buy grain when the price is low.

181 Swift, J. J. (ed.) (1984) 'Pastoral Development in Central Niger'. Final Report of the Niger Range and Livestock Project, Niger. Niamey.

182 Swift, J. (1988) 'Les grands thèmes du développement pastoral et le cas de quelques pays africains'. Organisation des nations unies pour l'alimentation et l'agriculture, Rome. [Major issues in pastoral development with special emphasis on selected African countries. Rome: FAO]. 76p.

Key words: government role / NGO role / local knowledge / social structures / participation / land rights / common property resources

The document intends to highlight the problems faced by pastoral economies in order to compile a list of priorities for governments and aid agencies. It recognises that the key to success in implementing credit systems, cereal banks and other measures for security during drought is dependent on political factors; this is an area in which more research and discussion is needed, and in which the pastoralists themselves need to be involved. There is a dichotomy between primary objectives, which see development in strictly human terms, and intermediary objectives, which take a more holistic view, including the health of animals and land management, which indirectly impact on human wellbeing. Primary objectives include the improvement of the production and distribution of food products, the assurance of food security, the improvement of revenue, the amelioration of productivity, and the equilibrium between the economic and the ecological. This is to be pursued alongside the development of collective management amongst the pastoralists, and greater integration of the pastoral sector into the political environment. One of the most important reasons for the failure of pastoral development has been their marginalisation from economic, social and political life. There are three major groups of local traditional institutions: firstly when there is no surviving traditional structure above the level of nomad camps; secondly where there traditional structures are not democratic and are dominated by chiefs; and thirdly where traditional structures are more or less democratic and can act as a base for further social organisation.

After reviewing the experiences of various countries, the author concludes that the first lesson to be learned is that pastoral development requires a form of local community structure, which provides a contact point for the government. However, there are two levels of traditional structure; the one recognised and supported by the government and the second which is the reality on the ground, but incomprehensible to outsiders. One of the primary tasks of traditional organisation is to control, on a collective level, access to pasture. Colonial and post-independence governments have paid little attention to pre-existing land rights, and have generally appropriated all natural resources. The complexity of the issue of land rights and common property resources needs to be appreciated with a view to development, and the author proposes a number of concerns to be borne in mind. These include enlarging and decentralising the regimes of land use and the management of common property resources and protecting rights. Despite the focus on the role of government and development organisations, the report ends with the warning that unless a central position is granted to pastoralists themselves, the next phase of development will be no more successful than the last.

183 Tapson, D. R. (1991) 'The Overstocking and Offtake Controversy Reexamined for the Case of KwaZulu'. *Pastoral Development Network Paper* 31a, July 1991. 21p. London: Overseas Development Institute.

Key words: Southern Africa / KwaZulu / stocking rates / destocking

Cattle in KwaZulu constitute the non-human wealth of western societies. In this role they provide consumable goods, investment and security. In view of this, reduction in the numbers of cattle to

accommodate concern over the environment would result in a real loss of wealth and therefore welfare to the communities. In contrast the evidence supporting the recommendation is not robust enough to support so drastic an intervention. Further, the cost in terms of stock reduction in order to achieve relatively minor increases in cover are very great. If the case against destocking is accepted as valid, then planners will be able to concentrate on maximising the welfare derived by human populations from cattle, rather than the welfare of the grazing resource. [Author]

184 Tiffin, M. (1976) 'The Enterprising Peasant: Economic development in Gombe Emirate, North Eastern State, Nigeria, 1900–1968'. *Overseas Research Publication* 21. Ministry of Overseas Development. London: HMSO.

Key words: Fulani / Nigeria / population growth / settlement / seasonality / self-sufficiency

The book examines the level of economic growth in Gombe Emirate, north eastern Nigeria over the two generations from the beginning of the century; the time from the first decade to the 1960s saw a fourfold population increase from 150 000 to 600 000 due to natural increase and immigration. From 1949 onwards there has been enormous commercial growth, largely on account of the enterprise of peasant farmers, and without abnormal aid inputs. The nature of the soils and water resources and population density affect settlement and land use. There are four main soil types in the area; red loamy soils, used mainly for wet season grazing as their water retention is low, moderately fertile loamy soils, clayey and heavy loam soils used mainly for cotton growing, and rocky hill soils which have thin soils and are mainly forest reserves. The Fulani have been the dominant group in the area politically and numerically; this population consists of cattle Fulani, semi-settled Fulani and settled Fulani. During the 1930s many semi-nomadic Fulani settled in southern Gombe and, on account of the good grazing and farm land, decided to stay, some giving up their herds altogether to concentrate on cotton and corn production. Settlers frequently travel for miles with their families, bringing supplies of seed and tools for farming; loans of money, and small scale food for work schemes are in operation to tide the settlers over until the first harvest. Although most farmers believe that they have attained a higher standard of living since settling, shortage of cash resources is the most frequently cited problem faced by new settlers. The settlement has been voluntary and as such has produced greater returns than government-aided schemes. The general direction of development has shown wider access to markets resulting in increased agricultural production, and increased wealth stimulating industrial development. The enterprising characteristics of the farmers have been the most important agent of development in the region, particularly the willingness to migrate and experiment with new production methods. The major reason for the spurt of activity is the higher prices offered for livestock, a commodity which they have the resources to produce. Agricultural production has been stimulated by the fact that the size of the home market allows increased access to international markets; isolation from markets is the greatest hindrance to development, and remote villages suffer from poorly developed road networks. This also limits the extent to which villages can specialise in response to soil quality, as they need to be self-sufficient for parts of the year. Labour has been a constraint to development and, apart from the plough, there have been few labour-saving implements made available; capital constraints arise out of the fact that farmers have to sell all their produce in the dry season when the roads are open, but suffer from considerable cash-flow difficulties during the wet season. Events in Nigeria have shown that migration to more favourable employment can take place within the rural sector and does not imply the gradual rural to urban flow. The strategy for future development is dependent upon Nigerians deciding their own social and political objectives.

185 Tiffin, M., Mortimore, M. and Ackello-Ogutt, A. C. (1993). 'From Agro-pastoralism to Mixed Farming: The evolution of farming systems in Machakos, Kenya', 1930–1990. *ODI Agricultural Administration (Research and Extension) Network Paper* 45. December. 35 pp. London: Overseas Development Institute.

Key words: feeding methods / agropastoralism / crop residues / stocking / privatisation of grazing land / labour costs

The transformation of livestock-feeding methods as farmers move from an agro-pastoralist system to intensive mixed-farming is discussed in relation to theories evolved from a broad survey of sub-Saharan Africa (McIntyre et al.) and a detailed case study in Machakos District, Kenya. In the process, crop residues become a much more important component of livestock diet, but the use of planted fodder and stall feeding is more important in small farms in the more humid areas than on larger farms in the drier areas. Feeding methods also vary according to farm size. High stock/hectare ratios have been maintained without land degradation, contrary to general belief. Pasture management on small farms has evolved out of farmer experimentation, to provide fuel and timber as well as grazing, despite official neglect since the 1950s. This has depended on the privatisation of grazing land. Several issues needing research are raised; they involve a careful assessment of the economics of the livestock component in the farming system, alternative uses of crop-residues, and labour costs. In the past, the livestock component in the economic analysis of farming systems has been handled badly. [Author]

186 Topps, J. H. (1991) 'Problems in Establishing a Livestock Policy Compatible with Combating the Long Term Effects of Drought'. In: Stone, Jeffrey C. (ed.). *Pastoral Economies in Africa and Long-term Responses to Drought.* Proceedings of a colloquium at the University of Aberdeen 1990, Aberdeen University African Studies Group 1991, UK. pp. 221–226.

Key words: livestock / development / investment / bush encroachment / carrying capacity / slaughter rate / agriculture

Africa's livestock industry has made little progress in the last 25 years, despite the billion dollars invested in development schemes, and it has failed to keep abreast with the growing population. The livestock population has also increased, but accurate figures are hard to come by. Overgrazing is variously regarded; some change in vegetation, particularly around watering holes has been recorded, but acceptable stocking rates are difficult to assess and are not uniform over regions. Bush encroachment refers to the deterioration of palatable grasses and the invasion of poorer, fibrous species, and it results in the reduction of the carrying capacity of the land, but not soil erosion. The challenge to the livestock farmers is to increase productivity so that the same or greater output comes from fewer animals. The first step is to improve forage or feed supply preferably through the establishment of drought-tolerant forage legumes. Avoiding weight-loss saves on forage as animals reach slaughter rate a year earlier. Older animals should be culled to reduce pressure on the land, and if they can be fattened beforehand, a reasonable price can be fetched. In areas where rainfall is 500mm or less, attention should be given to livestock production and the reduction of cropping, as agricultural output is unlikely to increase. Wetter zones should be given over to agriculture, and produce sold at a fair price to livestock producers in the drier areas.

187 Toulmin, C. (1987) 'Drought and the Farming Sector: Loss of animals and post-drought rehabilitation'. *ODI Development Policy Review* 5(2), June. pp. 125–148. London: Overseas Development Institute.

Key words: drought recovery / rehabilitation / livestock mortality / draft animals / grain reserves

The paper examines the short- to medium-term policies to reduce the length of time taken for the farm sector to recover its productive capacity after drought. 'Rehabilitation' is defined as the 're-establishment of productive farm capacity in drought affected regions' (p. 125). Certain changes that take place during a drought; the loss of animals through death and sales, the alteration of movement as herders search for fodder as well as the changing distribution of wealth as a result of falling animal prices and rising grain prices. This interaction between the impact of drought on livestock and agriculture is particularly significant on account of the importance of grain in the pastoral diet, and also the use of livestock as investment. Farmers use a number of strategies including sharing animals between households, the use of other animals for draft, and the use of incomes gained elsewhere to buy replacement oxen, all of which prioritise the cultivation of crops as a means of drought recovery. There are also a number of possible responses for governments: the reduction of poll or land tax, the raising of farm prices, the minimising of constraints on rural migration and the control over the export of livestock.

The establishment of less drought-vulnerable systems, including the provision of relief food supplies to farmers in distress at an early stage of the drought cycle, obviates the need to liquidate livestock holdings. Along with grain provision there is a need for grain production to keep down the price of cereals relative to that of livestock, and thereby reduce the pressure on herders' incomes.

188 Toulmin, C. (1995) 'Tracking through Drought: Options for destocking and restocking'. In: Scoones, I. (ed.) *Living with Uncertainty: New directions in pastoral development in Africa*. pp. 95–115. London: Intermediate Technology Publications.

189 Turton, D. (1995) 'Constraints on Mursi Production'. A report for Oxfam. Oxford, UK: Oxfam.

Key words: Mursi / Ethiopia / pastoralism / land rights / common property resources

The objective of the study was to describe the constraints on Mursi pastoral production and secondly to suggest ways in which the impact of these constraints could be minimised in order to make pastoralists less vulnerable to climatic and other uncertainties. Given the position of the Mursi, in terms of physical and cultural environment, the most effective means of increasing food security is through the improvement of the productivity of their herds.

The current mean rainfall in Mursiland (Southern Ethiopia) is likely to be under 480mm, and the minimum rainfall required to support a purely agricultural livelihood is estimated at 700mm. Added to this is the uncertainty of quantity, timing and location of the rainfall. The Mursi rely on three activities, which, taken together, offer them some degree of certainty. They are: flood-retreat cultivation at the Omo, rain-fed cultivation in the bushbelt and cattle-herding in the higher wooded areas. This transhumance means that all sectors of the population are required to maintain a level of mobility. The Mursi have been in a 'permanent emergency' for the last 23 years (p. 9), chiefly on account of drought and military conflict, and the resultant economic vulnerability at a household and community level. Rainfall is the major determinant of movement with animals, as herders 'track' the available water and grazing, as an 'opportunistic management strategy' (p. 31). The farmers' attitude

to drought was no less intense than their attitude to disease, on account of their heavy losses in previous years and their belief that the drought is part of a long-term process. The fall in local rainfall is compounded by the gradual drying of Lake Turkana, a lake which has seen considerable fluctuations in its water level over several thousand years. There is evidence to suggest that agriculture was viable in the area only 200 years ago. The Mursi report a continued drying process over the last 20 years, along with a greatly increased cattle population. Access to land has also proved a threat to the Mursi, as land held in common has been legally classified as 'public', or has been subsumed into National Park land, which removes the herders' control of resources and ability to manage them. With regard to this, the report examines some of the proposals that have been made for expanding the scope of the national parks to include human populations. It finds that programmes have treated human populations as animals, particularly in the respect to basic needs requirements, rather than rights entitlements. No attention has been paid to the expertise of the pastoralists in coping with the uncertainties of their own environment. The politics of the tourist trade are partially to blame, as the propagation of the myth of the African wilderness requires the belief that few, if any, people have been living on the land, let alone in any sense changing or managing its natural state. The local population is understood to be living, preferably settled, outside the national parks, and there is no recognition of their mobility and their reliance on the resources inside the park fences.

In terms of recommendations, the author sees the provision of veterinary services and the institution of paravets at a local level as high priority. This includes legal changes to allow the Mursi to administer strong drugs, particularly Trypamidium. As regards water, the author emphasises that the drought of 1993–4 was 'merely a particularly severe manifestation of a continuing and growing problem' (p. 43). The loss of animals during the drought was not a result of their exceeding a predetermined 'carrying capacity', but occurred because, on account of the shortage of water, they were exposed to long treks and increased risk of disease. Water was considered among the Mursi to be the chief problem facing them. Exogenous factors, such as rainfall, are responsible for controlling herd growth in non-equilibrium environments, and for this reason, the creation of borewells as a permanent water supply, is important. This is not unproblematic: there are political risks involved as well as technical issues arising from the equipment's upkeep. With all development plans, it is of primary concern that humans are considered as central to the conservation of the area; if not, the Mursi will be further marginalised ultimately losing the right to live on their land.

190 Turton, D. and Turton, P. (1984) 'Spontaneous Resettlement after Drought: An Ethiopian example'. *Disasters* 8(3) pp. 178–189. London: Overseas Development Institute.

Key words: Mursi / ethnicity / migration / conflict / settlement / government role / NGO role / local knowledge

The Mursi, suffering from their worst drought in living memory, have received only sporadic food distribution, and have relied chiefly on the resilience of their own subsistence systems including divestment of livestock. In 1979 a spontaneous migration began which displaced 20% of the population to land in the Mago Valley which is agriculturally more favourable, whilst being pastorally less so. The result has been the emergence of a new agricultural and cultural identity. The hypothesis runs that the determining factor of the Mursi ethnogenesis has been their adaptation to a particular environment, whereas the collective memory of the Mursi holds that they are a ethnic group which has wandered across the landscape preserving its distinctiveness. The creation of a new identity brings with it considerable internal conflict, as the Mago settlers have sacrificed their pastoral existence for an agricultural life. They are in a dilemma faced by migrants who hold to some extent to their traditional value systems, whilst their behaviour itself is a denial of those systems. Whatever resources the Mursi received from outside were distributed through existing mechanisms, so did not

lead to the creation of a large population of dependent people. The provision of more assistance would very probably have resulted in the gravitation of large number of people to distribution points and the formation of a famine camp. The whole issue of rehabilitation is divisive in that it assumes that people are unable to direct their own lives. Even with respect to settlement, it is evident that nomads are not averse to settling if it is in their interests to do so. The conclusion is that, rather than initiating settlement, the sensible role for external agencies and governments to take is in facilitating local initiatives,

191 Twose, N. (1984) 'The Sahel: Behind the weather. Why the poor suffer most: Drought in the Sahel'. Oxfam Public Affairs Unit. pp. 19–24. Oxford, UK: Oxfam.

Key words: adaptation / government role / NGO role / desertification / food supply / marginal land

The restocking period after drought is an important time for the re-establishment of a pastoral economy. The author highlights the success of an aid programme which used the traditional method of lending a cow for a period of time *before* a family becomes destitute, and the adoption of the practice by the Niger government. Drought, far from being an unexpected natural disaster, is a recurrent part of life in the Sahel, but has not, on the whole, been adequately prepared for; in recent years, the change is not in the extent of the drought, but in the capacity of large sections of the populations to deal with it. Desertification is increasing on account of the fact that marginal land is becoming more and more intensively exploited with no respite allowed for recuperation. Meanwhile states have shown little willing to provide cereal supplies to the poorer sections of the population, which are continuously excluded from the main flow of national development. Progress is being made by the implementation of small projects, aimed at decentralising development initiatives in order to promote the needs of communities most at risk. However, cuts and the restructuring of aid programmes is posing a threat to this alternative approach.

192 Van Apeldoorn, G. J. (1981) 'The Imposition of the Colonial Economy', and 'Conclusion: Atrophied defences of the poor'. In: *Perspectives on Drought and Famine in Nigeria.* pp. 94–9 and pp. 113–169. London: George Allen and Unwin.

Key words: collective ownership / monetary economy / intercropping / agriculture / seasonal adaptation

This chapter examines the social impact of the colonial economy and traces the 'detrimental actions' of populations in vulnerable areas. There is 'a progressive weakening of collective control mechanisms, so that all that remains is responding to an aggravating situation caused by forces from outside the rural world' (p. 95). The lack of rural control over their own material conditions causes drought to result in famine. The externally imposed monetary economy has the effect of fundamentally changing the object of existence from the satisfaction of needs to the acquisition of money.

There are three broad means by which sedentary farmers may combat the worst extremities of drought. The first is by use of intercropping techniques, the second by the use of seeds adapted to local conditions, and the third is the adaptation of crop combinations to the development of each season, and with an eye to changing soil fertility.

The demands of the money economy have had devastating effects on the grain reserves as farmers have been forced to sell their crop at a low price at harvest time only to buy it back, at an inflated price, in times of shortage. As a result there has been collapse or at least severe limitation put on the techniques for coping used in pre-colonial times. New mechanisms which have arisen to cope with drought, such as the increase of infrastructure, are in the hands of the government rather than the rural poor. The poor are in the position that their former means of survival have been undermined, and nothing has replaced them in terms of what they themselves are able to effect.

193 Van Apeldoorn, G. J. (1981) 'The 1972–4 Disaster: Responses and Consequences'. In: *Perspectives on Drought and Famine in Nigeria*. pp. 57–72. London: George Allen and Unwin.

Key words: Nigeria / social strata / food security / dependence / migration / food aid / overgrazing / subsistence farming / rehabilitation

Studies on the differing effects of drought on different strata of the population is limited. There are four broad mechanisms for coping with drought; these are not exclusive of each other and can be used other than at times of distress. Firstly there is agricultural adaptation, secondly the exploitation of different means of making money to buy food, thirdly the use of alternative food sources, and finally increased dependence on others. This decline in true pastoral living may well be accompanied by an increase in praise-singing, begging and ultimately stealing.

The 1972–4 drought in Nigeria saw important changes in the patterns of migration. Instead of voluntary migration, larger portions of the population are forced by necessity to migrate further and for longer, many finding themselves dependent on aid distribution or urban centres. During such migration it becomes a matter for debate as to who is responsible for providing food during drought. According to a study by Mortimore (1977), in Kano State 93% of the population thought it the duty of the government to provide food during drought.

During drought, survival tactics bring an intensification of some 'detrimental' processes. What is unclear, though is the extent of the depletion of tree and bush stock and the effects of overgrazing, and the permanence of such effects. He notes that in the past, solutions have been sought through the installation of technology-intensive equipment, large-scale irrigation and mechanised farming. Unlike poorer Sahelian countries, Nigeria has not emphasised the role of the subsistence farmers in reproducing their own environment, and since the drought no attempts have been made to rehabilitate the victims. This imposition of solution is indicative of the thinking behind the 'tragedy of the commons' version of events, but this erroneously blames the 'commons' and finds causative factors of the famine only within the region.

There is a trend in the work of international organisations and academic circles towards seeing drought and its concomitant famine as an evil brought upon a population which refused to acknowledge natural law and stretched the resources of their environment too far, ignoring obvious constraints. The author posits that the 1972–4 disaster was instead a phenomenon in which socio-political factors were dominant over so-called 'natural' causes.

194 Van Brabant, K. (1994) 'Cycles of Relief and Rehabilitation in Eastern Ethiopia: 1973–93'. *ODI Relief and Rehabilitation Network Papers 1994–6. RRN Network Paper* 4, September. pp. 21–46. London: Overseas Development Institute.

Key words: Ethiopia / off-take / Somalia / Somaliland / trade / sedentarisation / local knowledge / refugees / NGO role / national interest

The paper reviews the livestock schemes introduced into Ethiopia between since 1973 and finds that, in general, they have not been successful. Schemes have focussed on livestock and rangeland rather than herders, assuming that pastoralism is deleterious and irrational, and that pastoralists should be integrated into sedentary society. Solutions were technical, taking no account of local knowledge or culture, leading Somali pastoralists to see the development projects as means of state control. More recent research has appreciated the resilience of arid-land vegetation and the understanding of the pastoralist. In the light of this the Southeast Rangeland Project (SERP) was reviewed in 1992, but has not managed to define its role satisfactorily on account of extraneous factors such as the influx of refugees and returnees, and a Save the Children Fund recovery-support programme. The second problem arises from the tensions faced by SERP between logistics and service delivery: the Ethiopian government does not have the infrastructure or financial means to conduct veterinary service delivery to the entire country, and a similar problem concerns the regulation of livestock off-take. The government is in the position of wanting to promote livestock raising and a sustainable livelihood for the pastoralists, but sees that trade links formed are with Somalia and Somaliland and not with Ethiopia.

195 Von Kaufmann, R. R. (1978) 'The Tribal Grazing Land Policy's Relevance in a Drought-prone Environment'. In: Hinchley, M. T. (ed.) *Proceedings of the Symposium on Drought in Botswana*. National Museum, Gaborone, Botswana, June 5th to 8th, 1978. pp. 255–260. Botswana Society/Clark University Press.

Key words: Botswana / livestock / grazing / common property / technical inputs / monetary economy / TGLP / drought contingency

The challenge facing those holding resources in common is to function under an equitable system which allows for a livelihood to be made without destroying the resource base. Farmers' ability to cope with drought depends on their perception of the likelihood of drought and its consequences, their experience and their technical possibilities. Botswana livestock producers are permanently resident in defined regions, and the absence of external threats to the tribe, along with increased exposure to jobs, education and a monetary economy has weakened internal tribal cohesion. The institution of a Tribal Grazing Land Policy (TGLP) is designed to establish better stock and pasture management both before and during a drought, and farmers will be in a position to introduce drought relief measures at short notice. The level of social organisation will make farmers more accessible to extension advice and help, and will make them more commercially oriented, encouraging them to sell more unproductive stock. Access to cash and technological inputs improves the farmers' ability to manage the herd productively. The dangers facing the TGLP are that drought will be too severe, or that the farmers or government will not allow the scheme to work, either through inertia or ignorance. Experience has shown badly run ranches to be a sure means of degrading land; there are problems left to be solved, for example the land-use rights of non-stockowners, and the high stock numbers which prove unviable when drought strikes. The TGLP is not to be regarded as a project, and conclusions are hard to draw as its state is foetal, but if it proves successful, it will make a useful contribution to development and drought management.

196 von Kaufmann, R., Chater, S. and Blench, R. M. (eds) (1986) 'Livestock Systems Research in Nigeria's Subhumid Zone'. *Proceedings of Sub-humid Zone Livestock Conference*. ILCA, Addis Ababa.

197 VSF (1996) Activity Report 96. Unpublished report. Vétérinaires sans Frontières. Lyon.

198 Waller, R. (1979) 'Comments on Network Paper 7d/1979 (Meadows and White on: herd structure and off-take in Kajiado, Kenya)'. *Pastoral Development Network Paper* 9e, December 1979. Agricultural Administration Unit, Overseas Development Institute, UK.

Key words: herd structure / off-take / Kenya / Maasai / drought recovery / monetary economy / herd maximisation / herd structure / disease

Waller responds to the former article written by Meadows and White on the possibility of increasing off-take from Maasai herds. Meadows and White consider four determinants of sale: rainfall, the availability of stock, quarantine restrictions, and the growth of consumer needs, and Waller identifies the prices paid to the producer as an important fifth element. Past attempts to force Maasai farmers to sell have been based on the assumption that they have no rational market sense, and so have failed, and the author posits that what is needed instead is a guaranteed market and attractive prices. Alongside this, though, he appreciates the high social value of cattle and the fact that, as far as possible, Maasai will feed themselves from their herd irrespective of the opportunities available on the market, and will not change their self consumption patterns as a means of getting more cash. The open market also tells only part of the story, as unrecorded sales are beneficial to the Maasai in that they can be used to evade quarantine restrictions, and are carried out on a smaller and more personal level than government transactions.

Waller's contribution is followed by Meadow and White's defence of their original article and the presentation of further evidence to support their argument, particularly evidence concerning the ratio of male to female cattle in Maasai herds. Their findings show the possibility of very rapid recovery of herd numbers after drought, on the basis that pastoralists maximise female survival. Disaster caused by disease allows for no such management and results in longer term depletion of the herd.

199 Ward, K. W. (1978) 'Livestock Marketing and Supplementary Feeding in Times of Drought'. In: Hinchley, M. T. (ed.) *Proceedings of the Symposium on Drought in Botswana.* National Museum, Gaborone, Botswana, June 5th to 8th, 1978. pp. 239–246. Botswana Society/Clark University Press.

Key words: Botswana / livestock marketing / feed / veterinary medicine / government role / slaughter / herd management

During drought, five options are available as strategy for livestock producers: (a) sell surplus stock, (b) sell all stock, saving the proceeds to restock later, (c) sell all stock, (d) move stock to new grazing, or (e) take no action. Stock can be sold to agents, to marketing co-operatives, or direct to the Botswana Meat Commission. In practical terms, a drought obtains if no rain falls in January or February; the Department of Animal Health is then responsible for arranging slaughter quotas for the worst-hit areas. Livestock Advisory Centres have been established to provide vaccinations and feed supplements, although this cannot compensate for the bulk provided by feeding on pasture, and there is no provision for feeding animals on hay or setting aside forage. Response from farmers shows that the government has a captive audience when offering advice on livestock rearing, and that farmers are becoming accustomed to livestock buying and selling. The basic tools for a drought strategy are

already in place: a channel for selling, a means of moving livestock, slaughter facilities, and a distribution network for supplementary feeding. In view of the probability of future drought, attention needs to be given to the transportation of cattle, the expansion of processing capacity and the conservation of fodder. As far as the farmers are concerned, the two important adjustments to be made are to use surplus grazing to make hay, and to reduce the number of old stock kept.

200 Ware, H. (1975) 'The Sahelian Drought: Some thoughts on the future'. Mimeo from Demographic Department, Australian National University. Paper produced for United Nations ref. No: ST / SSO / 33. 41p.

Key words: NGO role / poverty / productivity / trade / overpopulation / carrying capacity / soil fertility / population distribution

The paper opens with the proposition that 'the real problem faced by Sahelian countries is not the possibility of a recurrence of the drought but their overall poverty year in and year out' (p. 1), hence the challenge for development is to increase productivity to the extent that deficits one year in one country can be met by regional trade. Interpretations of overpopulation versus underpopulation are considered in the light of Malthus and Boserup, but evidence from the Sahel is difficult to interpret. One major famine in 60 years is not proof of overpopulation, but it does suggest that there should be contingency plans against shortage if the carrying capacity of the land is not to be reduced to the carrying capacity of the poorest year. There are three levels of fertility: ecological balance, soil exhaustion and conservation, and the challenge is to move from the first, which is reasonable, but unsustainable given population growth, to the third, without passing through the second. In terms of soil improvement, this has to be carried out in the context of the market as countries are unwilling or unable to invest in fertilisers for subsistence production; the use of irrigation further enhances the productivity of the soil, but is viable only near towns. The future of nomads in the Sahel lies in producing for export, as cattle breeders and migrant workers in the south of the monsoon areas. This increases the options available to nomadic families, which is characteristic of their opportunistic survival pattern. Given the low productivity of the Sahel, there is no reason to make more people dependent on the land by the promotion of peasant agriculture. To this end, it is important that planning treats the area as a whole rather than focusing on the rural sector in isolation, and projects should be framed in terms of the cultures concerned rather than provision for the poor. Population problems arise more obviously from the distribution rather than the size of the population, besides which, fertility reduction, even if it were desirable, could not be achieved until the overall level of development has risen considerably.

201 Warren, D. M. and Rajasekaran, B. (1995) 'Using Indigenous Knowledge for Sustainable Dryland Management: A global perspective'. In: Stiles, Daniel (ed.) *Social aspects of sustainable dryland management.* pp. 193–209. Published on behalf of the UNEP, John Wiley and Sons.

Key words: water conservation / soil conservation / sustainability / local knowledge / government role / NGO role

Shortcomings in water and soil conservation projects in the past have been due to their predominantly top-down, complex and expensive administration. Scientific reductionism, the introduction of technology and short-term horizons have led to insufficient attention being given to what contribution can be made by local knowledge and decision-making procedures. Ignoring indigenous knowledge has resulted in misallocation of resources and the application of inappropriate management through

the failure to appreciate the value of knowledge evolved over generations. Indigenous knowledge must be strengthened through co-operation with NGOs and government programmes in order to facilitate the implementation of locally described development. There is still a role left for the NGO or governmental body involved, and incentive schemes can encourage projects that are compatible with agro-ecological conditions as well as being socially acceptable. Indigenous knowledge is not static, and progress is made through innovation, as with other forms of knowledge. The viability of management structures depends on who is willing to support them, and the involvement of local knowledge and local decisions in the process of dryland management is conducive to increasing productivity and sustainability.

202 Watts, M. (1987) 'Drought, Environment and Food Security: Some reflections on peasants, pastoralists and commoditisation in dryland West Africa'. In: Glantz, Michael H. (ed.) *Drought and Hunger in Africa: Denying famine a future*. pp. 171–211. Cambridge University Press: UK.

Key words: risk / food security / peasant farming / local knowledge / rainfall variability / degradation / climate / micro-climate / crop rotation / conflict

There are two foci in pre-capitalist societies of risk and subsistence security, and within the Sahel there are three major systems of livelihood: nomadism, transhumance and sedentary peasant farming. There is a diversity of factors to be considered in our assessment of long-term degradation, and even 10 years after a drought its effects are not fully understood. This is illustrated by the example of the recent discovery of the significance of nitrogen and phosphorus to Sahelian productivity, and warns against generalisations on ecological degradation. Climate has been reasonably stable in the Sahel for the last two-and-a-half millennia, but the climate is bimodal, and therefore precipitation is almost always considerably above or below a mean statistic. On the social side, there has been a trend in the last 15 years towards acknowledging the expertise of farmers and pastoralists in reproducing their environments.

Given the variability of rainfall, and the propensity towards drought, and the accumulated knowledge of the local population, the formulation of a model of farming behaviour is rejected in favour of a series of sequential adjustments. Responses to drought fall into two broad categories, namely the control of the microclimate, and the sequential use of crop varieties. Having determined that adaptation is part of normal life for Sahelian populations, the question arises as to what are the large conjunctional forces which disequilibriate what is essentially a resilient system, resulting in the culmination of poor rainfall, ecological upheaval and land-use conflict. There are three possible approaches, the first of which is primarily Malthusian, positing that the carrying capacity of the land has been overreached. This has little mileage, especially as far as the human population is concerned. The second argument stems from the logic of property resources, and is similar to Hardin's 'tragedy of the commons', but this badly misunderstands the dynamics of locally constructed exclusive use. The third argument addresses the social dimension, and highlights the differentiated ways in which households reproduce themselves, with size, off-farm earning capacity, landholding, herd size and capacity to save and invest as factors determining response. During drought we may expect to see what Bernstein (1978, 1979) has called a 'simple reproductive squeeze' which constitutes the reduction in consumption alongside the intensification of production.

Household inequality gives insight into how changing terms of trade lead to land–labour intensification during periods of drought, resulting in ecological deterioration among poorer households. Further, differentiation locates the ecological stress both in terms of class, as poor households are particularly vulnerable, and geographically as the poor find themselves on increasingly marginalised distant, crowded and unfertile soil. In the Sahel, loss rates of 80–90% of a

herd is not uncommon; pastoralists need the capacity to recover from this in terms of animal reproduction, but the falling cattle prices in relation to millet increase the threat of herd decapitulation. This combination of factors presents pastoralists with an incentive to take up cultivation.

203 Weiker, M. (1993) *Nomades et sédentaires au Sénégal*. Dakar, Enda-Editions, 1993, Série Etudes et Recherches no. 139–140.

Key words: Senegal / economic crisis / conflict / politics / regional development / environmental pressure

The pastoral crisis in the Sahel is intimately connected with the general economic crisis of the rural sector and the agropastoral system of the region. The loss of control of the land has resulted in a decline in the mobility of pastoralists and constitutes a major blow to the economic base of the pastoralists. The solution to the present problem has to come from the pastoralists themselves along with a delimitation of the zones and the cultures. The integration of nomads into the political, social and economic life of their respective countries is fraught on account of the fact that there are almost invariably conflicts between nomadic and sedentary communities. The book examines the historical background that has given rise to the socio-economic development in Senegal, what is the relationship between agriculture and animal rearing, and what are the various interest groups behind the economic system, and the political actors involved. The hypothesis is that the development of the agricultural sector is determined by the interests of the elites, and that nomads and rural populations are engaged in a latent conflict over dwindling natural resources. In as much as the conflict becomes manifest, it is conducted only at a local level. These hypotheses are supported by evidence from the Ferlo region: infrastructural development has been directed specifically for the export trade, and similarly agricultural land has been given over to cash crops at the expense of staple food production. This has forced nomads onto more marginal land, whilst their mobility has been undermined. The challenge for development lies in regulating the conflict in a peaceful way, whilst promoting the interests of nomadic peoples at the regional level. This involves the conflicting parties resolving their differences, rather than social scientists imposing their value systems on the situation. In the immediate future the important factor is to establish regulations which satisfy the interests of both parties; this involves the definition of cultural and pasture zones, allowing pastoralists to graze their herds on harvested land, a system of compensation for damage caused, and a system of barter or sale for obtaining forage in return for dairy products. Longer term, there needs to be rotation of pastoral and agricultural activity on land in order to maintain its agricultural potential.

204 Wienpahl, J. (1985). ‘Turkana Herds under Environmental Stress’. In: *Nomadic Peoples* 17, February 1985. Commission on Nomadic Peoples, International Union of Anthropological and Ethnological Sciences. pp. 59–88. Oxford, UK: Berghahn Books.

Key words: Turkana / Kenya / stocking / destocking / environmental stress / camels / small stock / cattle

The occurrence of ecological disasters provides a rationale for the seemingly excessive numbers of livestock kept by pastoralists, and are understood in terms of ‘adaptive value’ or ‘selective advantages’. The herds of four nomadic pastoral households of the Ngisonyoka Turkana are examined with a focus on the environmental stress during 1980–1. The pastoralists try to maintain herds of small stock, camels and cattle, a policy of multispecies holding being a result of experience of environmental stress. The advantage of small stock is their rapid recovery after drought, even though

numbers lost are high. Camels are much less vulnerable to drought, but reproduce at depressed levels, and have long gestation periods. During good years, cattle surpass camels in production and reproduction. High mortality is off-set by large numbers of animals.

205 Williams, T. O., Powell, J. M. and Fernández-Rivera, S. (1995) 'Manure Utilisation, Drought Cycles and Herd Dynamics in the Sahel: Implications for cropland productivity'. In: Powell, J. M., Fernández-Rivera, S., Williams, T. O. and Renard, C. (eds) *ILCA Livestock and Sustainable Nutrient Cycling in Mixed Farming Systems of Sub-Saharan Africa.* Volume II: Technical Papers. Proceedings of an International Conference, International Livestock Centre for Africa (ILCA) Addis Ababa, Ethiopia, 22–26 November 1993. pp. 393–409.

Key words: manure / fertiliser / population pressure / government role / productivity

Animal manure is vital in West African farming due to the low level of inorganic fertiliser use and the intensification of land use. It augments soil organic-matter content, raises soil pH, and improves nutrient exchange and water-holding capacity. Drought induced changes to livestock thus filter through to impact on agricultural productivity, and rainfall has been declining in the region since 1968, with severe droughts occurring in 1968–73 and 1983–5. The effect on livestock depends on species composition, duration of the drought, rangeland productivity before the drought and other factors. Given current herd sizes and fertiliser needs, farmers cannot fertilise their farms with the manure from their herds alone, which is the reason for pooling herds and having crop residue agreements with transhumant herders. Nonetheless, the shortfall should be bridged by the use of inorganic fertilisers if the fertility of the soil is not to suffer. Increasing animal numbers in order to increase the amount of available manure is not viable given the competition which already exists for grain and land. At present there is a shortfall even to cover 30% of land; there is a role for government in facilitating fertiliser distribution.

206 Wolmer, W. (1997) 'Crop–Livestock Integration: The dynamics of integration in contrasting agroecological zones: A review'. Institute of Development Studies, Sustainable Livelihoods Program, *Working Paper* 63, December 1997. University of Sussex, UK.

Key words: agropastoralism / population pressure / specialisation / epizootic / local knowledge

The development of mixed farming follows the principle that it is the most natural response to increased population pressure, and also the most efficient use of the land for subsistence farmers. Specialisation in farming is the direct result of the resource competition resulting from increased population pressure. Mixed farming provides a use for the by-products produced from both farming methods. According to the Boserupian logic of population and land pressures, the explanatory factors in crop–livestock integration are population/labour availability, land availability, market proximity, national government policy, structural adjustment programmes, and reduced trypanosomiasis threat. When sedentary farmers accumulate livestock, it is not necessarily as a means of pursuing a policy for integrated farming, as livestock have capital, social and cultural value besides the role that they play alongside agriculture. Settled farmers generally invest less time in their herds and herding activity than pure pastoralists and transhumants. There is no reason to assume that a simple relationship exists between intensification, crop–livestock integration and environmental sustainability. Often livestock cannot be maintained without additional input, and nutrient outflows from pastures exceed inflows. The loss of forage constitutes a decrease in the national food production, and the incorporation of transhumant or nomad animals into the agropastoral system leaves large areas of dryland unexploited.

Through a series of case studies, the authors demonstrate that herders' and farmers' decisions about the management of crops is not solely a function of population density and opportunity cost of labour. Aggregate approaches to understanding trajectories of change are inadequate, as averaged data do not show the high inter-household or inter-village variations in management practices. It is important to appreciate the agency of the actors involved. Further, institutions play an important role; access to tenurial rights to grazing land, manure exchange contracts and livestock loans impact on farmers' ability to form cart, labour and kraal sharing agreements in the management of their farms. The image of a single development trajectory with sites at various stages along it must be rejected as relationships and outcomes associated with particular crop and livestock production systems are highly variable.

207 Wood, A. P. (1976) 'Farmers' Responses to Drought in Ethiopia'. In: Hussein, A. M. (ed.) *Drought and Famine in Ethiopia*. African Environment Special Report 2. pp. 67–88. International African Institute, London, UK.

Key words: Ethiopia / drought contingency / migration / government role / social strata

During the drought of 1965–6, 90% of Ethiopian farmers had supplementary income, the major source of which was the sale of livestock. Other contingency measures included the use of stored grain, engagement in paid employment (primarily gathering firewood), borrowing money, and the sale of personal possessions. In the later years of drought many were forced migrate, a course of action which would not usually be considered by those of Mara, given the traditionally strong links with the land. So alien was the concept of moving that there was limited information about where it would be sensible to migrate to, as only 3 out of 94 family leaders had ever been outside the sub-provinces of the communities before. The government provided food and clothing to the migrants and designated four sites to accommodate them. The migrants themselves stressed the cultural and physical difference between the land they had migrated to and their homeland, some of which had practical impacts. Relationships between the migrant and host community were reported as good, but after a year the settlers had not learnt the local language, suggesting that they did not consider their migration as long term or permanent. There was a gradual flow of migrants towards the main road, which possibly led to a greater dependence on the government for assistance. Government action is needed, as it is at the times of stress that the labour market collapses, and food-for-work schemes may help to keep the farmers away from total dependence on external assistance. If implemented early enough, employment or assistance may keep the farmers on the land, thus avoiding the added stress of migration, which is increasingly becoming an enviable means of coping with drought.

The effect of the drought was not uniform on all social strata. Wealthier farmers survive even if their harvest is significantly below average, as a loss may be only in the surplus they would have produced over and above their consumption needs. So at any one point in time only a small portion of the population will have reached such destitution that they are willing to consider migration.

208 Young, J. (1992) *A Report on a Village Animal Health Care Workshop*, Kenya, February 1992. Rugby: Intermediate Technology Development Group.

Index to Annotated Bibliography

This index contains key words, authors and selected terms appearing in the titles of the annotated bibliography. It does not cover the introductory essay. Figures refer to the abstract numbers, not pages.

——A——

Abatan, A. A., 10, 86
Abbink, J., 1, 2
access, open, 124, 165
accountability, 98, 165
Achmed, M. F., 145
Ackello-Ogutt, A. C., 185
adaptation, 87, 118, 167, 191
  livestock, 121
  seasonal, 192
Ademosun, A. A., 3
Adu, I. F., 10, 86
advocacy, 52
Africa, 15, 16, 20, 46, 52, 61, 69, 88, 108, 110, 113, 114, 123, 124, 126, 129, 131, 160
African Ranches Ltd, 64
agenda setting, 154
agents, external, 17
agricultural drought, 136
agriculturalists, 18
agriculture, 67, 69, 97, 137, 147, 166, 175, 186, 192
  policy, 111
agropastoralism, 44, 117, 146, 153, 154, 185, 206
aid targeting, 47
Aken, N. B., 157
albedo, 112
Amin El-Tom, 102
animals, draft, 187
annual plants, 103
appropriate technology, 46
aridity, 69
Aronson, D., 4, 5, 6, 8, 12, 30, 44, 53, 82, 95, 170
Asiwaju, A. I., 27
assimilation, 134
Atampugre, N., 7
Atbara, 90
Awogbade, M. O., 8, 9, 10, 86

——B——

Ba, B., 157
Baggara, 166
Barker, R., 51
Barraclough, S., 11
Bates, D. G., 12
Baumann, M. P. O., 13
Bedouin, 167, 171
beef production, 23
Behnke, R., 14, 15, 16
Bennet, O., 157
Benson, C., 17
Berland, J. C., 18
Bernus, E., 19, 20
Berry, L., 22
biodiversity, 111
birth rate, 140
Blair Rains, A., 23
Blakeway, S., 24
Blench, R. M., 25, 26, 27, 28, 196
Bohle, H. G., 29, 127
Boosh, A., 90
Botswana, 49, 58, 65, 93, 105, 174, 195, 199
Boudet, G., 31, 32
Bougeot, A., 30
boundaries, state, 149
Bourn, D., 33
Bovin, M., 34, 35, 80, 134, 137, 153, 166
Brandt, H., 36
Breedveld, Anneke, 28
Breman, H., 37
bride wealth, 84
Buchanan-Smith, M., 38
Burkina Faso, 7, 34, 175
bush
  encroachment, 186
  fires, 37

——C——

camels, 141, 145, 177, 204
  herding, 87, 121
Cameroon, 77, 84
Campbell, D. J., 39
Campbell, W., 99
capitalism, 152
CARE, 97, 99
carrying capacity, 14, 31, 33, 34, 52, 80, 86, 89, 91, 100, 102, 107, 108, 109, 125, 137, 176, 186, 200
Catley, A., 40, 41, 42, 43
cattle, 33, 45, 61, 79, 173, 177, 204
  rearing, 9
census, 104
Central Africa, 3
Central African Republic, 151
Chad, 38, 74, 84, 96, 159
Chad, Lake, 25, 73
Chapman, G. P., 91, 107
Chater, S., 196
Chouinard, 8, 12, 30, 44, 53, 82, 95, 170
Cissé, A. M., 37
Cissé, S., 44
civil society, 97, 98, 99
Clark, N. T., 45
Classen, G. A., 46
Clay, E., 17
climate, 102, 120, 129, 202
  change, 22, 49, 51, 91, 110, 111, 122
  global, 163
  variability, 49, 81, 110, 163
  zones, 22
co-herding, 54
Cole, R., 47
collective ownership, 192; *see also* Common property
colonialism, 152

Colville, G., 48
commercialisation, 58
common property, 30, 78, 94, 106, 128, 165, 182, 189, 195
commons, tragedy of, 16, 78, 109, 128
competition, 143
Conant, F. P., 12
concertina economy, 58
conflict, 2, 11, 36, 89, 97, 98, 113, 138, 149, 150, 154, 157, 190, 202, 203
  ethnic, 34
  resolution, 98
conservatism, 34
consumption, 63, 95, 124, 170
Cooke, H. J., 49
co-operation, regional, 112, 125
Copans, J., 50
coping strategies, 47, 97
crisis, 162
  ecological, 2
  economic, 203
crop
  residues, 185
  rotation, 202
Cross, N., 51
Cullis, A., 52
cultivation, 31, 39, 90, 145
culture, 6

——D——

Dahl, G., 53, 54, 55, 56
data collection, 75
Davies, S., 38
de Brujn, Miriam, 28
De Haan, C., 57
de Leeuw, P. N., 61
death rate, 140
degradation, 11, 16, 22, 49, 93, 102, 111, 114, 124, 144, 169, 176, 178, 202
Delaney, P., 42
democracy, 6, 98, 157
demography, 104, 140
dependence, 142, 156, 193
desertification, 11, 91, 93, 101, 108, 109, 111, 116, 125, 136, 152, 161, 163, 169, 178, 179, 191
  as political statement, 178
destocking, 183, 188, 204
development, 5, 6, 12, 78, 88, 98, 100, 113, 126, 144, 147, 169, 171, 176, 186
  discrete areas, 160
  failures, 154
  participatory, 106
  regional, 203
  top-down, 154, 176
Devereux, S., 59, 60
Devitt, P., 58
Diarra, L., 61
Dietz, T., 62
diguettes, 7
discrete development areas, 160
disease, 3, 31, 173, 198
  epidemic, 81
  epizootic, 177, 206
disequilibrium, 179
diversification
  economic, 72, 101, 133
Djiteye, M. A., 37
donor agencies, 38, 157
  role, 36
Doornbos, M., 63
Downing, T. E., 29, 127
draft animals, 187
drought, 2, 20, 36, 45, 54, 56, 67, 69, 73, 81, 88, 97, 105, 109, 110, 120, 122, 123, 128, 136, 142, 148, 150, 163, 174, 176, 187, 207
  agricultural, 136
  contingency, 21, 57, 150, 195, 207
  hydrological, 69, 136
  impact, 17
  length, 175
  meteorological, 69, 136
  mitigation, 17
  preparedness, 62
  recovery, 54, 62, 142, 187, 198
  recurrence, 88
  seasonal, 102, 174
dry spell analysis, 175
dry-season pasture, 32
Dunbar, G. S., 64
Dyson, P. D., 65

——E——

early warning, 38, 70, 71, 72, 73, 74, 92, 110, 113, 162
East Africa, 28, 42, 97, 99
ecology
  crisis, 2
  degradation, 36, 44, 83
  disequilibrium, 179
Economic Community of West African States, ECOWAS, 125
economy, 68, 111, 126
  change, 144
  concertina, 58
  crisis, 203
  diversification, 72, 101, 133
  fluctuation, 179
  household, 142
  integration, 17, 56, 82, 101
  monetary, 170, 192, 195, 198
  national, 5, 17, 63
  pastoral, 126
  specialisation, 104, 206
  subsistence, 162
education, 51, 115
El Niño, 69, 163
Elsberse, W. Th., 37
emergency relief, 120, 162
employment, 68
encroachment, bush, 186
environment, 68, 112, 161
  change, 144, 150
  degradation, 20, 86, 112, 122
  fluctuations, 179
  management, 155
  pressure, 203
  refugees, 11
  stress, 67, 204
epidemic, 81
epizootic, 177, 206
Équipe Écologie et Anthropologie des Sociétés Pastorales, 66
erosion, 7, 22, 91, 111, 130, 148
Ethiopia, 1, 2, 38, 43, 63, 158, 162, 189, 190, 194, 207
ethnic conflict, 34
ethnicity, 190
evaporation, 46
exchange value, 123
export, 35, 63
external agents, 17

——F——

fallback area, 92
famine, 34, 38, 81, 97, 109, 113
  early warning system, FEWS, 70, 71, 72, 73, 74
  prevention, 97
  relief, 100
FAO, 67, 68, 72, 182
Farah, M. A., 43
Farmer, G., 69

farming
mechanised, 63, 145, 166
mixed, 61, 143, 144
peasant, 202
subsistence, 193
wildlife, 87
feed, 199
feeding methods, 185
Fernández-Rivera, S., 61, 205
fertiliser, 80, 205
Field, J. O., 29, 127
fire
bush fires, 37
wildfires, 32
fishing, 73
flood, 47
floristic composition, 103
food
aid, 47, 156, 193
distribution, 156
security, 17, 38, 39, 63, 68, 72, 74, 75, 84, 97, 105, 108, 117, 122, 126, 130, 139, 146, 149, 153, 155, 166, 174, 193, 202
supply, 84, 191
forage, 37, 61
forecast, rainfall, 65, 69, 92, 110
fossil fuel, 93
Frankenberger, T., 75, 139
Frantz, C., 76, 77
Fratkin, E., 78
Fre, Z., 157
Fricke, W., 79
Friis-Hansen, E., 80
Fulani, 3, 8, 95, 184; *see also* Ful≡e, Peul
Ful≡e, 8, 28, 34, 76, 77; *see also* Fulani, Peul
funding, 57, 151

——G——

G/wi, 174
Gado, B. A., 81
Galaty, J., 8, 12, 30, 44, 53, 82, 95, 141, 170
Gallais, J., 83
Garine, I. de, 84
GCCIP, 85
Gefu, J. O., 10, 86
gender, 99
Ghana, 115
Gillet, H., 87
Glantz, M. H., 88, 109, 163, 202
goats, 45, 135
Goldschmidt, W., 89
Gombe, 184
Gorman, M., 90
Gourma, 30
government
ranch, 23
role, 5, 8, 17, 39, 49, 50, 74, 91, 93, 99, 110, 130, 133, 134, 138, 151, 152, 153, 157, 160, 182, 190, 191, 199, 201, 205, 207
grain
reserves, 187
sales, 153
yield, 80
Grainger, A., 91
Grandin, B., 92
grazing, 61, 103, 107, 165, 195
laws, 9
reserves, 9, 10
Greater Horn of Africa, 42, 97, 99
group cohesion, 174
group ranch, 39, 94
Grove, A. T., 93

——H——

Hailu, T., 157
Halderman, J. M., 94
Hama, A., 95
Hammel, R., 96
Hanang, 134
Handule, I. M., 43
Harrison, G. A., 84
Harvey, P., 97, 98, 99
Haywood, M., 114
Heffernan, C., 100
herd
co-herding, 54
composition, 123
critical size, 58
diversity, 50, 117, 123, 180
growth, 54, 55, 135
management, 4, 5, 12, 55, 100, 116, 199
maximisation, 39, 53, 54, 117, 170, 198
optimal size, 117
ownership, 55
reconstitution, 95
splitting, 54, 55, 76, 92
structure, 54, 55, 56, 77, 89, 198
herder organisation, 21
Herren, U. J., 101
Hidore, 102
Hiernaux, P., 61, 103
Hill, A. G., 104
Hinchley, M. T., 49, 58, 65, 93, 105, 174, 195, 199
Hissène, M., 157
history
context, 19, 81, 138
oral, 51
Hitchcock, R., 105, 106
Hjort, A., 54, 55, 56
Hodgkinson, K. C., 107
Hopkinson, N., 108
Horn of Africa, 2, 112, 138
Horowitz, M. M., 109
horse, 87
Hoste, C. H., 129
household
economics, 142
food security, 17, 75
Hulme, M., 110, 111
hungry season, 74
Hussein, A. M., 207
Hutchison, R. A., 112
hybrid grains, 80
hydrological drought, 69, 136

——I——

Ibrahim, N., 29, 127
IDS, 113
IGAAD, 108
ILCA, 61, 114
ILEIA, 115
immigration, 39
import substitution, 120
income generation, 135
indicators, 75, 139
Indigenous knowledge, *see* Local knowledge
industrialisation, 93
information networks, 110
inputs, technical, 94, 195
institutional rules, 165
integrated approach, 154
intensification, 3, 72, 143, 155
intercropping, 192
Inter-Governmental Authority on Drought and Development, IGAAD, 108

Inter-réseaux, 116
investment, 186
irrigation, 73, 175
Ishtirak, 159

——J——

Jamtgaard, K., 128
Johnson, D. L., 117, 118
Jost, C., 119

——K——

Kajiado, 39, 92, 198
Kal Tamacheq, 95
Kalahari, 172
Kallah, M. S., 10, 86
Kamrany, N. M., 120
Kaputei, 94
Karamoja, 41
Karimojong, 119
Kassala, 145
Kay, R. N. B., 121
Kenworth, J., 122
Kenya, 38, 39, 62, 92, 101, 141, 142, 148, 149, 156, 177, 185, 198, 204, 208
Kerven, C., 123
Köhler-Rollefson, I., 145
Konczacki, Z. A., 124, 125, 126
Koppert, G., 84
Kotido, 41
Krings, T., 127
KwaZulu, 183

——L——

labour, 141
  costs, 185
  scarcity, 146
Lahawin, 90
Laikipia, 101
Lake Chad, 25, 73
land
  distribution, 111
  management, 11
  marginal, 120, 123, 191
  rights, 82, 123, 182, 189
  tenure, 9
  use, 30, 31, 49, 146, 148
Le Houérou, H. N., 129
Lee Gilles, J., 128
Leisinger, K. M., 130
Lembke, H. H., 36
Lembuya, P., 92
Leonard, D. K., 131
Leyland, T., 132
linkages, 93
Little, P. D., 109, 133
livestock, 3, 68, 101, 116, 121, 129, 141, 186, 195
  adaptation, 121
  as capital, 44, 124
  association, 56
  bank, 89
  destocking, 183, 188, 204
  draft, 187
  fertility, 104
  health services, 13, 41, 42, 131, 132, 158, 159, 173, 208
  marketing, 123, 199
  mobility, 103
  mortality, 104, 135, 187
  needs, 87
  off-take, 23, 45, 92, 123, 170, 194, 198
  population growth, 101
  production, 3, 20
  sale, 56, 84, 90, 153
loans, 21
local
  institutions, 99
  management, 16, 106
  knowledge, 12, 51, 52, 82, 115, 118, 125, 133, 137, 150, 151, 152, 155, 162, 169, 182, 190, 194, 201, 202, 206
Loiske, V. M., 134
Lufadeju, E. A., 10, 86
Lusigi, W., 150

——M——

Maasai, 39, 39, 92, 94, 101, 198
Mace, R., 135
Machakos, 185
macroeconomy, 17
  stagnation, 36
Maïga, C. K., 157
Mainguet, M., 136
maize, 80
Mali, 30, 38, 44, 61, 72, 95, 114, 127, 175, 180
malnutrition, 173
Malthus, 143
Mambila, 76
Manger, L., 34, 35, 80, 134, 137, 153, 166
manure, 205
marginal land, 120, 123, 191
marginalisation, 34, 50, 109, 134
Markakis, J., 138
market, 141
  system, 162
Massa, 84
Mauritania, 67, 74
Maxwell, S., 75, 99, 139
Mbororo, 76, 77
McCauley, H. M., 42
mechanised farming, 63, 145, 166
Meir, A., 140
Meneka, 21
meteorological drought, 69, 136
micro-climate, 202
Migot-Adholla, S. E., 141
migration, 47, 50, 134, 152, 162, 190, 193, 207
  out-migration, 56, 125
  seasonal, 90, 145
  urban, 88, 124
milk
  marketing, 173
  production, 180
millet, 114
mines, 157
mixed farming, 61, 143, 144
mobility, 16, 20, 50, 53, 77, 83, 92, 117, 133, 150
modern strategies, 134
modernisation, 9, 10, 118
Mohammed, A. Sh., 43
Mohammed, O., 157
moisture levels, 7
monetary economy, 170, 192, 195, 198
monoculture, 145
Moris, J. R., 142
Mortimore, M., 143, 144, 185
Mukogodo, 101
Mursi, 189, 190
Musa, B. E., 145
Mussey, 84

——N——

Namibia, 60
national:
  economy, 5, 17, 63
  interest, 194
natural resource management, 57

Ndagala, D. K., 146
networks, information, 110
NGO, 52, 104, 142, 150
  role, 17, 74, 82, 104, 110, 133, 151, 152, 182, 190, 191, 194, 200, 201
Niamir, M., 147
Niger, 4, 6, 21, 34, 74, 95, 151, 175, 181
Niger Range and Livestock Project, 4, 6, 181
Nigeria, 8, 9, 10, 26, 27, 48, 64, 76, 77, 79, 82, 86, 115, 164, 184, 192, 193, 196
nomadism, 18, 19, 32, 117, 140, 167, 171
nonseparabilities, 165
Nugent, P., 27
nutrient dynamics, 115

——O——

Oba, G., 148, 149, 150
OED, 151
off-take, livestock, 23, 45, 92, 123, 170, 194, 198
oil drilling, 171
Olkarkar, 92
open access, 124, 165
opportunism, 34, 94, 176
oral history, 51
Ornäs, A. H., 146, 153, 154, 155
Ouédraogo, B., 157
out-migration, 56, 125
overgrazing, 8, 16, 33, 36, 100, 103, 124, 128, 165, 193
overpopulation, 200
overstocking, 33, 150
ownership
  collective, 192
  private, 94, 128
Oxfam, 142, 156

——P——

Paine Conant, F., 12
PANOS, 157
paraveterinary services, 159
PARC-Ethiopia, 158
participation, 6, 7, 14, 19, 30, 134, 153, 160, 182
participatory development, 106
pastoral economy, 126
pastoralism, 5, 66, 116, 141, 148, 189
pastoralist associations, 116
pasture
  dry-season, 32
  wet-season, 32
peasant farming, 202
perennials, 37
Peters, H., 159
Peul, 4; *see also* Ful≡e, Fulani
plants
  annual, 103
  growth, 37, 129
Pokot, 62
policy
  agricultural, 111
  regional, 149
politics, 38, 138, 203
  emergency, 98, 99
  environment, 111, 166
  involvement, 134
  representation, 52
pollution, 111
population
  control, 125
  distribution, 114, 200
  growth, 8, 32, 35, 72, 83, 93, 124, 140, 184
  pressure, 4, 10, 20, 44, 49, 53, 76, 101, 108, 114, 137, 138, 143, 146, 205, 206
poverty, 58, 200
Powell, J. M., 61, 205
Pratt, D. J., 160
preparedness, 62
private ownership, 94, 128
privatisation, 116
  grazing land, 185
production objectives, 147
productivity, 107, 120, 129, 200, 205

——Q——

Queen's University of Belfast, 161

——R——

Rahim, N. A., 157
Rahmato, D., 162
raiding, 62, 148
rainfall, 22, 33, 87, 114, 120, 125, 129, 130
  prediction, 65, 69, 92, 110
  variability, 22, 37, 65, 112, 143, 149, 163, 202
Rajasekaran, B., 201
ranch
  government, 23
  group, 39, 94
ranching, 57
range management, 5, 14, 20, 31, 32, 100, 107, 130
rangeland, 57, 147
Rashaida, 145
Rasmusson, E., 163
rationality, 152
reciprocity, 58
Red Sea Province, Sudan, 47
refugees, 194
regional
  co-operation, 112, 125
  policy, 149
rehabilitation, 97, 99, 187, 193, 194
relief, 38, 113
  –development continuum, 99
  emergency, 120, 162
Renard, C., 61, 205
Resource Inventory and Management Limited, 164
restocking, 21, 100, 109, 135, 142, 149, 188
Richards, Paul, 102, 152
risk, 202
rules, institutional, 165
Runge, C. F., 165
runoff, 46, 111

——S——

Sahel, 7, 11, 22, 31, 32, 34, 36, 37, 38, 50, 51, 61, 71, 72, 74, 81, 87, 88, 104, 116, 130, 191, 205
Said, M. Sh., 43
Salih, M. A. M., 166
Salzman, P., 5, 8, 12, 30, 44, 53, 82, 95, 167, 170
Samburu, 177
Sandford, S., 168, 169
Schmitt, K., 130
Schneider, H. K., 170
Scholz, F., 171
SCIDR, 172
Scoones, I., 188
seasonal

adaptation, 192
drought, 102, 174
migration, 90, 145
variability, 122
seasonality, 53, 89, 103, 180, 184
SECADEV, 96
security, 120, 155
food, 17, 38, 39, 63, 68, 72, 74, 84, 97, 105, 108, 117, 122, 126, 130, 139, 146, 149, 153, 155, 166, 174, 193, 202
sedentarisation, 3, 5, 10, 19, 23, 31, 34, 67, 76, 77, 78, 83, 86, 104, 109, 118, 126, 138, 140, 141, 147, 148, 167, 173, 176, 180, 194
Seifert, H. S. H., 173
self-sufficiency, 10, 73, 184
semi-nomadism, 142
Senegal, 151, 175, 203
settlement, 8, 9, 82, 94, 184, 190; *see also* Sedentarisation
Shaw, T., 48
sheep, 45
Silberbauer, G. B., 174
Sivakumar, M. V. K., 175
slaughter, 95, 199
rate, 186
small stock, 204
social
capital, 99
cohesion, 105
controls, 147
differentiation, 109
division, 67
hibernation, 174
organisation, 7, 30, 35, 155, 160, 166, 174
restructuring, 135
status, 6
strata, 30, 53, 58, 101, 193, 207
structure, 2, 51, 182
socio-economic systems, 18
soil
conservation, 7, 201
degradation, 80, 91, 136, 137
erosion, 7, 22, 91, 111, 130, 148
fertility, 200
Sollod, A. E., 176
Somalia, 13, 45, 63, 194
Somaliland, 40, 194
Songhai, 95
Sørenson, J., 2
Southern Africa, 65, 111, 183
Southern African Development Community, SADC, 111
specialisation, economic, 104, 206
Sperling, L., 177
stagnation, macroeconomic, 36
state boundaries, 149
Stiles, D., 11, 16, 106, 178, 201
stock association, 56
stocking, 14, 185, 204
overstocking, 33, 150
rates, 183
restocking, 21, 100, 109, 135, 142, 149, 188
Stone, J. C., 39, 62, 63, 101, 121, 154, 176, 186
structural adjustment, 108
subsistence, 93
economy, 162
farming, 193
Sudan, 24, 38, 47, 63, 90, 145, 166
Sudanian zone, 31, 129
Suri, 1, 2
survival strategies, 62
sustainability, 16, 53, 107, 112, 143, 145, 201
sustainable
agriculture, 68
development, 98
Swift, J., 179, 180, 181, 182
symbiosis, 8
systems
approach, 148
traditional, 20, 105

——T——

Tanzania, 80, 134
Tapson, D. R., 183
targeting, aid, 47
taxation, 123
technical inputs, 94, 195
technology, appropriate, 46
terms of trade, 4, 112
Tiffin, M., 184, 185
top-down development, 154, 176
Topps, J. H., 186
Touareg, 50; *see also* Tuareg
Toulmin, C., 187, 188
Touré, B., 157
trade, 72, 122, 194, 200
terms of, 4, 112
traditional
strategies, 134
systems, 20, 105
tragedy of the commons, 16, 78, 109, 128
transhumance, 4, 31, 32, 173
Tribal Grazing Land Policy, 195
tsetse fly, 23, 33
Tuareg, 4, 30; *see also* Touareg
Turkana, 149, 156, 204
Turner, B., 144
Turton, D., 189, 190
Turton, P., 190
Twose, N., 191

——U——

Uganda, 41, 62, 156
United Nations, 75, 178
United Nations Environment Programme, UNEP, 11, 16, 106, 178
United Nations Research Institute for Social Development, UNRISD, 11
urban
demand, 35
migration, 88, 124
urbanisation, 88
USAID, 4, 42, 70, 71, 72, 73, 74, 133

——V——

Van Apeldoorn, G. J., 192, 193
Van Brabant, K., 194
van Dijk, H., 28
vegetation, 61, 87
degradation, 91
Vétérinaires sans Frontières, VSF, 197
veterinary
medicine, 5, 35, 126, 140, 199
services, 116
Von Kaufmann, R., 195

——W——

Wabarabaig, 134
wage employment, 47
Waller, R., 198
war, 47
Ward, K. W., 199

Ware, H., 200
Warren, D. M., 201
water, 94
  conservation, 7, 201
  development, 19, 30, 130, 147
  management, 11, 110
  points, 128
  resource, 46, 73
  retention, 7, 102, 121
Watts, M., 202
weapons, 2
weather, 37, 191
Weiker, M., 203
well management, 147
West Africa, 3, 23, 69, 70, 82, 104, 120, 175, 180, 202
wet-season pasture, 32
Wienpahl, J., 204
Wigley, T. M. L., 69
wildfires, 32
wildlife farming, 87
Williams, T. O., 61, 205
Wisner, B., 152
WoDaabe, 34, 34
Woldegabriel, B., 157
Wollo, 162
Wolmer, W., 206
Wood, A. P., 207
World Bank, 17, 57, 86, 157

——Y——

Young, J., 159, 208

——Z——

zebu, 173