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The Role of Mobility Within the Risk Management Strategies of Pastoralists and Agro-Pastoralists

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THE ROLE OF MOBILITY WITHIN THE RISK MANAGEMENT STRATEGIES OF PASTORALISTS AND AGRO-PASTORALISTS¹

Introduction

African livestock owners pursue their livelihoods in a dynamic and risky environment. The external dynamic processes that affect livestock keeping include population growth and migration, changes in exchange relations, intensification of crop cultivation, expansion of crop cultivation, and changes in property rights to croplands, natural pastures, watering points and transhumance routes. There are also a number of dynamic, and stochastic, processes that influence livestock keeping in the shorter-term, such as fluctuations in rainfall and market conditions. Together these long-term and short-term processes shape the production and investment strategies of individual livestock keepers and the institutional arrangements that define property arrangements among livestock keepers and their neighbours.

These dynamic and risky processes affect human welfare and environmental quality, some of which were discussed in detail at the Woburn and Matopos Workshops hosted by the Commonwealth Secretariat in 1990 and 1992 (Behnke *et al*, 1993; Behnke, 1992). Attention focused on the short-term dynamics of rainfall, forage availability and livestock production, and on the dynamic relationships between ecological change and livestock numbers. The evidence supports four propositions:

1. The greater the average annual rainfall received by an area of natural pasture, the lower the coefficient of variation in spatial and temporal variability of both rainfall and primary production;
2. Spatial variation in soil types and topography results in pastures that are very patchy. Certain patches may be utilised 10 or 20 times as heavily as other areas. In dry areas, patches of high production are most likely to be found along rivers or run-on areas;
3. Natural pastures receiving lower amounts of rainfall tend to be dominated by annual species of grasses. Livestock grazing tends to have little impact on grasses in such environments. Variations in climatic conditions are so frequent and large that they drive the livestock-rangeland system;
4. Natural pastures receiving higher amounts of rainfall tend to be dominated by perennial species of grasses. These pastures are more susceptible to grazing pressure and less susceptible to fluctuations in climatic conditions.

The workshops explored the implications for pasture management based on these propositions. Utilisation of arid pastures requires herd mobility and tracking strategies that allow livestock keepers to adjust animal numbers to match available feed resources. The main objective of individual herd managers and policy makers in such circumstances is to make optimal use of the periodically available forage with minimum wastage of the animals that convert that forage into valuable products. Utilisation of natural pastures in wetter areas with perennial grass species generally requires less herd mobility and changes in animal numbers but more careful attention to the overall stocking rate. Because livestock can have negative impacts on the vegetation, policy makers need to consider carefully the possible tradeoffs between short-term welfare and long-term productivity of the pasture.

This paper considers the role of mobility within the overall strategies available to livestock owners and the property rights institutions that govern access to and control of land resources. Key questions related to risk and risk management are:

1. What risk factors affect rural residents in different production environments?
2. What strategies do livestock owners adopt to deal with those risks?
3. What is the co-variation between different sources of risk?
4. Could increased mobility expose livestock owners to higher levels of other risks?
5. Are other strategies complementary or competitive with mobility and tracking?
6. Under what conditions might other strategies be preferable to mobility and tracking?

These questions are dealt with first, leading to a series of propositions. Once the role of mobility within the risk management strategies of livestock keepers is established, this paper considers the property rights institutions that determine whether or not such strategies can be implemented. Theory and case study evidence will support several propositions related to property institutions. The paper ends by drawing on the propositions to discuss the likely impacts of several policy options.

Household and Group Strategies for Risk Management

Discussions of African range management and policy tend to focus on the strategies and welfare of pastoralists. Swift (1988) defines pastoral households as those in which at least half of household gross revenue comes from livestock or livestock-related activities. Bonfiglioli (1992) estimates that there are 22.5 million pastoralists in 17 of the African countries with the largest populations of pastoralists. The total number of pastoralists in Sub-Saharan Africa is thus in the region of 25 million. Bonfiglioli (1992) notes, however, that there are very few 'pure' pastoralists who derive all their gross revenue from livestock. Most pastoral households also engage in activities such as the cultivation of cereal or vegetable crops, gathering, hunting, fishing or wage labour, which form important components of their survival and risk management strategies.

Most of the livestock in Africa are kept by agro-pastoralists, people who derive more than half

of their gross revenue from agriculture and at least 10 percent of their gross revenue from livestock (Swift, 1988). I estimate that in Sub-Saharan Africa there are about 240 million agro-pastoralists, 216 million of whom reside in households that derive significant quantities of feed from natural pastures and fallow lands. Therefore only about 12% of those who depend on natural pastures are pastoralists while 88% are agro-pastoralists. To different degrees, therefore, livestock keepers in Sub-Saharan Africa face many of the same risks and utilise many of the same strategies. Perhaps more important than the pastoralist/agro-pastoralist distinction is the distinction between livestock owners with less/more access to markets for livestock, cereals and wage labour.

Environmental Risks

As mentioned, spatial and temporal variations in rainfall result in corresponding variations in the quantity and quality of forage available from natural pastures and fallow lands. Variations in rainfall also cause variations in the production of planted crops. Binswanger and McIntire (1987) hypothesise that in low rainfall areas sedentary crop production is more risky than mobile livestock production. Crop risks pose risks for livestock which feed significantly on crop residues.

Other environmental risks are due to temperature changes, interactions with wildlife, and livestock and crop diseases. The level and variability of temperature determines both the suitability of different species and breeds of livestock and the potential benefits of herd movement. Domesticated livestock and wildlife interact through grazing, disease transmission and predation. Interactions through the forage base may have a negative impact on livestock production if the wild and domesticated species have similar foraging patterns and a positive impact if the foraging patterns are markedly different. Most livestock disease risks increase with the amount of rainfall.

Property Risks

Property is an expectation to a stream of future benefits and a property risk is a risk that a household or group will lose their access to or control over the resources from which they expect to derive future benefits. The most important resources for (agro)pastoralists are their animals, natural pastures, fallow lands and crop land. Livestock owners face property risks to their animals, as a result of severe environmental conditions (eg drought, lightning), diseases, changes in social relations (eg changes in livestock sharing and tenancy arrangements) and theft.

The risks of theft are closely related to overall security and the risk of violence. Security in pastoral areas in the horn of Africa and across the Sahel is particularly problematic at the present time. For example, over a two-week period in late January and early February of 1993, at least 700 cattle and 10,000 sheep and goats were stolen during raids in northern Kenya and at least 59 people were killed in the raids (*Daily Nation*, January 26-February 11, 1993). At a workshop on East African pastoralism held in December 1988 it was noted that as much as

half of the Turkana highland grazing areas had been declared to be "no-go areas" by the Kenyan authorities (Lane and Swift, 1989).

Livestock owners also risk losing access and/or control to grazing areas to absentee herd owners, commercial ranchers, state farms, wildlife conservation areas or small-holder agriculturalists. Over the last 50 years the Maasai and Barabaig pastoralists of northern Tanzania have lost grazing rights to large areas of pasture as a result of government policies that support private and state wheat farms, support the villagisation of transhumant pastoralists and the demarcation of national parks and conservation areas (Lane, 1991). The II Chamus pastoralists of Kenya's Baringo district have lost property rights to dry-season grazing areas through the encroachment of Tugen agriculturalists and the use of dry-season grazing areas by absentee and part-time herd owners (Little, 1987). In Somalia small-scale pastoralists have lost access to wet-season grazing areas through the introduction of new water techniques by commercial livestock producers (Swift, 1977). And across the Sahel population pressures and the advent of new crops and production practices are causing a northward expansion of cultivated areas so that crops (e.g. millet) are now regularly cultivated in areas where average annual rainfall is between 200 and 300 millimetres. As a result, dry-season grazing areas have been converted into croplands. Increased settlement has also increased the pressure on trees for fuelwood and timber.

Market Risks

Other risks are associated with the markets through which rural households obtain, or don't obtain, credit, insurance, production inputs, subsistence and luxury products in exchange for their labour and any surplus agricultural products. The degree of market dependence varies for different (agro)pastoral groups, with pastoralists particularly reliant on those markets. For example, revenue from milk sales comprised only 5 percent of average income among the pastoral Maasai of Kenya (Grandin, 1988) but 40-45 percent of average income among Fulani and Baggara pastoralists in the South Darfur region of Sudan (Kerven, 1987). Agro-pastoralists in a remote mountain village in Lesotho receive an average of 73 percent of their gross household income in the form of cash from the sale of labour and livestock products and obtain most of their consumption needs through local markets (Lawry, 1988).

Variability in the prices and availability of inputs, outputs and consumer goods create market risks. Market risks depend on the size of the transactions domain and the type of exchange mechanism. Producers who compete for markets with international competitors eg. producers of live animals in the Sahel who compete in West African urban markets with imports from Europe and South America are exposed to the vagaries of world markets, international disputes and currency fluctuations. On the other hand, producers operating in markets that are exclusively served by local production are protected from international market conditions but more exposed to variations in local market conditions. Variations in local market conditions may be dampened by the presence of reciprocal exchange mechanisms. Deterioration of the bases of those mechanisms exposes individual households to more market risk.

Correlation Between Environmental and Market Risks

Environmental risks and market risks are correlated in ways that change over time. For example, where most rainfall normally falls during a four month rainy season, livestock owners may initially react to an extended dry season by reducing discretionary expenditures and withholding animals from the market. Farmers may also hold cereal products from the market. The result is likely to be increases in the prices of both livestock and crop products, and relatively little change in the terms of trade between livestock and cereal products.

If rainfall conditions improve, animals will continue to be withheld to fatten on the newly available fodder. Livestock prices will continue to rise, then fall as fattened animals are released onto the market. Prices of cereal products would fall as new production becomes available. If, however, drought conditions persist, livestock owners may try to sell animals that would otherwise die. Large numbers of poor quality animals on the market will reduce the price quite drastically at the same time as cereal prices would continue to rise. The terms of trade would move dramatically against livestock producers until environmental conditions improve. Webb *et al.* (1992) document movements in the terms of trade between sheep and maize in Wollo before, during and after the Ethiopian famine of 1984. The sheep/maize price ratio fell by 75 percent between April 1983 and December 1984, then gradually rose to twice the pre-famine level by February of 1987.

Risk Management Strategies for Households

To survive in their risky environment, livestock-owning households adopt production and risk management strategies including mobility and migration, asset accumulation, diversification of domesticated animals, diversification of income and subsistence sources, migrant wage income, and adoption of new technologies. As Reardon *et al.* (1992) discuss, the virtual absence of credit and insurance markets in Sub-Saharan Africa makes these self-insurance strategies essential.

Mobility and Migration. Mobility is part and parcel of extensive livestock production in Sub-Saharan Africa. Livestock owners undertake mobility, ranging from daily herd movement to seasonal transhumance or migration. For agro-pastoral households and an increasing number of pastoral households, herd mobility usually does not imply household mobility. Normally many agro-pastoralists only undertake daily herd movement. If the areas around villages are used for crop production and livestock foraging, herders may move to cattle posts or cattle camps during the crop growing season and return to the village area after the harvests. For example, in Lesotho, households have grazing rights in their village areas and in specified cattle post areas where they own permanent corrals and huts. The animals are taken from the corrals to graze each day and returned at night (Shoup, 1987). Migration of the household unit is usually seen as a last resort measure for agro-pastoral households.

Efficient use of the variable and patchy forage resources produced in arid areas usually requires more frequent and flexible herd movement than is consistent with sedentary agro-

pastoral production systems. Stenning (1957) described three types of extended herd movement that are undertaken by nomadic pastoralists: transhumance is regular seasonal movement; migratory drift is the gradual displacement of transhumance orbits; and migration is the assumption of new transhumance orbits by a sudden and often lengthy movement. Pastoralists who adopt any of these strategies over long periods develop specialised knowledge about the environments that they exploit which is very costly for non-pastoralists to acquire. Pastoralists also develop working relationships with other pastoralists and agriculturalists that they encounter. In arid areas, differences in these transaction costs makes pastoral production strategies considerably cheaper than agro-pastoral strategies, and supports the continued specialisation of livestock and crop production systems (McIntire *et al*, 1992).

Migration patterns are affected by environmental conditions, government policies, new technologies, and public services. In West Africa there has been large-scale drought-related migration from the Sahel into the Sudan and Guinea areas. While much of this migration has been internal, some has been international. Policies and technologies have caused pastoralists in general to migrate permanently from tsetse-free areas in the semi-arid zone to tsetse-affected areas in the sub-humid zone. For example, the government of Côte d'Ivoire has encouraged migrants from the Sahel to settle more permanently in northern Côte d'Ivoire following the droughts of the 1970s and 1980s. Drug therapy and tsetse control techniques and the improvement of roads and communications systems is also fostering a permanent migration into tsetse-affected areas of Tanzania (Galaty, 1986) and Nigeria (Jabbar *et al*, 1990). The improvement of education, health and water services in towns have prompted pastoralists to settle closer to towns in drought-affected areas.

Asset accumulation and depletion. One of the main methods for self-insuring against risk is to accumulate food stocks and marketable assets. Due to the limited durability and storage costs of cereal crops, livestock are the major form of wealth and insurance substitute across much of Sub-Saharan Africa. Accumulation, depletion and replenishment of livestock inventories is also consistent with the "opportunistic" grazing strategies discussed by Sandford (1982).

Livestock owners tend to respond to drought or crisis conditions in steps. Webb *et al* (1992) discuss three stages that Ethiopian households went through during the famine of the mid-1980s: risk minimisation; risk absorption; and risk-taking to survive. Livestock were important in all three stages. During the risk minimisation stage, livestock owners tried to accumulate livestock and to minimise the risk of losing any. During the risk absorption stage, livestock keepers undertook measures to sustain their most valuable animals and marketed less valuable animals to buy food. In the stage of risk-taking to survive, households sold their most valued animals and/or migrated from their home areas.

Diversification of livestock species and breeds. By keeping more than one species of livestock, (agro)pastoralists are able to generate a wider variety of livestock products, harvest more of the available forage, use different environmental niches, and generate livestock

output in different seasons. For example, in Lesotho, livestock keepers graze their mixed herds of cattle, sheep, goats, donkeys and horses on different patches of mountain and lowland grazing areas during different seasons of the year (Lawry, 1988).

Different breeds of livestock have different production characteristics and abilities to handle stresses of nutritional deprivation, climate and disease. For example, the East African Zebu cattle are able to lower their metabolic rates under heat stress and quickly regain weight with improvements in nutrition (Western and Finch, 1986). The West African taurine breeds of cattle like the N'Dama, Baoulé and Muturu are tolerant to trypanosomiasis and apparently resistant to other diseases prevalent in the humid and sub-humid areas of West Africa.

Diversity and flexibility in crop cultivation. As noted above, most livestock-owning households engage in some agricultural production. For example, while the Dinka of southern Sudan consider livestock production their most important economic activity, they also cultivate crops including: sorghum (92% of households), tobacco (80%), pumpkins (71%), maize (39%), okra (36%), beans (29%), groundnuts (20%) and sesame (13%) (Lako, 1985). Agro-pastoralists in Ethiopia intercrop sorghum with chat or barley with lentils, and wheat, stagger the planting of crops with different maturation periods, and disperse their plots up and down hill slopes (Webb *et al.*, 1992).

Wage labour and self-employment. In many areas of Africa, wage labour and self-employment in non-agricultural activities are becoming increasingly important for rural households. Wage labour is particularly important as a risk absorption strategy during times of stress. For example, Fleuret (1989) compared wage labour in Taita households (Kenya) during normal and drought years. She found that 39 percent of households engaged in migrant wage labour in a normal year and 53 percent in a drought year. During the stress period, households with access to wage labour also employed more destitute people as casual employees.

Wage labour can also be important for pastoralists. Among the Samburu pastoralists of northern Kenya, the income from wage labour allows relatively wealthy households to maintain and expand their livestock holdings and relatively poor households to remain viable (Sperling, 1987). Young unmarried Dinka men who undertake labour migration and stock trading are able to use their earnings to accumulate animals more quickly than would otherwise be possible (Ring, 1990). Compared to agro-pastoralists, however, pastoralists may have less access to non-agricultural employment because they live in relatively sparsely populated areas (Webb *et al.*, 1992). The main disadvantage of labour migration is the labour shortages that result. For the WoDaaBe of central Niger, White (1990) noted that labour migration led to shorter herd movements, less herd splitting, poorer disease management, and greater reliance on boreholes rather than dug wells.

In some densely populated regions, however, the opportunities for non-agricultural employment are severely constrained even for agro-pastoralists. In a survey in the Wollo area of Ethiopia, for example, Alemneh Dejene (1990) found that only 3% of households participated in any non-agricultural income-earning activities. Wollo was the most severely affected area.

in the Ethiopian famine of the mid-1980s.

New livestock production techniques. The new production techniques that have been adopted most widely are water-provision and disease control techniques. In the arid areas of Somalia and Senegal, new boreholes have extended the grazing season and thus caused increased resource pressure in areas that were previously used only for wet-season grazing (Swift, 1977; Touré, 1990). Relatively wealthy livestock owners who can afford to pay for water are most able to benefit from such techniques. Trypanosomiasis control techniques, especially drug therapy and tsetse control, have allowed pastoralists in Tanzania and Nigeria to make greater use of natural pastures in the tsetse-affected areas (Galaty, 1986; Jabbar *et al*, 1990). Trypanosomiasis control appears to be prompting a large in-migration into the Ghibe Valley of south-west Ethiopia (preliminary results of own research).

A variety of feeding techniques (strategic feeding of agro-industrial bi-products, herbaceous legumes, multipurpose trees and improved fallows) have been developed but adopted less widely. McIntire *et al* (1992) note that the adoption of planted forages are affected by: 1. mobility, with the more mobile production strategies providing fewer possibilities for forage production; 2. labour supply, as forage production and feeding are labour intensive; and 3. overall supply of feed from other sources. Because they are consistent with mobility and labour constraints, agro-industrial by-products have been adopted most widely and appear to raise production successfully. Temporary tenure, insecure tenure, and multiple ownership of land and trees may constrain the adoption of feed production techniques like multipurpose trees that require relatively long-term investments.

Risk Management Strategies for Groups

Besides these 'self-insurance' mechanisms, groups of pastoral households also adopt 'group-insurance' mechanisms, including group inheritance of livestock, multiple-ownership claims to livestock and crops, livestock tenancy arrangements, and bridewealth. Many of these group insurance mechanisms are under pressure from new economic and political circumstances.

Sharing and hospitality. The sharing of food and productive assets generally appears to increase during initial periods of stress, then diminish under prolonged stress. Households suffering prolonged stress may rely on family members elsewhere who are not subject to the same stresses. Pastoral communities generally have stronger sharing institutions than agro-pastoral communities (Webb *et al*, 1992, Messer, 1989)

Group ownership and inheritance. Matrilineal group inheritance of productive resources, especially cattle, date palms, gardens and salt pans ('living milk') has been an important mechanism for inter-generational and inter-household sharing of assets among the Twareg of Niger. The demise of the institution in recent years has had negative impacts on the entitlements of women (Oxby, 1990).

Bridewealth. Bridewealth is an important mechanism for sharing livestock wealth. Ring

(1990) argues that the bridewealth practised by the Dinka has helped to maintain kinship relations and share livestock wealth across kinship lines and between generations. However, the increased purchase of animals with the proceeds of stock trading and wage labour is reducing the basis of the joint ownership that is central to wealth sharing.

Livestock tenancy arrangements. There are four types of arrangements by which African livestock owners share the management responsibilities and products generated by their livestock: 1. tenancy arrangements in which mobile pastoralists care for animals entrusted to them on annual or seasonal bases by sedentary agro-pastoralists in exchange for some of the products generated by the animals and the right to graze animals on the agro-pastoralists' harvested fields; 2. 'stock friend' arrangements in which pastoralists or agro-pastoralists will herd and manage others' animals on a reciprocal basis; 3. contract herding arrangements in which pastoralists herd and manage animals owned by settled agro-pastoralists in exchange for milk produced by the cows and/or cash; and 4. contract herding arrangements in which pastoralists herd animals owned by absentee investors. McIntire *et al* (1992) argue that livestock tenancy arrangements are an efficient solution to the problem of pastoralists wanting to expand their herds without a functional credit market and for settled agro-pastoralists to take advantage of the superior information and cost advantages of pastoralists' mobile production practices.

Patron-client relationships. Circulation of group property from richer to poorer households and from one generation to the other has been crucial to the recuperative power of WoDaaBe households in central Niger. However, since the drought of 1974, there has been a change in animal ownership with a sharp increase in the proportion of animals owned by farmers, merchants, and civil servants. These investors have been able to take advantage of changing relative prices that have made livestock relatively inexpensive (White, 1990).

Rotating credit societies. Savings clubs in which members contribute equal amounts of cash to a rotating pool are ubiquitous across Sub-Saharan Africa. They take the place of savings and credit institutions and often are used to finance lumpy purchases of building supplies or agricultural assets. Of all of the group strategies for risk management mentioned in this section, rotating credit societies are the only strategy that appears to be gaining popularity. They are quite consistent with the more atomistic and commercialised economies that are developing in rural Africa.

Propositions about Mobility, Risk and Risk Management

The above discussion supports several propositions:

- P1. The most important sources of risk for (agro)pastoral production are: 1. the risks of nutritional stress that are negatively correlated with rainfall; 2. the risks of livestock disease that are positively correlated with rainfall; 3. the risks of reduced crop production that are negatively correlated with rainfall; 4. the risks of low livestock prices that are negatively correlated with rainfall; and 5. the risks of high crop prices

that are negatively correlated with rainfall for households with recurrent crop deficits. The correlation between risks is strongest and most positive for pastoralists who are relatively immobile and dependent on purchased grains.

- P2. Property risks are one of the greatest constraints to pastoralists' mobility and production in the horn of Africa and the Sahel. The risks of banditry, theft and loss of life means that people stay closer to towns and keep their animals in larger herds. They are less mobile across wet-season grazing areas and more likely to over-exploit resources near towns.
- P3. The risks of expropriation of grazing rights are positively correlated with the suitability of the land for agriculture and wildlife conservation. The households that are most vulnerable to expropriation of grazing rights are those with the least cultivated land and those with the most mobile livestock production strategies.
- P4. The livestock and crop sectors are both complementary and contradictory. Increased crop production reduces mobility for households that raise crops and others who lose rights to dry-season grazing areas and transhumance routes. On the other hand, crop production can make new feeds available. Increased livestock production can improve crop production through the transfer of nutrients from pastures to crop lands and by providing animal traction. However, increased livestock production can also disturb standing crops and remove nutrients from crop lands.
- P5. Most new livestock production techniques affect mobility. For example, the use of trypanocidal drugs may enhance mobility by allowing livestock to go deeper into trypanosomiasis risk areas, while most feed production and water provision techniques reduce mobility.
- P6. In many areas of Africa, local non-agricultural employment provide the most attractive alternatives for (agro)pastoral households to become established or to survive unfavourable production conditions. However, because labour is removed from the household, migrant labour is inconsistent with labour-using mobility strategies.
- P7. The general deterioration of group risk management strategies is increasing the risks faced by agro-pastoral households. One way to counter this is to expand the transaction domain in which livestock owners exchange inputs, outputs and consumer products to include larger regional and international markets (Bromley and Chavas, 1989).
- P8. More active and efficient credit and livestock markets would reduce the need for asset accumulation as a risk management strategy.

Property Rights Institutions

After 25 years of debate between the proponents of privatisation (cf. Hardin, 1968) and the defenders of common property (cf. Bromley and Cernea, 1989), and 25 years of interventions designed to transform tenure institutions, most analysts now accept that there is no single property rights regime (private property, common property, state property, or open access) that suits all of Africa's natural resources. Participants at the Matopos Workshop noted that an important criteria for evaluating the performance of property rights institutions is the extent to which they accommodate herd mobility and tracking. 'Focal point management', in which key and limiting resources are managed by groups of livestock owners, was recommended as an appropriate management concept (Behnke, 1992). It is important to recognise, however, that focal point management may not be appropriate for all circumstances and that there are other factors to be considered when contemplating tenure policies. Anthropological evidence and theoretical findings are reviewed here to support several propositions about the institutions governing resource access and control.

Indigenous Common Property Institutions

Research on specific situations has pointed out that collectively-used natural resources are governed by regimes that approach the conceptual essence of common property; that is, a set of ordered institutional arrangements that define the conditions of access to, and control over, a stream of benefits arising from collectively-used natural resources. Common property is quite distinct from the "free-for-all" of open access in which everyone has the privilege to access the benefits derived from a resource and no one has the right to take control of or manage those benefits. Examples from Lesotho (Box 1) and Ethiopia (Box 2) serve to illustrate several points about indigenous common property regimes.

Box 1. Seasonal grazing rights in Lesotho

Since the beginning of the twentieth century, livestock owners in Lesotho have practised a system of seasonal transhumance in which animals are kept in village grazing areas and harvested fields during the winter months and moved to mountain pastures during the summer. A system of seasonal grazing rights was established in the 1920s to coordinate this transhumance, to protect the mountain rangelands from over-exploitation, and to protect crops from wandering cattle. The regime was enforced by the Paramount Chief and the Principal Chiefs. One of the main roles of the chief was to set the opening and closing dates (Sheddick, 1954).

Common Property Innovations

Most African countries have had experiences with pastoral or grazing associations, or group ranches that have been designed and implemented with the assistance of government and/or donors. Theoretical analyses suggest that common property innovations are most likely to be successful when a well-defined group of resource users holds effective property rights to a defined set of resources and there are effective mechanisms for group governance. The

Box 2. Seasonal focal point management

The Borana of Southern Ethiopia regulate the use of rangeland resources through the limited number of wells located at relatively wide intervals across the rangeland. Each well is considered to be the property of a particular Borana clan. The difficulty and expense involved in constructing and utilising new wells limits their numbers. Each well has a council of well-users and a 'father of the well' who oversees the daily operations. The limited supply of well water places an upper limit on the number of livestock that can be grazed on Borana pastures and the amount of labour available to the household restricts the number of livestock that any household can provide with water (Helland, 1982).

definition and enforcement of those property rights may require a central authority that can arbitrate between the interests of broad groups of the population and enforce boundaries and agreements between groups (Swallow, 1991). Informal governance mechanisms can be sufficient if group size is small, if members can impose credible punishments on those who violate implicit rules, or if there are financial, market or cultural restrictions that limit the ability of potential deviants to take advantage of short-term profit opportunities (Swallow and Bromley, 1994). Otherwise more formal governance mechanisms will be necessary. See Boxes 3 and 4 for examples.

Box 3. Eastern Senegal Pastoral Units

One of the World Bank's most successful experiences with common property management has been with the Eastern Senegal Livestock Development Project. During the first phase of the project (1976-1983), 53 pastoral units were established in about 10,000 square kilometres in eastern Senegal. The pastoral units collaborated with the project in the delivery of supplemental feed and veterinary supplies and served as collective guarantors of credit. Debt repayment was very high. During the second phase (1984-88), the pastoral units began to assume common property management as a secondary activity. A Protocol Agreement was passed in 1984 that permitted the pastoral units to register legally-defensible communal rights to grazing lands and watering points (Vedeld, 1992). The pastoral units began to administer grazing rotations to coordinate the grazing and watering activities of their members as well as the agricultural and livestock activities in the area (Associates in Rural Development, 1989; Bromley and Cernea, 1989).

Box 4. Grazing Associations in Lesotho

The Sehlabathebe Grazing Association was established in 1982 with support from the USAID-funded Land Conservation and Range Development Project as a mechanism for the residents of mountain areas in Lesotho to take greater control over local grazing resources. The 300 km sq. area allocated to the grazing association includes village grazing areas, cattle post grazing areas, and 11 villages. Village residents have been granted exclusive grazing rights to the area, a concept that project personnel have labelled 'controlled' communal grazing (Weaver, 1986). The enforcement of exclusive use by local residents resulted in an immediate reduction in the number of livestock grazed in the area. The consequent decrease in competition for forage has resulted in a regeneration of the rangelands and improvement in the condition and productivity of local animals.

The chief, the project manager, and the grazing association have been quite successful in enforcing the regime's boundary. They have been far less effective, however, in enforcing rules within the regime. Project frustration with the grazing association has resulted in the project playing an increasing role in the active management of the association. As of August 1986, it was the project manager, not the executive committee, who directed the range riders, set the dates for grazing rotation, and administered the finances of the association (Lawry, 1988).

State Property Regimes

In theory, a state property regime is a set of institutional arrangements in which the state retains direct control of the benefits derived from a resource by determining access and use rules for individuals (Bromley, 1991). In many African countries governments have proclaimed state ownership over all land, but in very few cases has this *de jure* situation been consistent with the *de facto* situation on the ground (Riddell and Dickerman, 1986). Several factors have contributed to the many failures:

1. state agencies tend to be rigid in their application of rules;
2. state agencies usually ignore, or even attempt to undermine, indigenous political structures and institutions;
3. state agencies often lack the power, authority and/or will to implement rules prescribed at regional or national levels; and
4. state employees who are responsible for the enforcement of resources use rules are often remunerated, legally or illegally, through the collection of fines.

However, a review of situations in which governments have attempted to manage public domain rangelands in cooperation with local authorities suggests that governments can play important roles in defining and protecting the 'boundaries' of common property regimes. Local community groups can play important roles in making and enforcing rules on local members.

Private Property Regimes

A private property regime is a set of ordered institutional arrangements in which the state protects the rights of certain individuals to access and control and manipulate resource benefit streams. Others have a right to expect that only socially-acceptable uses will occur, and a duty to refrain from preventing those uses. Economists note many advantages of private property including efficient allocation of pasture resources and investment in resource improvements (Hopcraft, 1981; Evangelou, 1984). Those arguments have been used to support the wholesale imposition of private property zoning and registration schemes for natural pastures in countries such as Botswana (White, 1992) and Kenya (Box 5). In other areas, such as the case from Somalia (see Box 6), private property has emerged spontaneously for small pasture areas.

Box 5. Private ranches in Kenya's Maasailand

Individual title to Maasai rangeland was first granted just before Kenyan independence in 1963. After independence, the Kenyan government and donor agencies supported group ranches and discouraged the development of individual ranches. Nevertheless, by 1981, 300 individual ranches had been adjudicated in Kajiado District. Adjudication of more individual ranches and subdivision of group ranches is now the trend in Maasailand. Solomon Bekure *et al* (1991) note that in many areas, group ranches now exist only in name. As of 1988, 29 of the 52 group ranches in Kajiado had resolved to subdivide their ranches.

Individualisation of pasture lands is consistent with national individualisation of arable land and with current economic and social trends in Maasailand. The decrease in average settlement size, for instance from 6.2 households in the 1950s to 2.7 in the 1970s, reflects more individualistic economic and social structures. The Maasai are also turning more frequently to cultivation as a means of diversifying their income sources, a trend that is consistent with their decreased mobility. The dispersion of domestic residences has resulted in a deterioration of the linkages between households and settlements, so that individual homesteads now generally maintain fewer, but closer relationships (Grandin, 1988).

Box 6. Semi-enclosed pastoralism in Somalia

The construction of deep wells in the Ceel Dheer District of central Somalia prompted agro-pastoralists to expand their enclosures to include land for grazing and forage production. These enclosures were supported by land law developed to protect cultivated fields from livestock (Behnke, 1988).

Evolution of Property Institutions

The regimes that govern the access to and control of pasture resources in sub-Saharan Africa are changing in response to shifts in the of political and economic power of the regimes' members, changes in production techniques, and changes in demand for the benefit streams generated by the resources. Customary authorities have been weakened by the actions of both colonial and post-colonial governments and by reductions in their economic power. Starr (1987) and Swallow (1991) describe these processes for cases in Niger and Lesotho. The economic and political bases for local collective action have also been reduced. Collectives that share resources are becoming more heterogenous in terms of their access to new techniques degree of commercialisation and access to political power. In many cases, the village economy is becoming more integrated into increasingly open regional or national economies. This is enabling villagers to take greater advantage of external economic and political opportunities and more non-residents to exploit village resources.

Many non-economists who have studied the evolution of resource management institutions in intensifying crop-livestock production systems have focused on changes in power as the primary force, and imposition and spontaneity as the main processes of regime change. For

example, Lane (1991) argues that the main causes of the displacement of Barabaig pastoralists from the Arusha-Ngorongoro area of northern Tanzania to more southerly areas are related to power. Due to their greater political power, agriculturalists and conservationists have been able to displace pastoralists from their former rangelands to make way for large and small-scale farms and national parks. In those areas the Tanzanian government has imposed a new tenure regime that is consistent with its policies of villagisation and wildlife conservation.

Economists tend to focus on changes in economic conditions as the main forces behind regime changes. For example, Bromley (1991) argues that a change in economic conditions (eg. factor prices, production technique, marketing technique) that makes a resource, or an investment in a resource improvement, more valuable to the members of a collective will prompt the collective to re-evaluate the appropriateness of the regime and possibly invest funds to change it. Property rights theory suggests that the demand for individualised property rights to a resource will be greater, the greater the potential to generate economic rents, the lower the spatial and temporal variability, the lower the private costs associated with the protection of boundaries, and the more efficient the public land tenure system (cf. Runge, 1986).

Propositions about Property Institutions and Mobility

- P1. The management of key resources is most important in situations where certain resources constrain production. Watering points are the most obvious candidates for focal point resources.
- P2. Institutions that regulate grazing rights need to be most formalised, rigid, and heavily-enforced in areas that have high potential for alternative uses. The more formal and rigid, the less the room for mobility.
- P3. Local authorities are best equipped to enforce regulations affecting the type and timing of resource use.
- P4. African governments are rarely effective in directly managing public domain rangelands but can be effective in defining the boundaries between rangelands. Boundaries clearly define the domain for herd movement. Care must be taken to set boundaries to encompass a variety of resources.
- P5. There are complex relationships between property rights institutions and the adoption of new techniques of water provision, disease control and feed production. On the one hand, the provision of new production techniques can increase the demand for individual property rights. Spontaneous tenure change can result. Alternatively, livestock owners may choose to locate new investments only on land for which they have secure and undivided tenure.

Evaluation of Policy Instruments

Governments and donor agencies can be positive agents of change in Africa's extensive livestock-natural pasture systems. Preservation and enhancement of mobility and tracking is one policy objective for governments and donor agencies. Other policy objectives are to:

- increase the production of livestock products;
- increase the economic returns generated through the production of livestock products;
- diversify the sources of livestock owners' incomes;
- decrease the riskiness of livestock keeping as a livelihood option;
- diversify the sources of livestock owners' incomes; and
- maintain or enhance the productivity of natural pastures and fallows.

The ultimate goal of policy interventions is to enhance and stabilise the capabilities and entitlements of pastoralists and agro-pastoralists. There are several policy instruments that might advance that goal and are related to mobility.

Drought Recovery Instruments

Governments can assist livestock producers, particularly pastoralists who are exposed to the greatest and most covariant risks, to recover from the effects of extended drought or other sources of famine. One mechanism that has been used successfully in northern Kenya is restocking. For example, drought-impooverished Turkana pastoralists have been provided with sheep and goats, pack donkeys and maize (Hogg, 1987). Restocking can also help pastoralists to re-initiate the mobile strategies over which they have a comparative advantage.

What needs to be worked out on a case-by-case basis for restocking programmes are: the portion of loan versus grant (to be sustainable by African governments it must be mostly loan); the need for veterinary inputs to accompany the capital assets; and the mechanisms for repayment of loans. The East Senegal Livestock Development Project had success with issuing loans to groups of livestock owners who were then jointly responsible for repayment by individuals (Bromley and Cemea, 1989). Most pastoral groups have customary institutions for livestock loans that can be used as models.

Security

In many areas of Africa, especially in the Horn of Africa and the Sahell, governments have the potential to improve people's welfare by increasing security for people and their property. Improved security can support grazing patterns that are more mobile and take advantage of a wider range of permanent pastures.

Development and Extension of New Techniques and Inputs

International, national and regional research organisations are investing resources to find new

techniques for disease control and feed production. Important questions for judging the appropriateness of such techniques are:

1. Are the techniques labour-saving or labour-using? Labour-using techniques such as improved fallows or alley farms are likely to compete directly with mobility, another labour-using technique. Veterinary treatments are more labour-saving and consistent with mobility.
2. Do the techniques require fixed investments and inputs? For example, community-based tsetse control programmes using the new traps and targets require investments and maintenance inputs into particular areas of land, while trypanocidal drug treatments move with the animals. Fixed investments mitigate against mobility.
3. Are there mechanisms in place for the consistent and timely provision of the necessary inputs? My experience in a tsetse-infested area of Ethiopia shows that people are prepared to pay considerable cash for reliable supplies of veterinary inputs but that the black market private sector is much more reliable than the public sector in delivering supplies.
4. What animal health services are most appropriately supplied by government veterinarians, private veterinarians or veterinary auxiliaries?

Changes in Property Rights Institutions

The discussion of property rights institutions supports the concept of co-management in which state agencies define and enforce group property rights and the boundaries between regimes, while local groups of resource users define and enforce rules within the boundaries of the regimes. In arid areas the boundaries may define the areas served by specific watering points, while in more humid and highland areas the boundaries may be more associated with natural boundaries between areas of natural pasture and fallow. The areas should be large enough to permit mobility and flexible grazing patterns but small enough so that groups are relatively homogenous and the costs of information, contracting and enforcement are relatively low. If possible, boundaries should correspond to the jurisdictions of customary authorities. Once such boundaries are accepted and maintained, there may be room for the development of tenancy relationships or markets for trading grazing rights between groups.

In agro-pastoral areas, certain tenure innovations may be necessary to support the adoption of improved feed production and feeding practices. This may often simply require the elimination of government distortions, such as the forest codes of West Africa, or the development of institutions for private ownership of land or trees.

Market Development

One of the most important arenas in which governments can enhance and stabilise the entitlements and capabilities of livestock owners is through market development. It was noted above that major sources of risk for livestock producers are the markets in which they purchase inputs, sell livestock and other agricultural products, and purchase consumer goods. For households that are net producers of livestock products and net consumers of crop products,

market risks amplify, rather than decrease environmental risks. The amount of amplification depends on the size of the transaction domain in which livestock owners transact. The more localised livestock and crop markets are, the greater the amplification. Governments can reduce the co-variation between environmental risks and market risks by undertaking market development initiatives. Such initiatives are more urgently needed where customary sharing institutions are declining.

With appropriate developments and reforms, more rural people will come to regard markets as reliable mechanisms for securing their subsistence. They will then become more adept at using the market to their advantage. For example, the development of markets for live animals can also reduce the need for individual households to accumulate livestock and attempt to hold them through drought periods.

Governments have several policy instruments for fostering market development. They can support the construction of general physical infrastructure, like roads, bridges and communications, or of specialised marketing infrastructure, like livestock sales pens and trek routes. They can eliminate state monopolies and encourage fair competition in the markets for agricultural inputs and outputs. They can reduce restrictions on inter-provincial or inter-district movement and trade in livestock and agricultural products. And, perhaps most importantly, they can adjust macro-economic and international trade policies to encourage more trade between neighbouring countries.

Income Diversification and Rural Economic Development

In the long term, governments and donor agencies can have the greatest impact on the welfare of pastoralists by promoting labour intensive industries as part of a strategy of rural economic development. Most of those industries will produce and process livestock and agricultural products. For example, the dairy industry in Kenya employs large numbers of rural residents in producing feed, producing milk, collecting and selling raw milk, processing dairy products, and retailing. In other situations, cash crops such as pyrethrum or horticultural crops will be more appropriate. No matter what the product, however, all rural-based industries will rely on the infrastructure and institutions that support market transactions.

Notes

1 This paper draws heavily on another paper I wrote under the auspices of the programme on "Tenure Issues in Natural Resource Management in Sub-Saharan Africa" at the Land Tenure Centre, University of Wisconsin-Madison (Swallow, 1990). The International Livestock Centre for Africa (ILCA) supported the preparation of the paper and the Commonwealth Secretariat covered some of the costs of my attendance at the Workshop. Peter de Leeuw, Robin Reid and Kimberly Swallow provided useful comments on a previous draft of the paper.

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