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INTERVENTIONS FOR AFRICAN PASTORAL DEVELOPMENT UNDER ADVERSE PRODUCTION TRENDS

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Introduction

1. This paper analyses the selection of livestock interventions aimed at the transformation of indigenous pastoralism. It is well known that the first generation projects implemented by newly independent African governments in the 1960s usually failed because of severe implementation problems. Among these were the low degree of commercialisation among producers, a high disease challenge, poor transport and communications, absence of technical staff, and low prices. There was also uncertainty about land rights and the choice of institutional setting to promote livestock development.

2. In the 1970s, however, it seemed that the earlier constraints were being overcome:

   - techniques of range management seemed applicable to African dry lands;
   - disease control measures became operationally effective;
   - there were new frameworks for group involvement of pastoralists (either associations, committees, or group ranches);
   - the veterinary services emphasis of the delivery system was broadened to incorporate new technical packages for animal production;
   - external credit was extended to the pastoral sector;
   - infrastructure (communications and water) was greatly improved;
   - training programs began to provide needed technical staff; and
   - higher prices because of rising demand were anticipated.

3. The rapid expansion of government activities oriented towards Africa's pastoralists which took place in the 1970s assumed that these favourable trends would predominate in the production environment. It seemed that pastoralism was becoming commercialized, and that a production breakthrough was technically feasible. For a brief period, external lending by the World Bank, USAID, and other donors was greatly increased and many livestock projects were established throughout Africa's drier lands. Today, in contrast, external financing has largely dried up as project after project has failed to meet its targets. What went wrong?

4. Anyone analyzing the continuing low performance of African livestock projects, particularly those oriented towards moderinizing pastoralism,

can no longer blame the implementation constraints experienced earlier. Access to Africa's dry lands is now much better; large cadres of technical staff have been trained and appointed; pastoralists are now eager to find a more secure and profitable livelihood; and rapid urbanization has created an expanded market for livestock products. In short, the economic transformation envisioned in the early 1970s has occurred; and yet pastoralists have become further marginalized and most livestock interventions remain operationally and economically unsuccessful.

5. To explain why this should be so, one must begin by reviewing the characteristics of indigenous pastoralism as a system. Then the major technical and institutional interventions are described, along with the reasons why they have proved so difficult. A finding emerging from this review is that over and above these proximate considerations are emergent adverse trends with major implications for the performance of livestock projects. These issues are discussed in sequence under the relevant headings of the paper.

Characteristics of African pastoralism

6. Studies of African pastoralism suggest that the traditional systems shared several features which account for producers' ability to use a harsh and uncertain environment. Almost always people relied upon several species: sheep, goats, cattle and either camels or donkeys. The key constraints were low rainfall, the long dry season, and the spatial variability of precipitation. In reaction, people started to rely more on browsing animals (like camels or goats) and shifted their households over the season. By leaving grazing as a common property resource, the resource use system permitted maximum flexibility in response to the vagaries of rainfall and disease outbreaks. Smallstock were traded for grain, and in good years allowed for a comparatively rapid recovery of flocks and herds. The system was quite labour intensive, with separate herding for young animals and those not in milk. Contrary to many statements, existing resource use was comparatively efficient when considered in relation to environmental constraints.

7. These features explain why in the past pastoralists made little use of permanent investments (fencing, paddocks, and irrigation) and resisted

mass education (because of competition for labour). While they sold smallstock readily to obtain grain and cash over the season, they treated their large female animals (cattle and camels) as capital which were sold only in extreme circumstances. Offtake of large stock into commercial channels took place mainly in years of drought, when the larger system often could not absorb the many animals on offer. As a consequence, pastoralists' terms of trade vis-à-vis grain farmers tended to decline precipitously. The overall production system was not in equilibrium, but showed an opportunistic build-up of stock populations in good years balanced by high losses during major droughts.

8. Many of the problems in Africa's first generation livestock projects after independence can be explained in relation to the very poor fit between the technologies being promoted and the recipient systems. Obvious points of friction included:-

   - the preoccupation of project interventions with cattle, to the exclusion of small ruminants and camels;
   - an end-sale meat production orientation whereas indigenous systems emphasized production of milk and breeding stock;
   - promotion of rotational grazing in environments where this practice increased risks and did not outperform indigenous grazing methods;
   - lack of a technical solution for periods of extended drought;
   - failure to protect pastoralists' terms-of-trade vis-à-vis grain producers, especially evident in dry years;
   - introduction of unsuitable breeding stock requiring high management skills;
   - rapid deterioration of facilities provided to pastoralists;
   - inability to offer attractive prices for superior stock.

9. Detailed field studies have shown that existing production was relatively efficient when compared to other systems with similar constraints. Those pastoralists who enjoyed access to higher prices and good marketing did enter the market, with Somalia's traditional sector becoming a major supplier of Saudi Arabia's market (until blocked by Saudi Arabia in 1983). In the drier areas, at least, studies failed to find an untapped surplus of livestock being held supposedly for "prestige" reasons.

Inventory of livestock interventions

Technical interventions

10. Water development has been probably the most effective single intervention, though not leading to the hoped for commercialization of the system. It can consist of seasonal ponds ('hafirs'), shallow wells (if technically feasible), or deep wells ('boreholes'). Problems have been the rapid buildup of livestock numbers around a water supply point, the alienation of land to crop farming or outsiders, high water losses and siltation, and the inability to keep pumps operating. In ponds, protection of the catchment is especially important. There are also human health risks from contamination, and the need to protect physical structures.

11. Breed improvement is often thought to provide rapid increases in productivity; in reality, outside breeds often perform poorly under the severe constraints seen in dry lands. The usual approach has been to introduce males from other areas, e.g. Boran bulls to the Kenya Maasai — sometimes accompanied by the formal organization of a "bull station" to serve the community. Communal care of breeding animals requires close supervision, and is best left to areas with a strong communal tradition. A major policy issue is whether to aim at upgrading of local breeds, cross-breeding with external types (to retain disease resistance but increase output), or replacement by external breeds (e.g. imported dairy stock). The latter policy usually requires major improvements to nutrition and health care.

12. High technology options also exist, either fetal implants to speed up introduction, or artificial insemination. The latter requires that farmers notify insemination staff quickly, and that staff have access to liquid nitrogen storage of semen and adequate transport.

13. Grazing blocks have been instituted many times, often in combination with restrictions on herd movement and even forced destocking. One common system was to lay down 5 blocks, 4 used in each year (for 3 months each) and one rested and then burned. The regulatory focus of such grazing schemes has made them highly unpopular with pastoralists. In some cases rich owners have been able to control access while keeping extra animals outside the scheme. Few grazing schemes have succeeded in the long

run, but they remain a common government approach to the problem of livestock numbers on common range.

14. Range management has been mostly a post-colonial approach, adopted once the earlier attention to veterinary measures was broadened to include concern for animal production. Range management projects typically begin with measurement of pasture resources, using thus resulting data to design a management plan for a particular area. Recommended stocking rates are then established, and a system of rotational grazing between blocks worked out. Range management projects usually include provision for water supplies, firebreaks, and marketing facilities; sometimes they hire marketing speicialists and sociologists. In some countries, a range management division has been set up at Ministry headquarters, and perhaps specialized training in range management established within the country. A few range management projects have also included an extension component, or provision for herders' associations. Range management in the past was strongly top-down in its approach, since technicians make the key decisions and people were often told that they were destroying their resources. Recent experimentation has been with more participatory approaches, the establishment of assocations, mapping of people's traditional rights and movements, and introduction of short duration grazing.

15. Veterinary campaigns constitute one of the oldest approaches, often implemented by mass innoculations in an attempt to clear entire areas of an endemic disease (e.g. rinderpest campaigns). In addition to mass innoculations, most countries try to diagnose disease outbreaks and institute qauarantine measures while also controlling stock movements. Foot and mouth disease has been an especial problem in Africa since European countries will not import meat from FMD areas.

16. Tick control is usually obtained by either communal acaricide 'baths' ('dips') through which livestock are driven once a week, or by issue of portable spraying equipment to individual owners. Dips require a water supply and backup organization to deliver acaricide drums; they constitute fairly large and expensive structures. To be effective, dipping must be adopted by all categories of stock and all herds in an area. The acaricide must be checked and renewed to keep it to strength. Usually this means having a salaried 'dip attendant', supported either by the community or, more

commonly, by the veterinary department. It is useful to have also a 'dip committee'. The days for 'dipping' provide an excellent occasion for extension work and for monitoring herd structure. The financing of acaricide supply remains very problematic, especially because it requires foreign exchange.

17. Fodder banks consist of a centrally located and fenced area which a herd owner establishes as a forage reserve. When fenced, the area is used for keeping animals at night until the rains begin, at which time it is seeded to a legume which is theoretically reserved for use by the calves and milking animals during the dry season. In the succeeding season, the area may be planted to a grain crop to tap the build-up of nutrients which will have occurred. This innovation (pioneered by ILCA near Kaduna in Nigeria) tried to encourage owners to identify the key livestock with greatest nutritional need in the dry season. It also encourages an individuation of holdings, since the physical investment in fencing reinforces the herd owner's continued claim to the land so improved, which can be gradually extended as new fodder banks are established.

18. Grazing cells based on the 'Savory system' for short duration grazing have been set up in parts of southern Africa. Initial capital costs are high, since the idea is to have a set of fenced paddocks (looking like the segments of an orange in cross-section) arranged in a circle around a water point. The gate to each paddock is at its narrow end opposite the water point. The animals graze in one paddock at a time, but use the grass for only a short period before being rotated into the next adjoining paddock. They are also herded in the traditonal way, with stock being forced to graze as they move to and from the water point (thus minimizing the overgrazing of the more palatable species). Savory has claimed that regularized use of short duration grazing can allow higher stocking densities than is permitted under uncontrolled grazing.

19. Stockroutes, holding grounds and field abattoirs are all measures which may be instituted to improve livestock marketing, either by lowering costs and risks associated with stock movement or by bringing the point of slaughter closer to producers. As land becomes more intensively utilized, these become more important. However, such facilities have often been left to fall into disrepair, perhaps because of the financial difficulties

experienced by parastatal marketing companies. Field abattoirs can be especially important during drought years, when they can handle 'salvage' sales of livestock too weak for external trekking. In such situations, they help protect pastoralists' terms of trade.

20. Camels and milking goats are being introduced to ex-cattle pastoralists who live in areas subject to increasing drought or with ample browse. Official government programs in the past paid almost no attention to these species, but it is now realized that having access to camels or milking goats has a tremendous advantage to pastoralists who must live on milk for extended periods.

Institutional interventions

21. Group/cooperative ranches are an attempt to incorporate existing social groupings as a basis for allocation of land title, by making them the owners of a commercial entity intended to operate as a commercial ranch. Management is often by a committee, perhpas advised by a technician. While this solution keeps outsiders from "grabbing" common lands, it may still exclude other pastoralists who used such land seasonally. There have been many difficulties over management and control of finances in group ranches.

22. Parastatal ranches are an alternative approach, often adopted on lands which have been cleared from tsetse infestation. They generally aim at beef production by a parastatal agency which controls the ranches and does the capital development (staff, water, fences, firebreaks, etc.). Few parastatal ranches have run at a profit, and many have had difficulties with cash flow (disease outbreaks), security, and trespass. They tend to occur where governments do not want to give large tracts of land to private individuals.

23. Fattening/stratification programs seek to uncouple livestock breeding from the finishing of stock for final sale. It was hoped that the drier lands would concentrate upon a cow/calf operation, producing the immatures which could be sold to those in the higher rainfall zones for fattening (perhaps using crop residues). Some countries have used mainly credit to finance the purchase of immatures. Others have tried to establish feedlots near sources of demand or slaughterhouses. Feedlots have a

poor record in Africa because of highly unstable sources of feed concentrate, and also unpredictable price variations.

24. Service centers and barefoot veterinarians represent institutonal innovations to insure that producers have access to drugs and animal health care within easy reach. Field veterinary centers may be established as an organizational base for the stocking of drugs and the offering of simple treatment. Alternatively, local communities may be encouraged to employ their own field assistants after a short period of externally assisted training. However organized and staffed, such units are only effective if supported by training and supervision from a higher level which can insure access to drugs and adequate quality control for the services offered.

25. Herders' associations can be established to open the door for local participation in the provision of services and the regulation of grazing. In theory, they can serve several purposes: i) to raise investment capital locally; ii) to channel credit; iii) to operate joint enterprises, such as a ranch or livestock trading; iv) to regulate stocking quotas and rates; v) to pay for services by means of levies; vi) to control trespass; vii) to employ service delivery staff; viii) to buy and hold supplies and drugs; ix) to build and maintain water supplies; and x) to be the point of contact in extension campaigns. These are very ambitious objectives, seldom realized in practice. Herders' associations require much organizational support, especially in societies which lack hierarchical or stable leadership. They are also subject to capture by richer members or by local elites. Nevertheless, they remain an attractive option for giving pastoralists more say in service delivery.

26. Mobile extension units have sometimes been created to convey new ideas. At first this was done by mobile cinema vans, usually under Ministry control, which might travel from market to market. An alternative 'low technology' option has been travelling puppet shows, which have been very popular where pastoralists are accustomed to gathering for evening entertainment. More recently attention has shifted to using these units for exchanging information between pastoralists, and for incorporating local knowledge into officially sponsored extension outreach (introducing a two-way information flow).

27. Restocking projects are designed to provide pastoralists who have lost most of their animals with the means to rejoin the pastoral economy. Most such projects give destitute households goats or sheep, but in West Africa sometimes a few larger animals are given out. The transfer may take the form either of an outright gift or a loan, with restrictions on sale or slaughter. To re-equip a household with small stock requires between 30 and, say, 80 animals selected to insure a large proportion of breeding females. Usually a donkey or camel is included to provide transport, and recipients may be given food rations during the initial period to keep households from selling or killing the stock they receive. Restocking projects have been very popular.

28. Sedentarization efforts aim at settling former nomads onto fixed parcels of land, usually around water points and where there are social services. Many countries would like to see nomadic peoples settle, so that services can be planned and commercialized production encouraged. The actual record is disappointing, since there are often negative environmental impacts.

29. Small-scale irrigation has often been introduced in the hope that ex-pastoralists might be able to grow their own food and thereby reduce dependence upon their herds for subsistence. Such projects of course require a reliable water supply — a need which puts irrigators in competition with pastoralists wherever water is scarce. Most small-scale irrigation projects have proved very expensive, because of the small areas actually irrigated and the few beneficiaries; output has also been disappointing. Such schemes usually require specialized assistance and backup support (fuel, pumps, pest control) which can prove difficult for a community to organize. Negative environmental impacts (malaria, nematodes, loss of trees) have been great.

30. Water harvesting is also sometimes suggested as an answer to pastoralists' needs for alternate food and forage supplies. It is more effective when done by means of micro-catchments oriented towards trees and horticulture; there are few examples of success in regard to grain and forage production. In essence, water harvesting represents a diversion of water to concentrate surface flow higher in a drainage. (Roadside runoff collection points represent an alternative example). It should be recognized that trees

in the dry zones are usually located according to drainage rather than rainfall — the implication being that water is being used by trees even if it may seem to be "wasted". Successful water harvesting requires major attitudinal changes among the people, and tends to accompany a settled way of life.

31. It would seem from the diversity of measures outlined above that most possibilities have already been tried, at least in a few sites somewhere within Africa's dry lands. The three interventions not yet attempted "on the ground" are:

    i) technical packages oriented around the use of old kraal sites (to tap their enriched nutrients);

    ii) experiments to find alternative approaches to primary schooling which also permit herding; and

    iii) better use of indigenous knowledge within field programs.

Why the improvement of pastoralism is so difficult

32. In the process of implementing the many different project types itemized above, African governments and external donors have been forced to recognize that it is not easy to improve upon traditional pastoralism. Earlier, officials condemned traditional practices without understanding the systemic reasons which accounted for their success. Experienced livestock advisors are today much more cautious in predicting how interventions will perform, because they know at first hand what the difficulties have been. These include:-

    (i) Effective development usually requires inter-sectoral cooperation between different technical functions. The key areas in regard to pastoral development include how water and land rights are allocated, land use planning, the financing and operation of improved water supplies, veterinary services, adequate security, available animal production packages, and extension contact and training. Most of all, improved marketing is essential so that producers receive attractive prices. It is, in fact, fairly rare to find these inter-linked measures operationally effective in the same place.

(ii) There are in fact relatively few 'technical packages' which perform well under adverse managerial and resource circumstances. Most improved practices which livestock development departments have been recommending are suited to more highly capitalized, medium-to-high potential ranges. The heavier beef animals which pastoralists were urged to adopt require better forage and more water than can be supplied in dry periods. Indigenous stock have generally shown greater disease resistance, trekking ability, and hardiness than the introduced stock being promoted.

(iii) Some of the grazing and disease control measures require joint action by all users of a range before they are profitable to individuals. Tick control or saving forage until later in the season are wasted effort if they are only partially adopted.

(iv) Many capital improvements presuppose permanent residence, so that producers will enjoy the benefits for an extended period. But at the same time, fixed residence brings with it a buildup of parastites and diseases, and leaves the herds more vulnerable to the spatial variability in rainfall which is characteristic of the drier rangelands.

(v) Fixed investments in things like fencing or improved water tend to be perceived as a threat to other users of common property resources. Encouraging fixed investments accelerates the individuation of land holdings, and consequently the vulnerability of those using the most marginal pastures or lacking political power within the community.

(vi) Most improvements are effective only if accompanied by security for people and animals using the range. When producers are subject to frequent raiding or when resources can be alienated by force, they lose any incentive to upgrade their herds and their pastures.

(vii) Introduced systems for stock management were heavily oriented towards production of cattle for end-sale. It was not recognized that the producers depended upon various types of stock which had to be managed differently. As a total system, indigenous pastoralism could support more people on the land than can the introduced, special purpose systems.

(viii) In some pastoral systems (particularly within East Africa), the social system puts livestock under the control of elders — even to the detriment of the interests of women, young children and young men. In many East African pastoral communities, one can find younger men who want to manage stock in different ways but are denied control over the herds by their older relatives.

(ix) Range science concentrates upon the management of grassland resources; but it is now clear that browse and browsing species like camels and goats may be more important for the success of African pastoralism. In regard to these topics, pastoralists may well be more knowledgeable than are the specialists.

Emergent adverse trends

33. It is important that advisors come to recognize that producers respond to the immediate circumstances they encounter, both positive and negative. The "proximate" factors cannot be judged from a distance, and often are not known when livestock projects are being designed. And yet the output realized will depend heavily upon the relative balance between positive and negative pressures as they are actually experienced in the field.

34. A striking feature of Africa's official programs for livestock development is their continued reliance upon "elite" technical packages. "Elite packages" are an assemblage of interventions which assume favourable conditions within the production environment. For example, the construction of acaricide dips assumes that acaricide is available, that resistant strains of ticks have not yet emerged, that all farmers will use the facility, and that its water supply will be kept operating. Across Africa, we find that ministries continue to sponsor dipping, tsetse control, improved breeds, artificial insemination, holding grounds, veterinary training, and so forth — the whole array of interventions itemized earlier in this paper. However, on closer inspection it can be seen that a majority of these measures require favourable conditions for their success. Africa's livestock services attempt to support much the same project portfolio which they offered a decade ago when funding was easy and when trends seemed favourable. When encountering adversity, many Ministries have simply cut back on recurrent operating funds, leaving field centers without drugs, spare parts, water or transport. Official plan documents continue to describe livestock program objectives as if favourable conditions persist.

35. This paper suggests, to the contrary, that the weak performance of "elite" technical packages occurs because at the local level where pastoralists become part of the system, adverse trends have become strongly entrenched.

36. The adverse influences we itemize below can be grouped into three broad categories: i) spontaneous developments accompanying population growth and commercialization in a common-property resource setting; ii) drought-related impacts; and iii) effects of economic dislocation and insecurity.

Spontaneous development trends

37. Land alienation which removes critical dry season forage reserves from pastoral use has accelerated in many countries. For example, virtually all of Africa's major irrigation schemes have been located in what had been critical dry season grazing for pastoralists. There has been an intensified population movement from crop farming areas into rangelands, both in the Sahel of West Africa and on the margins of the East African highlands. Large pieces of land have been taken for national parks, game reserves, and forest reserves. And, of course, most governmental investment in state ranches, fattening lot, and holding grounds occurs on land which was earlier used by livestock keepers. The detrimental effects of such excisions are amplified because the rangelands removed are often the best dry season grazing.

38. Enclosure of common property rangelands is also accelerating, though it can take a variety of forms: i) privatization of wells; and dams; ii) individuation of holdings by fencing; iii) exclusive claim to certain key resources by powerful individuals; and iv) ploughing up of pasture for arable farming. Again, it tends to affect the highest potential lands and to be instituted by richer producers or outsiders who may continue to keep other herds on the remaining commons.

39. Reduced size of holdings is the inevitable consequence of human population growth but exclosure and land alienation reduces the size of the remaining rangelands. While government planners continue to prepare schemes to provide individual ranches of a 1000 ha or more, those left on communal lands face the need to support themselves from units of less than 100

ha each. Hardly any detailed planning has been done which caters to livestock-based small holdings in semi-arid environments. One can anticipate that such holdings will rely more upon small-stock than cattle, and will usually entail some agro-pastoral component.

40. Loss of the herding force occurs as young men enter schooling or leave to look for work elsewhere. Traditional herd management was fairly efficient because different species were herded separately and families split the milking herd from the dry animals (kept at a longer distance). This labor intensive pattern cannot be maintained once teenage boys are withdrawn from the system. Despite being against traditional custom, these days girls are seen as herders for the "home" animals.

41. Emergence of agro-pastoralism is taking place even in very dry lands where cropping is not technically advisable. It reflects pastoralists' own fears regarding their access to grain in dry years, as well as a spontaneous adjustment to the sedentarisation which has occurred around famine-relief distribution points.

Drought-related impacts

42. A major drought, particularly if it extends over several seasons, is the test of any livestock production system. It seems clear that the preference of Africa's dry lands producers for having multiple species is related to their desire to minimize drought impacts. It is also important to recognize that recent droughts have been very severe and are part of world-wide climatic trends. The Sahelian drought of 1984 was preceded by warmer than average ocean temperatures in the South Atlantic, and was part of a much larger climatic anomaly which severely affected South Africa and Australia as well.

43. Loss of animals has taken place during both the mid-1970s and early 1980s in many African countries, to such an extent that entire populations were left without a means of livelihood. Aerial censuses undertaken by Ecosystems/NORAD and Ergo/ILCA in Turkana and in central Niger document very large fluctuations in livestock numbers during the recent droughts. In Sudan, nomads east of the Nile lost almost all their animals. It is now realised that few pastoral groups had many surplus animals even

before the drought. A 50% or more reduction in herd sizes leaves many poorer families without the means to re-enter semi-nomadic pastoralism.

44. Spontaneous sedentarisation has become evident over most of the zone, either around food distribution points or in the form of squatter settlements on the fringes of major towns. The concentration of large numbers of people in permanent settlements without a means of livelihood other than famine relief, and without improved sanitation, greatly increases environmental pressure and health risks. Initially, many governments welcomed sedentarisation in hopes that it would give officials greater control over pastoralists. Now, it is increasingly realised that people living in such settlements are losing their traditional skills and are likely to become a permanent welfare burden upon the state.

45. Loss of trees is accelerating not only because of the drought but also because of charcoal making by destitute ex-pastoralists and fuelwood cutting around the emerging settlements. This loss has serious negative consequences for pastoralists who depended upon browsing camels and goats to survive in the driest zone. The World Bank's recent study of Sahelian desertification concludes that the Sahel's wood resources (i.e. household energy) will be depleted even before water and arable land become limiting.

46. Emergence of destitute and refugee populations seems to be likely in the more marginal areas where traditional livelihood was based on camels and goats. This tendency is exacerbated where there are military conflicts, as in northern Chad or along the Somali borders. Those who favour a drastic reduction in the human populations living in the semi-arid zone fail to recognize that much of the population increase originates from the higher rainfall areas and that there is no place for ex-pastoralists to go. Instead, they are becoming permanent consumers of Europe's grain surplus.

Induced systemic crises

47. Economic retrenchment has accompanied the deepening economic crisis which afflicts many African economies. Caused by a combination of over-ambitious industrialisation, too rapid growth of public institutions, and a fall in export earnings, this crisis has forced countries to limit imports

severely. Livestock producers in marginal environments are especially vulnerable to shortages of drugs, lack of transport, and unavailability of spare parts for water pumps. Many countries discontinued their spraying programs to control locusts, and stopped carrying out annual innoculation campaigns. Many dips were left without acaricide or reliable water. The departmental staff have lost their recurrent operating funds, making it impossible for them to travel or to support capital projects. These distortions are likely to be seen most clearly in isolated locations which have little political influence at the sources of national supply.

48. Military conflicts have erupted within many of Africa's drier lands, either through armed insurrections or by outside interference. Once modern weapons get into local circulation, groups are tempted to raid their neighbours to replace animals lost to drought or through other reciprocal raids. Insecurity coupled with access to arms has a ripple effect spreading far beyond the initial area of conflict. Since livestock are very easily slaughtered or stolen, livestock production suffers disproportionately when such conflicts occur. It becomes extremely difficult to justify investment in improved stock or careful breeding if one's animals are likely to be stolen. Large areas of southern Africa, the Horn, and the borders of the Sahara are now subject to military action and becoming abandoned by pastoralists.

Policy implications

49. The adverse trends we have itemized tend to be interactive, so that their negative consequences become more powerful once several trends become overlaid within the same locality. Unfortunately, many of Africa's dry lands have experienced major drought, military conflicts, and economic dislocation simultaneously.

50. In addition to specific consequences, these trends have the general effect of raising the levels of risk attached to animal production. This in turn stronlgy influences production strategies, though in complex ways not yet fully understood. However, what can be stated with some certainty is that these circumstances do not encourage "modern" animal production of the kinds promoted by animal scientists. Those producers who adopt

"elite" technical packages without the benefit of exogenous buffering mechanisms (like remittances from relatives working in the Near East) are likely to suffer economic disaster as a consequence.

51. Few existing programs are designed to tackle the entitlement issue after a major drought. It seems that under present circumstances it is more difficult for pastoral producers to regain a nucleus herd sufficient for them to rejoin a semi-nomadic way of life. At present, this represents the single most critical gap in governmental programs for livestock producers.

52. More generally, it would seem that the portfolio of interventions which most governments offer to the livestock sector is not well suited for situations where frequent and severe droughts occur. Certainly, spontaneous sedentarization does not lead to a better way of life for pastoralists in such environments.

53. Governments also need to screen their choice of interventions to find those which are relatively robust in regard to their tolerance of economic dislocations. Projects which require import support are especially dangerous.

54. The degree of dislocation is not, however, uniform within and between countries. There is much scope for identifying "recommendation domains" which take into account the presence or absence of adverse proximate trends.

55. Finally, governments have proved rarely adept at suggesting what livestock producers should do under circumstances of reduced holdings and more frequent droughts. The cutback in focused research on production systems suited to modern pastoralism is especially unfortunate. Pastoralists possess a wealth of experience about their species and environment which needs to be supported and refined by imaginative scientific inquiry.