

TOWARDS SUSTAINABLE RANGELAND MANAGEMENT AND LIVESTOCK PRODUCTION IN NAMIBIA

A.S. KRUGER (Chief Agricultural Researcher) and R. F. KRESSIRER (GTZ Advisor)

Ministry of Agriculture, Water and Rural Development, Private Bag 13184, Tel 061-2022146, Fax 061-222205, Windhoek, Republic of Namibia.

ABSTRACT

Rainfall variation and thus fodder availability in terms of space and time are phenomena known to the Namibian livestock farmer. Instead of trying to predict the unpredictable future, more emphasis should be put on adapting to the ever changing situation. This "opportunistic" approach where opportunities are seized and hazards are avoided, will have to form the basis of sustainable rangeland management in the arid and semi-arid areas of Namibia. Due to different reasons, neither the ranch model nor the open flexible movement of animals will provide the best basis for sustainable livestock production. The answer to sustainable rangeland utilisation will have to be a combination of both models where farmers are supported to improve rangeland management and livestock production in the areas where they normally reside, but are also supported to develop mechanisms to increase their flexibility in terms of moving animals to areas where sufficient fodder is available. Tracking is the process by which animal numbers and their feed demands are matched with available fodder sources. A few ways in which tracking can be achieved as well as some constraints to effective tracking are discussed.

Keywords: rangeland management, opportunistic management, tracking, livestock production.

INTRODUCTION

Arid and semi-arid lands cover about one-third of the earth's land surface, but nearly two-thirds of the African continent. The majority of African livestock and possibly 30 million livestock-dependent people reside in these dry zones along with the greatest and most diverse concentrations of large wild mammals in existence (Ellis, J.E. & Galvin, K., 1994). Namibia is the driest country in Africa south of the Sahel where almost the entire land surface can be classified as arid and semi-arid. More than 60% of Namibia's population live in the rural parts of the country where livestock production is the predominant economic activity to sustain a decent living for rural households (Kressirer, 1995).

The ranching model was the blueprint for African range and livestock development projects during the 1960's and 1970's (Behnke & Kervin, 1994). The overall objective of these projects was rangeland conservation by trying to reduce stock numbers in line with the carrying capacity of a certain area. It was believed that lower stocking rates would ensure that forage deficiencies never occur. This however proved to be uneconomic in very dry environments with extreme fluctuations in rainfall. Overstocking was perceived as the major reason why African rangelands were degraded, herd output was low, and pastoralists were poor. The problem with these ranching projects was that they could never deliver lower stocking rates (Behnke & Kervin, 1994).

Range deterioration is something that is taking place in an episodically rather than incrementally fashion. This means that variables such as rainfall, which are outside management control, are the dominant forces responsible for eco-

logical changes and that botanical indices like species composition, vegetative mass, range trend, succession and carrying capacity are relatively weak parameters to determine the influence of livestock on the rangeland. In these "event dominated" ecological systems in the arid and semi-arid rangelands, it is unrealistic for managers to try and minimise rangeland variation by attending only to a single biological variable such as livestock numbers. If managers can not control their changing environment, which is practically impossible in arid and semi-arid areas, they will have to adapt to it very quickly in order to minimise the consequences of unpredictable rainfall fluctuations.

OPPORTUNISTIC MANAGEMENT STRATEGIES IN A VARIABLE ENVIRONMENT

Grass production and thus forage availability can vary from about zero to several tonnes per hectare between two subsequent years in arid and semi-arid areas. Another phenomenon is that certain patches might have good production and are quite stable from year to year, but other patches in the same area are much more unstable and yield much lower production per hectare. The process by which animal numbers and their feed demands are matched with available fodder sources is called tracking. Effective tracking may be achieved in four ways:

- Increasing locally available fodder by importing feed from elsewhere or by enhancing fodder production, especially drought feed, through investment in key resource sites.
- Moving animals to areas where fodder is available.
- Reducing animal feed intake during drought through shifts in watering regimes, reducing parasite loads or breeding for animals with low basal metabolic rates.
- Destocking animals through sales during drought and restocking when fodder is available after the drought.

The challenge for researchers, extension officers and pastoralists is therefore not to transform pastoral systems into ranching systems, but to increase the efficiency of tracking under conditions of restricted flexibility in especially the communal areas of Namibia. It is common knowledge that pastoralists used to be more flexible in animal movement in order to find enough fodder for their herds. Conditions like national borders, wildlife conservation areas, commercial farms and even the new phenomenon of so-called "defensive fencing" in the communal areas, make it more and more difficult for pastoralists to be flexible in their efforts to match animal feed demands with available fodder production. Hence the solution for Namibia (commercial/communal) will be a combination of elements from both the ranching model and a more flexible open system of rangeland management.

Against the background of the fact that farmers find it more and more difficult to move around with their animals in search of fodder, the emphasis should however be to improve the rangeland management and livestock production in the very area the community is residing most of the

time. For emergency reasons during periods of excessive food scarcity, moving of animals to other areas, should be considered as a possible option by the farmers (Kruger, 1995).

Rotational resting under normal and good rainfall years

Strategies will have to be worked out whereby maximum benefit can be achieved as far as range rehabilitation is concerned during years of average or above average rainfall. When those years occur, it will be very much beneficial to the range to recover in terms of seed production and restoring the carbohydrate reserves of individual plants to tolerate heavy utilisation and drought periods. The only way this can be achieved will be to introduce rotational resting practices. With proper infrastructure like camps and adequate water distribution on a title deed farm owned by one person, it has proved to be very efficient to allocate certain camps to certain livestock herds and to rotate between the different camps.

The challenge is however, to allocate certain areas within an unfenced communally utilised grazing area for utilisation by certain livestock herds during certain times of the year. Issues making it very difficult or preventing it from happening at this stage, are poor water distribution, free roaming of livestock in all directions from a central water point, lack of participation and willingness amongst farmers to co-operate in grouping livestock herds together and identifying certain areas to be rested in order to allow for recovery during the rainy season. However, one of the most serious reasons preventing farmers from taking active responsibility of the natural resources is the lack of ownership or at least some kind of exclusive user rights of a community over a piece of grazing. This prevents farmers from deciding how best to utilise "their" area and whether they would like to allow others coming into the area or not. It is the responsibility of the community to identify and demarcate (not necessarily fence) their traditional grazing areas during normal years as well as during periods of feed scarcities. Within these demarcated areas, an inventory of available infrastructure like fences, water points, roads, etc. need to be done as a next step. Information regarding the vegetation such as rangeland condition, different veld types and current grazing capacity need to be collected.

On the basis of this information and in collaboration with the local farmers, a zoning of the area should be made in order to divide the area into possible grazing zones that do not have to be fenced off, but should only be identified and made known to all the farmers in that area. For this purpose either "life fences" or existing boundaries like dry river beds, mountain ranges, roads, etc. could be used. On the basis of mutual consent and backstopping from professionals, some areas need to be rested while animals are grouped together and allocated to graze only in other areas at certain times of the year. Grouping together does not necessarily mean that one herd is formed, but that several livestock owners agree to send their individual herds jointly to one grazing area.

Strategies of livestock movement.

Taking into account the huge variation in rainfall in arid and semi-arid areas of Southern Africa (Co-efficient of variation exceeding 33%) (Ellis & Galvin, 1994), it should be kept in mind that the availability of fodder for animal consumption is closely correlated to it. This will result in occasional fodder deficiencies despite proper range management sys-

tems being implemented. Examples of such fodder deficiencies related to low rainfall are currently evident in the eastern areas of Namibia and even some of the commercial farmers in that area are forced to find alternative fodder for their animals elsewhere. This led to several commercial farmers being forced to find fodder in the western regions of Namibia which received very good rains during 1995. It is also known that several hundred livestock from the eastern communal areas (Okakarara) had to be moved to areas in the Erongo region in search for fodder.

This occasional movement of animals in search for patches or areas where better grazing is available, should not be seen as an abnormal activity related to poor range management, but should be seen as a normal phenomenon and an integral part of livestock farming in highly dynamic environments. The movement of animals in response to spatial and temporal variation in resource availability is perhaps the most classic of all tracking strategies (Swallow, 1994).

The challenge is to find ways and means how such movement of animals can be organised and institutionalised in order to allow the communal farmer to benefit most out of it. One way might be to support local community based organisations (CBO's) like the community management in the SARDEP programme, to develop and operate an information network regarding the availability of fodder in a larger area e.g. a constituency or even in another region. Through this network the CBO can collect information on rainfall patterns, availability of fodder, where it is and at what price, for how many livestock and for how long it will be available. This information can then be made available on a regular basis at a central point in order to inform other communities about it. Pre-requisites needed in order for this network to be operational, will include the willingness and capacity of local CBO's to perform this duty against a commission, proper professional backstopping from the side of research and extension to prevent over-exploitation of certain areas as well as the right of local communities to use income derived from renting out their areas for own development purposes. Proper supportive services like veterinary permits, trekking routes and, if distances are very far, even support in transportation of animals should be considered very important.

The use of well adapted indigenous livestock together with improved animal husbandry practices.

By farming with well adapted indigenous zebu type livestock, mortality rates can be considerably reduced during droughts and even recovery rates can be increased dramatically after droughts. Indigenous zebu cattle have energy sparing mechanisms that act as an adaptation to under-nutrition and water deprivation (Finch & King, 1979; King, 1983; Nicholson, 1987). Trials showed that increasing the walking distance and decreasing the watering frequency, as might happen in a period of drought, did not result in any significant loss of weight in African zebu (Finch & King, 1979).

Results of work done with Borana cattle in Ethiopia showed that reduction in milk supply to the calf (through droughts or human consumption) did not affect the longer term target weight of calves, despite reducing calf growth rates in the short term (Coppock, 1992). Recovery following the drought is equally rapid. When food is available again there is a rapid response in metabolic rate levels and, with increase in nutrition levels, conception rates greatly increased amongst mature female zebus.

It is thus very clear that indigenous animals are physiologically adapted to mobility and flexible responses to uncertain fodder and water availability. Due to reductions in fasting metabolism, more animals can be sustained on a given amount of available fodder during periods of drought than would be possible if there was no physiological tracking of the environment. Forage needs during droughts can be reduced with as much as 30 % through shifts in metabolic rates (Scoones, 1994).

Healthy animals are best able to track environmental fluctuations. Animals with high parasite loads are less resilient to stress. Veterinary interventions and support in general and specifically during drought periods are seen to be of utmost importance in order to increase the tracking ability of herds. These support efforts and interventions should be complemented by indigenous knowledge of veterinary care.

The introduction of animal husbandry practices like early weaning of sucklings and mating seasons that will allow young to be born during times of sufficient grazing, should get very high priority amongst livestock managers, farmers and researchers. It is well known that the springtime (August to November) is the time of the year in Namibia when the lowest fodder availability is occurring. It is very common to find female animals with big calves/lambs still sucking during this period which put an extra stress on these animals usually already in a poor condition.

Livestock marketing as a way of tracking.

The success of livestock farming in the arid and semi-arid areas of the world, and especially in Namibia, is very much dependent on the ability of the farmer to determine the current grazing capacity (fodder availability) at the end of the rainy season and to match the livestock feed demand to it. This should be done on an annual basis at the end of each rainy season because rainfall variability is high and thus fodder availability will also fluctuate widely on an annual basis. There is an urgent need for an easy but accurate method of estimating or calculating fodder availability by the farmers themselves.

Should the livestock fodder demand exceed the fodder availability at any time, opportunities for rapid destocking through efficient marketing channels should be accessible to farmers as one way to get rid of excess animals. Another way might be to move them to areas where sufficient fodder is still available. This strategy is already discussed in more detail earlier on in this document.

The ability of pastoralists to restock after droughts should also be enhanced. This includes also alternative investment opportunities where money derived from animal sales during droughts can be invested in such a way that it is easily available to buy livestock after the drought. Mobile banking services to remote areas will contribute a great deal towards achieving this objective.

Problems encountered with livestock marketing in the communal pastoral areas of Namibia include lack of quarantine facilities, lack of competition from buyers, lower prices due to higher risks of animal diseases and long distances from urban markets, insufficient marketing infra-structure like auction pens and also lack of knowledge and understanding amongst livestock farmers regarding prices and free market economics. Namibia, being an exporter of red meat, is in a lucky position as far as marketing infra-structure like abattoirs and external markets are concerned. Private sector is also very well organised in livestock marketing. The challenge, however, is to increase the access of marketing facilities and to secure improved prices to the average communal livestock farmer in Namibia.

Feed supplementation to rangelands.

A common problem with research in fodder crops is that researchers tried to provide equilibrium solutions to highly variable non-equilibrium environments. Re-seeding with legumes or planting of fodder trees appeared to provide some promise of boosting productivity in more humid agro-ecosystems, but such technologies have rarely proved viable in drier situations, especially when repeated droughts or intense grazing wiped out vulnerable grass and legume species or killed trees (Bayer & Waters-Bayer, 1994).

The identification of strategic "key resources" that sustain animals in times of fodder shortage, should be done on the basis of studying how livestock herds use fodder landscapes during periods of droughts. These areas usually have a more stable production of fodder due to specific characteristics like better soils, more soil nutrients and higher moisture contents. These "key resources" should be the focus for fodder improvement. The introduction of fodder species that are well adapted to that environment and severe grazing, re-seeding by using seeds of species already existing in those areas and by introducing proper fodder management practices to enhance livestock production in normal years and survival feeding in bad years (Barton, 1993) are recommended. Strategic movement of animals to such sites should be considered.

Simple practices like cutting grass in road reserves and specifically cleared areas during years of normal rainfall, should also be considered. Other possibilities are the reeds in the Fish River Canyon and even garden residues. This fodder can easily be stored for several years and can be used during periods of food scarcity. This fodder is usually very handy to feed sick animals, breeding stock outside the mating season and even fattening of livestock before marketing, or any other purpose.

Depending on the livestock species, browse may also act as an important key resource. The availability of coppiced trees and shrubs in dryland areas is often critical to the nutrition of livestock in times of drought. Tree pods in particular may be an important protein supplement that increase appetite and ensure maintenance of animals during periods of stress (Coppock & Reed, 1992; Oba, 1993). It is important not to see all trees and shrubs, especially in the savannah areas, as part of the "bush encroachment" problem, but rather to try and adapt the livestock breeds to the available browse fodder sources. Scientists in Namibia however, are also aware of the limitations in this regard.

The enhancement of agro-pastoral linkages and the promotion of integrated mixed farming systems are seen as another way of reducing fodder variability in dynamic environments. Despite the fact that the majority of pastoral areas, especially in the central, eastern, western and southern areas of Namibia, are not very much suited for any kind of crop production, doubts also exist whether such mixed farming systems will significantly contribute towards reducing risks in fodder availability and eventually animal output. Where mixed farming systems are possible, especially in the northern and north eastern parts of the country, considerable contributions towards reducing the risks of fodder production can be made. It is however doubtful whether the tendency to settle farming systems as a result of population pressure and the promotion of mixed farming practices as opposed to a more transhumant way of livestock farming will be desirable on the long run. The solution should rather be sought in a system where crop residues are being used by livestock after harvesting and that the majority of the livestock are still being moved to the cattle-post areas away from the larger settlements.

Farmers should also have access to concentrates (mineral/protein/energy licks) as a feed supplementation. Feed supplementation should not be seen as necessary only during periods of food shortages, but rather as a normal strategy to enhance animal production. Current incentives to support farmers with licks during drought periods while the actual problem is a deficiency in fodder, should be reconsidered.

Supplementing or diversifying income from other sources.

The task of farmers in the communal areas of Namibia is currently to sustain a decent living of a growing population to ensure subsistence for their families (SARDEP, 1994). It is becoming more and more difficult to base it purely on income derived from animal production. According to communal farmers in the southern, eastern and northern SARDEP programme areas, a household needs currently at least 150 small stock or 50 large stock in order to meet the basic demands of an average family. Large numbers of households in communal areas do not have any livestock at all, and a large number of households have animal numbers well below these subsistence levels.

This contributes towards the further impoverishment of local communities. In order to survive and be able to achieve their task of sustaining their families in a decent way, the introduction of alternative income generating activities need to be considered. Other possibilities are the processing of animal by-products e.g. leather tanning, cheese making, soap making and also the utilisation of resources locally available like charcoal production, crushing stones for the building sector, collecting minerals, etc. Problems like the identification of economic viable enterprises and sufficient technical and financial support need to be addressed. One of the biggest problems in this regard is the small local market and purchasing power of local people. An involvement of relevant private organisations and non-governmental organisations is seen as a pre-requisite for success.

CONSTRAINTS TO OPPORTUNISTIC MANAGEMENT

The previous part illustrates briefly a few strategies to be considered in order to improve efficient tracking and enhancing opportunistic management. It is clear that a combination of these strategies can allow a highly efficient pastoral land use strategy making optimal use of variable fodder supplies for maximum return over time. There are however a number of constraints, hampering the introduction and maintenance of efficient tracking strategies:

Labour and skills

Herding of animals in order to keep them away from areas designated to receive rest and tasks like fodder collection, preparation of feed supplementation and other necessary animal husbandry activities like dehorning, castration, parasite control and vaccinations will need considerable skilled labour. Currently the out-migration of male pastoralists to seek alternative employment opportunities in larger towns and the fact that children are being sent to schools, largely exaggerate this problem.

One alternative could be that communities must employ and train labourers for these tasks. This poses a lot of other problems like payment of the herders and possibilities to train them in livestock husbandry practices. In this regard capacity building of CBO's on grassroots level and empowering them to maintain a community fund to pay the herders should be considered. Training should also be a major com-

ponent of government or donor funded project support. The documentation of existing local know-how and the introduction of that know-how into training curricula should be considered as a high priority. The inclusion of theoretical and practical training in livestock and crop production in the curricula of school children can at least ensure a basic level of agricultural knowledge for the next generation.

Ownership and commitments

Today an increasing proportion of pastoral herds are owned by absentee herd owners like government officials and urban businessmen with little or no knowledge about the complexities of pastoral production in dry, dynamic ecosystems. Even where hired herdsmen are being employed, they don't own the animals and often have less incentives to really care for the animals the way their owners should have done. This results usually into lower productivity of herds and thus inefficient management practices. Because of the fact that most of the absentee livestock owners have other sources of income, there is less commitment from their side to really make tracking, as a way of opportunistic management, work.

Access to land

Securing rights of access to land and water is perhaps the most important challenge for the future of pastoralism. Local pastoralists should be given the responsibility of managing their own rangelands and should also be empowered through proper institution building, training and exposure to do opportunistic management. Appropriate resource tenure regimes and associated institutional and administrative arrangements are the keys to increase the efficiency of tracking.

Legislation is urgently required which will clarify access to and management of land. As traditional authorities in Namibia are still perceived by the majority of the communal farmers as those responsible for the allocation of land, their capability to still support land allocation, even within the legal body of a land board, and combination with technical support from Extension and organisational support from a CBO, should be enhanced. Regional governors and councillors should also be involved in decision making or at least in the consultation process within the framework of such land boards.

The utilisation of the natural resources should be allowed by local communities on several conditions. The primary objective should be the sustainable utilisation of the resources. Abuse of the resources should be connected to penalties installed by the communities, e.g. payment of veld rehabilitation costs. Grazing fees paid by farmers can be put into a community fund and administered by the community themselves. These funds can be used for infrastructure development, social events, payment of grazing fees to other farmers if animals have to be moved to other areas, payment of herders, etc.

Borders, boundaries and conflicts

For efficient tracking in dry dynamic environments, large areas are usually needed. This situation is however far from being conducive in Namibia due to the erection of regional and national boundaries. The establishment of National Conservation Areas, commercial farms and the new phenomenon of "defensive" fencing in the communal areas contributes largely towards this unwanted and inconducive situation.

All people of Namibia have the constitutional right to settle themselves at any place in the country. Together with the uncertainty about the rights and authority of traditional leaders and the unclear situation regarding local and regional government in relation to the allocation of land and the management or utilisation of such land, local communities find it impossible to control and take up responsibility for their traditional rangeland areas, and thus have no legal or traditional way of preventing others from settling in their area. All these facts contribute largely towards uncontrolled movement of animals and exploitation of the rangelands and resources of local communities by outsiders. A possible solution for this dilemma might be to distinguish between the right to settle wherever a person desires and the right to utilise the resources available in this place (Fuller & Turner, 1995).

Information

Efficient tracking is very much based on a good information basis. Information about rainfall patterns and fodder availability, the quantities, qualities and where to find it, prices of livestock to be sold, etc. is of paramount importance. The availability of this information to other pastoralists all over the country on a regular basis is seen as the responsibility of local CBO's. The use of early warning systems like satellite technology, without proper field verification, have very limited application for pastoral managers. Pastoralists tend to prefer information that is generated by themselves, rather than information generated by satellites and scientists (Scoones, 1994).

Provision of services

The provision of basic services like schools, health, veterinary services, etc. in such a way that it supports a more transhumant rather than sedentary lifestyle, is important. The idea, although it might sound a little farfetched at this stage, should be considered seriously. One way to introduce such services, might be to investigate possibilities of mobile service centres.

CONCLUSION

Living in an uncertain environment with huge variation in rainfall from year to year and subsequent variation in fodder availability, a more flexible way of rangeland management should be followed. This entails, under the specific conditions in Namibia, a combination between a ranching model on a demarcated area and the flexible movement of animals to other areas where sufficient grazing might be available, combined with other relevant strategies (animal health care; indigenous livestock, fodder production, etc.) necessary to sustain the management system.

This strategy, called tracking, should be implemented within the framework of participation of local communities and CBO's. Emphasis should be put on empowering local CBO's to, not only resume responsibility for the management of their resources, but also to enable them through adequate training and exposure, to implement and maintain such management systems by themselves.

The Sustainable Animal and Range Development Programme (SARDEP) of the Ministry of Agriculture, Water and Rural Development is currently involved in several communal pastoral areas in Namibia with the view to identify and test relevant practices and strategies, some of

which are discussed in this document, with full participation of all relevant actors like Extension, Research, Veterinary Services, other resource based Ministries, non-governmental organisations, private organisations and the farmers. The combating of desertification and prevention of further impoverishment of pastoralists will to a large extent be determined by the willingness amongst all the key players to co-operate in order to find the best suitable strategy(ies) for opportunistic rangeland management in Namibia.

REFERENCES.

- BARTON, D., 1993. Community participation in range rehabilitation in Kenya. Case study paper for the conference on New Directions in African Range Management and Policy, 31 May - 4 June. Woburn, UK. IIED, ODI and Commonwealth Secretariat, London.
- BAYER, W. & WATERS-BAYER, A., 1994. Forage alternatives from range and field: pastoral forage management and improvement in the African drylands. In *Living with Uncertainty*. Intermediate Technology Publications Ltd, 103-105 Southampton Row, London WC1B 4HH, UK.
- BEHNKE, R. & KERVIN, C., 1994. Redesigning for risk: Tracking and buffering environmental variability in Africa's rangelands. *Natural Resource Perspective*. Overseas Development Institute, Regent's College, Inner Circle, Regent's Park, London NW1 4NS, UK.
- COPPOCK, D.L., 1992. Bigger calves make better cows. Fact or fantasy in variable environments? *ILCA Newsletter* 8: 1-3. International Livestock Centre for Africa (ILCA), Addis Ababa.
- COPPOCK, D.L. & REED, J., 1992. Cultivated and native browse legumes as calf supplements in Ethiopia. *Journal of Range Management* 45: 231-8.
- ELLIS, J.E. & GALVIN, K., 1994. Climate patterns and land use practices in the dry zones of Africa; *BioScience* 44(5): 340-9.
- FINCH, V.A. & KING, J.M., 1979. Adaptation to undernutrition and water deprivation in the African zebu: changes in energy requirements. Research Co-ordination Meeting on Water Requirements of Tropical Herbivores Based on Measurements with Tritiated Water, Nairobi. International Atomic Energy Agency, Vienna.
- FULLER, B. & TURNER, S., 1995. Resource Access and Range Land Management in Three Communal Areas of Namibia. Social Science Division, University of Namibia, Windhoek.
- KING, J.M., 1983. Livestock water needs in pastoral Africa in relation to climate and forage. *ILCA Research Report* 7. International Livestock Centre for Africa, Addis Ababa.
- KRESSIRER, R.F., 1995. On-farm research in animal production and range management in the communal areas of Namibia - one way how to look at it. Unpublished report, Sustainable Animal and Range Development Programme, Ministry of Agriculture, Water and Rural Development, Windhoek.
- KRUGER, A.S., 1995. Opportunistic Management - An alternative way of livestock farming in a variable environment. Unpublished report, Sustainable Animal and Range Development Programme, Ministry of Agriculture, Water and Rural Development, Windhoek.
- NICHOLSON, M.J., 1987. Effects of night enclosure and extensive walking on the productivity of Zebu cattle. *Journal of Agricultural Science* 109:445-52.
- OBA, G., 1993. Management of patchy resources in a patchy arid ecosystem of northern Kenya. An indigenous approach to rangeland classification, assessment and management. Case study paper for the conference on New Directions in African Range Management and Policy, 31 May - 4 June, Woburn, UK. IIED, ODI and Commonwealth Secretariat, London.
- SARDEP., 1994. Main Mission Report. KEK/CDC Consultants, Switzerland.
- SCOONES, I., 1994. (ed.). *Living with Uncertainty*. Intermediate Technology Publications Ltd, 103-105 Southampton Row, London WC1B 4 HH, UK.
- SWALLOW, B.M., 1994. The role of mobility within risk management strategies of pastoralists and agropastoralists. *Gatekeeper Series* SA47. International Institute for Environment and Development, London.