STUDIES OF RANGE

LIVESTOCK PRODUCTION SYSTEMS

UNDER INDUCED CHANGE

INTERNATIONAL LIVESTOCK CENTRE FOR AFRICA

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This booklet describes that part of ILCA's research which is located in, and has direct impact on, national development schemes; where present systems of range livestock production are undergoing induced change as a result of development efforts. The focus is on the design and application of monitoring techniques for the study of these systems and their response to development inputs. Although the work is described here as "ILCA's monitoring programme" the work in reality comprises only one component of ILCA's total programme and it is very much a cooperative undertaking between ILCA and the national authorities concerned. The booklet is intended to show others the value of monitoring and how ILCA is seeking to improve monitoring procedures and capabilities.

SCOPE OF STUDY

Range livestock production systems are in particular need of scientific study because of their geographic and economic importance and of their sensitivity to change. These systems support over half of the livestock of tropical Africa and, in their traditional form, as practised by pastoral societies, they present a highly delicate balance between man, livestock and environment. Already imbalances have led to widespread deterioration in range condition. Interdisciplinary monitoring procedures are therefore much needed, in order to understand the dynamics of the production systems and the changes that occur as a result of (or despite) development inputs.

Such studies have several advantages. To begin with the monitoring of the interactions between man, animal and environment helps to build an understanding of the dynamics of these systems of production. Secondly, monitoring when fully developed provides organized reporting of the impact of development inputs. Thirdly, monitoring provides a technique for systematic pre-development surveys as well as for the establishment of research priorities. The value of concentrating the initial studies in ongoing development schemes is that there is usually more to be learned from systems undergoing induced change than from systems that are more static.

The knowledge that accrues from well-designed monitoring helps not only project managers but also the planners of future development projects and research organisations in need of help in identifying research priorities. With the aid of modelling techniques, it is also possible to extrapolate results from one study site to other situations. But to implement well-designed monitoring procedures itself requires research, for there are many possible parameters to measure, and appropriate procedures will vary according to the nature of the system and the development project concerned. Compromises also need to be made between the quest for knowledge and the capabilities of national authorities in terms of manpower and funds. Involvement in this field should therefore stem directly from an assessment of actual development experience and needs.

ILCA PUBLICATIONS

The International Livestock Centre for Africa (ILCA) is an autonomous research and information centre, whose activities and publications are funded by the Consultative Group on International Agricultural Research (CGIAR). The CGIAR members which have funded ILCA to date are the International Development Research Centre, the United Nations Development Programme, the World Bank and the governments of Australia, Belgium, the Federal Republic of Germany, France, Iran, the Netherlands, Nigeria, Norway, Saudi Arabia, Sweden, Switzerland, the United Kingdom and the United States of America. Responsibility for ILCA publications, however, rests solely with the centre and such other parties as may be cited as joint authors.

Over the past 20 years, efforts to increase livestock production in tropical Africa have largely taken the form of livestock development projects, funded by national governments and bilateral and multilateral development agencies. Altogether, more than US$650 million has been invested in livestock projects in Africa during this period, but the results have generally been disappointing, and sometimes even negative.

Livestock projects consist of technical, capital and institutional inputs which are introduced into pre-existing production systems in the hope that they will produce desirable changes. It is generally agreed that the technical inputs required to increase animal productivity in Africa have already been developed in several parts of the world, but the introduction of techniques and management practices developed elsewhere into African production systems has often been unsuccessful. This has usually been due to an inadequate understanding of the pre-existing situation, including the complex interlinkages between environmental, animal, social and economic factors which characterize livestock production systems.

The International Livestock Centre for Africa (ILCA) is a multidisciplinary research, information and training centre, established with the aim of increasing livestock production and thereby improving the lives of the people of tropical Africa. Livestock development projects, which are carried out

Sample animals are eartagged for identification and their growth rates are monitored over time.

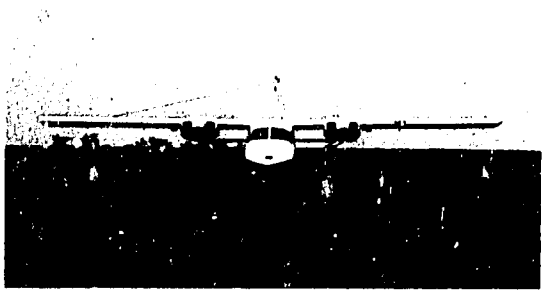
with the same goals, have appropriately become one of the focuses of ILCA's research programme. This focus was described as follows, in the document setting out ILCA's mandate when the centre was established:

It will be important to examine the response of traditional systems to development processes. Indeed the monitoring of ongoing development programmes needs to receive a high priority since these programmes represent unique experiments which can never be reproduced in the confines of a research station. If not given early attention, a great volume of information crucial to future livestock development will be lost.

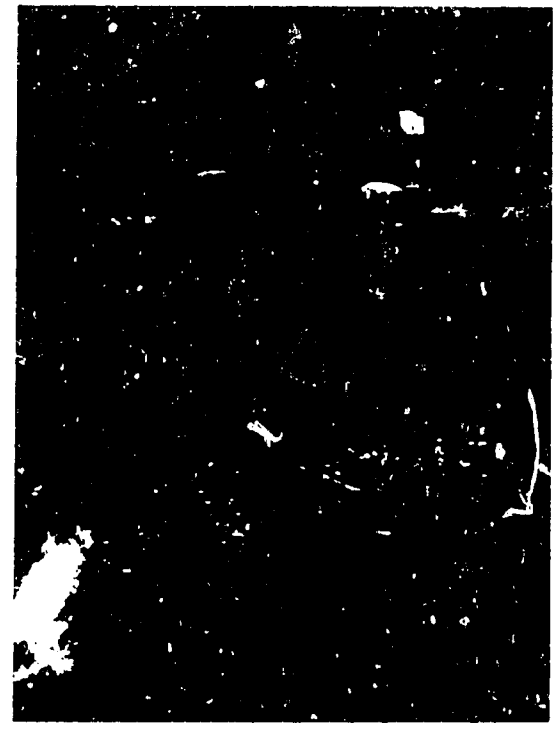
DEVELOPMENT OF A MONITORING METHODOLOGY

ILCA's monitoring methodology is being developed by an interdisciplinary team of scientists based in Kenya, with country monitoring officers in Botswana and Ethiopia. A set of activities has been designed to check and assess the level of project inputs and outputs over time, as well as changes in the livestock production and marketing systems affected by projects. The approach is interdisciplinary, because livestock production systems are the outcome of environmental, animal and human factors which cannot be described or measured accurately by the formulations and methodologies of a single discipline. Only a small number of ecological, animal production, economic and social indicator factors can be followed over time, given financial and manpower constraints, and these are chosen to help identify causal connections in the production system as a whole, leading to a broader understanding of livestock production and development processes.

The livestock development projects chosen for study include individual projects in production systems which are representative of broader situations and projects with special features of particular interest. They focus on the development of traditional pastoral production systems or ranching operations in the arid and semi-arid zones, where the bulk of funding for livestock development in Africa has been directed. They all involve the intro-

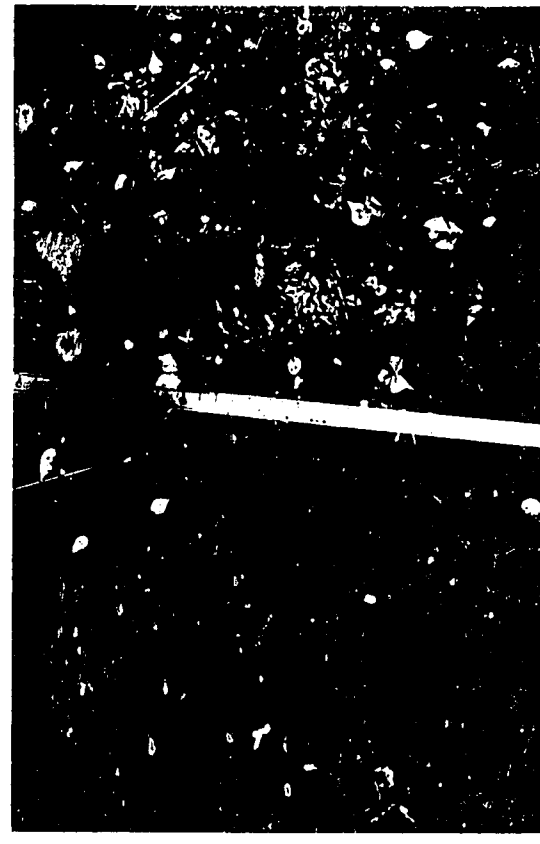


Large-scale aerial surveys are carried out with a twin-engine Partenavia.



Pastoralist settlement photographed from the air: Note cattle tracks and signs of erosion.

Measurements of vegetation are taken along a 50-meter transect line



All plants are recorded in a 2.5-cm ring placed every 50 cm along the transect.

duction of new forms of social and territorial organization, which is a principal concern of all of ILCA's research work in pastoral areas.

The monitoring methodology which is being developed is extended to national governments and assistance is provided for data analysis and also, in the form of training, for the establishment of national monitoring teams. Through this cooperative work, ILCA, in turn, gains access to a wide range of information on the livestock production systems of each participating country, which supplements ILCA's own research programmes. The components of ILCA's monitoring methodology will be described in more detail.

Ecological monitoring

The purpose of ecological monitoring is to detect changes in the environment, especially in the primary production of the rangelands. When a development project is introduced in an area, the implicit hypothesis is that any proposed changes in land use will not have adverse effects on the soils or vegetation, and may even result in an improvement of range resources. In such situations, it is important to collect accurate information on the ecological changes which do in fact occur.

Trials were carried out in Kenya, comparing various measures of basal cover and frequency of species in the grass and woody layers in terms of their feasibility, time requirements, replicability and costs. As a result, one method was chosen combining measurements on fixed transects with rough estimates, which can be related to studies made of larger areas based on photo-interpretation or satellite imagery.

At every monitoring site, two permanent lines are established, going out from one point at right angles for a distance of 50 m. The three end points are marked by metal rods planted firmly in the ground. Measurements of the grass layer are made along these lines every year. In addition, the tree

Marking the end point of a transect.

and shrub cover is measured every 5 years on two 1-m wide belts along the same lines. About 24 secondary points are also selected over an area of 100 to 1000 km^2 around the fixed transects. Here the cover is estimated and the three dominant plant species listed for the grass and woody layers using range assessment cards.

Monitoring transects and secondary points have been established in areas where livestock development projects are being implemented, at 36 sites in Kenya and 10 in Ethiopia, and the system is being introduced in Botswana. In Kenya, ILCA's ecological monitoring programme has already revealed a number of interesting patterns. In general, the condition of grazing areas appears to be more closely linked with stocking rates and grazing strategies than with basic ecological conditions. It was discovered that the maps available to ranch managers in Kenya are frequently inaccurate and, partly for this reason, facilities such as tracks and watering points are not always well located. Recommended stocking rates have been determined, and it was found that most ranches covered by the monitoring programme in Kenya are understocked. However, rotational grazing schemes are frequently not put into practice, so that some areas are severely overgrazed while others are not used at all.

Livestock monitoring

When the monitoring programme was originally established in Kenya, ILCA scientists developed an intensive livestock survey method, based on the physical inspection of large numbers of animals at frequent intervals by a survey team, combined with detailed recording carried out by livestock owners. This approach requires a great deal of time and a high level of recording and organizational skills and, for this reason, ILCA scientists are now developing a simplified survey method, based on a limited amount of information compiled from actual measurements and questions addressed to livestock owners.

The production parameters measured and information obtained vary to some extent according to the needs of each particular survey. Parameters which might be recorded include livestock population figures, broken down by species and class of animals, annual and seasonal birth rates, pre- and post-weaning mortality rates and growth curves for different classes of stock on a seasonal and annual basis. They might also include age at first parturition, parturition intervals, milk yields and length of lactations, offtake rates, dressing out percentages and reasons for offtake, such as home consumptions, sales, gifts, festivals or emergencies.

A simplified survey generally covers complete or partial reproductive histories of breeding females and herd or flock structures. From this in-

To measure rangeland production, a sample of grass is cut and weighed.

An ecologist and an animal scientist compare their observations.

A sociologist interviews Masai group ranch members in Kenya.

formation it is possible to calculate birth rates, prolificacy rates and approximate mortality and offtake rates. Management practices are also recorded, including information on breeding, disease control, grazing strategies and supplementary feeding.

Economic monitoring

To evaluate the impact of a livestock development project, a general understanding of the broad political and economic framework in which livestock producers operate is essential. Factors such as livestock ownership patterns and land-tenure systems influence the objectives and strategies of livestock producers. The accessibility of markets and credit facilities also affects production, along with the availability and quality of extension and veterinary services.

A great deal of background information is usually available from the reports of government ministries, universities and research organizations. Gaps in the information available from these sources are identified which can be filled in the course of monitoring activities in the field.

Livestock producers in the arid zones, where development projects are being implemented, may be traditional pastoralists or commercially oriented ranchers. The parameters chosen for economic monitoring vary in these two cases, and are also determined by the nature and objectives of each particular development project. For instance, some projects aim to increase the quantity of milk or meat produced through the introduction of innovation packages to the livestock producers. Other projects attempt to increase the income of producers by reducing production costs or improving marketing. Others are designed to reduce the risks incurred by livestock producers through the provision of water and the establishment of fodder banks.

The economic success of projects aimed at commercially oriented producers is measured in

Aerial livestock census. The frame in the foreground delineates the strip on which all animals are counted.

A herdsman is interviewed.

terms of the level of net income achieved. The inputs and outputs of a commercial livestock enterprise are measured, based on three sets of records:

- an inventory of all infrastructure and other assets, updated as additions are made
- a herd register, in which additions or removals from the herd are recorded, including births, deaths, purchases, sales and gifts
- an income-expenditure record, in which all monetary transactions are recorded, including purchased inputs and other expenses such as taxes, insurance premiums and loan repayments.

Projects aimed at traditional producers may focus on ensuring the subsistence of pastoralist households. The economic impact of livestock development projects on these production systems is also measured in terms of inputs and outputs. Inputs include pasture and water resources, livestock, labour and purchased items such as additional animals, salt, bonemeal, acaricides and other veterinary supplies. To monitor the use of labour involves determining which household members perform which tasks and for how long. An assessment of the use of purchased inputs is based on information concerning the quantities purchased, the frequency of such purchases and the prices paid. Turning to output, milk and animal sales are recorded along with prices received. In some situations, the economic returns from other activities are also assessed, including seasonal cropping, handicrafts and charcoal production. Offtake for home consumption is measured, along with the allocation of cash income, and various types of exchange relationships are considered, for instance, when some animals are managed by a hired herdsman in exchange for milk and perhaps some of the calves produced.

In this breeding herd, calves are left to suckle after milk is taken for the owner's family.

Labour requirements are an important aspect of livestock production systems.

A crucial factor in the development of livestock production is an efficient marketing system for animals and animal products. The efficiency of livestock marketing is assessed in terms of the prices obtained by producers, the costs of transport, handling and marketing, and the prices ultimately paid by consumers. A development project may promote increased stratification of the livestock industry by encouraging the establishment of separate breeding and finishing operations, and slaughtering and processing facilities may also be developed.

In monitoring marketing operations, the level of offtake and prices are determined and the marketing component of a development project is assessed in terms of its contribution to the achievement of stated project goals. Market surveys also reveal changes in offtake rates and the categories of stock sold, which are important indicators of changes in livestock production systems.

Social monitoring

Beginning in 1979, ILCA's monitoring work has focused increasingly on the behaviour and social organization of livestock producers, aimed at the design of a two-tiered social monitoring system and the identification of a small number of measurable social indicators. At one level, traditional anthropological field work involves the presence of a skilled observer in one area for extended periods to record many aspects of community life in detail. At a second level, a number of observable and relatively objective attributes are designated, which can be quantified and taken as indicators of a wider and more complex situation. These two approaches are complementary: detailed social investigations lead to the identification of a number

Masai women are interviewed by an ILCA sociologist.

of parameters which can be observed on a wider basis, while the broader network of data collection leads to the identification of particular situations which call for more detailed research.

SCOPE OF PRESENT ACTIVITIES

Monitoring in Kenya

The major livestock development project in Kenya over the past 10 years has been the Kenya Livestock Development Project (KLDP), initiated in 1972. The two phases of this project cover a rangeland area of about 1.36 million ha and involve a budget of about US$103 million. This is, in fact, one of the largest and most comprehensive livestock development projects in Africa.

The objectives of the KLDP are to increase meat production, enhance employment in the livestock sector, encourage a more equitable income distribution, contribute to the country's foreign exchange earnings, ensure the conservation of range resources and improve technical services to the livestock industry. To achieve these objectives, a number of project components are being implemented, including the provision of financial and technical resources for the development of existing beef cattle ranches and the establishment of new ones. The goal is to set up ranches or other management units which are financially viable and yield an adequate income to the owners. Funding for the project has been provided by the Internat-

ional Development Association (IDA), the United States Agency for International Development (USAID), the British Overseas Development Agency (ODA), the Swedish International Development Agency (SIDA), and the Canadian International Development Agency (CIDA).

The KLDP covers five general types of ranching enterprises – group, commercial, company, cooperative and individually-owned ranches – as well as grazing blocks. Group ranches represent one approach to the problem of vesting land rights in pastoral communities and, as such, have aroused particular interest. The rancnes are adjudicated and title deed is vested collectively in groups of 30 to 450 pastoral households who are the traditional users of the land. The owners agree to maintain certain stocking rates and to cooperate in livestock marketing, but they continue to own their herds individually. The main investments financed through the KLDP have been water development, firebreaks, tracks, stock dipping and handling facilities, housing, the purchase of fattening steers and breeding stock, and working capital.

A rancher is interviewed in Kenya.

Grazing blocks have been established in the arid Northeast Province of Kenya. Efforts have been made to identify the traditional users of each block and to introduce rotational grazing systems, with infrastructure provided by government.

The monitoring team in Kenya has assumed a central role in ILCA's monitoring programme, concerned not only with monitoring the KLDP, but also with developing a monitoring methodology which can be extended to other countries. Monitoring activities are directed towards identifying and following trends in rangeland ecology, animal productivity levels, the economic performance of participating ranches and the social organization and management practices of the livestock producers. In addition, formats have been designed for recording information on project implementation to provide project managers and government officials with timely information on the physical and financial progress of development activities. The success of these formats has been demonstrated by their use in Botswana.

On the basis of this monitoring work, ILCA has contributed to evaluation sessions with the KLDP donor agencies, and to a national programme to analyse the genetic potential of indigenous livestock breeds. ILCA has also cooperated in professional training courses and supervised the training of field workers. From 1980 to 1982, ILCA will continue these activities with increasing support from the Kenya Government and will participate in the development of a national monitoring unit. Future monitoring activites will be directed primarily towards producer organizations and the development of group ranches and grazing blocks.

Monitoring in Botswana

In 1970, the Government of Botswana launched a comprehensive Tribal Grazing Lands Policy (TGLP), designed to develop the country's livestock potential and to protect the rangelands from ecological damage. This policy is part of a comprehensive strategy for rural development based on reform of the land tenure system. Some areas are zoned for commercial livestock production, where farmers are developing their ranches on the basis of 50-year leases. In areas zoned for communal development, the government helps the local people to improve their livestock production systems in the context of traditional grazing and husbandry patterns.

The First and Second Livestock Development

Projects are part of the government's overall programme for livestock development, closely tied to the TGLP and financed in part by the World Bank. The First Livestock Development Project was initiated in 1973 to develop a block of cattle ranches at Nojane, to establish the Botswana Livestock Development Corporation as a cattle fattening and marketing agency, to develop Karakul sheep farms and to construct cattle trek routes. The Second Livestock Development Project, launched in 1967, is assisting farmers to develop 100 ranches in the commercial areas and supporting the development of 14 communal grazing units. This project includes the extension of credit to ranchers and small communal production schemes, the support of a new Agricultural Credit Division of the National Development Bank, the development of livestock marketing infrastructure, the provision of technical services, the opening of a ranch training centre and a monitoring and evaluation programme.

The ILCA country monitoring officer works in close cooperation with the government officials responsible for planning and implementing livestock development in Botswana. ILCA's assistance focuses on:

- monitoring the operation of the Nojane ranches established under the First Livestock Development Project
- monitoring the implementation of the Second Livestock Development Project
- developing a methodology for monitoring the impact of livestock development activities.

The monitoring programme covering the 25 Nojane ranches was initiated in 1977 and expanded in 1978 with the involvement of ILCA. Ecological monitoring began with an assessment of range conditions on each operating ranch. Monthly herd registers have been introduced, and a computer-based ranch simulation model has been constructed which makes herd projections for a period of 12 years. Annual ranch cash budgets are also computed.

ILCA has also assisted in developing formats and guidelines for planning annual work programmes under the Second Livestock Development Project, so that progress on project components is reported on a 6-month basis. Government accounting procedures have been reorganized to show the expenditures for each project component, as set out in the plan document. The objective is to provide a complete review of the implementation status of the project on a regular basis, so problems can be identified quickly, solutions proposed

ILCA has designed a portable weighbridge for monitoring pastoral herds.

and the effectiveness of these solutions documented.

Members of ILCA's monitoring team have met with government range ecology and livestock production specialists to devise a methodology for monitoring the impact of the Second Livestock Development Project on traditional production systems. A system for monitoring livestock productivity and ranch economic performance has been devised, based on two sets of simplified formats. A number of social indicator factors have also been identified which will be included in the monitoring programme.

ILCA's work in Botswana is closely integrated with activities of government departments. As of 1980, the government will provide funding to cover 80% of the operating costs of ILCA's monitoring programme in Botswana.

Monitoring in Ethiopia

ILCA's monitoring programme in Ethiopia was initiated in 1976 when the government launched a comprehensive Rangelands Development Project (RDP), aimed at rehabilitating and developing the most important of Ethiopia's lowland range areas over a 5-year period. The project consists of an integrated programme of range management, water development and marketing and veterinary services.

Monitoring activities began in 1976 with a baseline survey of the Jijiga Rangelands Development Unit (JIRDU), covering ecological, sociological, demographic, herd structure, economic and marketing factors and including a land-use survey and an assessment of land capabilities. The study was accompanied by 18 agro-ecological, vegetation and land-use maps, which served as a basis for recommending modified development strategies for four main land-use zones.

In early 1977, ILCA shifted the focus of its monitoring activities to the North East Rangelands Development Unit (NERDU) at the request of the Ethiopian Government. A comprehensive baseline survey was carried out covering 5500 km^2 in the southern half of the project area and including 48 agro-ecological, land-use, livestock and socio-economic maps. Ongoing monitoring in this area now focuses on the impact of the RDP on the traditional pastoral production system.

The government is cooperating closely with ILCA's monitoring activities and contributing 50% of the necessary financial support. A team of data collectors is being trained which will collect a range of socio-economic and animal production data from a sample of pastoral households.

ILCA's involvement in monitoring in the NERDU area is expected to continue into 1982. By that time, a government monitoring team should be fully trained and capable of carrying on the programme. During the period of ILCA's involvement, assistance will be provided in setting up a similar impact monitoring programme in the Southern Rangelands Development Unit (SORDU), which is potentially the most productive rangeland area in Ethiopia.

LIVESTOCK PROJECTS STUDY

A study has been proposed of the full range of livestock development projects which have been implemented in tropical Africa over the past 20 years. Several funding and implementing agencies have been approached concerning financial support for such a study.

Initially, a desk study is proposed of all the livestock development projects which have been carried out, describing them and classifying them according to several criteria. This phase would be followed by intensive interdisciplinary case studies of a sample of representative projects. The entire study should last 12 to 18 months.

The proposed study should reveal interesting insights on project design, financing and implementation, based on past experience. This information would be invaluable in planning future development projects in the livestock sector.

FUTURE PROSPECTS

By the end of 1982, national monitoring teams are expected to be trained in Kenya, Botswana and Ethiopia which can carry on the monitoring activities described here. ILCA's methodology for monitoring the impact of livestock development projects is expected to be presented at that time in the form of a monitoring manual for national authorities and funding and implementing agencies.

Once sufficient experience in monitoring has been gained, ILCA proposes to conduct training courses for monitoring officers and conferences on monitoring for representatives of national governments and financing and implementing agencies. These activities are scheduled to begin in early 1982.

A number of African governments have expressed a growing interest in livestock development monitoring. The Governments of Kenya, Botswana and Ethiopia are contributing an increasing share of the costs of ILCA's monitoring programme, and other countries, such as Somalia and Niger, have asked ILCA for assistance with their own monitoring activities. This widespread interest could lead to cooperative projects in several countries, with ILCA providing a country monitoring officer, on a reimbursable basis, backed by the central monitoring team. The benefit to ILCA of such cooperative activities would be access to information on a wide range of livestock production systems, which would in turn be made accessible to interested agencies and national governments throughout tropical Africa.

In the course of ILCA's monitoring work, a number of relevant topics for further research have suggested themselves. Broader applications of ILCA's monitoring methodology are also possible, for instance in the preparation of plans for livestock development projects and the identification of the most appropriate topics for intensive research.