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PLANNING FOR MANAGEMENT OF COMMUNAL NATURAL RESOURCES AFFECTED BY LIVESTOCK

Proceedings from a Workshop for SADCC Countries held in Mohale's Hoek on May 28-June 1, 1990

Edited by
Enrique M. Portillo, L. Chris Weaver and B. Motsamai

Maseru
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FOREWORD

Historically, mankind has secured most of its livelihood from communally accessed natural resources. Hunters, gatherers, agriculturalists, pastoralists and fishermen obtained their food, shelter and other needs from commonly shared resources. However, a number of factors and developments, prominent among them a rapidly growing human population and its associated stresses, have placed communal natural resources under increasing strains.

Traditional management approaches, which evolved in a setting in which resources were abundant and demand low, have been unable to adapt to the challenges of meeting the heavy demands on now limited resources. Similarly, traditional social institutions have been unable to cope with these heavy demands. As a result, over-utilisation and mismanagement of resources are common place, and the long-term outlook for rural communities depending on communal natural resources for their survival is dismal.

The deterioration of the world's common natural resources is a subject for concern. Resource degradation does not recognise national boundaries. Most problems are of a global nature and their major causes seem to be similar the world around. Though a subject of extensive study and increasing concern, no blueprint has yet been produced which can accommodate the great diversity of natural environmental and socio-economic conditions encountered in the management of communal natural resources.

In the southern Africa sub-continent, particularly after the collapse of the colonial system, a rather complex set of land use competition and conflicts have developed in communal areas. A rapidly expanding human population and their high dependence on livestock is central to this situation. Throughout the SADCC Region, livestock are of great importance in terms of national economies and the social and economic well-being of rural populations. Yet, at the same time, livestock are a threat to the natural resources which ultimately must sustain the region's rural populations. Mismanagement of expanding livestock numbers are resulting in overuse of the region's rangelands. As a result, rangelands are deteriorating, wildlife is being removed to allow greater available forage for livestock, and even croplands and native forests are suffering from mismanagement of livestock.

Given this background, three Lesotho institutions (the Range Management Division of the Ministry of Agriculture, Cooperatives and Marketing; the

USAID funded Lesotho Agricultural Production and Institutional Support Project; and the SADCC Coordination Unit for Soil and Water Conservation and Land Utilization Sector) decided to hold a joint regional workshop on planning for management of communal natural resources affected by livestock.

The purpose of the workshop was to facilitate the exchange of experiences, identify principles of success and produce recommendations regarding management of communal rangelands through community-based programmes with the objective of introducing and developing better resource management.

The following proceedings of the workshop held in Mohale's Hoek, Lesotho, on May 28–June 1, 1990 have been organised basically following the sequence of the workshop. Thus, the first block contains country situation reports as submitted by national representatives. The second block groups key and discussion papers delivered by resource persons and participants, respectively. While, the third block contains a brief description of group work, workshop findings and recommendations.

We sincerely hope that this publication serves to stimulate further discussion and exchange of ideas and experiences in the SADCC region, and is found to be of utility to specialists, planners, and managers in other countries and regions as well.

The Editors

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PLANNING FOR MANAGEMENT OF COMMUNAL NATURAL RESOURCES AFFECTED BY LIVESTOCK

28 May – 1 June, 1990 — Mohale's Hoek, Lesotho

28 May (Monday)

8:15 a.m.	Workshop Opening
8:45 a.m.	Clarification of Workshop Objectives and Roles of Participants (SADCC)
9:00 a.m.	Country Status Report - Angola
9:30 a.m.	Country Status Report - Botswana
10:00 a.m.	Country Status Report - Lesotho
10:30 a.m.	Tea
11:00 a.m.	Country Status Report - Malawi
11:30 a.m.	Country Status Report - Mozambique
12:00 a.m.	Country Status Report - Swaziland
12:30 a.m.	Lunch
2:00 p.m.	Country Status Report - Tanzania
2:30 p.m.	Country Status Report - Zambia
3:00 p.m.	Country Status Report - Zimbabwe
3:30 p.m.	Tea
4:00 p.m.	General Discussion Period
5:15 p.m.	Resource Persons meet to discuss roles and duties.
6:00 p.m.	Reception

29 May (Tuesday)

8:00 a.m.	Organisation and Constraints to Management of Common Rangelands (Neal Artz)
9:00 a.m.	Discussion Paper - Zimbabwe Representative
9:30 a.m.	Questions and Discussion
10:30 a.m.	Tea
11:00 a.m.	Discussion Paper - Tanzania Representative
11:30 a.m.	Questions and Discussion
12:30 a.m.	Lunch
2:00 p.m.	Break into five discussion groups
3:30 p.m.	Tea
4:00 p.m.	Discussion groups continued

30 May (Wednesday)

8:00 a.m.	Holistic Resource Management as Applied to Communal Resource Management (R. Buzzard)
9:00 a.m.	Discussion Paper - Swaziland Representative
9:30 a.m.	Questions and Discussion
10:30 a.m.	Tea
11:00 a.m.	Discussion Paper - Lesotho Representative
11:30 a.m.	Questions and Discussion
12:30 a.m.	Lunch
2:00 p.m.	Break into five discussion groups
3:30 p.m.	Tea
4:00 p.m.	Discussion groups continued

31 May (Thursday)

8:00 a.m.	Gather at Hotel for travel to Mohale's Hoek Airport
8:30 a.m.	Flight to Sehlabathebe Airstrip
9:15 a.m.	Arrival Sehlabathebe Airstrip
9:45 a.m.	Tour Sehlabathebe RMA Headquarters
10:30 a.m.	Coffee/Tea
11:00 a.m.	Visit with Executive Committee members of the Sehlabathebe and Ha Moshebi/Ha Ramatseliso Grazing Associations
12:00 a.m.	Lunch
1:00 p.m.	Tour to cattleposts and fire treated area
2:30 p.m.	Visit Breeding Stock
3:00 p.m.	Depart Sehlabathebe
3:45 p.m.	Return to Mohale's Hoek

1 June (Friday)

8:30 a.m.	Summary of findings by Rapporteur of 'Administration and Policy Setting' Group
9:00 a.m.	Questions and Discussion
9:30 a.m.	Summary of findings by Rapporteur of 'Planning for Multiple-Use Considerations' Group
10:00 a.m.	Questions and Discussion
10:30 a.m.	Tea

11:00 a.m.	Summary of findings by Rapporteur of 'Community Participation' Group
11:30 a.m.	Questions and Discussion
12:00 a.m.	Summary of findings by Rapporteur of 'Technical and Physical Aspects' Group
12:30 a.m.	Questions and Discussion
1:00 p.m.	Lunch
2:00 p.m.	Summary of findings by Rapporteur of 'Programme Sustainability' Group
2:30 p.m.	Questions and Discussion
3:00 p.m.	Summary of Recommendations
3:30 p.m.	Closing of Workshop
4:30 p.m.	Return to Maseru to spend night at Victoria Hotel

2 June (Saturday)

First transport of participants from Victoria Hotel to Airport.
Second transport of participants from Victoria Hotel to Airport.

CURRENCIES IN SELECTED SADCC COUNTRIES

E	=	Swaziland Emalangeni (singular Lilangeni)
K	=	Malawi Kwacha
M	=	Lesotho Maloti (singular Loti)
P	=	Botswana Pula
TSh	=	Tanzanian Shilling
ZK	=	Zambian Kwacha
Z$	=	Zimbabwe Dollar

OPENING SPEECH

P. S. M. Ramaqele*

First of all, I would like to welcome you all to this important workshop on behalf of the Government of Lesotho and the Ministry of Agriculture, Cooperatives and Marketing. It is gratifying to witness such enthusiastic support and participation on the part of SADCC; it has been too long a time since we have seen representatives of all but one member state together under one roof. Your presence testifies to the importance of the issue at hand. I am also happy to see so many participants from various organisations and projects in Lesotho. Your contributions will be appreciated. Again, welcome.

The common issue which brings us all to this workshop is our concern regarding the management of communal resources, particularly those used to support the livestock so vital to our rural economies. Productive use and conservation of the ecosystems which provide forage as well as wildlife habitat, water, fuel and many other vital natural resources are key factors in the development of all our nations. Likewise, we see communal use and management of these resources as an essential aspect of our strategies to assure the welfare of our rural populations. Our traditions and our vision of the future demand that we maintain these resources as a trust for ourselves and for generations to come.

Unfortunately, the institution of common resource use has increasingly come under fire. As our populations grow at alarming rates, as the traditional society and its implicit control over resource use gives way to modernisation, as new technologies for using resources are developed and competing uses emerge, the demands we place on communal natural resources have skyrocketed. As a result, degradation of vital natural resource bases is steadily advancing, and common use is cited most frequently as the culprit.

In the SADCC region, we echo and amplify world concern over the condition of our rural poor and the state of the environment. While both food production and resource conservation by necessity figure prominently in our development plans, we recognise the potential incompatibility between these

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* Acting Principal Secretary, Ministry of Agriculture, Cooperatives and Marketing, Maseru.

two objectives. At the same time, we remain committed to the institution of communal use. As a result, our task is to facilitate the evolution of effective systems of natural resource management under common use to meet the multiple objectives of assuring the welfare of rural people, increasing the productivity of natural ecosystems, and reversing the trend toward environmental degradation. This is a formidable undertaking.

Your presence indicates your concern over, and knowledge of, these issues. Some of you have been fortunate enough to achieve a measure of success in applying this concern and knowledge, and making some headway down this difficult path. By sharing your experience with us, you will provide the raw material for discussion and analysis which, by the end of the week, will result in guidelines to help us all tackle more effectively the intractable problems of improving management of communal natural resources. I speak for myself, my nation and the people of our region, continent, and indeed our world in wishing you well in this venture.

In conclusion, I would like to thank the personnel of the Range Management Division, SADCC and the LAPIS Project who have worked long and hard to organise this workshop; USAID without whose financial and logistical support we would not be here today; and you, the participants, whose efforts will determine the success we achieve.

INTRODUCTION

Enrique M. Portillo*, L. Chris Weaver** and B. Motsamai***

BACKGROUND

Livestock play a central role in the economic and social welfare of rural inhabitants throughout the southern African region. Livestock provide meat, milk, hides and skins for subsistence needs; they also provide draught power and transport in remote areas; they are used for ceremonial and traditional purposes; and the sale of livestock and livestock products generate relied upon sources of income. It is safe to say that without livestock, a great proportion of rural population in the region would not be able to survive. This has been the historical trend and will continue to be so in the foreseeable future.

Though livestock play a positive role in the livelihood of rural communities, they contribute negatively towards management of natural resources. Overgrazing removes vegetative cover, thereby exposing soil surfaces to erosion. Continued long-term overgrazing results in deterioration of plant communities. Grazing of crop residues leads to erosion of croplands and reduction of soil fertility. Livestock, protected by man, out-compete wildlife, thus greatly reducing natural biological diversity. In effect, mismanagement of livestock within southern Africa's natural ecosystems has resulted in soil degradation, deterioration of vegetative communities, disappearance of wildlife and, in general, a decline in the ability of natural resources to sustain themselves. This situation is exacerbated further on communal lands where individuals openly compete with one another for access to limited amounts of forage.

In short, livestock are an enigma to life in southern Africa. They play a central role in the social and economic life of rural households throughout the

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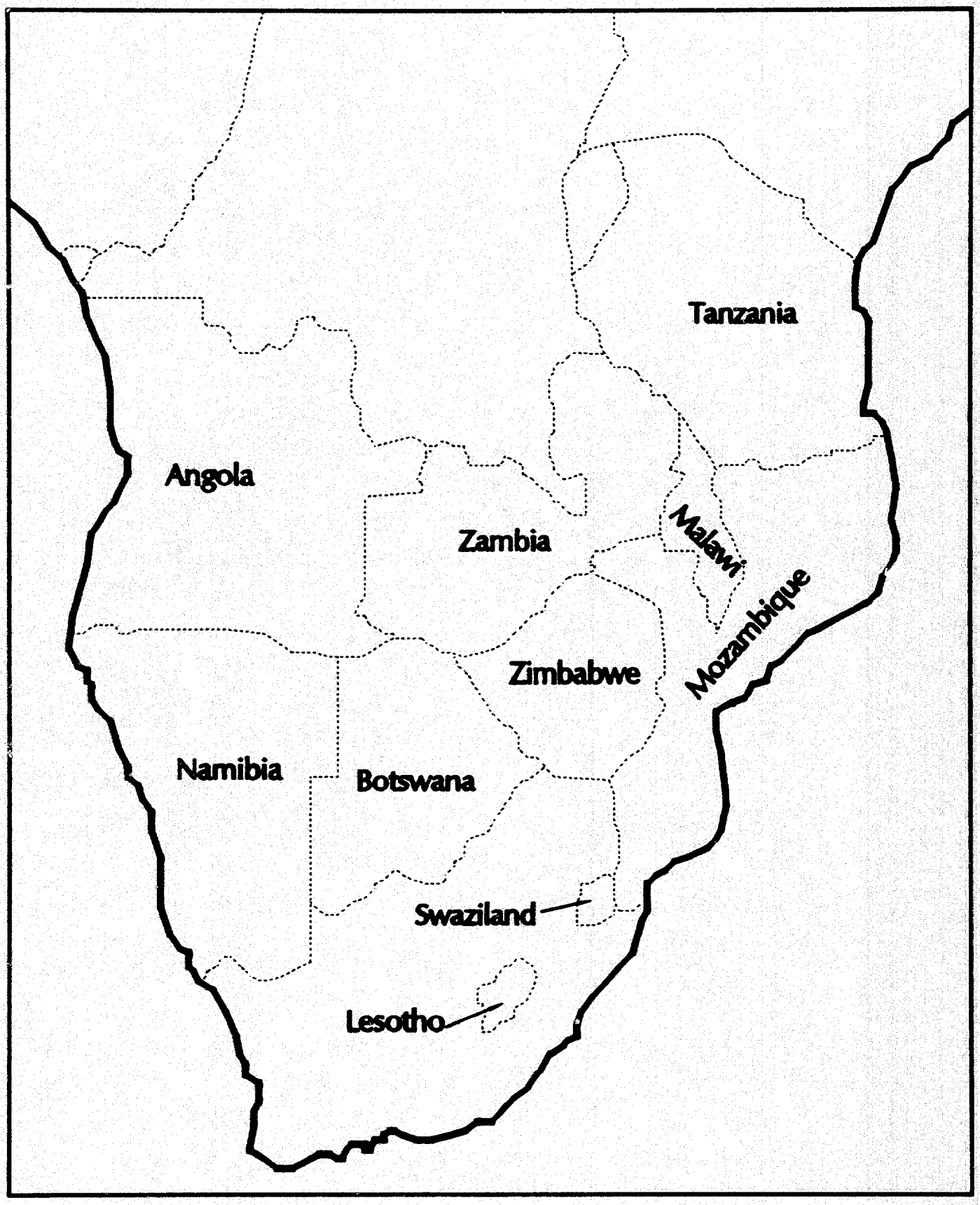


Southern Africa and the SADCC Countries

region. Yet at the same time, livestock represent one of the single greatest threats to the sustained use of the region's natural resources.

It is apparent that regional natural resources are being subjected to strains which they cannot withstand. It is equally apparent that given projected population growth rates throughout Africa that greater strains will be placed on these resources. Increased human population will result in greater demands for residential sites, croplands, forestry preserves, water development, etc. In most cases, these developments will be carved out of rangelands and wildlife ecosystems; thereby, further contributing to livestock over-utilisation of declining resources.

The role of the natural resources manager in Africa is difficult, and becoming more difficult each year. She/he must try to balance resource uses with the abilities of the resources to sustain themselves on a recurrent basis. For much of the southern African region this is particularly difficult, as the resource manager is dealing with communal lands and rural inhabitants who raise livestock for both social and economic reasons which are deep rooted in tradition.

In general, most countries are armed with inadequate knowledge to effectively deal with communal resource management. However, a wealth of information and knowledge exists throughout the region. Over the years, a number of donor and government funded programmes and projects have been introduced to southern African countries in an attempt to improve management of communal natural resources. Some of these attempts have been successful, while many have not. Unfortunately, very little information is passed onto other countries so that they too can share in successful (or unsuccessful) experiences. This is particularly true for communal resources management and related problems, specifically with regards to livestock interactions.

Since its inception in 1985, the SADCC Coordination Unit for Soil and Water Conservation and Land Utilization has been conducting regional activities pertaining to natural resources management, soil and water conservation, conservation project design, monitoring and, more recently, environmental aspects of agricultural development. Mostly, general issues only have been addressed and when dealing with specifics, emphasis has tended to be placed on farming systems. Before mid-1989, rangelands and livestock-related issues had not been dealt with separately nor received the attention they obviously deserve in the southern African regional context.

By mid-1989, however, the SADCC Coordination Unit in consultation with the United Nations Environment Programme (UNEP) embarked in the

development of a programme for the Kalahari-Namib affected countries which focused on communal rangelands and livestock management. In general, this programme was conceived to include preliminary surveys in five SADCC countries, the design of specific country projects, the introduction of improved management in pilot areas and regional exchanges. It was then apparent that the knowledge acquired and the experience gained in this field by each country have not been passed onto others and even less, shared at regional level. Therefore, there was obvious need and advantages in organising a workshop with a view to initiate exchanges of information about current programmes/projects, problems and experiences, and proposed actions.

In the case of Lesotho, on the other hand, the establishment of range management areas and their related grazing associations had proven to be an effective way of improving livestock management in conditions of communal rangelands. The Range Management Area (RMA) Programme initiated in 1982 by the Range Management Division of the Ministry of Agriculture, Cooperatives and Marketing received United States Agency for International Development (USAID) assistance through the Land Conservation and Range Development (LCRD) Project up to 1988 when the project was closed; USAID assistance was then channelled through the on-going Lesotho Agricultural Production and Institutional Support (LAPIS) Project. The LAPIS Project has played a central role in the formulation and development of the RMA Programme in its present form.

Despite the relatively short life of the RMA Programme, substantial progress had been made and considerable success had been achieved by 1989. At the same time, socio-economic processes and natural environmental interactions had been closely observed and their complexity realised; thereby, new questions arose and problems could now be seen in a different light. Thus, the Range Management Division was very eager to share the range management area's concept, approach and practical experience of implementation with institutions, government officers, subject matter specialists and managers throughout the region. In return, the Range Management Division would greatly benefit from information on experiences and developments in other countries. This knowledge would certainly assist when tackling problems already encountered in Lesotho and/or in anticipating potential areas of future problems.

Thus, SADCC Coordination Unit, Range Management Division and the LAPIS Project agreed to jointly organise and hold a regional workshop on planning for management of communal natural resources affected by livestock.

USAID had earlier sponsored the LCRD Project in Lesotho and had been funding the LAPIS Project since 1986. Besides, USAID had been and was still involved in similar programmes and projects in several southern African countries. Some of them were SADCC projects while others fell within bilateral agreements. Therefore, the proposal for a joint regional workshop was welcome.

WORKSHOP PURPOSE AND OBJECTIVES

The purpose of the workshop was for SADCC countries to jointly share their current programmes, problems and experiences regarding management of common rangelands and wildlife resources being infringed upon by livestock. Specific emphasis was to be placed on programmes and projects which had focused upon developing community-based efforts to overcome management problems.

The workshop objectives were stated as follows:

1) To allow an exchange of experiences on management of communal rangeland resources;
2) To identify principles of success which have been successfully utilised to develop community-based programmes having the objective of introducing improved rangeland management; and
3) To produce a workshop proceedings inclusive of papers presented and a summary of identified successful principles for developing community-based programmes.

WORKSHOP INPUTS

Two types of papers constituted the main inputs to the workshop, namely country situation reports and discussion papers.

Country situation reports. Each national delegation was requested to prepare and deliver a short country report which was to focus on management of communal grazing/rangelands and cover the following items:

- Types of rangelands and extent of each type *i.e.* private, communal, government owned, etc., in hectares;
- Summary of economic significance of rangelands to each country;
- Condition of rangelands and condition trends;

- Major causes of rangelands deterioration in the country;
- Stocking rate of rangelands, including numbers and optimum stocking rates;
- Historical government programmes to combat rangeland degradation problems, including highlight of the most successful and least successful efforts and explanation of causes;
- Government resources to implement rangeland management programmes; and
- Areas of joint cooperation between range management and livestock programmes on communal resources.

Discussion papers. A number of specialists from several SADCC countries were invited to present detailed case studies. These papers would be used to initiate group discussion. In order to compare results between countries, it was necessary for certain key issues to be discussed within all papers. Some of the issues to be considered were:

1. Specific projects or programmes within the country should be addressed with regard to:

- Programme objectives;
- Programme targets (who and how many people were involved);
- Procedures used to involve the people (steps implemented in the field);
- Extent of the resources being managed (number of hectares, livestock, and areas involved);
- Level of participation on the part of the targeted people (*i.e.* contributions, funding of the programme, etc.);
- Problems encountered during programme implementation;
- Steps taken to overcome the problems and degree of success;
- Steps taken to ensure programme sustainability;
- Effectiveness of the steps to ensure sustainability (both successful and failed attempts); and
- Overall effectiveness of the programme in relation to achievement of stated objectives.

2. A discussion on the 'lessons to be learned' from this programme. This section was meant for stimulating group discussions and allowing workshop participants to define basic principles to be applied in a successful model for planning for management of communal natural resources.

Case studies were not necessarily restricted to current or on-going activities; projects or programmes undertaken in the past could be considered as well if appropriate.

In addition, a few specialists were asked to prepare key papers which would address conceptual and methodological issues. A first paper was intended to assist the working groups in the process of reflecting on the overall situation in the region as outlined through country reports, and in the analysis of cases studies presented in order to draw correct conclusions and propose meaningful recommendations. Two other papers were expected to further stimulate group discussion by elaborating on aspects of management of natural resources.

THE WORKSHOP

The workshop took place from 28th of May to 1st of June, 1990 at Mount Maluti Hotel in Mohale's Hoek, a district capital in south west Lesotho. Range Management Division and the LAPIS Project were jointly charged with the responsibility for in-country organisation and holding of the workshop.

Country situation papers, following the guidelines reproduced above, were given to the workshop by representatives from Lesotho, Malawi, Swaziland, Tanzania, Zambia and Zimbabwe, while Botswana's representative delivered an oral report.

Four detailed case studies were presented. They referred to the Range Management Area (RMA) Programme in Lesotho; the Intamakuchubekela Phambili case, an example from the Grazing Land Management Demonstration (GLMD) Programme in Swaziland; the Maasai Project in northern Tanzania; and the Administrative Management Design for Game Management Areas (ADMADE) in Zambia. A brief description of the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) in Zimbabwe was also given.

A key paper addressed to opportunities and constraints in the management of common rangelands served as general introduction to group work and the assessment of case studies. Two other papers discussed the management of pasturelands under the communal land tenure system and the holistic resource management approach.

Workshop participants were divided into five working groups and provided with terms of reference. Each group corresponded to a recommendation domain or concern area. The areas considered were administrative and policy

setting, community participation, planning for multiple-use considerations, technical and physical aspects, and sustainability issues.

Discussion papers were analysed by working groups in relation to issues pertaining to each of the domains; conclusions were drawn and recommendations were put forward. Daily, groups reported to a plenary session and a general discussion took place. At the end of the week, daily reports from working groups and plenary session's discussions were synthesised in a set of preliminary findings and recommendations by a drafting team. A draft was submitted to the last plenary session; at the end of a very intense discussion and adequate adjustments, final workshop findings and recommendations were adopted by all participants.

As part of workshop activities, a field trip to Sehlabathebe was conducted. Participants had the opportunity to visit one of the range management areas and meet government technicians, chiefs and members of the grazing association.

WORKSHOP PROCEEDINGS

Proceedings have been arranged in three parts. The first part contains country situation reports from Lesotho, Malawi, Swaziland, Tanzania, Zambia and Zimbabwe, and a summary of Botswana's verbal submission prepared by the Editors.

Discussion papers in the second part comprise the case studies in Lesotho, Swaziland, Tanzania and Zambia, and the brief report on Zimbabwe as well as the key papers. The sequence of the papers in the proceedings follows the order in which they were presented to the workshop.

The third part describes the working groups in brief, and workshop's findings and recommendations are also included here.

In the process of putting together these proceedings, papers and other materials were organised following a similar format, language mistakes or inconsistencies were corrected, and the graphic presentation enhanced. However, the Editors did not attempt to research into or verify the factual contents of papers and reports, nor bibliographic references. Data, information and statements were not modified while editing. Therefore, contents and opinions in the papers remain the sole responsibility of the respective authors.

COUNTRY SITUATION REPORTS

MANAGEMENT OF COMMUNAL RANGE RESOURCES IN LESOTHO

B. Motsamai

INTRODUCTION

Lesotho has four main agro-ecological zones: the lowlands on the west, foothills in the middle, Senqu River Valley from the north east to the south west, and the mountains in the east (see map).

The lowlands are found at altitudes between 1,500 and 1,830 metres, and make up about 15 percent of the country. Soils are generally derived from sandstone. The lowlands are the most densely populated zone, and are where most of Lesotho's cultivation occurs. Severe land degradation has scarred this part of the country, with extensive dissections being common place due to gully erosion. High intensity, short duration rainfall, coupled with light soils and poor land husbandry practices have contributed to extensive erosion.

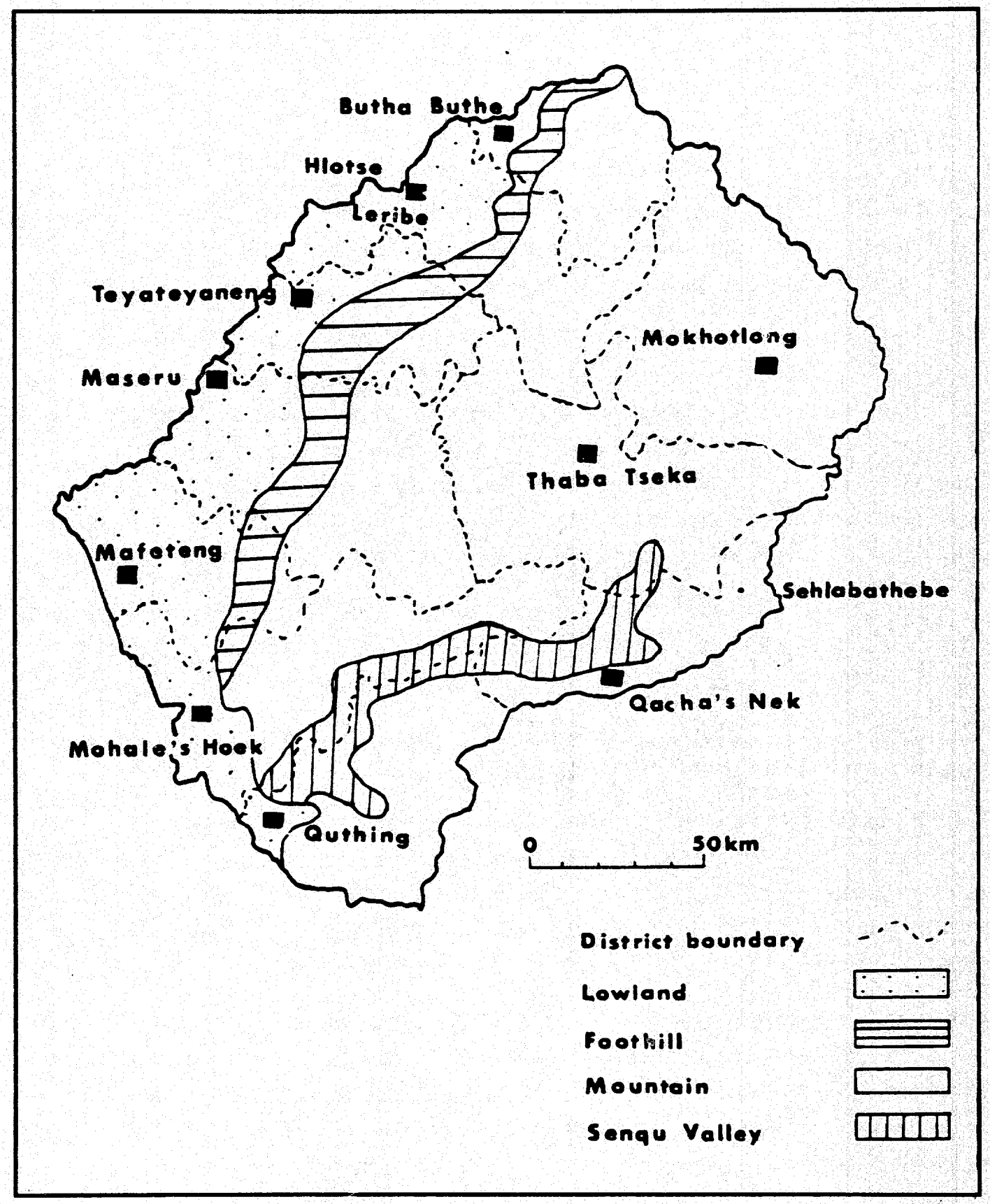
The foothills rise from 1,830 to 2,130 metres and comprise about 8 percent of the country. Soils are derived from volcanic rock, except in Quthing and Tsoelike (Qacha's Nek) where soils are from sandstone.

The Senqu River Valley lies between 1,500 and 2,250 metres. Soils are light without much organic matter and, readily eroded.

The mountains comprise about 66 percent of the total land mass. Lesotho's mountains are categorised as low mountains ranging from 2,130 to 2,590 metres, high mountains rising from between 2,590 and 3,050 metres, and higher mountains between 3,050 and 3,480 metres. Thabana Ntlenyana (3,480 metres) is the highest peak in the southern African region.

Climatic conditions in Lesotho are temperate. Rainfall in the lowlands averages 735 mm with about 80 percent of it coming during the warmer growing season from October to March. The eastern mountains have an annual mean precipitation of 680 mm. The areas of highest rainfall (1,200 mm) are found in the mountains along the Drakensberg escarpment.

The lowlands experience an average annual temperature of about 15° C, with the highest mean of 20° C occurring in January; the lowest means occur in June or July at 7.4° C. In the mountains, Letseng-la-terai has recorded an



Topographic Map of Lesotho

annual average temperature of 5.8° C. Extremes of −20.4° C in June and −1.2° C in January have been experienced. Mokhotlong has a mean of 9° C and a maximum and minimum of respectively 13.9° C and −4.1° C. Extremes reach 35° C and −12.5° C. The average frost duration is 177 days.

LAND TENURE

Land tenure system is premised upon the principle that all land in Lesotho belongs to the Basotho Nation and is held in trust by the State, as representative of the Nation. Chiefs are charged with the responsibility of administering the land on behalf of the State. However, the Land Act of 1979 instituted Land Allocation Committees of which chiefs are chairmen and *ex-officio* members. The committees have powers to allocate land and revoke allocations, particularly with regard to cropping fields. Allottees have use rights over land for farming and residence. The Land Act provides for long-term lease arrangements, but this has been applied mainly in urban areas and for commercial sites in both rural and urban areas. Land use rights are determined on the basis of citizenship, sex, age and marital status. Only the applicants who are citizens may gain rights of access to land. This includes companies and societies registered and carrying out business in Lesotho.

Arable land in Lesotho is allocated only to male household heads. However, women may obtain land rights if their husbands die. In such instances, the widow retains the land rights only until the first son becomes of age, at which time he inherits the land rights. Should no son exist, the widow may retain permanent rights to the land.

All livestock owning citizens have open access to rangelands, regardless of sex, age or marital status. Management of the rangelands is vested with the chieftainship. Chiefs are required to consult with the Land Allocation Committees in setting aside areas for closure from grazing for a specified period, or for specific purposes, for advancement of the principles of good range and livestock management. These provisions are entailed in the Range Management and Grazing Control Regulations of 1980 (as amended in 1986). Under these regulations, chiefs have powers to impound livestock that trespass on grazing areas which are closed for range rest or reclamation. The owner can procure release of such livestock only upon payment of fines at rates stipulated in the regulations.

ECONOMIC SIGNIFICANCE OF RANGELANDS

Livestock

Livestock derive direct benefit from the range forage, and although 50 percent of rural households are said to own livestock, other beneficiaries from the livestock industry increase that figure considerably. Livestock alone contribute a substantial portion to the non-diamond merchandise exports. Wool, mohair, hides and skins made up 50 percent of Lesotho's exports in 1985 (USAID 1987). Live animal exports fell from 4.7 to 2.4 percent of the non-diamond merchandise export between 1981 and 1985. This could have been attributable to the effects of drought. The 1988/89 wool and mohair export figures indicate that Lesotho earned just over M31 million (Khusu 1990, personal communication).

A study conducted in south eastern Lesotho, in Sehlabathebe (Qacha's Nek District) showed that 78 percent of all household income is in the form of cash (Lawry 1986). While the principal source of cash income is remittances from Basotho working in South Africa, the second most important income is generated from livestock. Remittances provide 50 percent of total income, whereas livestock-derived income (inclusive of non-cash income, *i.e.* draught power, milk production, etc.) accounted for 25 percent of total household income.

Wildlife

Although Lesotho had herbivorous wildlife in the past (zebras, elands, grey rhebuck, red hartebeest and hippos), these are not present any longer. The only exception is the rhebuck which is found in a few isolated areas throughout the country. Most wildlife species migrated from Lesotho due to increased anthropogenic disturbances and range deterioration. Presently, there is only one national park with rhebuck and several small mammals being the dominant wildlife. Plans are underway to develop additional parks in the near future. These parks will be established to assist tourism development.

Water Resources

The hydrological cycle involves the process of continual transfer of water from land and ocean surfaces to the atmosphere and back. Vegetation plays a significant role in the circulation of atmospheric moisture (Stoddart *et al* 1975). Any manipulation and utilisation of vegetation affects the hydrological cycle. It is prudent, therefore, to make optimum use of the vegetation while

bearing in mind possible effects on water yields (quantity and quality). Stoddart quotes Liacos (1962) as having found that light grazing had a higher yield of water than protected plots and produced no run-off. Where an oak forest was converted to a grassland increased water yields of 80 percent were realised (Papazafiriou and Burgy 1970).

Approximately 60 percent of Lesotho is made up of natural grasslands, although 12 percent of this has been invaded by the karoo shrub, as shown somewhere else in this paper. This makes Lesotho unique in its ability to produce water from the rangelands. In about six years Lesotho will commence the sale of water ('white gold') to the surrounding Republic of South Africa through the Highlands Water Project. Substantial revenue and other economic spin-offs will accrue to Lesotho. Water will also be used internally for 1) domestic consumption, 2) hydro-electric power generation, 3) farm irrigation and livestock, 4) industrial supply, and 5) recreation and tourism.

Tourism

In the SADCC region, tourism industry should be rated very high in terms of revenue earnings for each country. It is only now that Lesotho is awakening to the realities of the importance of tourism, despite its high potential due to the aesthetics of its mountain ranges. Good management of the rangelands contributes towards increased tourism activities, and thus foreign exchange earnings. Good rangelands imply more water (for recreation), more wildlife, and more cottage industries.

Other Range Products

Plant materials for development of handicrafts require protection through judicious utilisation of the rangelands. With increasing tourism the handicraft industry is becoming an important income earning enterprise for many rural households.

Medicinal plants are fast becoming extinct because of over utilisation of rangelands. One of the most prominent traditional doctors (herbalist) raised this concern to the Range Management Division three years ago. An inter-disciplinary meeting was also convened in Lesotho last year by the World Health Organisation to address the same problem. It is apparent that a reliable supply of medicinal plants can only be maintained by conservation of the rangelands through proper management.

CONDITION AND TREND OF RANGELANDS

The state of overgrazing and the resultant land degradation problem in Lesotho have been well documented. Lesotho stands out prominently in the world with its severe soil erosion problem. Conservation Division (1988) reported average annual erosion rates of 20 tons/ha from croplands and 18 tons/ha from rangelands. These represented total soil losses of 15.4 million tons from croplands and 23.4 million tons from rangelands.

Lesotho's land resources are gradually being depleted. The major cause of depletion is overgrazing. There is a direct relationship between overgrazing; reduced plough (draught) power; increased utilisation of crop residues which are essential for improvement of the soil fertility, moisture holding capacity and reduced erodibility; reduced crop yields; and the consequent soil erosion (Motsamai 1988).

A satellite picture depicts a delineation of the borderline of the international boundary between Lesotho and the neighbouring country very clearly. A straight fence line is also clearly discernable. This is so because land degradation has mapped out the country very well. There is a stark contrast between vegetative cover and land use practices of the two countries.

Combs and Hunter (1987) cited James Clarks's review of a book entitled *Climatic Change and Variability in southern Africa* by Professor T. D. Tyson: 'The Karoo (*Chrysocoma* invader shrub) is advancing in Lesotho'. On an accompanying map, Lesotho is coded at 'patchily below critical stage', only one stage above 'desert'. Surrounding Lesotho on the map are less critical stages of mainly above critical stage' and 'Karoo pioneer plants in evidence' of the Orange Free State and most of Natal.

Vegetative cover data indicates 21 percent of the rangelands have 80 percent canopy cover, 50 percent have 50 to 80 percent cover, and 29 percent have less than 50 percent cover (Conservation Division 1988).

MAJOR CAUSES OF RANGE DEGRADATION

The principal causes of deterioration of rangelands are man-made. Kassas (1987) examined the status of rangelands in the USA thus:

> In the late 1860's an influx of settlers, chiefly grazers, flowed westward to the poorly administered territories. For some 50 years the practice was open range, and conflict and violence were widespread.

During this long period of unrestricted grazing the rangelands were subjected to overstocking and little management. When the drought of the 1930's occurred the territories were so vulnerable that they soon became the dust bowl of the USA.

Remedial action took these forms: legislative control, soil conservation programmes, mechanised transhumance, animal breeding programmes, ecologically sound range management, mechanical innovations in water development, and effective extension service.

Similarities between the American example and Lesotho, and indeed southern Africa, are striking: open rangelands, physical confrontations, drought of 1933, overstocking, legislation (grazing permits) and transhumance.

Early Settlement

The early cattle-owning settlers arrived in Lesotho from other parts of the southern African region and were spread among the San people by the late eighteenth century. Originally only the lowlands of the country were occupied. By the middle of the nineteenth century, settlements and the establishment of outposts for livestock were encroaching into the mountainous region (Staples and Hudson 1938). It is also reported that the livestock outposts (cattleposts) date from about 1890 when large herds were sent to the mountains for summer grazing.

Impact of Climatic Changes

In 1931 livestock population in Lesotho had reached 1.5 million animal units. The drought of 1933 hit the region so hard that, resembling the 'dust bowl of the USA', there was scarcity of water, crops, grazing vegetation and general food supplies. Livestock population was reduced by half due to drought-induced mortalities, and people resorted to feeding on grass seeds. Subsequent heavy rainfall began to inflict scars of gullies that are still present today. Very little soil conservation measures were undertaken at that time. Since the drought, animal numbers have never reached the 1.5 million level, as there has never been adequate range forage.

Institutional Problems

Chiefs' Role. Management of the rangelands is vested in chiefs in accordance with the Laws of Lerotholi of 1939 and Range Management Regulations of 1980 (as amended in 1986). Historically, chiefs have been powerful and

effective administrators, but today their effectiveness in regulating grazing control has been eroded. As one travels throughout the country and sees differences in the condition of grasslands, it immediately strikes one that areas with good cover must have a chief with strong leadership. Weakness in the administrative strength of chiefs can be traced from socio-economic and other factors. In any society a wealthy person has more influence than a poorer person. While in the past chiefs had more land, more livestock and had their subjects working on their fields during major crop farming activities, this is no longer the case today. Large numbers of men work in the mines and bring home substantial remittances. Few chiefs portray a deportment of a good leader. The diminishing and scarce range resources have also led to survival of the fittest, hence the frequent violent incidences. Every man and herdboy wishes to see his animals well fed at all times. The chief, who rules more by tradition, cannot cope with increased demands for development activities as his office lacks the commensurate administrative capacity that should come from more government support (manpower, logistics support services). Village development councils are the logical grassroots institutions that must alleviate all the pressing responsibilities from the chiefs and encourage community participation. They, as well, need government support, and current efforts seem to point in that direction.

Legal Aspects. The Laws of Lerotholi, which were promulgated on the basis of customary practices during the colonial era, were perhaps adequate to address the mounting problems of range degradation only at the time. It was only in 1969 that the Land Husbandry Act was passed. Following this Act came the Range Management and Grazing Control Regulations of 1980, amended in 1986. It took eight years to get these regulations gazetted, and consequently a decade lost before any legal enforcement could be made. By that time trespass fines were least effective under Laws of Lerotholi. For example, owners of large stock were charged 7.5 cents per animal and one cent for small stock. The 1980 Regulations raised the fines to 50 and 5 cents for large and small stock, respectively. These were not found to be punitive enough and were then raised to M2.50 and M1.00 for large and small stock, respectively, in 1986. The charges are to be quadrupled for subsequent violations. The people who are sent by a chief to impound stock were expected to be paid 30 percent of the total fine collections. This remuneration was found to be too little. Thus, remuneration was increased to 70 percent of the fines with the passage of the 1986 amendment. Additionally, this money is to be shared equally by the people who have impounded the stock. Although there may still be the desired effect on protection of rangelands, it

is generally known that most chiefs do not send any money collected from trespass charges to government, and some of those who do so, pay very little money to the people who impounded animals. In fact, in some cases these people get nothing. This practice results in the erosion of the chiefs' effectiveness in administering people under their jurisdiction (referred to earlier), and general reluctance of village men to impound any livestock.

The Range Management Division has held annual meetings for all Principal Chiefs over the last five years. These meetings provide a forum for discussions of all range management and related issues. The Principal Chiefs have constantly complained about the capabilities of the lower courts to administer justice. Their court cases pend for too long, during which time many cases are lost and/or continued infractions are committed by the same or other culprits. Cases are also lost because the defendants bring lawyers with them while government does not provide the chiefs with similar legal support. Additional problems include: leniency on the part of the court (*e.g.* a defendant may be fined M10 while the maximum fine is M500), staff of the local and central courts are not well trained, and a general lack of conscientiousness for the dire need to protect the environment on the part of court presidents. At present the Ministry of Justice is doing all it can to address these problems. Several training sessions have been held with follow-up inspections of the customary courts. The Range Management Division and the Ministry of Justice held meetings with court presidents and chiefs throughout the country.

Unprescribed Fires. There has not been any study made on the extent of fires during the winters, but it is reasonable to assume that they have contributed significantly to range deterioration. This practice was initiated long ago by the San people who burned grass to attract prey to early lush green growth. Today, it is continued by farmers who seek to stimulate grasslands to 'green-up' early. Although *Themeda* grasslands are fire-maintained climax communities, more harm has been done in the absence of adequate vegetative cover.

Research is presently being undertaken to investigate the best use of fire as a management tool, especially for eradicating *Chrysocoma tenuifolia* (sehalahala). Preliminary results indicate that range rest treatment together with fire bring the shrub under control, whereas other alternatives would be too expensive, for example, use of herbicides and mechanical control (using either labour or machinery).

Stocking Rates

The carrying capacity of Lesotho's rangelands has not been in ecological balance with the livestock population for quite some time now. Reference has already been made to the effects of drought of the 1930's, and that it called for a pro-active impetus with which to tackle the overgrazing problem, but it never materialised.

Marketing

Implementation of the Range Management and Grazing Regulations (1980) have been impeded by inadequate marketing system. A regulation pertaining to culling of undesirable and less productive animals could not be enforced while marketing infrastructure was ill-equipped to handle the anticipated offtake.

Farmers cannot stay contented when the price of their animals on the market goes down while butchers maintain the same high selling prices. Farmers are justified in feeling overexploited and therefore reluctant to sell their livestock, particularly at auction sales. Swallow *et al* (1986) found that auction sales in Lesotho account for only three percent of cattle offtake. This is a serious constraint to stimulating commercialisation through higher offtake from the overstocked rangelands.

Inadequate Pasture Development

Livestock numbers in excess of the carrying capacity of the rangelands should ideally be canalised to alternative improved pastures and fodder. Animals feed on crop residues to supplement their grazing, but due to low crop productivity residues are insufficient. There has not been development of an improved pasture programme so that grazing pressure on the rangelands can be ameliorated. It is only the dairy farmers who undertake to plant pastures.

Public Awareness Programmes

Emphasis on intensive extension programmes has only materialised in the last five years through training courses for members of village development councils, chiefs, farmers and personnel of the judiciary as mentioned above. Radio broadcast programmes on range management were also lacking in the past.

Our extension target groups were mainly farmers and chiefs, and we found that we missed the weak link. Herdboys were never addressed in the past, as they are now. These are the key people who are with the animals on a routine daily basis.

School *curricula* lack a strong environmentally orientated basis. This must be rectified for it is the future generations who must correct and reverse the degradation process. If the current generation had received strong and appropriate training background during its early schooling, the status of rangelands might have changed for the better.

STOCKING RATES

Range scientists recognise that estimating carrying capacities of rangelands only gives a rough guideline for purposes of future directions in management and policy formulation. Carrying capacities cannot therefore be regarded as exact figures in absolute terms.

Table 1 illustrates stocking rates in relation to carrying capacities during the 1972/73 grazing season. Total large stock units (LSU) were 899,548 compared to the carrying capacity of 617,497 during the summer grazing period. Excess livestock were 252,193 LSU, or 41 percent overstocking. Only Mokhotlong district had higher carrying capacity than the stocking rate, hence the excess figures did not reflect the pattern for the whole country.

In about a 10-year period since the last estimations were made, a national rangelands inventory was carried out between 1983 and 1986. This exercise was more detailed than in the past, involving training of an inventory crew, mapping using colour aerial photographs at the scale of 1:20,000, field sampling procedures and data analysis maps showing different vegetation types.

On the basis of carrying capacity estimates reported by Range Management Division (1988) and a report on animal unit equivalents applicable to Lesotho (Meissner 1989), Table 2 indicates that rangelands in the country may be overstocked by about 75 percent.

It must, however, be borne in mind that the overstocking rate could be much lower than 75 percent due to the fact that data collection in the field was carried out during an exceptionally dry period. The onset of the drought took place in the early part of the 1980's.

Table 1. A summary of carrying capacity of Lesotho rangelands in 1972/73

District	Carrying capacity (LSU) Summer	Carrying capacity (LSU) Winter	Actual LSU Sept.'71	Excess stock (LSU) Summer	Excess stock (LSU) Winter
Butha-Buthe	43,710	21,274	54,926	+16,216	+38,647
Leribe	51,921	46,936	121,166	+71,244	+76,230
Berea	41,251	50,128	91,868	+40,591	+31,714
Maseru	151,905	141,442	164,039	+12,134	+22,596
Mafeteng	14,433	77,095	90,349	+53,884	+13,254
Quthing	55,277	50,914	76,435	+21,158	+25,521
Qacha's Nek	102,396	107,102	108,612	+6,216	+1,510
Mokhotlong	127,317	46,674	102,950	-24,367	+56,476
Mohale's Hoek	29,287	97,932	84,204	+55,117	-13,728
Total	617,497	639,302	899,548	+252,193	+252,220

Thaba Tseka did not yet exist as a district.

Source: Motsamai, B. A review of range resources use and management in Lesotho (1984)

Table 2. Stocking rate estimates for Lesotho using 1986/87 livestock statistics

Livestock Type	Total Population	Meissner's Animal Unit Factor	Animal Units
Cattle	639,670	0.720	460,494
Sheep	1,669,670	0.089	148,601
Goats	1,239,495	0.072	89,244
Horses	127,145	0.560	71,201
Donkeys	136,470	0.340	46,400
Total			815,940
Carrying Capacity (Meissner, 1989)			465,089
Excess Stock			350,851
Percent overstocking rate			75

MAJOR VEGETATION TYPES

The Range Management Division inventory (1988) also shows different vegetation types of Lesotho inclusive of other land categories.

Vegetation makes up about 69 percent of Lesotho's total surface area. Of these, grasslands alone comprise 61 percent, including the invading *Chrysocoma* species (sehalahala), shrub lands 8 percent, and boglands 0.07 percent. Other land categories are shallow rocklands 5 percent, residential areas 2 percent and cultivated areas including woodlots 25 percent.

Table 3. Vegetation types of Lesotho and their extent of coverage

Vegetation/Land category	Size (ha)	Cover (%)
Hyparrhenia	350,190	11.0
Eragrostis/Aristida	147,550	5.0
Themeda	474,7971	6.0
Festuca	358,316	12.0
Chrysocoma/Artemesia	359,6801	2.0
Leucosidea	131,201	4.0
Rhus	110,771	4.0
Merxmuellera	106,356	4.0
Shallow rocklands	158,202	5.0
Residential areas	69,431	2.0
Cultivated fields	765,5122	5.0
Boglands	2,224	0.1
Total	3,034,235	100.0

HISTORICAL GOVERNMENT PROGRAMMES

Range Management Areas Programme

The idea of grazing associations was conceptualised in the southern districts, especially in Quthing during the early 1970's. The first was Mat'seng Brown Swiss Association whose main specific purpose was to breed brown swiss cattle and sell them to other farmers throughout the country. The other was

Ongeluk's Nek Grazing Association with the aim of producing beef cattle for sale to butchers and the national abattoir. Both associations have obtained support through the EEC/Lesotho Government funded Mphaki Project.

The design of the USAID/Lesotho Government sponsored Land Conservation and Range Development (LCRD) Project captured the concept of grazing associations from these and other earlier experiences, the only difference being that the LCRD Project's main thrust focused on participation of the whole community in natural resources management in a specific area. All other associations limited membership to farmers with special and common interests. The LCRD project has evolved in what today is termed Range Management Areas (RMA).

Three main goals of the RMA programme are to: a) increase productivity and income of rural livestock producers, b) stimulate commercialisation of the extensive livestock industry, c) allow management of natural resources in a manner which is sustainable and socially acceptable to Basotho in rural areas. This programme demands a very intensive extension component, requiring an RMA manager, an extension person and a livestock specialist. RMA's headquarters have to be located in connection with already existing Livestock Improvement Centres. There are forty five such centres in the country. The programme has currently concentrated on the mountain region where a group of villages has adjoining summer cattlepost grazing areas.

In order to avoid any legal challenge to the existence of an RMA, a chief declares the establishment of such an area with powers vested in him by the Range Management and Grazing Control Regulations 1980 and by virtue of being a gazetted chief according to the Chieftainship Act of 1968. The declaration with a map attached is signed by the chief in the presence of a witness, and then date-stamped.

A grazing association formed in an RMA must be registered by the Register General of the Law Office in Maseru. This is the most successful example thus far, and there are presently four RMA's totalling 130,000 ha: Sehlabathebe with 33,000 ha (Qacha's Nek district), Ha Moshebi/Ramatseliso with 10,000 ha (Qacha's Nek), Pelaneng/Bokong with 35,000 ha (Leribe district) and Mokhotlong/Sanqebethu with 52,000 ha (Mokhotlong district)[1].

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1 See 'Management of Communal Natural Resources through Community-Based Grazing Associations' by L. Chris Weaver in pp. 154-180.

Thaba Tseka Grazing Association

The Canadian/Lesotho Government funded Thaba Tseka Rural Development Project, which was enthused by the idea of grazing associations, attempted to start on an area of 1,500 ha. However, there were insurmountable problems from the start to the end of the association (1979 to 1980).

The first problem was that membership was limited to wool and mohair growers association members. These were the most progressive farmers with the most advanced breeding programmes. As they were few in numbers, registered members only reached eight whereas the minimum number of an association must be ten before it can be registered legally. In essence, an association never legally existed. The majority of other livestock farmers saw the association as an elite group to which the government granted special privileges, *i.e.* exclusive use of grazing land.

As time passed, the land set aside for the association improved its production considerably. The grass grew too tall for sheep and goats to be able to graze. Hence, the association decided to introduce members' cattle to reduce the herbage. At that point, non-members thought that the area had been opened to all, and also brought their cattle in for grazing although the area was fenced. This led to confrontation which ended in court.

The judge of the court made a ruling based on the fact that the group never registered with the Law Office and that no proof was brought forth as evidence that the land had been allocated to them, not even to the project. Even if the group would have been allocated land there was no basis for exclusive usufruct rights over the area, as they were not a legal entity.

This brought an abrupt end to the association. Fences were destroyed. Though there were dismal attempts to revive the idea, they were to no avail.

Policies

Livestock policies were enunciated in more detail in 1987. Areas covered were animal production through intensive breeding programmes, animal health, marketing of livestock and livestock products, and range resources management.

Major advancements were made in range management. These were on government intentions to:

a) **Terminate transhumance of livestock from lowlands and foothills to the mountains.** This termination was intended to reduce soil erosion caused

by seasonal migrations of stock, reduce grazing pressure on the fragile mountain ecosystem, and introduce more intensive livestock production options in the lowlands and foothills.

b) **Adjudicate grazing rights.** There is at present an unorganised allocation of grazing permits and cattlepost sites which complicates management. A survey of cattleposts is therefore being undertaken to determine 1) names of farmers using cattleposts, 2) villages of origin, 3) number of livestock by type, 4) length of period of ownership of cattleposts, 5) length of seasonal grazing period, and 6) other relevant management data.

This information will assist in discussions with chiefs and farmers in reallocation of grazing areas so that groups of villages can be given designated cattlepost areas in closest possible proximity to them.

c) **Introduce grazing fees.** Grazing fees are to be introduced in order to induce farmers to rationalise on the keeping of an animal within a herd or flock. The increased costs will force farmers to determine whether individual animals bring sufficient benefits or income, or whether it is better to sell particularly non-productive animals. This should reduce the stocking rate considerably and thereby give rangelands an opportunity to recuperate. Fees are to be collected by village development councils and used for development activities pertaining to livestock and range, or other programmes as may be determined.

USAID has allocated funds to assist Lesotho in implementing these policy-related strategies. Part of this funding was made available through SADCC.

RESOURCES TO SUPPORT RANGE MANAGEMENT PROGRAMMES

Activities in the field of range management were consolidated from the Divisions of Livestock, Conservation and Crops and culminated with the creation of the Range Management Division in 1979; most of the manpower and transport came from the then Livestock Division.

The structure of Department of Livestock Services to which Range Management belongs is shown in Figure 1.

Manpower Resources

The newly born Division had only a few skeletal staff at the headquarters. With the support of the USAID-sponsored Land Conservation and Range

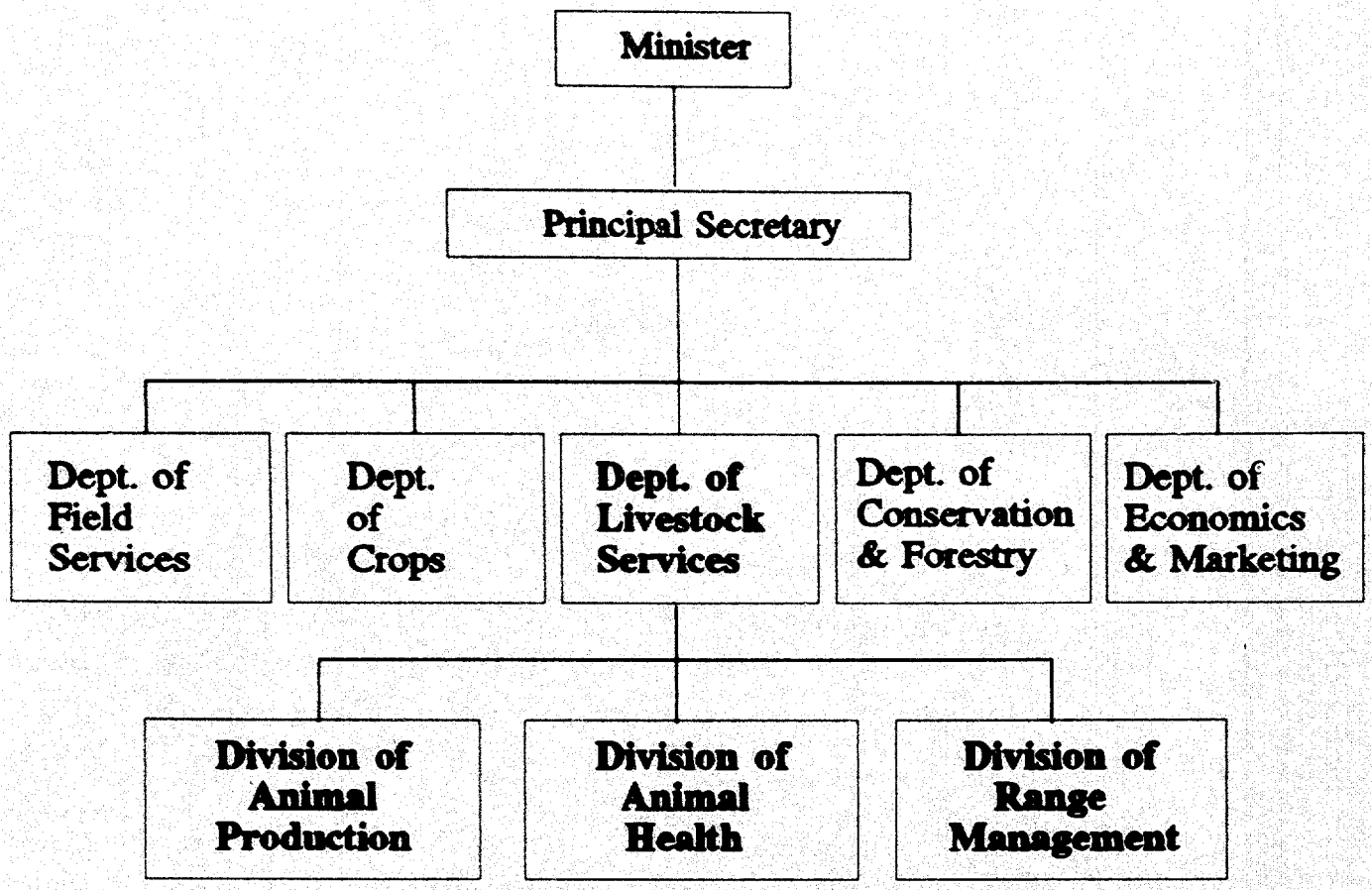

Figure 1. The structure of Department of Livestock Services

Development (LCRD) Project, which operated from 1981 through 1988, a total of 13 staff members were trained to degree level, one to master's level and 6 to diploma. Additional support continued under the Lesotho Agricultural Production and Institutional Support (LAPIS) Project (also funded by USAID) which provided training for 3 more officers: 2 to the B.Sc. level and another to M.Sc.

The present staffing position, considering headquarters, district level and RMA Programme, but not including administrative support staff, stands as shown below.

Staff and levels of training

Headquarters

M. Sc.	2
B. Sc.	4
Diploma	2
Certificate	7
Other (incl. computer operators)	3

District

B. Sc.	2
Diploma	5
Certificate	3
Other	66

RMA Programme

B. Sc.	1
Diploma	2
Certificate	4

Out of the total training programme from the LCRD and LAPIS projects three officers were transferred from Range Management Division: two to Agricultural Research Division and one to Lesotho Agricultural College. One of the graduates resigned from government and another was lost through a fatal vehicle accident.

The technical assistance team members from the USAID support project have been five in number. Presently, there is one more year remaining of their contracts, as the LAPIS project is scheduled to end in June 1991.

Financial Resources

The Division of Range Management receives about 2 percent of the recurrent annual budget of the Ministry of Agriculture, Cooperatives and Marketing. This is mainly in support of headquarters activities and the RMA programme. The rest of the support goes through the Department of Field Services in providing salaries, subsistence and transport for district staff.

The major financial support comes from donors, in particular USAID. Other donors include the EEC (Mphaki Livestock Project), Sweden, Germany and the World Bank.

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THE STATUS OF LIVESTOCK PRODUCTION IN COMMUNAL GRAZING LANDS OF MALAWI

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ABSTRACT

The potential of natural resources to produce basic food commodities including meat and milk products has been outlined. Generally, the grazing resources are dwindling following expansion of cultivable land. Livestock feed shortages are caused by seasonal weather fluctuations of alternating wet and dry seasons. Dambos in some areas provide the dry season grazing. Two case studies of projects aimed at improving the carrying capacity of natural pastures and livestock productivity have been reviewed and possible causes of failures suggested. The information collected could be used to formulate future projects. Present integrated land utilisation programmes aim at conserving natural resources to ensure continued land productivity to support a growing human and livestock population.

INTRODUCTION

Malawi with an area of 94,396 sq km is dominated by the final section of the Rift Valley system which fractured the high South Central African plateau to form a deep trough occupied by Lake Malawi, which is drained by the Shire River following the line of rift into the Zambezi River (Agnew and Stobbs 1972). The faulting and the subsequent erosion cycles created diversified topographies which have been modified by the influence of Lake Malawi, the Intertropical Convergence Zone and the Southeast trade winds to give rise to tropical and subtropical environments (Agnew and Stobbs 1972).

In order for Malawi to effectively utilise the endowed natural resources, the government's primary objective is to make the country self-sufficient in the basic food commodities and industrial raw materials. Animal products in the form of meat and milk have a crucial role in balancing the diet of both rural and urban populations who represent respectively 85 percent and 15 percent.

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For this objective to be achieved at all times emphasis is placed on the proper land utilisation to ensure that natural resources are well managed. Modern methods are employed on cultivable land supported by technology generated by dynamic research programmes. The next section outlines the present land distribution in Malawi.

LAND DISTRIBUTION

Table 1 shows the distribution of land assigned to different uses.

Table 1. Distribution of Land Uses in Malawi

Land Use	Proportion (%)
Uncultivated	25.0
Cultivable land	23.0
a. Commercial estates	7.3
b. Customary land	14.3
c. Surplus land	1.2
Forest on customary land	28.0
Forest reserves	10.4
Urban areas	1.6

Source: Arup-Atkins. National Livestock Development Study (1988)

The total area with accessible grazing resources is 2.09 million hectares out of which 2.06 and 0.31 million hectares are respectively dryland and dambo. The figures imply that great care should be exercised in the use of present grazing resources.

VEGETATION TYPES

The country is divided into three broad physio-geographic categories. These are the Rift Valley floor, the plateau area and the highlands. The following account summarises their main vegetation features.

(a) The Rift Valley floor consists of the lakeshore plain and the Lower Shire whose altitudes are 20-120 metres and 550 metres, respectively. Rainfall is rather erratic in some years and temperatures are generally high. The

woody vegetation consists of *Acacia*, *Cordyla*, *Adansonia* and *Sterculia* species and some *Combretum* phases in some dry areas.

The Lower Shire grass cover consists of *Urochloa mosambicensis* on the heavy clay soils. *Peniceem* species occur around swampy areas (Jackson and Wieke 1959) which are dominated by *Echinochloa* species. *Sesbania* in swampy areas, and *Phynchosia* and *Chitoria* are the legume species. Numerous cattle and goats are kept in this area.

The lakeshore plain herbaceous cover comprises *Panicum*, *Pennisetum*, *Cynodon*, *Digitaria*, *Brachiaria*, *Setaria*, *Neonotonia* and *Aeschynomene* species. The swamp vegetation along rivers and behind the lake beach comprises *Phragmites* and *Echinochloa* species. Cattle, goats and sheep are kept in this area.

The vegetation of the Nkhata Bay section comprises the lowland moist evergreen *Brachystegia* and associated forest species with a dense understorey of creepers and climbers. Open spaces are dominated by *Brachiaria* and *Panicum* species while the dambo and riverine areas are dominated by *Pennisetum*, *Echinochloa*, *Brachiaria* and *Panicum*, and *Setaria* species on the dambo margins. Livestock keeping has not been traditional in this area and there is no danger of tsetse fly. The Karonga lakeshore plain has a rainfall pattern of increasing intensity as one goes from south to north. The woody vegetation consisting of *Acacia*, *Adansonia* and *Sterculia* species give way to *Brachystegia* and *Julbernardia* on sandy areas. The grass cover comprises *Cynodon*, *Urochloa*, *Panicum*, *Setaria*, *Brachiaria* and *Hyparrhenia* species on the dry and partially wet areas whereas *Echinochloa* and *Phragmites* species occur in swampy areas. Large numbers of cattle are kept in this region and they rely on swamp grazing in the dry season.

(b) The plateau areas fall between 700 to 2,700 metres and cover the Lilongwe, Kasungu, Mzimba and Chitipa plains. Temperatures are cool to hot (17° C to 30° C) from the south to the north. The Lilongwe plain woody vegetation comprises the *Acacia-Piliostigma-Combretum* phase on heavy soils and the *Brachystegia-Julbernardia* on sandy soils. The herbaceous cover comprises *Panicum*, *Pennisetum*, *Cynodon*, *Setaria*, *Brachiaria*, *Urochloa*, *Hyparrhenia* and *Themeda* species. Numerous cattle, goats and sheep are kept in this heavily cultivated region so that livestock depend on the dambo grazing resources discussed elsewhere in this paper.

The Mzimba plain has rather shallow soils in some sites and a rather dry climate due to its position on the leeward side of the Viphya and Nyika plateau and Njakwa hills. The woody vegetation comprises *Brachystegia*, *Isoberlinia* and *Julbernardia* species, and *Acacia* and *Piliostigma* on the alluvial soils. There is also a *Brachystegia-Uapaka* phase on unfertile soils. The herbaceous cover is of low density comprising *Hyparrhenia*, *Themeda*, *Setaria*, *Panicum*, *Cynodon* and *Neonotonia* species. Abundant herbs flush before the onset of rains and therefore contribute to the grazing resources at a period of feed scarcity (Jackson 1968). The plain is densely populated and cattle, goat and sheep keeping is traditional amongst farmers.

The Chitipa plain woody vegetation cover comprises the *Brachystegia-Isoberlinia-Julbernardia* complex with a *Acacia-Piliostigma* phase on fertile areas. The pollarding of trees for finger millet growing has a destabilising influence on the herbaceous cover. *Hyparrhenia*, *Themeda*, *Panicum* and *Cynodon* on sandy soils and *Neonotonia* species occur on this plain which supports large numbers of cattle giving rise to high annual offtakes.

(c) The highlands of Mulanje mountain, Shire highlands, Zomba mountain, Kirk range, Viphya and Nyika plateaus and the Misuku hills do not warrant any detailed description because most of the land is taken up for forest reserves, national parks or the vegetation has denuded as a result of intensive cultivation.

LIVESTOCK FARMING

Farmers in Malawi have a long tradition of keeping cattle, goats and sheep. Commercial farmers also keep livestock on their farms and ranches. Livestock population stands at 1 million cattle, 0.79 million goats and 0.7 million sheep against a human population of about 8 million.

Livestock graze communally because most of the land is still under customary tenure. As a result there is no limitation on the number of livestock owned by individuals and the extent of the area to be grazed. Therefore nobody has the responsibility of checking the condition and trends of communal grazing lands. The situation is worsened by specific roles assigned to livestock as being kept for dowry payments, meat bank for ceremonies, live banks for prestige. Therefore there is no systematic culling of livestock by farmers.

However, some forest reserves provide grazing resources for a nominal fee of K0.10 animal/month to permittees. The majority of these forest reserves are in the central and southern regions where grazing land is taken for cultivation to accommodate the rising human population. Areas selected for grazing have moderate slopes and show less risk of environmental degradation. The majority of forest reserves and national parks are set aside to supply drinking water, protect flora and fauna, and for aesthetic values.

STOCKING RATES ON RANGELANDS

Stocking rates for the different ecological zones have not been systematically determined but estimations were made based on livestock census and estimated dry matter production. Table 2 shows the contribution of various land uses in calculating the carrying capacity. At present estimated carrying capacity is between 3.55 hectares per large stock unit (LSU) of 500 kg and 4.41 ha/LSU (Arup-Atkins 1988). The highest and lowest carrying capacities are in respectively the central and southern, and the northern regions. The implication from these estimates is that grazing resources are dwindling, pasture productivity is low and numbers of livestock greater than advisable are kept (Arup-Atkins 1988). Seasonal shortages are not likely to improve due to herd growth rates of 3.5 percent and 8.2 percent for cattle, and goats and sheep, respectively. Otherwise, the sum total of national feed requirements stand at 28.43 percent and 29 percent for the northern, and central and southern regions respectively (Arup-Atkins 1988).

As pasture quantity and quality fluctuate along the year, calves and kids dropped at the peak of the dry season rely heavily on mother body reserves. Crop residues which become abundant after harvesting provide supplementary feed as outlined in Table 2. In areas where *Acacia albida* occurs the pods containing over 10 percent of crude protein are a major source of protein supply. Older animals go through the compensatory growth syndrome so that productivity per animal is delayed while grazing resources are depleted. However, the feed situation tends to improve at the onset of rains when shrubs and herbs provide high quality diets (Walker 1980).

CASE STUDIES OF GRAZING PROJECTS

Northern Region Grazing Project

The project was established on the premise that the majority of feeder grade cattle transported to the central and southern regions were produced on

Table 2. Estimated maximum grazing and crop residue resource

Land Use	Area (000's ha)
Total land area of Malawi	9,427
Total area available for cultivation	2,165
Total uncultivated land	2,367
25% of forest on customary land	754
Subtotal	5,282
Less:	
Land under cultivation	2,300
Land unsuitable for cultivation	894
Total accessible rough grazing (including 31,176 ha of dambos)	2,088
Plus suitable weed grazing resource	644
Total available grazing land	2,732

Source: Arup-Atkins. National Livestock Development Study (1988)

northern plateau areas by smallholder farmers under range conditions. The ranges are characterised by low quality grasses which accumulate dry matter within the 5-month rainfall season. Nutritional problems are experienced in the dry season when protein supply from grasses is very low. In order to increase the feeder grade cattle supply, the FAO/UNDP Project MLW/75020 was set to achieve the following objectives: a) to improve the quality and carrying capacity of the range through the introduction of suitable and appropriate legume species; b) to increase livestock productivity through the utilisation of genetically superior *Bos indicus* Brahman and Malawi zebu bulls; c) to improve the general performance of cattle by providing basic animal health and husbandry packages and d) to encourage farmers to market steers, excess and culled cattle. The areas chosen were Mjinge, Madise, Luzi in Mzimba District and Mwazisi in Rumphi District.

The approach adopted was to organise participating farmers into committees to foster the management of adopted grazing systems. Both uplands and

dambos at Mjinge were fenced off and oversown with *Stylosanthes guianensis cv Cook*, silverleaf desmodium (*desmodium uncinatum*) and greenleaf desmodium (*desmodium intortum*). The project provided free legume seeds and helped in their establishment. The fencing was done by the project for the farmers. At the other three sites, Mwazisi, Madise and Luzi farmers were organised into grazing committees to oversee pasture establishment.

The results showed that silverleaf desmodium and Cook stylo were useful in wet and dry seasons, respectively. Greenleaf desmodium was not successful on account of low soil nutritional status and its requirement of a long growing season. Silverleaf desmodium is very palatable and grows in phase with the rainfall pattern and facilitates animals to be fattened off pastures for the end of wet season sales. Cook stylo grading over 12 percent of crude protein accumulated 45 percent of its dry matter after the rains (Lamboll 1982) but in the project areas rains do not contribute to support continued growth.

Cattle gained about 0.25 kg/ha/animal on Cook stylo reinforced range at Mjinge while at Mwazisi heifers and calves grazing a plot of Cook stylo to supplement range pastures gained over 0.45 kg/ha/animal during a 70-day period. Cook stylo had a significant influence on weight changes because it becomes more palatable in the hayed off state. Results indicated that there is a potential for producing feeder grade cattle within a shorter time compared to the normal 4-year period.

The project never continued after the phasing out of external funding. The were a number of reasons for failure.

i. The project was highly capital intensive and wholly run by expatriate personnel;

ii. There were social problems caused by non-participating farmers who started fires or their cattle went into the improved areas;

iii. Cattle sales were not increased because of social factors. Cattle are multiple owned and this requires the consent of everybody concerned. Some farmers are custodians (*mafisa*) for other people. Normally, cattle are sold only if other sources of income are exhausted or in years of crop failures; and

iv. Bulls died of diseases due to lack of proper care.

However, the legumes have survived and spread themselves to other spots through cattle that ingest Cook stylo seed heads and drop them with the drug

which also provides nutrients and a suitable germination environment. Silverleaf desmodium seed dispersal is effected by the hairy pods adhering on animal coats or clothes and dropped at distant places. Some farmers have continued harvesting seed for local sales but they lack better market outlets.

Dambo Utilisation Project

Dambo is a low lying area or valley floor characterised by seasonal and permanent water logging. The water table fluctuates throughout the year; there is a rise and recession of water in the rainy and dry seasons, respectively.

In some parts of the country dambos occupy as much as 30 percent of the catchment area. Traditional dambo uses are vegetable growing, thatch grass, brick making, sand extraction, tobacco nurseries, water supply and livestock grazing (Russell 1971).

High stocking densities on dambos throughout the year as a result of expansion of cultivable land have led to the disappearance of the palatable grasses and their replacement by *Sporobolus pyramidalis* and *Cynodon* species which have the ability to colonise bare patches. *Cynodon* species spread towards dambo centres from anthills on dambo margins. *Cynodon* pastures are very palatable and provide good dry season grazing and withstand very high stocking rates. Moisture and livestock wastes seem to be the driving forces supporting the high production of dry matter. Heifers on well managed *Cynodon nlemfuensis* pastures have attained daily gains of 0.61 kg/head (Dzowela 1984). However, *Sporobolus pyramidalis* known for its unpalatability and as an indicator of overgrazing forms the main forage grazed soon after the onset of the rains.

Dambo Forage Production. Forage productivity potential estimated at a mature grass stage gives yields of about 2 tons/hectare grading 4 percent crude protein and the crude fibre is normally high (Harker 1975). Pasture renewal is effected by unscheduled fires started when grasses have just finished translocating reserves to the roots. The sprouting grasses use these stored reserves, get scorched by the high temperature and fail to replenish the reserves before the onset of rains. Eventually, these fires coupled with the high stocking rates drastically reduce forage vigour and productivity.

Dambo Revegetation Species. Both legumes and grasses have been identified for revegetation and reinforcement of dambo areas. Legumes suitable for the dry parts and with a capability of generation from seed are *Alysicarpus*,

Cassia, *Aeschynomene americana*, *Cassia mimosoides*, *Vigna* species, *Centrosema pubescens*, *C. virginianum*, *Desmodium intortum*, *Lotononis angolensis*, *Zornia tenuifolia* and *Desmanthus virgatum*. *Setaria sphacelata*, *S. splendida* and *S. palustris* which grow both on dambo and upland areas are leafy, high tillering, recovery from cutting and the ability to grow longer into the dry season (MANR 1980).

Brachiaria decumbens cv Signal shows good forage yield potential under wetter conditions on dambo margins and stays green longer into the dry season (MANR 1980). *Panicum repens* has demonstrated the ability to colonise other adjoining areas (Hodges *et al* 1983).

Livestock Productivity Potentials. During the rainy season which lasts five months livestock graze on the dambo to avoid damage to field crops (Russell 1971).

Livestock of all age groups form a continuous population prone to disease and pest spread (Hammant 1971). Malawi zebu cattle calve in the dry season (July-December) a period during which stocking rates are very high in relation to grazing resources' availability and quality (Wilson 1946, de Koning 1976). These calves enter the wet season in a poor condition only to face serious diseases and pest pressures. The commonest tick borne diseases are East Coast Fever (ECF), anaplasmosis and red water, and parasites are liver fluke, roundworms and other intestinal worms.

The dambo could improve livestock production by means of instituting grazing management. The Kalumba dambo grazing trial demonstrated that young stock could gain weight and reduce mortality rates with mere fencing to implement rotational grazing (Woodford and Cox 1971). Crop residues were used to supplement dambo grazing, especially groundnut tops, which supply more nutrients than growing stock requirements (Mtikuso *et al* 1983). There is a possibility of improving on weight gains if forages described above were utilised in either rotational grazing or stall-feeding practices. Controlled grazing would facilitate village herd productivity by using superior bulls and castrating the inferior ones.

The study revealed that there are a number of problems associated with dambo utilisation for livestock production. Fencing off some part of the dambo would require the consent of other farmers (Woodford and Cox 1971, Russell 1971). In addition, fencing materials are very expensive and beyond the financial capability of smallholder farmers. However, live fences constructed from sisal (*Agave sisalana*) seem to be a possibility worth trying. In case

fences are put up, wild fires and non-participating farmers would interfere with forage resource utilisation. Finally, the financial benefits would be the driving force for dambo improvements.

REDUCTION OF GRAZING PRESSURE

The government has established cattle markets throughout the country for farmers to sell their animals based on live weight and graded on the hoof. Sales are advertised on radio for the benefit of both farmers and buyers. The highest bidders buy the animals but farmers are free to withdraw animals when prices are not satisfactory. Prices of animals have been raised and meat prices liberalised. Both farmers and buyers have benefited from these adjustments.

Stall-feeding beef and dairy cattle are being encouraged around urban areas. This practice is aimed at reducing grazing pressure on rangelands while at the same time availability of manure could stimulate intensive farming. However, stall feeding of dairy cattle is capital intensive and government provides loans for purchasing cows and equipment.

The system of shifting cultivation, especially for finger millet, takes away grazing land and the resultant dense coppices reduce grass understorey. Such a scenario is found on the Mzimba plain. The use of inorganic fertilizers is encouraged rather than relying on wood ash as a source of nutrients.

The government through various departments has embarked on land utilisation projects which have a direct bearing on the problem of overgrazing. The Land Husbandry Department teaches farmers to appreciate the value of natural resources and formulates detailed farm plans to minimise soil erosion. The Pasture Section is always screening materials which would fit in the farming system and advises on possible ways of maintaining pastures. Mixed cropping is being encouraged so that assorted food products are harvested from a small area. Livestock feed provision from the agro-forestry system is being investigated and extended to farmers. The Forestry Department is canvassing for tree establishment for fuelwood and building materials.

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A REPORT ON MANAGEMENT OF COMMUNAL GRAZING IN SWAZILAND

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INTRODUCTION

Statistics of the various veld types occurring in Swaziland and their extent in hectares are presented. This paper is confined to the exploitation of rangelands, especially in Swazi Nation Land (SNL) where utilisation is communal, and it is characterised by the lack of stewardship.

Factors influencing the current use of rangelands are considered in addition to the problems encountered; range condition and trend, major causes of deterioration and governmental programmes aimed at rationalising the utilisation of rangelands are tersely highlighted.

Areas of joint cooperation have been identified and presented in the paper. Finally, government resources to implement rationalised rangeland utilisation are discussed.

VELD TYPES AND THEIR EXTENT

Swaziland has four agro-ecological regions running from north to south, namely highveld, middleveld, lowveld and Lubombo. Ideally, the highveld and most of the middleveld support the sour type of vegetation dominated by the tallest and medium grass species. This type of vegetation is not good for grazing.

The sweet type of vegetation is supported by the lowveld and Lubombo. The dominant grass species consist of *Panicum*, *Setaria*, *Chloris* and *Themeda*, and the vegetation type is enriched by the occurrence of abundant browse species of the *Febaceae* family.

Table 1 below depicts the extent of grazing in each agro-ecological region of Swaziland. It should be noted that each agro-ecological region is composed of sub-vegetation associations which will not to be delved on in this paper.

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Table 1. Grazing lands by agro-ecological regions

Agro-ecological region	Area (ha)
Highveld	225,037
Middleveld	298,306
Lowveld	143,892
Lubombo	185,515

Source: Census for Agriculture, 1983-84. Ministry of Agriculture and Co-operatives, Mbabane

Figure 1 shows how each veld type in the respective agro-ecological region is subdivided into sub-associations. For management purposes the associations in each zone are considered as one vegetation type.

Agro-ecological region	Veld type
Highveld	Mountain sour veld Sour veld
Middleveld	Tall grass veld Tall dry-grass veld Upper broad-leaf tree savanna and hillside bush Upper tall-grass veld
Lowveld	Lower broad-leaf tree savanna Dry *Acacia* savanna
Lubombo	Eastern open savanna Semi-open grassland

Figure 1. Veld types per agro-ecological region

RANGELANDS CONDITION TREND

There is sufficient documented evidence suggesting that natural grazing lands do change for better or worse as a result of the management to which they are

subjected. This holds true for Swaziland. The 'mining' of grazing resources as practised in communal areas is due to lack of stewardship. Livestock farmers are interested in optimum animal production from rangelands, yet it is imperative that as producers, the farmers should recognise the early symptoms of deterioration in terms of plant/animal relationship. Such a notion would facilitate stocking rates' adjustment to counteract detrimental trends or to encourage advantageous trends. Provided the assessment of the 'state of health' is based on sound criteria, carrying capacity is directly related to condition.

While species composition and density are dependent upon climate and soil characteristics, four criteria are universally employed in evaluating condition *i.e.* botanical composition, vigour, basal cover and soil surface condition. Results may vary greatly depending on the intuition of technicians employing the criteria. Traumatic and subtle changes in grazing lands as a result of management occur in a predictable sequence, as outlined in Figure 2. Generally, with prolonged grazing as the case is in communal areas, the following chain of reaction may be expected:

- vigour of palatable species is reduced;
- botanical composition is directly affected, and general decrease in desirable species follows;
- basal cover decreases initially as a result of the decline of many palatable species, but more hardy species colonise the spaces thereby surpassing the original cover;
- soil surface condition due to impediment may result in increased detachment; and
- splash erosion.

With regard to procedures employed in condition assessment there is a certain variation and this is dependent on other factors which will not be addressed in this paper.

STOCKING RATES OF THE VARIOUS AGRO-ECOLOGICAL REGIONS

The terrain of an area determines the stocking rate and the best combination of animals to graze. For Swaziland's agro-ecological regions various stocking rates would be appropriate if controlled livestock numbers were implemented.

Time frame	Processes	Symptoms
	Original vegetation	Dominated by a dense cover of productive, perennial, upright grasses usually of high acceptability.
	OVER-UTILISATION ↓	
Seasonal	Reduction of vigour	Decreased leaf area, lower reserves, reduced growth rate, less culms, less seed, less seedlings, death of tufts, reduced surfaces organic matter. Unpalatable species unaffected.
	↓	
Short term	Decrease in cover	Smaller tufts, less tufts, lower competition, sparser cover, increased bare soil surface, formation of large bare areas.
	↓	
Medium term	Change in botanical composition	Pioneers colonise bare areas, increase in annuals, expansion of prostratehalut species, dominance of unpalatable species, maintenance of species resistant to heavy use, appearance of woody weeds, poisonous species become problematic.
	↓	
Long term	Deterioration of soil surface	Low and variable plant cover, splash erosion, crusting, increased run-off, pedistilled tufts, higher rate of erosion, lower infiltration, drier soil, unsuitable germination conditions, death of mesophytic species, lower soil fertility, dominance of xerophytes, formation of permanent scalded areas on heavy soils.

Figure 2. Theoretical sequence of processes in land degradation following continued over-utilisation of the vegetation.

The keystone of good management is control: control of stock density and offtake, of lack of stewardship, of grazing lands, of watering points and of animal marketing outlets. Awareness of all the factors which concur to develop good grazing systems results in effective control. Ideally, stocking rate determination should be holistic in approach *i.e.* incorporate climate, plants, animal and human interactions.

Under the communal system of land use, that is mixed farming systems characterised by lack of stewardship of natural resources, it is impossible to intensify and tighten grazing control on the less productive natural grazing lands. The most important management concept is correcting the stocking rate. There are subsidiary factors which modify stocking rates: the seasonal variability of grazing pressure, the use and control of indiscriminate and untimely fires, and the development of more than one species. In this paper, however, such factors are not to be dealt with.

Of great importance in this context is that different stocking rates are used in government ranches well situated in different agro-ecological regions, and they are equally applicable in Swazi Nation Land (SNL). Table 2 depicts proper and optimum stocking rates which have been considered to be applicable to Swaziland.

Table 2. Proper and optimum stocking rates in Swaziland

Veld type	Correct stocking rate (ha/AU)	Optimum stocking rate (ha/AU)
Highveld	8–12	4–8
Middleveld	6–10	4–6
Lowveld	4–6	2–3
Lubombo	4–6	2–3

It should be noted that stocking rate is a function of herbage production which shows a linear correlation with rainfall. Also topography and soil erodibility directly affect stocking rates.

The major problem facing communally grazed rangelands is poor perception of the causes and effects of environmental degradation associated to traditional

pastoral societies. Management of grazing lands is the expression of the human society living in them; it reflects human adaptation to biological, economic and political environments over a long period. Range improvement programmes failing to take into account these three aspects are unlikely to produce tangible positive results.

Currently, the national stock density ranges between 1.3 and 1.6 beasts per hectare. The number of animals is the most influential factor, but the numbers can be limited under a social system when controls have been built in. Under the communal management system, control of stock is not practicable. Without the government decree, change of land tenure system and control of watering points, over-exploitation of rangelands seems inevitable.

MAJOR CAUSES OF RANGELAND DETERIORATION

There is adequate evidence to suggest that Swaziland is plagued by soil erosion resulting mainly from overgrazing. Many other causes can be behind a problem which has proven extremely difficult to solve. Major causes are:

- Steady increase in both human and livestock population resulting from advances in veterinary and human health disciplines which have gradually led to intensified pressure on rangelands. Unfortunately, changes in land use pattern are not monitored annually.
- Growth of agro-business in the country which contributes substantially to increasing pressure on grazing lands. For instance, the establishment of Simunye (third sugar mill in Swaziland) meant the loss of 9,000 hectares of grazing land to which the establishment of the cotton ginnery mill in the lowveld and the discovery of diamond reserves in the Dvokolwako area could be added.
- Resettlement programmes: phases I and II did result in increased pressure on rangelands. Under these programmes, fenced areas were subjected to high stock densities with lack of subsequent control of livestock numbers and grazing management practices.
- Land tenure system, especially in SNL, which does not hold anyone responsible for 'mining' the rangelands.
- Use of untimely and indiscriminate fires resulting in increased soil loss and reduced soil fertility. In a case study carried out in 1983, results

presented in the International Training Centre Journal (T.C. 1983) revealed that 7,000 hectares of veld were burnt in June. From such a study inferences can be made as to what extent the damage could be if July, August and September were considered.

However, the use of controlled fires for range management is a proven and accepted method of maintaining grasslands, and to a large extent 'suppressing' bush encroachment.

- Steady growth of fuelwood requirements for rural communities and urban dwellers. The high cost of energy has led to rural communities increasingly resorting to indiscriminate cutting of wood; this in turn has resulted in reduced canopy cover.
- Kraaling of livestock by pastoral communities contributes remarkably to soil erosion.

GOVERNMENT PROGRAMMES TO COMBAT RANGELAND DEGRADATION

Rangeland degradation problems such as decreased herbage production, increased soil erosion, declining carrying capacities, and ultimately a reduction in the living standard of the rural communities have been cause for concern in Swazi Nation Lands ever since the 1940's. Because of the prevailing land tenure system, programmes aimed at combating degradation have not produced tangible benefits for the farmers.

Realising the risks posed by soil erosion, the government as early as in the 1950's established some institutions with a view to stabilising soil loss problems. The programmes included such components as Lifa Fund, holding grounds, Swaziland Meat Corporation (SMC), rural cattle sale yards, Central Rural Development Board (CRDB) Sisa ranches, resettlement and Range Management Grazing Demonstration Areas. Concomitant with these were acts aimed at curbing rangeland degradation. They included the Forest Act and the Fire Act.

On account of the lack of stewardship for rangelands as exercised by pastoral farmers in the communally grazed areas, the 'mining' of grazing resources still continues unchecked. However, there was initial success in the case of Holding grounds, especially in the first five years of implementation considering that the areas from which excess animals were removed recovered. Unfortunately, the subsequent lack of control and manipulation of

stocking rates continued and resulted in imminent improper utilisation of rangelands.

The programme which stood firm with some formidable results is the SMC which remained functional till 1985 when it closed down. The only flaws which were built into the programme were the monopoly in the manipulation of the cattle grading system and the determination of a 'floor price'. Furthermore, it absorbed carcasses which were considered unfit for human consumption and encouraged the keeping of old stock to the disadvantage of grazing resources.

Sisa ranches, on the other hand, never showed any measurable success at all. The main problem was that areas were not targeted as one would have expected in such a programme.

The recent idea of Range Management Grazing Demonstration Areas did serve as educational tools in the respective SNL where they were established. However, the will amongst pastoral communities to adopt the principles and establish or incorporate more hectares in adjacent SNL areas has not been encouraging.

THE ECONOMIC SIGNIFICANCE OF RANGELANDS

The expanse of rangelands, rather than their productivity, relative to the various uses *i.e.* wildlife, water management, fuelwood, forestry, grazing for domestic animals and other aesthetic needs, makes rangeland management to be of very important economic value.

The overall government policy in the agricultural sector is to enhance the quality of rural well-being and to assist farmers to change from subsistence to semi-commercial and commercial farming. Fortunately, Swaziland is endowed with the physical land resource base and favourable climatic conditions to facilitate the attainment of these objectives.

The extent of rangelands in the country as shown in Table 3 demonstrates how important this resource is to the national economy.

Of the total available grazing lands, 73 percent is located in SNL where management of grazing resources is not practised. With the lack of controlled grazing, rangeland degradation is rampant, and this has led to lowered range productivity. Concomitant with declining productivity is reduced foreign earning capacity. Livestock products contribute more that 3 percent of

Table 3. Total grazing in the Swazi Nation (hectares)

	Whole country	Swazi Nation Land (SNL)	Individual tenure farms
Natural veld	1,131,581	852,750	278,831
Planted Pastures	33,724	-	33,724
Total	1,165,305	852,750	312,355

foreign exchange and the participation of the communal sector is quite substantial because 80 percent of the total cattle population is from SNL.

Considering the importance of the products from rangelands and other aesthetic values, it becomes apparent that such a resource deserves to be accorded due planned management instead of the 'mining' approach the resource is subjected to at present.

AREAS OF JOINT COOPERATION BETWEEN RANGE MANAGEMENT AND LIVESTOCK PROGRAMMES

Among the many areas where joint efforts are required, the following are the most urgent:

- Market improvement: the price of beef cattle should be such that young stock fetched more money to encourage early sale of animals.
- Boards responsible for proper rangeland utilisation should be formed with the participation of highly qualified soil conservationists as opposed to the present situation.
- National rangelands inventories directed to ascertain the extent of rangeland damage and to design proper utilisation should be commissioned and carried out on an annual basis.
- The change of land tenure system should be carefully analysed at both grassroots and national levels. From such a land tenure system change, it is hoped that stewardship concerning rational utilisation of grazing lands would be installed amongst resource users.

- The development of an early warning system referring to rangeland misuse is necessary. It may facilitate easy legislation.

It should be noted that whatever joint areas of cooperation were identified, they should focus on the causes of rangeland degradation and try to redress such problems.

GOVERNMENT RESOURCES TO IMPLEMENT RANGELAND MANAGEMENT PROGRAMMES

Under Swaziland's present priority ranking of national objectives, it is impossible to implement improved rangelands management. Personnel is clearly insufficient: range specialists falling under the Department of Agricultural Extension are only two.

MANAGEMENT OF COMMUNAL NATURAL RESOURCES IN TANZANIA

M. A. Mwenye*

INTRODUCTION

The need for proper utilisation of the country's rangelands resources and their potential contribution to the national economy cannot be overemphasised. These lands occupy extensive areas and yet contribute little to the economy or even sometimes they represent a serious liability.

The challenge of increasing the productivity of these rangelands is indeed formidable. Most rangelands experience severe droughts either annually or every few years, so that sustained production is impossible. Moreover, livestock numbers have increased to the extent that extensive areas have been overgrazed and their productivity declined.

Land pressure and competition with crop production coupled with the problem of ill-defined land use policy have resulted in cattle owners, particularly those with large herds, to be moving permanently from one place to another.

In contrast to this situation is the under-utilisation of certain rangelands by livestock because of constraints such as heavy tsetse fly infestation, lack of water and inadequate basic infrastructure as *e.g.* dips, water points and so forth. These and other factors limit a more widespread distribution of livestock production and create an awareness that something ought to be done now to avoid misuse of communal natural resources by livestock.

TYPES OF RANGELANDS

Tanzania is located between latitudes 1° and 12° South and longitudes 30° and 40° East in eastern Africa. It covers 881,289 sq km of continental land, excluding the islands of Zanzibar and Pemba which have a total surface area of 2,332 sq km, but including some 58,800 sq km of inland waters.

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The range area of Tanzania constitutes a basic resource, the utilisation and orderly development of which demands an understanding of the nature and role of each of the components of the ecosystem.

Pratt, Greenway and Gwynne (1966) classified the country's rangelands into six eco-climatic zones and a comprehensive series of physiognomic vegetation types. The characteristics of each of the zones and their potential and limitations for range management are described in Table 1. The classification system used has taken into account the ecological potential of the land and the description of the present vegetation, with emphasis on the nature and relative contribution of the woody plants and grasses.

The objective of classifying the country's rangelands is twofold: a) to assist in the management of land already under economic production and b) to indicate priorities and potentialities in the development of new areas.

Legally, however, the range areas comprise several categories of land:

- Land that is formally set apart as national parks, or as game or forest reserves (about 325,060 sq km).
- A small area of title-deed land already occupied by commercial ranches (about 7,800 sq km).
- A very large area occupied by subsistence pastoralists and pastoralist-cultivators (260,838 sq km).
- There also remains some unoccupied and unallocated land.

On the whole, about 500,369 sq km is land suitable for grazing. The area of commercial ranches is the only land held under registered title. This land represents only 16 percent of the range area, compared to 52 percent occupied by subsistence agro-pastoralists. The latter is held by tribal and sub-tribal communities who have traditional rights of occupancy under non-statutory customary law, but whose land is owned legally by the state or is vested in trusteeship to local authorities.

The maintenance and improvement of these lands depend crucially upon the users. At present, most of the pastureland is communally grazed by individually owned livestock except those lands under commercial, parastatal and private ranching operations which hold land titles. This practice of grazing private livestock on communal land constitutes the single major constraint to improving the management of rangelands. The inevitable result of this system of livestock production is for the cattle owners to keep

excessive livestock numbers which in turn leads to overgrazing, soil degradation, low fertility and high mortality rates.

In terms of development opportunity, the greatest potential for higher rewards lies in the subsistence pastoral areas. The reasons for this include the fact that 1) sustained offtake levels are necessary to the survival of these communities, and 2) the realisation of the economic value of subsistence herds by planners would aid in upgrading national and local economies most substantially.

ECONOMIC SIGNIFICANCE OF RANGELANDS

Grazeable lands comprise about 500,359 sq km (or 56.77% of the total land area) which support over 90 percent of the total ruminant livestock population (UDS 1979). According to the 1984 National Livestock Census, Tanzania has about 13 million cattle, 7 million goats and 3 million sheep. Practically all, 98 percent cattle, goats and sheep are kept by smallholders in rural range areas herein called the traditional sector (MALD 1984). However, despite the large number of ruminant livestock, overall productivity is low.

Of about 40–50 percent (EIU 1988) contribution of the agricultural sector to the national economy, the livestock sector accounts only for approximately 10 percent of the GDP. This small contribution is partly due to the fact that livestock production is mostly subsistence, whereby livestock are generally sold only when cash is needed.

Meat consumers, on the other hand, depend entirely on domestic production to meet their estimated annual requirements of over 200,000 tons. Milk production is however supplemented by imported recombined milk powder and butter oil to satisfy the annual demand of about 400,000 million litres.

Besides the above mentioned benefits the range livestock contributes substantially to social functions of the rural communities. In addition to ruminant livestock, the rangelands, especially Maasailand in Northern Tanzania, support one of the world's greatest spectacles of wildlife (Fallon 1962). Other areas of economic significance of the range resources include game viewing, sport hunting, game cropping, ground water source, catchment area and habitat utilisation.

RANGE CONDITION AND TREND

The condition of the rangelands is in general declining and in some areas degradation has reached an advanced stage. Overstocking, inappropriate

Table 1. Agro-climatic Zones of East Africa (Revised from Pratt et al 1966)

Climatic zone	Vegetation and land use
I. Afro-alpine climate (climate governed by altitude, not moisture)	Afro-alpine moorland and grassland, or barren land, at high altitude use and potential, except as water catchment and for tourism.
II. Tropical climate. Humid to dry sub-humid (moisture index not less than 10)	Forests and derived grasslands and bushlands, with or without natural glades. The potential is for forestry (sometimes with wildlife and tourism) or intensive agriculture, including *pyrethrum*, coffee and tea at higher elevations. The natural grassland requires intensive management for optimum production; one hectare or less and up to 2.5 ha is required per stock unit, dependent on whether the grassland is productive *Pennisetum clandestinum*, a *Themeda* association or coarse *Pennisetum schimperi/Eleusine jaegeri*. (Ground-water forests occur under climates drier than dry sub-humid).
III. Dry sub-humid to semi-arid (moisture index 10 to 30)	Land not of forest potential, carrying a variable vegetation cover (moist woodland, bushland or 'savanna') the trees mostly *Brachystegia* or *Combretum* (and their associates) and the larger shrubs mostly evergreen. The agricultural potential is high, soil and topography permitting, with emphasis on lay farming. Large areas are still under range use; with intensive management their stock-carrying capacity can be high — less than 2 hectares per stock unit — though it is lower where dry seasons are long (as in southern Tanzania), and full realisation of the climatic potential may require bush control and fertilizers. Regular burning may be necessary, particularly where tall *Hyparrhenia* dominates.

IV.	Semi-arid (moisture index 30 to 42)	Land of marginal agricultural potential (limited mainly to sisal or quick maturing grains) carrying as natural vegetation dry forms of woodland and 'savanna', often an *Acacia-Themeda* association but including dry *Brachystegia* woodland and equivalent deciduous or semi-evergreen bushland. This is potentially productive rangelands — with less than 4 hectares required per stock unit, except where dry seasons exceed six months limited mainly by the encroachment of woody plants and sometimes by leached soils. The more open country with a high density of wildlife is a valuable tourist asset.
V.	Arid (moisture index 42 to 51)	Land suited for agriculture only where fertile soils coincide with very favourable distribution of rainfall or receive run-on; typically rangelands dominated by *Commiphora*, *Acacia* and allied *genera*, mostly of shrubby habit. Perennial grasses such as *Cenchrus ciliaris* and *Chloris roxburghiana* can dominate, but succumb readily to harsh management; more than 4 hectares is required per stock unit (though sown *Cenchrus* may support heavier use). Wildlife is important, particularly where dry thorn-bushland predominates. Burning requires great caution, but can be highly effective in bush control.
VI.	Very arid[1] (moisture index 51 to 57)	Rangelands of low potential the vegetation being dwarf shrub grassland or shrub grassland with *Acacia reficiens* subspecies *misera*, often confined to water courses and depressions with barren land between. Perennial grasses (*e.g. Chrysopogon aucheri*) are localised within a predominately annual grassland; growth is confined largely to unreliable seasonal flushes, and grazing systems must be based on nomadism. Populations of both wild and domestic animals are restricted severely by the environment.

1 The moisture index of zone VI was originally (Pratt *et al* 1966) extended to 60, but as this figure quotes to no rainfall, a revision of zone boundaries now curtails zone VI (semi-desert) at 57, and recognises indices 57 to 60 as representing true desert, zone VII, which is not found in east Africa.

cropping practices and deforestation are but some of the causes. This has resulted, in the most affected areas, in reduced livestock numbers and productivity.

The problem of rangelands destruction is very real and although certain projects have made localised impact, (e.g HADO and HASHI to be discussed later) the problem is of national dimension and threatens the rural economy of the country. The solution lies partly in solving land tenure issues, land use planning, and resource utilisation and management.

MAJOR CAUSES OF RANGELAND DETERIORATION

The agents causing rangeland degradation, even in purely pastoral areas, are not only livestock that graze, browse and trample the vegetation. There are other factors involved as well.

Land Tenure System. The land tenure legislation is complex and conflicting, and this has contributed in large measure to the slow progress of village land allocation, demarcation, registration and mapping. This situation maintains the uncertainty of land ownership rights and hampers development, especially of communal grazing lands. This is so because the individual farmer in many cases appears to lack security of tenure and consequently can be expected to have little interest in improving or protecting the land.

The **indiscriminate removal of woody vegetation** for timber, fuel, charcoal and browse.

The **uncontrolled burning of vegetation** which contributes to losses of feed, fuel and timber; to degradation, and to changes of climate.

The **clearing of natural vegetation cover** for cultivation of crops. Often these plots are abandoned after one year and in brittle environments the natural vegetation regenerates very slowly, if at all, leaving the soil exposed to the risk of destruction by wind or water.

As human population increases, the land in higher potential areas is subjected to **shorter cycles of shifting cultivation or unsustainable continuous use systems.**

All these factors, and more, lead to loss of trees and shrubs, replacement of perennial by annual grasses, development of weeds and bare soil, increased run-off, soil erosion, rangelands degradation and eventually desertification.

Table 2. Summary of Natural Grassland Resources in Tanzania

Ecological Zones	Semi-arid to sub-humid	Humid plateau	Humid lowland	Very humid highland	Very humid lowland	Total
A. Land Use (000's hectares)						
Total Area[1]	22,778	32,483	20,075	11,452	1,340	88,129
Cultivated Area[2]	1,026	1,697	1,160	472	168	4,523
Grazing land[1]	19,295	18,228	5,725	5,993	794	50,035
B. Cattle Population[3]						
Approx herd size (000's)	4,170	6,067	793	1,013	274	12,317
Distribution (%)	33.86	49.26	6.44	8.22	2.22	100
Offtake (000's)	309	449	59	75	20	912
Offtake (%) (Average)	7.4	7.4	7.4	7.4	7.4	7.4
C. Stocking Rate (hectares/head)						
Overall	5.5	5.4	29.3	11.3	4.9	7.2
Grazing lands	4.6	3.0	7.2	5.9	2.9	4.1
D. Climate[2]						
Rainfall (mm)	800	800-1,000	800-1,000	1,000	1,000	
Length of dry season (months)	5	4-6	4-6	5	3	
E. Typical Grass General[2]	*Hyparrhenia Cenchrus Cynodon Panicum*	*Hyparrhenia Digitaria Setaria*	*Hyparrhenia Panicum Heteropogon Cynodon Digitaria*	*Pennisetum Panicum*	*Hyparrhenia Heteropogon Digitaria*	
F. Major Regions Involved[2]	Arusha Singida Dodoma Iringa Shinyanga	Kagera Mwanza Mara Tabor K'njaro Mbeya Rukwa	Tanga Morogoro Coast Mtwara Lindi D'Salaam	Kagera Mbeya K'njaro Rovuma	Tanga	

Sources: 1 Department of Geography, University of Dar es Salaam. 1973. Bureau of Statistics, Dar es Salaam
2 Tanzania Society of Animal Production
3 MALD, Ministry of Agriculture and Livestock Development

STOCKING RATES OF RANGELANDS

The cattle herd is distributed unevenly throughout the country with more than 90 percent being confined to semi-arid to sub-humid regions and the humid plateau (See Table 2 for more details).

The general stocking rate is considered to be 7.0 ha/head for the country as a whole (88,128,900 ha) and 4.0 ha/head for the total grazeable lands (50,035,971 ha). Significantly, about 60 percent of the cattle, sheep and goats are kept on about 10 percent of the land (MALD 1983), mainly because of high tsetse infestation and a general lack of watering facilities, which restrict livestock keeping in many areas. In addition, there are inadequate basic infrastructures and pursuance of uncoordinated and conflicting objectives on the use of land, thus limiting a more widespread distribution of livestock. As a result of this situation, cattle distribution is such that the stocking rate is much higher in the northern regions of the country than those in the southern part which is generally under-stocked.

MAJOR VEGETATION COMPOSING THE RANGELANDS

Vegetation in Tanzania is usually classified into seven types, as shown in Table 3, apart from the land under cultivation. Forests are mainly limited to the higher uplands as dense stands of dry evergreens, and to riverine and swamp forests. Woodland was probably the general climax vegetation over much of the country, notably miombo woodland dominated by *Brachystegia* and *Julbernardia*. Miombo woodlands still cover nearly half the country and are the main source of commercial timber. Much of it is infested with tsetse fly. Woody grassland in many areas represents a forest climax.

Most semi-desert areas in Tanzania are the result of human and livestock depredation, rather than a climatic climax. Darkoh (1980) maintained that 4.5 percent of Tanzania suffered from desertification, while a further 35 percent was threatened. However, UNSO (1986) took a less extreme view but still found about one third of the country to be affected, with the worst impact in the Dodoma-Kondoa area (Central Tanzania).

HISTORICAL GOVERNMENT PROGRAMMES TO COMBAT RANGELANDS DEGRADATION PROBLEMS

To encourage an awareness of the potential for increased animal production through the application of improved methods of pasture management, the

Table 3. Vegetation types

Abbreviation and Name		Description
F	Forest	Continuous stand of trees with heights of 10-50 metres, usually multi-storied and interlaced canopies.
W	Woodland	Open cover tree without interlaced canopies and with grass and herb cover.
B/T	Bushland/Thicket	Communities of densely growing shrubs and small trees with a canopy cover of more than 50% and with a general height of 1-10 metres. Herbs and grasses may form part of the ground cover in bushland but are absent from thicket.
WG	Wooded grassland	Communities dominated by grasses and herbs with very scattered trees and shrubs, giving a canopy cover of less than 50%.
G	Grassland	Communities dominated by grasses and herbs with very scattered trees and shrubs, giving a canopy cover of less than 10%.
D	Semi-desert vegetation	Vegetation characterised by very widely scattered compound vegetation *e.g.* low shrubs, stunted trees and annual grasses.
B	Permanent swamps	Vegetation consisting of grasses, reads, sedges or rushes and associated with high water table or perennial flooding.
C	Cultivation	Areas where most of the original vegetation has been replaced by cultivation.

Notes: Compound vegetation *e.g.* W/B complex of woodland and bushland
Source: Definitions of vegetation types from Atlas of Tanzania. 1976

Government enacted the Range Development and Management Act of 1964. The major objectives of the Act were to conserve, develop and improve the rangelands in the pastoral areas of the country, notably Maasailand, Gogoland and Sukumaland.

Before independence, in 1961, there were no meaningful programmes governing the proper use of our rangelands, and hence the misuse of these lands was excessive. After the formulation of the Act in 1964, the Tanzania Government sought external donors who would assist in its implementation and this actually started in 1969 when UNDP launched a livestock improvement and range development effort in Sukumaland and Gogoland, while the USA Government undertook to improve livestock and develop the range in Maasailand.

The Maasai Range Development Project

The Maasai Range Management and Livestock Improvement Project operated in Northern Tanzania for a period of 10 years (1970–1980). It involved an area of approximately 24,000 sq km occupied largely by the semi-nomadic Maasai people.

The lands in question covered about 14 million acres along the Rift Valley zone bordering Kenya. It was estimated that these lands supported about 45,000 Maasai, 1 million heads of cattle and perhaps 1.25 million sheep and goats (Fallon 1963).

Implementation of the project included the formation of ranching associations, improved range management, animal health services, livestock husbandry, water availability, livestock marketing and improved extension services.

Attempts to institute controlled grazing and organised livestock marketing have been operationally successful but politically a disaster. However, animal health delivery services, water distribution, supply of improved bulls were highly appreciated by cattle herders while control of animal numbers was resented.

HADO and HASHI Projects

HADO project started in 1979 in Kondoa/Mvumi in Dodoma. The project was conceived as a means of tackling the problem of environmental degradation caused by increased pressures on land resulting from growing human population and livestock numbers.

The project involved total exclusion of cattle in the project area of 125,600 hectares where 90,000 cattle were removed and the area left ungrazed for 10 years. The visible success in revegetating and stabilising the area was spectacular. The project was extended to Shinyanga Region (HASHI) in the lake zone.

The second phase of the project will involve the introduction of improved cattle for dairy, based on a zero-grazing system and this seems likely to be a success, as fodder is now plentiful in what ten years ago was a semi-desert (FAO 1988).

GOVERNMENT RESOURCES TO IMPLEMENT RANGELAND MANAGEMENT PROGRAMMES

One of the major factor limiting the implementation of rangeland management programmes is the low investment injected into the development of the grazing lands. It is generally believed that provision of efficient livestock development infrastructure and approved feed base could have significantly increased productivity in the traditional sector. Until recently the traditional sector had received little attention in terms of investments thereby rendering vast areas of our rangelands unsuitable for livestock development.

In 1983 a Range Development Unit was set up in the Ministry of Agriculture and Livestock Development with the following responsibilities:

a) Assistance in the establishment of ranching associations, cooperative and village ranches;

b) Rangeland development i.e pasture improvement, provision of water and others;

c) Mobilisation of range resources and better land use management;

d) Resources surveys; and

e) Tsetse fly control.

Five range development zones were planned to facilitate implementation of the programme. However, only one zone has been established due to lack of adequate funds. Since the establishment of the zone much has been achieved, including the construction of 40 dams, design of several grazing management plans and more than 200,000 hectares cleared of tsetse flies.

CONCLUSION

Tanzania's human and livestock populations are growing rapidly. Therefore, a corresponding increase in food production must be ensured. Statistics show that the country has never been able to produce more than 80 percent of its food requirements during the last ten years, the average figure being around 60–75 percent. Deficits are caused by an increase in population pressure coupled with mismanagement of the natural resources.

Traditionally, the management of natural resources has been geared towards exploitation and very little has been done to ensure regeneration and sustainability of production. A good example is seen in the miombo woodlands where desert-like conditions caused by deforestation and cultivation on marginal lands have forced pastoralists to abandon their normal grazing lands and to move to new areas where conflicts with other land users have become frequent and the spread of animal diseases has become more pronounced.

To avoid further depletion of natural resources, there is a need for policy makers to promote environmentally sustainable land use policies. It is my hope that during discussions in this workshop, we will come up with suggestions and strategies on how to achieve sustained maximum animal production consistent with the perpetuation of natural resources.

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BLENDING WILDLIFE, LIVESTOCK AND RANGE MANAGEMENT IN ZAMBIA

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INTRODUCTION

Zambia is approximately 75 million hectares in size and lies between 8° and 18° South of the Equator. Most of the area forms a plateau lying between 1,000 and 1,600 metres of elevation above sea level. About 80 percent of the country is covered by miombo woodland dominated by species of *Julbernardia*, *Brachystegia* and *Isoberlinia*. The remaining 20 percent is composed of other varieties of forest, woodland and grassland of which six percent constitutes wetlands. The major plant species in grasslands (including wetlands) are *Nymphaea*, *Vossia*, *Echinochloa*, *Oryza*, *Phragmites* and *Aeschynomene*.

RANGELAND TYPES

Two types of rangelands can be distinguished: dambos and floodplains, and upland grasslands. Total grazing area is approximately 10 million hectares. The distribution of livestock in Zambia is influenced by several factors, the prominent ones been rainfall, vegetation and tsetse fly distribution.

Most of the livestock is kept by traditional herders. The major livestock areas are Central, Eastern, Western and Southern provinces. These provinces lie in the drier miombo woodland which is dominated by the Chipya and Munga vegetation. This vegetation has three distinct types of grasslands, as follows:

a. Rainfed grassland which becomes green only during the rainy season;

b. Seepage grassland which remains green throughout the year; and

c. Floodplain grassland which becomes available after flood recession.

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The growth of grass species in the drier miombo woodland is favoured by the 'openness' of this woodland which thus allows adequate sunlight to reach the ground. These areas receive adequate rainfall for grass growth (less than 1,118 mm per year). Except for the dambos and floodplains that experience acidity and alkalinity problems the rest of the drier miombo woodlands are not seriously affected. The major livestock areas are also free from tsetse fly infestation because of the open miombo woodland.

The northern parts of Zambia are characterised by the wetter miombo type of vegetation. Trees here are closely packed and as a result very little sunlight is able to reach the ground surface. These areas receive an average of more than 1,118 mm of rainfall per year. Heavy rains promote the leaching of bases from the top soil giving rise to acidity problems. Acidity and inadequate rainfall mean that grass growth in the wetter miombo is inadequate for grazing purposes. The wetter miombo is usually the home for tsetse flies.

RANGE MANAGEMENT

According to White (1987) range management requires man's stewardship in wisely coordinating the production and utilisation of plants in their existing environment. Very little had been done in Zambia in the way of range management until the beginning of this decade when a feasibility study to quantify the potential for wildlife utilisation was initiated (Collinson 1983). In the past, most farmers, largely expatriates, were too preoccupied with maize and tobacco production and therefore not much attention was paid to range management (Cranfurd 1980).

However, a number of farmers with suitable land are now beginning to establish game ranches with the assistance of the department of National Parks and Wildlife Service. Past and present wildlife utilisation, the potential for commercial wildlife use on private farmland and the distribution of animal diseases throughout the country have been discussed by Collinson (1983).

Since range management in Zambia is conducted on a very small scale only, rangelands tend to manage themselves in most cases. During the rainy season from December to April, grasslands in the valleys became flooded and hence not available to the herbivores. It is during this period that grasses mature.

Most peasant farmers burn pasturelands in the late season in order to favour the generation of grasses rather than woody species. However, this management practice can have adverse effects on the pastures and soil

structure if indiscriminate burning occurs. In a small but significant way livestock also help to manage these pasturelands. For instance, cattle can feed on pods of *Leucaena* and *Acacia* and since these seeds are usually not broken down during digestion, they are passed out in excreta and germinate.

The Zambian Government has set up Cattle Development Area (CDA) programmes. Under these programmes peasant farmers are to be encouraged to adopt modern methods of animal husbandry as well as pasture management and improvement. Government resources to carry out the programmes are quite adequate such as research stations in almost all the provinces of agricultural importance. There are farmer training centres at Monze, Mazabuka and Mpika.

RANGE MANAGEMENT ASPECTS

A thorough knowledge of the concepts basic to both game and livestock ranches is essential to successful formulation of range management programmes. These concepts are carrying capacity, stocking rates, nutritional requirements, habitat modifications and range improvements (White 1987).

Carrying capacity is simply the answer to the question of the maximum number of animals an environment will support on a sustainable basis. Carrying capacity can be determined from an understanding of the primary production in an area, the organisms living in that area and their requirements (Handles 1982). This requires a sound knowledge of animal metabolism, very often demanding a tedious exercise, especially in the case of game animals.

Stocking rate is defined as 'the number of animals per unit of land area that the plant population can support for a specified time period without detriment to the plants' (White 1987). Carrying capacity and stocking rates are expressed in animal unit equivalents and animal units, respectively. It is however important to estimate carrying capacity based on the area grazed during the critical time of the year and for the animal classes involved. For example, Kafue Flats, one of the wetland areas with an extension of 13,987 sq km (Chipungu *et al* 1982), is utilised by both wildlife and livestock mainly during the dry season. Therefore, the carrying capacity for the dry season when these animals compete for the available forage – instead of the rainy season, is the critical unit to be considered. Shaw estimated in 250,000 the carrying capacity of the Kafue Flats during the dry season, which corresponds to a stocking rate of 2 hectares per animal unit (Bingham 1982).

Adequate knowledge of the concepts discussed above is only a prerequisite for wise range management. Unwisely managed populations usually exceed optimum density, *i.e.* the population level at which the inhabitants of an area are most productive (White 1987). Overstocking eventually leads to deterioration of range condition.

RANGE CONDITION AND TREND ASSESSMENTS

Range condition and trend are two independent concepts which are important for management purposes. *Range condition* is defined as the present productivity of range relative to what that range is naturally capable of producing, while *range trend* is the direction of change in range condition. Unfortunately, no distinct studies have been done in Zambia although this knowledge is crucial in order to design stocking management plans.

Range condition is determined after measurements made at a point in time while range trend is usually assessed on a regular basis (*e.g.* once per year). Ecological surveys as described by Hein van Gils *et al* (1980) can give information on range condition after which the range trend can be monitored over time. Other concepts such as nutritional requirements, habitat modifications and range improvements have been discussed by White (1987).

WILDLIFE, LIVESTOCK AND RANGE MANAGEMENT

As already mentioned, range management in Zambia is still at an embryonic stage in comparison to wildlife and livestock management. A fruitful blend of these programmes may be reached from a sensitive response to specific needs of an individual area and inhabitants. Before an adequate combination of these programmes could be achieved, a thorough knowledge of each one is absolutely necessary. Mwima[1] discusses a successful wildlife management programme which has carefully directed attention to the complex management intricacies involved.

RANGELAND DEGRADATION

Of the 10 million hectares of grazing land in Zambia only one quarter is available for dry season grazing, which results in overcrowding of dambos

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1 See "Conserving Zambia's Wildlife Resources through a Local Community-Based Approach" in pp. 181-187.

and floodplains for most of the year. The dry season lasts six months, from April to October. During this period no special provision is made for dry season grazing; only those areas not under cultivation are considered for pasture. Tsetse fly control measures have also contributed to a livestock population boom that leads to overgrazing. Application of low dosage rates is used to eradicate tsetse flies.

Indiscriminate burning of rangelands contributes to further deterioration. The soil structure is weakened and trees that are supposed to bring water from a depth to moisten the top soil are destroyed.

About 90 percent of the livestock is owned by traditional herders who view it as a symbol of wealth. Animals are not killed for meat and rarely sold; only some 5 percent of the livestock is marketed every year.

In the absence of planned management of pastures, changes in vegetation and subsequently in other ecosystem components are taking place. Species most palatable to livestock are grazed frequently and those weakened by cropping practices are replaced by species which are able to withstand higher stress. Growth of coarser grass species takes over the rangelands thereby deteriorating them further.

CONCLUSION

Numerous studies have been conducted on livestock such that it would be possible to predict carrying capacity with relative precision. But very few studies on wildlife, especially in tropical areas, have been carried out and thus to have livestock and game animals to co-exit will require extensive research on the interaction between domestic and wild animals and their common habitat. Goss (1984) refers to this situation as 'tricky' but he has reported a fair amount of success regarding the management of game animals and livestock at his ranch.

Finally, the wise combination of different classes of animals has twofold economic advantages. Firstly, it is ecologically efficient and comparatively more profitable and, secondly, there is some diversification of investments. However, the venture may require considerable financial inputs and additional research to be successful.

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MANAGEMENT OF COMMUNAL GRAZING LANDS IN ZIMBABWE

B. Mache*

ABSTRACT

The main objective of this paper is to assess the impact of range management systems and technicians on the condition of rangelands in communal areas of Zimbabwe. It has been shown that range degradation in communal areas of Zimbabwe arises as a result of overgrazing, climatic conditions and socio-economic factors. In order to achieve environmental conservation of these grazing lands, an integrated and comprehensive approach should be taken, always bearing in mind the involvement of the people. Control and regulation of grazing were found to be primary requirements and in most cases, fences and watering points must be provided to make this possible. Periodic resting and selling of excess stock are usually sufficient to ensure re-establishment and survival of perennial grass species. However, the organisation of an effective and satisfying marketing system is essential. Reseeding and other cultural practices are necessary where degradation and removal of top soil are well advanced.

INTRODUCTION

Over 80 percent of Zimbabwe consists of natural vegetation which is the most important source of animal feed in the country. It is upon the conservation of grass through proper utilisation and management that rangeland stability will always depend. In addition, grass is the most important agent of conservation of soil and water resources. The watersheds of streams and rivers depend mainly on rangelands, and their management can have far-reaching effects on the stable flow of the rivers. Underground water resources are also affected by the management of rangelands.

The country has surface area of 39.1 million hectares out of which communal lands comprise about 16.4 million ha or 42 percent. In terms of farming potential, 91 percent of all this land is located in natural regions III to V,

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ZIMBABWE

MINISTRY of LANDS, AGRICULTURE and RURAL RESETTLEMENT

DEPARTMENT of AGRITEX

Natural Regions

AGRITEX: Agricultural Technical and Extension Services

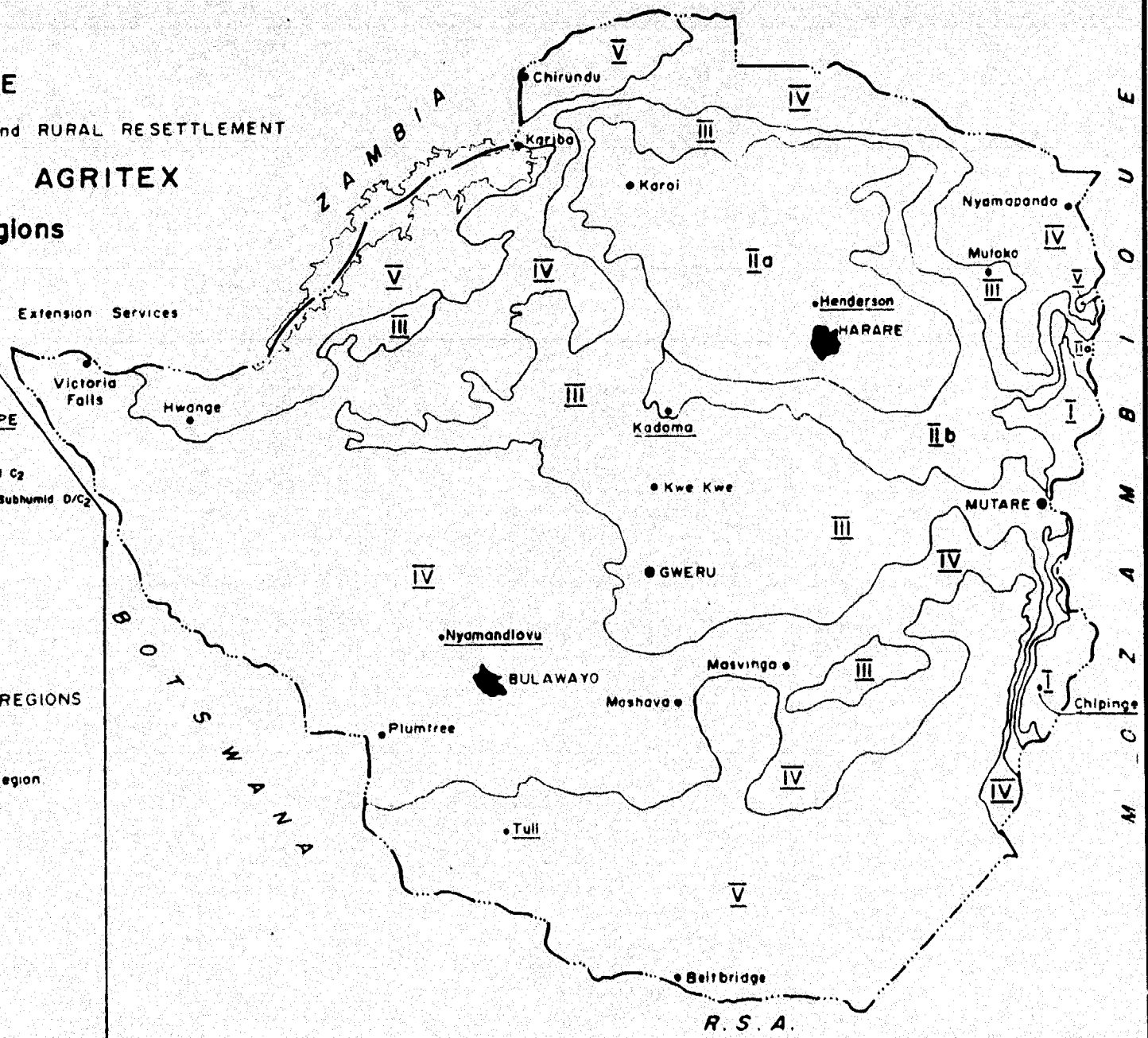
I CLIMATIC CORRELATIONS OF SELECTED STATIONS

STATION	LATITUDE	CLIMATE TYPE
Chipinge	20° 12' South	Humid B_1
Henderson	17° 35' "	Moist Subhumid C_2
Kadoma	18° 19' "	Semi Arid/Dry Subhumid D/C_2
Nyamandlovu	19° 58' "	Semi Arid D
Tuli	21° 23' "	Arid E

Based on Thornthwaite, 1948/55

II RELATED FARMING SYSTEMS AND REGIONS

- I Specialized and Diversified Farming Region
- IIa Intensive Farming Region
- IIb Intensive Farming Region
- III Semi-Intensive Farming Region
- IV Semi-Extensive Farming Region
- V Extensive Farming Region



which are considered marginal areas for cultivation, owing to low and erratic rainfall and/or poor soils (see map). The land under grazing has been estimated to comprise about 9 million hectares, or 55 percent to which a cropping and fallow area of another 4 million hectares or 25 percent could be added during winter. There is an additional area of just over 3 million hectares or 20 percent described as unusable for agricultural or even grazing purposes, because of rock outcrops, rugged terrain or bush density.

The human population in the communal areas is estimated to be over 4.5 million people and their livestock amount to about 3 million cattle, 1.5 million goats and sheep as well as a number of donkeys. There is also a wildlife population. All these animals feed on arable areas and grazing lands. The growing human population and the greater value of crops have led to a higher demand for more arable land causing a further decline in land available for grazing and hence, has increased the likelihood of severe overgrazing.

It is therefore necessary to look into the role of livestock in communal areas, current grazing and livestock situation as well as constraints to livestock development in Zimbabwe in order to appreciate the technical interventions advocated in the country.

CONDITION OF COMMUNAL GRAZING LANDS

If proper management objectives are to be achieved, it is necessary to get a knowledge of the current status of resources so as to be able to assess the changes induced by management decisions.

A survey of the condition of grazing lands was carried out in the early 1960's and reported by Cleghorn (1966). In this survey, Cleghorn calculated the proportion of grazing in the communal lands of different natural regions falling into several condition classes as shown in Table 1.

In this survey, bare areas are lands almost entirely devoid of grass cover for most of the year; on very overgrazed areas grass species are found low in the plant succession and affording a sparse ground cover. Dry season forage is in short supply. In the moderate class, plant succession may have been put back but the range is still in a productive state and is not overgrazed to the extent that forage is inadequate every dry season. Range in good condition is ungrazed or grazed within its carrying capacity so that the range remains vigorous and productive. Dry season forage is sufficient except during extremely severe droughts.

Table 1. Condition of grazing lands in communal areas of Zimbabwe

Natural Region	Condition Class					
	Bare	Very Overgrazed	Moderate	Good	Total	% of Total grazing area
I	-	21	77	2	100	1
II	-	66	18	16	100	7
III	-	68	13	19	100	14
IV	5	30	16	49	100	52
V	39	26	10	25	100	26
Average	13	36	15	36	100	100

Source: Cleghorn, W. B. 'Report on the conditions of grazing in the Tribal Trust Lands' (1966)

Nearly 50 percent of the total grazing areas of communal lands were either bare or overgrazed in the early 1960's. As pointed out in the introductory remarks, such conditions are particularly conducive to erosion. Most of the bare areas were in the low rainfall provinces and 70 percent of the total national bare and overgrazed veld fall into natural regions IV and V.

A recent soil erosion survey based on detailed analysis of nearly 8,500 aerial photographs indicated that slightly more than 1.8 million hectares of land was degraded, a conservative estimate since erosion must be fairly advanced before it is clearly visible on photographs (Whitlow 1987). This survey shows that the most extensive and severe erosion occurs within the communal lands where some 1.53 million hectares or 83% of the eroded land is found. In contrast erosion in the commercial farming areas is less than 9 percent.

Thus methods of increasing production and minimising range degradation are essential since there is little doubt that the situation may deteriorate further and productivity already falls far short of its full potential.

MEASURES TO INCREASE PRODUCTION

Data presented so far indicate that every effort must be made to reduce soil erosion, restore the vegetative cover of the range and establish methods of

rangeland management and fodder production that would stabilise the veld and the soil and at the same time ensure a more reliable supply of livestock feed in the communal areas. It should be pointed out that there are two broad approaches to erosion control in rangelands. The first is through appropriate management of the rangelands and grazing animals (prevention) and the second is through reclamation and stabilisation where erosion has already taken place.

The Development of Comprehensive Grazing Schemes

These systems include rest, reasonable stocking, flexible management, land improvements and constant watch for symptoms of degradation. Local experience and sound judgement is needed when applying these techniques since some methods are very site and situation specific.

In the high rainfall areas — natural regions I, II and parts of region III — there is intensive cultivation (30–50 percent) to a point where very little spare land is available for grazing and it is mainly confined to vleis and rough grazing. Thus in these areas, it is more appropriate to consider intensive cropping schemes which incorporate provision for the production of livestock feed from crop residues, short and long-term lays, planting of legumes and other fodder plants. Table 2 shows a list of possible plant species. However, there is need to do more work on fodder crops in the country.

The low and erratic rainfall areas — part of natural region III and regions IV and V — and a smaller proportion of the suitable cultivated land, are best fitted for the introduction of comprehensive grazing schemes. In such schemes, full community participation is always essential.

The introduction of grazing schemes which provide reasonable periods of rest during the growing season, should allow improvement in the condition of the veld from its present degraded state in some areas, provided that seed reserves are not depleted. A number of experiments have conclusively demonstrated positive effects on animal production obtainable by using planned grazing. Unequivocal results were obtained by Merrill (1986), Gammon (1982) and Froude (1974). Actually, a number of systems have been reported to have resulted in reclamation of degraded rangelands. These range from simple seasonal resting two-paddock systems as applied in Masvingo province to short grazing systems with 4 or more paddocks per herd as applied in a number of communal areas (Froude 1974).

Table 2. Selected plant species useful for forage production

Scientific Name	Common Name
Cajanus cajan	Pigeon pea
Cenchrus ciliaris	Sandbur
Chloris guyana	Rhodes grass
Cynodon dactylon	Bermuda or couch grass
Cynodon plectostachyus	Star grass
Desmodium intortum	Desmodium or silverleaf
Digitaria decumbens	Pangola grass
Dolichos lablab	Hyacinth bean, lablab
Eragrostis curvula	Weeping love grass
Glycine Max	Soya bean
Leucaena leucocephala	Lamtoro
Lolium perenne	Perennial ryegrass
Macroptillium atropurpureum	Siratro
Medicago sativa	Lucerne, alfalfa
Mucuna conchinchinensis	Velvet bean
Panicum maximum	Guinea grass
Paspalum notatum	Bahia grass
Pennisetum clandestinum	Kikuyu grass
Pennisetum polystachyon	Thin napier grass
Pennisetum purpureum	Napier grass
Sorghum spp.	Sorghum
Stylosanthes gracilis	Stylosanthes
Stylosanthes guianensis	Stylosanthes/Brazilian lucerne
Stylosanthes humilis	Stylosanthes
Trifolium repens	White clover
Urochloa Mosambicensis	Buffel grass

A UNDP project carried out in Eastern Senegal provides an example of proper management. In an attempt to overcome problems resulting from communal use of grazing, permanent rights were allocated to units of 100 families. Between 1977 and 1983 the grazing condition in the project area improved resulting in increased calving rates, decline in mortality and a change in herd composition. Between 1980 and 1982, the average income

from livestock per family increased by 48 percent owing to a higher offtake combined with better prices.

Thus grazing schemes have showed positive results in various countries and in Zimbabwe emphasis should once again be put on these schemes with a focus on low rainfall areas. However, it is important to note that even if rotational grazing does prove to be an effective tool, it will not work properly if the stocking rate is much higher than the recommended carrying capacity. This is why a package approach to the problem is necessary, including ways of increasing offtake from the communal areas and halting current escalating livestock populations there. See appendices 1 to 3 for statistical details on livestock population as well as estimations of benefits obtained from multiple use of cattle.

Specific Reclamation and Stabilisation Measures

Where the grazing land has been denuded and the cover is very low, specific reclamation ethos must often be employed. The soil in such areas, due to exposure to sun, wind and raindrop impact, usually develops a hard surface crust so that conditions for seed germination and seeding survival are often far from ideal. The ultimate objective here is to establish and maintain a vegetative cover. This can be facilitated by making farmers a part of the development process. Some promising technologies have been developed to achieve these goals.

Spot/Strip Seeding. Establishing even sparse vegetative cover increases water infiltration and reduces run-off and erosion (FAO, 1986). The objective here is to cover only a small part of the total area with species adapted to local conditions. Depending on soil depth and stoniness, spot seeding may be done by hand. Strip seeding can be done on suitable sites by ploughing or discing strips for seedbed preparation. It may not be possible to give such reseeded veld a full season's rest following establishment. Reseeding will have to be scheduled in such a way as to provide the greatest opportunity for establishment during the grazing rotation. After the grass is well established, it continues to spread by natural seeding, thus covering a large part of the area. The same work can be done by broadcasting the seeds and covering them by trampling of animals' hooves.

Contour Furrowing. Contour furrowing has evolved during the past 50 years as a mechanical treatment to increase forage production and control run-off and erosion on semi-arid rangelands in the United States (Earl 1980).

Furrows were found to be most effective if constructed on fine to medium textured soils and if spaced 2 metres apart and followed the contour layout. Contour furrowing can be applied in some communal lands of Zimbabwe to conserve water, control run-off and erosion, and increase range forage production. Vegetation response on areas with furrows 2 metres apart was found to be positive and forage increased 2 to 3 times as compared to unfurrowed areas (Wight 1978). A simpler and less expensive version of holding and storing run-off is range pitting. Contour furrows can be constructed with ordinary implements, pulled by either draught animals or tractors. Forage can usually be improved by seeding into the furrows at the time of construction. As far as possible the seed used in such a reseeding programme should be collected from desirable species within the same range type. Alternatively, grass which contains seed is harvested and spread over the denuded area (thatching).

In areas where there is sufficient bush available, this can be cut and spread over the seeded areas. It will give protection to the seedlings and soil until the grass is established. Once the grass has established itself, appropriate systems of grazing management should be applied.

A method which was found effective in establishing vegetation in the West African Sahel was the use of porous rock bands installed on the contour (Lal 1980). These bands reduce run-off and erosion, and increase the probability of young seedling survival. Seedling establishment can also be improved by a combination of rock bands and micro-catchment as was done in Niger. Experiments in Nigeria have shown that establishing vegetative cover improved solid organic matter contents by as much as 30 percent, reduced soil bulk density and increased infiltration rates.

Gully Treatment Measures. For more severely degraded rangelands as reported by Keech (1968), Stocking (1971) and Whitlow (1987), anti-erosion measures such as gully control, terracing and small-dam construction may be necessary. These operations are usually very expensive and much more difficult than is the control of sheet erosion.

It should be emphasised here that preventing the formation of a gully is much easier than controlling it once it has formed. A careful study of gully erosion over a period of more than 30 years in Natal (Republic of South Africa) has shown that it is possible to stabilise gullies and reduce erosion provided that certain principles are adhered to (Scott 1981). Essentially this involves a 3-pronged attack: the prevention of erosion in the floor of the gully (which

would otherwise make it deeper), along the sides of the gully (which would make it wider) and at the head of the gully (which would make it longer). Wherever possible, gully control should be achieved by biological methods or a combination of vegetation and cheap simple structures whose life is not important (Hudson, 1986). Special emphasis is given to the basic principle that prevention is better than cure.

CONCLUSION

This paper has shown that the overall impact of grazing animals is to influence, directly or indirectly, some combination of vegetation and soil characteristics. Overgrazing for extended periods results in vegetation changes, *i.e.* an increase in undesirable species and a decrease in desirable ones. This in turn leads to a reduction of the protective cover, increasing the erosivity of raindrops and surface crusting, diminishing soil organic matter and decreasing soil aggregation. The end result of extended periods of overgrazing is a lowering of production potential of an area and overall degradation. Overgrazing in the communal areas is a result of overstocking and mismanagement. Communal cattle, sheep and goats, and donkey populations have been increasing substantially over the past 20 years in all the country's provinces. This has resulted in deterioration of range conditions to the extent that over 50 percent of the total grazing areas in communal lands have been estimated to be either bare or very overgrazed for most of the year.

In order to alleviate grazing pressure in these areas, it has been shown that offtake could be increased significantly if price relations are sufficiently attractive from the farmer's point of view (Mache 1989). In addition, comprehensive grazing schemes have been found to be a necessary intervention which improves livestock production in the communal areas and helps to conserve vegetation cover on rangelands.

These systems include rest, reasonable stocking, flexible management, land improvement and constant monitoring for symptoms of degradation. In order to become successful, any grazing management scheme must be locally specific, taking into consideration critical constraints, availability of forage, browse resources as well as objectives and management capabilities of the local community.

Where the grazing land has been denuded and the cover is very low, specific reclamation measures have been found to be necessary. These methods include spot/strip seeding, contour furrowing, pitting and gully treatment. It

must be emphasised that preventing the formation of a gully in the veld is much easier than controlling it once it has formed.

In the high rainfall areas, it was realised that emphasis should be put on intensive cropping schemes which incorporate provision for production of livestock feed from crop residues, short and long-term lays, planting of legumes and fodder trees.

Finally, the author feels that wholesale recommendations for improving rangelands in communal areas can be dangerous and may cause disastrous results. This paper has shown that farmer training and farmers' involvement right from the start of any grazing management scheme are essential for success.

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Appendix 1. Cattle Populations in Communal Areas by Provinces, 1966—1987

Province	1966 (000's)	Annual growth rate 1966-73 (%)	1973 (000's)	Annual growth rate 1973-80 (%)	1980 (000's)	Annual growth rate 1980-87 (%)	1987 (000's)
Matabeleland South	187	9	349	1	386	2	432
Matabeleland North	208	6	306	3	387	1	410
Mashonalands	422	6	614	-1	570	6	891
Midlands	253	9	451	0	448	6	665
Masvingo	349	6	513	2	596	1	660
Manicaland	295	6	443	1	482	3	547
Total	1,714	7	2,676	1	2,869	4	3,605

Mashonaland Provinces have been shown as one because of re-organisation of boundaries

Source: Department of Veterinary Services, Zimbabwe

Appendix 2. Sheep, Goat and Donkey Populations in Communal Areas by Provinces. (000's heads)

Province	Sheep		Goats		Donkeys	
	1966	1987	1966	1987	1966	1987
Matabeleland South	82	103	250	394	24	105
Matabeleland North	21	50	139	212	15	69
Midlands	18	51	86	389	18	79
Masvingo	45	81	162	385	17	39
Mashonaland	13	60	49	240	8	12
Manicaland	35	85	93	387	6	9
Total	214	430	779	2,007	88	313

Source: Department of Veterinary Services, Zimbabwe

Appendix 3. Benefits obtained from multiple use of cattle

Ploughing

Value of ploughing:	Z$20.00/ha
	or: Z$10.00/day
No of ploughing days:	143
Average no. of oxen/span:	3
No. of oxen in herd (21.4%):	755,860
No. of spans:	251,953
Land area/span:	7 ha
Total value of ploughing:	Z$35,273,000

Value of Beef

Present offtake rate:	2%
Total herd:	3,532,040
No. of cattle sold:	70,641
Average live weight:	400 kg
Dressing out:	50%
Carcass weight:	200 kg
Total carcass weight:	14,128,200 kg
Total value at Z$1,70/kg:	Z$24,017,940

Value of Milk

Number of stock:	3,532,040
Percentage of cows:	30.8
No. of cows:	1,087,868
No. of cows in lactation/year (50%):	543,934
Average milk yield/day:	1.5 litres
Average lactation period:	150 days
Total milk production/year:	122,385,150 litres
Value of milk/litre:	Z$0.25
Total value of milk:	Z$30,596,287

Gross Returns from the System

	Z$89,887,227
Gross Returns from beef production alone:	Z$71,091,300

GRAZING SCHEMES IN COMMUNAL AREAS OF ZIMBABWE

Febbie Soko*

THE PROBLEM

The need to reconcile conservation with development has become central in most rural endeavours. Costly failures like silted dams and rivers have taught rural people to respect and become increasingly aware of their natural environment. Unfortunately, the tragedy is that remedial programmes of environmental rehabilitation often ignore farmers' needs and fail to build upon their capacity to conserve.

Around the countryside, farmers are shaping the environment and caring for it. For most of them a few heads of cattle, with some form of grazing, are fundamental to their survival.

Many communal areas have grazing lands which are totally inadequate for the maintenance of sufficient livestock to serve households with draught power, organic manure and transport means. Farmers are therefore having to intensify the forage component of their farming systems. Many leading farmers (those with most capital) are beginning to leave part of their arable land fallow in order to provide additional fodder. Already in some village development committees (VIDCO's) there is general consensus that the majority of grazing be provided from within and between arable fields, and support the idea of intensifying grass and ground legume production on an above or below contour.

MATTERS OF GREAT CONCERN IN RURAL AREAS

Major problems presently plaguing rural areas of Zimbabwe are:

- soil erosion and ensuing siltation;
- overgrazing;
- no land available to set aside for grazing;
- desertification and land degradation;

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- poaching and sharing of wild animals;
- timber cutting for commercial purposes;
- veld fires;
- poach grazing by communal area's cattle into neighbouring areas;
- lack of veld management schemes; and
- random and unplanned settlements leading to shrinking of arable land and rangelands.

THE IMPORTANCE OF GRAZING AREAS

Grazing lands in communal areas of Zimbabwe comprise mainly natural vegetation or veld estimated at about 75 percent, and fallow lands at about 10 percent. The grazing lands provide an annual supply of consumable herbage for domestic and wild animals at little or no cost to the people. Draught power depends upon grazing areas for most of its food supply.

Grazing areas are a source of other products such as timber for poles, grass for thatching, trees, shrubs, plants for medicine, insects, birds and other wildlife which can add to the diet.

Grazing lands also comprise the major portion of the catchment areas of the country's streams and rivers, which contribute to supplies of water for human and livestock consumption.

Vegetation in grazing areas protects the precious top soil from erosion, without which the land becomes impoverished and the streams, rivers and dams silted.

THE IMPACT OF LIVESTOCK ON NATURAL RESOURCES

Overgrazing

Basal vegetation or plant remains is the factor which normally gives protection to the ground between plants. This soil cover gives stability to the ecological system. Once this cover is removed there is deterioration of the grazing land.

When a plant is grazed, it is no longer able to continue growing. It will then draw its energy from root reserves resulting in temporary halting of root growth. The stored energy moves up to form new leaves. New leaves are more palatable and attractive to animals, thereby resulting in overgrazing.

Soil Surface Capping

The removal of litter exposes soil to raindrop action which shatters soil particles, seals and compacts the surface. Rainfall infiltration is reduced and there is excessive run-off.

Air supplies in the soil are not freely exchanged as a result of soil capping. Plant roots cannot develop adequately as carbon dioxide levels rise from respiration, while oxygen is insufficient. Micro-organisms in the soil require a free exchange of air. This cannot happen when the soil is capped.

Plant seed selection is also affected if the soil is capped. Adult plants can survive but seedlings cannot because of the harsh germination conditions prevailing at the surface. The capped condition favours pioneer plants which are unpalatable species, wash off the surface or lie on the surface with no means of penetration.

THE GRAZING SCHEMES

It is considered that the establishment of grazing schemes on communal grazing lands will bring about the following results:

- well managed grazing areas will improve cover and increase the land's carrying capacity;
- animals can be marketed at reasonable prices;
- children can be free to attend school rather than herd cattle;
- legumes can be planted to improve veld cover.

Education Extension and Training

The government should begin to consider education, extension and training more fully. This would move away from stressing just an awareness of environmental problems and focusing more on what can be done by farmers to improve their quality of life.

Where problems have reached such proportions as to be considered an ecological crisis, self-help programmes with government aid and technical experts to advise should be encouraged.

There should be emphasis on the need for community-based conservation work in communal areas. Awareness education, particularly about the relationships that exist between man and nature, are an essential component

of farmers' programmes. Their tasks in agriculture and animal husbandry make them the daily managers of the living environment.

Resource Requirements

At present, land is a problem and often unsuitable. Land is to be selected where there is or can be a permanent water supply. Funds contributed by farmers are often inadequate. Capital costs comprising cost of fencing materials, additional working tools, etc. may require additional funding from external sources. Labour requirements can generally be provided by households without affecting farming activities if work is done on *chisi* days *i.e.* sacred non-working days. Technical know-how is available locally from extension agents.

Environmental Implications

It is recognised that grazing schemes can check soil erosion if proper grazing systems are employed.

Technical Feasibility

Technical considerations of alternative grazing schemes should be taken into account, including opportunity costs. Grazing schemes should be designed to complement other grazing systems.

Grazing schemes are considered to be feasible and important for the production of grasses to support livestock populations. Ground cover that is required as forage depends on management practices which a grazing scheme can improve.

Management

Institutions recommended are VIDCO's and WARDCO's as these are more likely to succeed, owing to greater sense of ownership, cheap labour and promotion of self-reliance among members. Farmers' groups are also potential management institutions, deciding on practical management problems as well as operation rules covering contributions in the form of labour and cash. Practical management concerns include how to protect fences from vendors/intruders, and decisions on whether to plant fodder grasses and grazing patterns to be adopted.

RECOMMENDATIONS AND POSSIBLE SOLUTIONS

- Identification of activities which will better utilise the resource base *i.e.* land, water and biological resources.
- Creation, strengthening and/or support of institutions involved with issues pertaining to grazing and rangelands management.
- Increased involvement by farmers in designing, planning and participating in strategies concerning communal grazing.
- More materials addressing farmers be commissioned for education extension and training.
- Grazing areas be selected and those farmers who fail to comply be dealt with according to the constitution and rules of the grazing schemes.

MANAGEMENT OF COMMUNAL NATURAL RESOURCES IN BOTSWANA: A SUMMARY[1]

Background. Botswana is a landlock country with a surface area of 582,000 sq km and a relatively sparse human population estimated at about 1.2 million people. There are about 2.4 million cattle and 1.7 million small stock (sheep and goats). Cattle numbers have remained almost stable along the 1980's mainly as a result of a 7-year long drought spell. The severity and length of the droughts have had devastating effects on Botswana's once abundant wildlife which has drastically been reduced in numbers over the past decade.

Climate. The climate in the country is generally semi-arid. Climatic variations are closely related to precipitation. Rainfall is erratic in terms of both annual amount and distribution pattern. Mean annual rainfall ranges from a maximum of 650 mm in the north to less than 250 mm in the south west.

Rangelands. Predominantly of savanna type that represent some 85% of the country's area. Approximately 85% of the above is covered by Kalahari sands and the remaining 15% is composed of shallower but heavier soils, or hardveld.

Land Tenure. Most of Botswana is considered Tribal Land, *i.e.* communal land tenure system. In recent years, part of the communal lands were allocated to individuals under the TGLP ranch system. National parks and wildlife reserved areas represent 16% of the country. A very small area, but comprising most of the best lands and with reliable access to water, is privately owned land under the freehold system.

Economic Significance. Rangelands are of a great economic significance in Botswana as illustrated by a few key indicators:

a) Livestock contributes directly or indirectly to the well-being of 85% of the country's population.

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1 A verbal presentation was delivered by V. B. Thlarewa but no country situation paper was submitted. This summary was prepared by the Editors.

b) Meat exports contribute between 15 to 20 percent of foreign exchange earnings.

c) Wildlife is the basis of tourism industry, which in the period 1983/84 – 1987/88 realised P118 million.

Rangelands condition and trends. There is some deterioration which is a result of overstocking in certain areas, especially the eastern part of the country where most livestock are concentrated. Localised overgrazing in western Botswana and in some wildlife areas has been observed. Further deterioration is taking place in the sand veld due to introduction of livestock in this region. Even the hardveld is threatened with degradation if livestock population is not reduced.

TGLP ranches have rapidly expanded into communal rangelands, mainly in connection with water development in communal areas undertaken by government.

Major Causes of Rangeland Deterioration. Traditional land tenure systems and the development of TGLP ranches appear to be the main factors behind rangeland degradation. This is due to high stocking rates which increased again after the last severe drought, poor or lack of management development, remote control management by livestock owners who reside in town, insufficient awareness, and dual rights, mainly on the part of TGLP ranch owners who still are allowed to graze their animals on communal rangelands.

The institutional setup is such that land boards are entrusted the allocation of tribal (communal) lands but at the same time, chieftainship powers have been stripped. This situation often leads to uncontrolled grazing.

Other factors contributing to rangelands deterioration are inactive legislation such as the Conservation Act and dual rights. TGLP ranch owners' rights to graze their ranches do not preclude them from grazing their animals outside in the communal areas.

Socio-economic factors and social considerations contribute to cattle owners trying to increase stocks numbers and non-owners to acquire some. Of major significance here is EEC import quota of Botswana meat at prices well above world market prices (approximately 60 percent higher). Other economic factors such as inadequate marketing and insufficient facilities added to a much higher value of cattle lead to low offtake rates in communal areas.

Veld fires have had serious negative effects upon rangelands, *e.g.* some 60 percent of Chobe District burnt last year.

Stocking Rates. A large percentage of the rangelands is characterised by a very fragile environment, and this is especially true in the western part of the country. The westwards expansion of livestock activities, mainly cattle keeping, and the consequent introduction of livestock in the western region has tended to adversely affect carrying capacities.

As mentioned earlier, the eastern part of the country is mostly populated by both humans and livestock. An already high overstocking rate in this area has resulted in substantial changes of herbaceous vegetation.

Major Vegetation Types. There are six major vegetation types, namely:

a) Arid bush savanna;

b) Southern Kalahari bush savanna;

c) Tree and bush savannah, subdivided into Northern Kalahari and mixed *Acacia* sub-groups;

d) Mophane woodland;

e) Grasslands, of aquatic and Makgadikgadi sub-groups; and

f) Deciduous forests.

Historical Government Programmes. Several programmes were initiated when it was realised that rangelands degradation was worsening. Two government units were formed and charged with the responsibility of range research and inventory and monitoring. The two units are: Animal Production Research Unit which came into being in 1970 and Range Ecology Unit in 1973. These units were followed by the adoption of the Tribal Grazing Land Policy (TGLP) which started in 1975.

Government Resources to Implement Range Management. The Animal Production Research Unit is entrusted with range research, while the Range Ecology Unit is charged with the task of conducting range inventory and monitoring. The Communal Area Management Unit is responsible for the implementation of livestock and range management in communal areas. The Ranch Extension Unit is focused on livestock and range management in TGLP ranches. Since very few technicians have been recruited, the units are clearly understaffed.

DISCUSSION PAPERS

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OPPORTUNITIES AND CONSTRAINTS IN THE MANAGEMENT OF COMMON RANGELANDS

Neal E. Artz*

INTRODUCTION

Historically, common use has been the dominant form of property rights to rangelands worldwide. Since the first instance when human population growth and the associated increase in demand for diverse range resources put two user groups into conflict, uncountable use-rights institutions have evolved to replace the 'free and open access' which held sway before. The vast majority of these have fallen in the realm of common use, as tribes, communities and other social units seeking to assure their continued access to the resources involved have claimed exclusive use rights for their group. Over time, social and economic dynamics have fostered the development of private, individual property rights to rangelands in some situations, particularly in the so called Western countries. Another more recent development has been the establishment of public property rights, where governments bear responsibility for management and allocation of use rights to range resources, again, largely a Western concept. In spite of the evolution of property rights options, most rangelands in the developing world continue to be managed under common use.

This persistence seems to speak well for the institution of common use; it must do something better than other forms of property rights to explain its broad appeal. Common use continues to dominate the vast majority of African rangelands, as well as significant portions of Latin American, Middle Eastern and Asian pastoral zones.

On the other hand, the last century has seen previously functional common range institutions failing at an alarming rate, and the pressure to change management regimes in areas where common use still pervades is often intense. In many sectors of the development community, common use is viewed as, at best, a necessary evil. At worst, it is perceived as a sure recipe for the eventual destruction of the range resource base.

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A more rational approach to dealing with common use of range resources is emerging, and that is to view it as an integral aspect of the development setting and to foster the evolution of common-use management institutions which capitalize on the strengths and alleviate the weaknesses inherent in common use. This workshop exemplifies this approach.

Our purpose is to ascertain, on the basis of the successful, on-going efforts which will be described and discussed here, how effective resource management institutions based on common use can be established to help meet development goals in the realms of conservation, production and social welfare in the southern African region on a sustainable basis. The output will be procedural recommendations generalisable to other attempts to introduce or improve management of resources under common use in the region and potentially elsewhere.

This paper is presented to facilitate this process by providing a brief analysis of common use of range resources focusing on general factors favouring or working against this type of use. The issues identified here are intended to focus and clarify our thinking as we assess the case studies presented here, thus helping to make our recommendations as meaningful as possible.

Before proceeding further, some clarification of terms is in order. In this paper, the term *range* is used to specify the land type and resources we are considering. As used here, range is defined as land whose primary value is its production of forage for wild or domestic ungulates. Although rangelands are typically associated with livestock, this definition embraces other resources and uses, including wildlife, water and watersheds, wood for fuel and construction, and tourism. For our purposes, farming, particularly for subsistence, should also be included as a use of rangelands.

The other term requiring clarification is *common use*. Here we will define it as a property rights regime under which use rights are allocated equally to a defined group. In the ideal case, the resource base is defined (*e.g.* a delineated geographic area), and the user group is an intact social unit such as a village, community or tribe. However, the ideal case does not always obtain; in practice, common use is used to describe situations where the resource base, the type of use or the user group are more strictly or more loosely defined. The stated definition is most appropriate for our purposes.

CONSTRAINTS TO COMMON USE

Academic and applied assessments from a variety of disciplinary perspectives cite a number of aspects of common use which constrain effective management based upon it and explain its current disfavour. Most of these aspects relate to the widespread degradation of resources under common use which has been observed over the last century and attributed to a general lack of adequate regulation inherent in this type of use. This imputed lack of regulation will be addressed in the following section on opportunities for common use. For the time being, we will grant that inadequate control and resultant resource damage are the rule under most current common-use regimes, and we will outline the reasons put forward for this unfortunate *status quo*.

These reasons can be categorised as pertaining to our three management objectives: conservation, production and social welfare. While resource degradation under common use is a conservation issue on the surface, the spin-off effects on production and social welfare are obvious. The three objectives, and thus the constraints associated with them, are therefore related, but viewing them separately facilitates the analysis of management under common use.

Constraints to Conservation

Probably the most widely known and compelling complaint is based on the 'tragedy of the commons' paradigm. Simply stated, this view holds that an individual behaving in his own self-interest will continue to exploit a common resource, even when it is being overused and degraded, because the benefits of doing so accrue to him alone, while the costs are divided among the group as a whole. Under this scenario, the resource base is ultimately doomed to destruction. This paradigm has been validly criticised for a number of reasons, most importantly because it is oversimplified and fails to consider a number of alternative incentives to individual behaviour, particularly the regulatory mechanisms comprised by common-use institutions. However, 'tragedies of the commons' abound, as witnessed by the degraded condition of many rangelands under common use in this region and elsewhere in the world. The economic rationality of the paradigm clearly warrants consideration.

A related issue is how common-use regimes deal with increases in the number of users, a critical concern in this region given the high rates of human

population growth. If household subsistence needs or other economic considerations dictate a minimum level of resource use, and the number and size of households is increasing rapidly, the increase in cumulative demand on the resource base is explosive. When the individual incentives to overuse a common resource are amplified by an exponential increase in the number of individual users, destruction would seem to be assured. Indeed, examination of the impact of communal grazing in Africa over the past several decades, when human numbers have spiralled upward, indicates that the rate of population growth is a strong correlate with the rate and degree of degradation of common range resources.

Constraints to Production

The most broadly evident constraint common use poses to production results from the degradation of the resource base attributed to it for the reasons cited above; degradation is the antithesis of productivity in the long run. In addition, other characteristics of common use have been cited as shortcomings in this realm.

Many common range use systems have been thrown into imbalance and ultimate disfunction by the addition or encroachment of alternative uses. Examples include systems of communal wildlife utilisation which have been devastated by the introduction of livestock, and smoothly functioning pastoral systems crippled by the encroachment of cropping around water sources. Conceptually there is nothing to preclude common use institutions' accommodating multiple resources and uses, but changes in these variables or, perhaps more importantly, new users of the same resource base have certainly posed problems.

Common-use systems have often been negatively impacted by the introduction of new technology. Interventions designed to increase productivity can fundamentally alter modes of use and thus destabilise established institutions. For instance, the first type of technical interventions typically made to develop traditional pastoral systems focus on improving livestock health and breeding. Their immediate impact is to increase animal numbers, while offtake rates, for a number of reasons, remain static. The increased grazing pressure often triggers degradation of the resource base. Boreholes for stock water are another well intended intervention which often boomerangs, as witnessed by the barren wastelands surrounding so many boreholes in Africa's arid regions. Again, there is nothing inherently incompatible about common use and new

technology, yet many traditional common-use systems have been broken down by efforts to improve productivity.

Constraints to Social Welfare

Problems relating to conservation and production have obvious impacts on social welfare, but a number of other constraints in this area alone have been attributed to the institution of common use. These constraints typically result from shifts away from traditional modes of use and management which have occurred relatively recently through the process of modernisation. They may be evident in the social, institutional or technical domains.

Perhaps most significant is the impact of decreasing traditional, local authority and power, a predictable outcome of the establishment of modern, central governments. This process shifts the locus of decision making regarding social welfare to the state, away from the smaller social units (*i.e.* villages, communities and tribes) where effective common-use institutions typically evolved. This shift has several important implications.

First, the local regulatory mechanisms comprised by traditional common-use institutions, which have evolved over time to make and enforce rules regarding resource use, usually fall victim to the establishment of centralised administrative structures. This normally occurs before the central government has developed functional replacements for these mechanisms, so resource use is, for a time at least, unregulated. In this setting, degradation often begins or increases, and the institutions of traditional control are quickly forgotten. It is during this period, when regulatory mechanisms are absent or inadequate, that the shortcomings attributed to common use typically emerge. The negative impacts spread from conservation, to production, to social welfare.

A second, related impact is a decline in the quantity and quality of information, upon which management decisions and enforcement of regulations are based, which occurs with the shift to central authority and power. Timely information regarding the status of the resource base (*e.g.* range readiness for grazing or the drying up of stock water sources) and infractions of regulations is available most readily and at least cost on site. Since the capability of central governments to operate effectively in the field is generally limited, such information is often lacking. Though the level of technical expertise may be higher in government agencies, management decision making and enforcement of rules still suffer as a result of inadequate information. Social welfare is among the casualties.

The third problem associated with decreased local authority and power is the correlated reduction of individuals' dependence on the smaller social unit for their welfare. This dependence is a strong force motivating individuals to behave in the best interests of the group, and the cooperation born of interdependence is a key element of effective common-use institutions. In the long term, the increasing dominance of strictly defined individual self interest works to the detriment of all.

Another by-product of modernisation with negative implications for common-use institutions is social differentiation and stratification. Common use is most consistent with a certain level of unity and commonality in the user group, characteristics typically more descriptive of traditional than modern society. As modern economies emerge, new options arise, and traditional social structure erodes as individuals pursue them. This differentiation brings new and differing desires and expectations regarding common resources. In this milieu, common-use institutions tend to fall apart, management suffers, resource degradation is likely, and social welfare deteriorates. A common example in this region is the migrant labour situation which leaves women, without traditional knowledge or current authority to manage common resources, with *de facto* responsibility in this realm in addition to their normal household affairs.

Social stratification frequently takes place with differentiation as individuals meet with varying degrees of social and financial success in pursuing new options. Local elites come to dominate the rural scene. In the absence of effective regulatory institutions, they are free to use common resources as they choose, often dominating use to their own advantage and the detriment of their less fortunate neighbours as well as the resource base. New technology is often a factor in this process when it is accessible only to select influential or wealthy members of the user group.

OPPORTUNITIES FOR COMMON USE

In spite of the many criticisms levelled at common use, the institution has many advocates who counter these criticisms and cite a number of opportunities associated uniquely with this type of use. The most salient issue is the level of regulation of resource use which has been, is currently, or can be comprised by systems of common use. Critics hold that the inadequate regulation and resultant problems in terms of conservation, production and social welfare evident today are inevitable under common use. Advocates, on

the other hand, maintain that mechanisms to control use are the essence of common-use institutions, and the widespread breakdown of these mechanisms in recent history is the cause of the problems we see today. This breakdown is attributed largely to the factors cited in the preceding section. In other words, the institution of common use is not inherently flawed, it is just not generally working very well now.

From this perspective, it is possible to rework common range systems to overcome demonstrated constraints and capitalize on opportunities existing only under this regime. The factors which counter cited constraints and illuminate unique opportunities can again be categorised according to our three management objectives.

Opportunities for Conservation

The primary issue here is the degree to which individual and group behaviour can be regulated under common use to prevent overuse and destruction of range resources. Conceptually there is no reason why adequate control mechanisms cannot be put in place, and historical and current evidence supports this conclusion. Control of seasonal use to allow forage or wildlife resources to recover and reproduce is a fundamental aspect of many past and present common range systems, as is regulation of the type of livestock used to capture the value of common rangelands or the type of other resources allowed to be taken (*e.g.* limiting fuelwood collection to trees of a given size).

Regulation of the quantity of a common resource used is typically more difficult, as evidenced by the lack of limits to livestock numbers in most traditional and current common grazing systems. In some cases, this variable has successfully been controlled by linking the number of animals an individual is allowed graze on common ranges to the number he can support with some privately owned factor of production. For example, Swiss cattle keepers can only graze communal alpine pastures in the summer with the number of animals they can support with hay from their fields in the winter. Likewise, some Andean and Sahelian pastoralists privately own the meagre sources of stock water available and must limit their livestock holdings accordingly. Other limits to the level of resource use are environmentally imposed (*e.g.* by the quantity and distribution of ephemeral stock water in the Sahel before the development of deep boreholes).

Most of these control mechanisms limit individual behaviour, but, as noted above, the size of the resource-using group in a common range system is a

critical variable. As the size of the group with shared access to common ranges grows beyond a certain point, regulations to individual behaviour become increasingly untenable, and control breaks down. In the past, some pastoral groups were successful in controlling their numbers and thus avoiding this problem. In the future, the population control and industrialisation efforts of modern developing states must play an important role in maintaining the size of resource-using groups at viable levels. More to the point, new common range systems will probably by necessity include limits to the size of the user group. Issuance of limited numbers of grazing or harvest permits is the most likely vehicle, and the major issue will be equity.

Regulations of these types are typically not easy to implement. As noted above, traditional mechanisms have been destroyed, and modern substitutes not developed, largely because of inadequate central government capability. The challenge is to revitalise old regulatory mechanisms, start from scratch to devise new ones, or combine these two approaches to create modern institutions to assure that vital range resources are conserved and 'tragedies of the commons' avoided.

It is important to note here that degradation of rangelands is not the product of any single use-rights regime; the majority of privately owned range worldwide is overgrazed according to most estimates. In fact, private ownership provides incentives to overgrazing which do not exist under effective common use systems. For example, a private stockman is completely within his rights to overuse and destroy a private pasture to maximise short-term benefits when he perceives that such action is in his best economic interest. Alternatively, the owner of a small private holding may be forced to overgraze it to meet his current subsistence or commercial needs, and nothing in the laws regarding private land ownership prevents him from doing so. Common range institutions were devised expressly to do away with this type of behaviour.

Opportunities for Production

When common range institutions are effective in insuring resource conservation, the fundamental of cooperative management upon which they are based permits levels of productivity which can exceed those possible under private ownership. Academic economic assessments indicate graphically how the area under the benefit curve can be increased by common use, but there are more straightforward explanations.

First, common range systems typically focus on multiple products to a greater degree than do private enterprises. A shared resource base may be called upon to provide fuel, water, wild foods and medicinal plants, and construction materials as well as forage or wildlife for some or all users. This cumulative productivity can easily exceed the value of the single product, usually forage, normally exploited by a private owner.

Second, a single key resource such as forage can potentially be used more efficiently and thus productively under effective common use systems. Coordinated multipie users, with different economic strategies, capabilities and financial resources, can efficiently and comprehensively utilise a shared resource to meet their individual goals. A private land owner is often not willing or able to match this efficiency, and overall productivity suffers.

The negative impact of new uses and users on common range systems noted above is, again, a problem of regulation. A common-use system can readily prohibit certain types of use or coordinate them with existing uses. The inland delta of the Niger River, used cyclically by different transhumant pastoralists, sedentary farming and fishing groups, is the classic example. This traditional, integrated system is no longer functional, but it illustrates the principle, and a modern counterpart is certainly conceivable.

Another key factor here is land use planning. Effective resource inventory, zoning of land use and allocation of use rights are essential precursors to the revitalisation or establishment of viable common range systems. These regulatory functions fall outside the domain of the user group; timely action by central governments is required to set the scene.

In regard to the destabilising effects of new technology, common-use regimes must be viewed systematically. When all of the institutional pieces are in place, new technology to facilitate range-based production can only benefit the user group and the system as a whole. The issue is regulation. New communal systems must be 'smart' and robust enough to select and incorporate new technology without disruption. With adequate, dynamic control mechanisms in place, this should pose no insurmountable problem.

Opportunities for Social Welfare

The greatest benefits of common range utilisation are probably in this realm. Common-use institutions are maintained primarily because, by allocating use rights to economically important resources to all members of a community, they constitute a social safety net, often for marginal rural people with few

options. Equity is the key element, but it is irrelevant unless the objectives of conservation and production are met by a common range system. As noted above under constraints in this area, these objectives are generally not being attained — and social welfare thus not assured — because traditional control mechanisms have eroded and modern substitutes are typically not adequate. The issue is how to regain control of common range use.

The shift of management decision making and enforcement of regulations away from resource users is a vital issue. Governments in this region and elsewhere are recognising the ill effects of consolidating too much power and authority in central legislative and administrative bodies. Their concern is evidenced in the general trends toward decentralisation and mobilisation of communities to become more involved in their social welfare. Focusing efforts of these types on the management of common range resources is essential to the evolution of new communal management institutions. Governments and the range resource user groups they comprise logically share concern and responsibility for social welfare, and efficient use of capabilities and resources at both levels will be required to assure it.

Governments committed to common range use must actively set the policy and administrative stage. As noted above, land use planning and allocation of use rights are key activities. In addition, enabling legislation supporting local management institutions and extension support to facilitate the development of such institutions is probably required in most situations. User groups must be involved in these processes and be willing to mobilise for their common good.

In order to be effective, new management institutions must take advantage of the administrative and technical expertise held by appropriate governmental bodies as well as the local, site-specific information available to resource users. The goal is informed management decision making and effective enforcement of regulations framed by effective institutions to sustain these processes. These institutions must link the individual user and the central government with two-way information flow and accountability for assigned tasks.

Conceptually and realistically, the greatest impediment encountered in the evolution of communal range management institutions may be the combined product of decreased individual dependence on smaller, traditional, social units and social differentiation and stratification, factors working against unity and common purpose in the resource-using group. The modern functional

substitute for these forces which moulded behaviour in traditional groups dependent on shared range resources is regulation, a role largely usurped by government. Effective fulfilment of this role is critical to the success of common range systems in equitably meeting the welfare needs of the individuals they comprise. If these needs are not met, individual participation and compliance will fail, and the system will collapse like a house of cards, and all three management objectives will be thwarted.

Conservation, production and social welfare have been presented here as if the relationship linking them were linear. In theory — and perhaps in the long term — it may be, but in practice, particularly in the short term, it seems more rational to view the objectives as related but separate. While sustained range productivity and thus the welfare of people relying on range resources depend on conservation, this objective cannot and should not dictate the type of management applied in all cases. Immediate needs may require that productivity or social welfare be the priority, short-term objectives of a given common resource management plan. Thus, planners must juggle the three objectives in determining the most desirable communal management package.

CONCLUSION

This review outlines the cases for and against common use of range resources in general terms. Your participation in this workshop indicates both your commitment to the former case and your recognition of the latter. Our task is to analyse the case studies to be presented here which detail successful efforts to foster effective management of common range resources and generate practical recommendations based on these experiences to facilitate similar efforts elsewhere. Your first-hand knowledge of unique situations in your countries is the primary analytical tool; hopefully this review will help you to frame that knowledge, thereby sharpening that tool.

The institution of common use provided the format for management of range resources which traditionally met the three objectives addressed in this review in southern Africa. These objectives are still valid, as is the need to capitalize on the benefits of common use rather than shifting to alternative use-rights regimes. Our efforts here are therefore vital to the development of regional rural economies and societies. We must take full advantage of this opportunity to build on the success achieved to date by making a meaningful contribution to the development of this vital model of range resource use.

MANAGING PASTURELANDS UNDER THE COMMUNAL LAND TENURE SYSTEM

T. P. Z. Mpofu*

INTRODUCTION

There is no doubt that our communal areas are being effectively destroyed at an accelerating rate. The enormity of the damage to pasturelands is evidenced by the universal concern shown by the World Food Programme in their emphasis that effective and immediate development of the world's grazing lands for the intensification of animal production be undertaken (UN 1972).

As our pasturelands are being damaged, desert-like conditions are encroaching on formerly useful land. Deterioration of rangelands carries not only the consequences of lowered livestock-carrying capacities and diminished economic returns from the land, but affects all other natural resources including wildlife. Such damaged areas become a source of erosion and disruption of watersheds. Under these circumstances, which prevail for most practical purposes in all our communal areas in the southern African subregion, the ultimate ruin of the communal land resources is virtually assured.

Perhaps the first question that one needs to ask is how aware is the community and each of its members that communal resources are strictly limited and that there is nowhere else to go when such resources are finished. The ability to recognise that each area of pastureland has a carrying capacity is extremely vital as a starting point. The notion that the pasture user can always move on into another area of grazing should be discouraged as this movement results in competition with other pastoralists who will have depleted their own pasturelands and are also seeking for fresh grazing. The resultant damage may be virtually permanent in its effects if awareness is not created and if this awareness is not followed by measures to combat resource degradation.

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LAND TENURE

The issues arising from land tenure systems have been subject for debate in several seminars. Many people believe that communal grazing is inherently unmanageable, and that unlimited communal access to pasture can only bring about depletion and ultimate ruin of communal areas. They believe that communal pasture rights are incompatible with range management, and that, conversely, individual or corporate group ownership of land is bound to promote good husbandry. There is something very compelling about this idea, especially to those with Western experiences. Hardin (1968) says that control of the use of natural resources under the communal land tenure is vested in no specific individual, group or community and that anyone has unlimited access to land.

There are others, on the other hand, who believe that the view expressed above is rather simplistic. Unlike Hardin, Hughes (1974) does not regard the communal land tenure system as one of free and open access to resources, because 'the group (community) regulates the rights and claims of each in a way as to obtain for all their share of the common benefits' (p. 42). This is a mechanism of control that needs to be understood and developed.

TECHNICAL REQUIREMENTS

The main object of this paper is to show that it is premature to discount sound pasture management under the communal land tenure system. The issues affecting the apparent unmanageability are both technical and sociological. They are technical in the sense that the basic requirements for managing most pasturelands do not differ essentially whether grazing rights are communal or private.

More often than not, pasture damage occurs not because an area is grossly overstocked, but because the distribution of animals is uncontrolled. For example, grazing land that could potentially support one thousand animals may yet show serious denudation with a livestock population of five hundred if the animals are allowed to concentrate in the wrong place at the wrong time.

A variety of methods as means of influencing animal distribution over grazing areas have been suggested. These include the following:

- the provision of sources of salt or other desirable minerals in appropriate localities;

- location of areas in which supplementary feeding will be conducted, and
- where manpower is available, effective herding.

Perhaps the most effective and permanent method is through fencing, followed by a system of rotation and deferred grazing to allow certain pasture to recover. It is this method that has been and is still being adopted by most of our countries to remedy pasture deterioration. There is no doubt therefore that a series of technical requirements for sustained production of communal pastures are necessary in their management.

SOCIOLOGICAL REQUIREMENTS

The problems are also sociological because the degree of control that local communities can exert over their resources has not been understood and enhanced. Therefore this paper cautions against the over-simplification of the problem by adopting a single method of approach and looking for one 'stable' system of communal resource management which can be universally taught and applied.

This paper submits that there are features in each of our traditional systems which, if objectively studied, could offer a useful basis for future management of communal land resources. The correct sequence of activities is as important as the activities themselves in laying the foundations for local management of communal pastures.

Certain steps need to be taken as a prelude to efficient management of communal pastures. The first of these steps is to allocate grazing rights in a relatively small area to *bona fide* members of each local community. The primary objective of such an action would be to create awareness in each community that there is nowhere else to go once their common resources have been depleted.

Kenya's Swynnerton Plan, which resulted in the adjudication and registration of both arable and grazing lands was based on the 'tragedy of the commons' theory and proceeded to convert most of Kenya's commonages into private holdings. The results, as regards the pasture areas, have yielded neither the economic nor the ecological benefits intended. There are also plenty of cases of drastically overgrazed private farms within our subregion, illustrating that overgrazing is not confined to communal areas alone.

RECOMMENDATIONS

This paper advocates for means whereby the communal land system can be strengthened and modified to accommodate contemporary technical needs, rather than abandon it altogether. After all, it has so far served to protect the interests of the poor and the weak far better than imported systems of exclusive land rights. I therefore contend that communal areas presently degraded are in this ravaged state as a result, among others, of the decline of internal discipline which set limits to the greed or rapacity of individuals.

It is the weakness of the local control over local common resources that is the underlying cause of the present vulnerability of communal resources. The paper submits that the key to the management of communal resources is that the people who use communal resources should themselves control the manner and the rate of its exploitation. For this to be feasible, the community itself needs to be sufficiently cohesive for joint decision making, rule enforcement and mutual surveillance. This normally implies that the community should be small enough to enable its members to know one another by sight and live close enough together to meet and cooperate frequently. If the community is too spread out, concerted action and identification and restraint of offenders within the community becomes difficult, if not impossible. The size, density and cohesion of the community is therefore crucial to the success of communal resources management.

The communal pasture should not be so wide and far that the local community is unable to keep it under close surveillance. Communities' claims to specific areas have often proved weak because areas are so large and lacking in clearly defined boundaries. With increasing pressure on communal pastures, and the consequent need for better management, the delineation of boundaries should become an essential prerequisite for the development of local responsibility. There is evidence within the subregion that grazing rights in defined areas were traditionally allocated to members of certain descent groups or wards, and that others did not graze without permission in those areas.

The community must believe that their own communal grazing is a finite resource and that moving onto greener pastures once this one has been exhausted is impossible for, if such pastures exist at all, they belong to other communities. And more important than believing this proposition, communities must act on it! This is the basis of all conservation — the realisation that one can no longer exist by means of exploiting a resource to depletion and moving on to the next. Hence the need for awareness campaigns to achieve

an appreciation of the consequences of unrestrained exploitation of communal resources by unlimited numbers of people and livestock.

While the maintenance of stock within the carrying capacity of any land is essential, it should be encouraged through an efficient marketing system. This is an essential element of sound and profitable ranching as opposed to forced destocking.

CONCLUSION

The above few examples of the ways in which different communities exert varying degrees of management over their communal pastures suggest that the commonage is not inherently unmanageable. A common factor in all the cases is that small communities control small grazing areas. The people live close to each other, may be related, and there are strong formal as well as informal pressures within the group to urge conformity on its members. The approach to communal grazing through 'privatisation' is likely to lead to a situation of uncontrollably escalating inequality.

There is no doubt that communal grazing has become unmanageable. There is equally no doubt that rapidly growing livestock populations should not be permitted to graze unrestrainedly over dwindling areas of natural pastures. But this does not mean that the only available course of action is to partition the communal grazing areas into a number of group ranches under private and exclusive tenure. I am not aware of any example in Africa where a communal area is presently managed on individual basis. In Kenya, the transfer of communal land rights to private and exclusive interests has contributed to a massive problem of rural poverty, unemployment and landlessness (Sandford 1980).

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MANAGEMENT OF COMMUNAL NATURAL RESOURCES AFFECTED BY LIVESTOCK: THE MAASAI PROJECT IN TANZANIA

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BACKGROUND

Rangelands in Tanzania cover about 451,903 sq km or 51 percent of the total land area, and support over 95 percent of the total ruminant livestock and wildlife population. Most rangelands experience severe droughts either annually or every other few years so that sustained production is not easily attainable. In the attempt to overcome low productivity, traditional pastoralists tend to increase their herd sizes without commensurate increase in carrying capacity, and in so doing extensively accelerate overgrazing and environmental degradation.

In the past traditional pastoralists roamed the steppe extensively in search of pastures and water. Essentially there were no legal land use laws governing communal lands in Maasailand with the exception of those referred to national parks and game reserves. Later on, however, leasing started with German colonial administration (1890–1918). Pastoralists who did not understand the system were evicted from most of the highlands which incidentally constitute choice areas used for dry season grazing, only to be replaced by large-scale settler farms.

The advent of this new system completely took the Maasai unaware and overhauled the simple but practical traditional dry/wet season rotational grazing system. Within a very short period (1950–1960) vivid signs of overgrazing and erosion due to this 'land grabbing' were observed.

In May 1963 Leland E. Fallon, a range management advisor published a report on development of range resources. In his report, Fallon recommended the formation of ranching associations all over Maasailand '... not only to safeguard the interests of the pastoral community but urgently improve the already deteriorating balance between man, beast and nature.' Primarily,

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Fallon directed his efforts to addressing this imbalance. He particularly dealt with the administrative, legislative and organisational aspects of range resources management. His report provides a foundation on which a sound environmental programme can be built.

To attain sustainable productivity without serious damage to the natural vegetation of rangelands, an act to develop and manage all lands under this category in Tanganyika, the Range Development and Management Act of 1964 was passed. The major objective of this Act is the development and improvement of pastoral lands including Gogoland, Sukumaland and Maasailand; the latter is the focus of this paper.

In most rural areas of Tanzania and in Maasailand particularly, natural vegetation has been, and will remain for some time to come, the major source of fuel, construction materials and livestock feed. Up until the recent population explosion, balance between man, beast and nature had been fairly well maintained. It is the rapid growth in numbers of man and beast that has induced man to reap nature of its non-renewable resources.

The nightly corralling of cattle, sheep, goats and donkeys in the same enclosure is not in the best interest of the people, the land or the livestock. The daily back and forth trailing of livestock results in denudation of vegetation cover as well as erosion for a substantial distance from the *boma*. Again, changing this practice will be a slow process which must be brought about through education and by creating a desire for something better.

Among the Maasai, a desire and need for money to buy consumer goods should be stimulated to encourage sale of livestock as well as to improve their mode of life, for there is little or no incentive to sell livestock if there is no use for money. The Maasai like other pastoralists are receptive to development and advancement. All they need is an appropriate programme designed to make them help themselves.

Because traditionally Maasai do not eat game meat, there is an abundance of flora and fauna inhabiting the rangelands of Maasailand. The world famous Ngorongoro Crater Conservation Area, the Serengeti National Park, and the Manyara and Tarangire parks owe the game and tourism values to the Maasai.

Similarly, because wild game and livestock have always used the rangelands and their resources compatibly together, there should not be any serious conflict between pastoralism and wildlife if rangelands were properly managed, conserved and utilised.

It was not until 1969 that the Formation of Ranching Associations and Establishment of Ranch Lands Regulations were enabled under Section 55 (1) of the Range Development and Management Act of 1964. The regulations have been in existence since then in their explicit form and design despite several changes in national agricultural, livestock, land and environmental policies. The government administrative setup has also changed substantially based on the principles of socialism and self-reliance, decentralisation and power to the people through local authorities and village governments. To align it with current policies, the act was reviewed several times (the last being in 1983/84) and hence, the formation of the present Zonal Range Development Units. The zonal units divide rangelands into ecologically compatible regions that could benefit from integrated range development services and share the tackling of similar problems.

DEVELOPMENT PROJECTS

To assist Tanzania Government in the implementation of the 1964 Act, UNDP launched in 1969 a Livestock and Range Development Programme in both Sukumaland and Gogoland while in Maasailand USAID undertook the exercise in 1970 under the Maasai Livestock and Rangelands Development Project.

THE MAASAILAND

The Maasailand covers an area of 64,000 sq km; the livestock population has remained more or less stable over a period. Also, vast national parks, game reserves and game controlled areas are in Maasailand. In fact 25,670 sq km out of Maasailand are occupied by Serengeti National Park with 16,746 sq km and some 2 million wild animals, mostly zebras, wildebeests, impala, gazelles and giraffes; Ngorongoro Conservation Area with 14,750 sq km and over 1.3 million wild animals, predominantly wildebeests, gazelles and zebras; and Tarangire-Simanjiro National Park with 5,092 sq km carrying about 40,000 wild animals mostly wildebeest, zebras, buffalos and elephants.

The Maasailand is now being heavily encroached by modern cattle ranching and farming particularly the Loliondo area to the east of Serengeti National Park, and in the Lolkisale/Simanjiro area to the north and east of Tarangire National Park where over 30,000 and 152,000 hectares, respectively, are under bean farming. Also, in the very heartland of Kiteto District there is a pending application for allocation of 90,000 ha for ranching to one company. There are over 200 waiting applications for ranches and farms of various sizes

ranging from a few hundreds to thousand hectares. Hence, there is considerable pressure on the Maasai rangelands in terms of human, livestock and wildlife population, let alone increasing encroachments from large modern cattle ranches and farms. See Table 1 for details.

THE MAASAI PROJECT, ITS OBJECTIVES AND TARGETS

The objectives of the Maasai Livestock and Range Management Project

The objectives of the project were to:

a) improve range and livestock management;

b) control livestock diseases;

c) ensure greater land tenure security;

d) train Tanzanian specialists;

e) develop meaningful baseline data including livestock population and offtake, human population, socio-economic status of the people, climate, environmental status of Maasailand and other relevant aspects;

f) increase livestock offtake, incomes and quality of life of 110,000 Maasai who depend almost entirely upon livestock and livestock products for their subsistence;

g) assist the Tanzania Government in attaining self-sufficiency in livestock products and an exportable surplus to earn foreign exchange; and

h) integrate the Maasai into the national society by more permanently settling them and providing them with education, health, water supply and other services.

Targets of the Programme

Broadly speaking, the Tanzania Government through this project aimed at integrating the Maasai pastoralists into the national economy by settling them into more permanent villages and to avail them with essential social services such as education, health, water and communications.

The Maasai Project operated in a relatively isolated geographic area of 64,000 sq km, involved 70 percent of all the Maasai — out of 156,000 people living in Maasailand, and covered some 1.1 million heads of cattle at an estimated cost of US$10 million over a 10-year period from 1969 to 1979. A staff of 10 expatriates and 34 Tanzanians was engaged in the project. The work also involved the mobilisation of 43 vehicles and 17 heavy-duty machinery, and

Table 1. Area, Human and Livestock Populations in Maasailand

District	Area in sq km	Human Population				Cattle			Goats			Sheep		
		1957	1967	1978	1988	1964	1978	1984	1964	1978	1984	1964	1978	1984
Monduli	16,291	n.a.	n.a.	118,756	109,292	n.a.	349,491	300,639	n.a.	272,376	233,421	n.a.	187,905	164,893
Ngorongoro	14,498	n.a.	n.a.	n.a.	68,775	n.a.	234,342	270,631	n.a.	229,736	218,726	n.a.	202,037	156,152
Kiteto	32,480	n.a.	n.a.	29,756	127,360	n.a.	608,521	352,587	n.a.	125,180	119,980	n.a.	65,807	74,701
Total Maasailand	63,976	64,684	106,892	148,512	305,427	901,930	1,192,354	923,857	474,500	627,292	572,127	381,060	455,749	395,746
Total Arusha	82,306	407,473	610,474	926,223	1,351,675	1,532,820	2,026,393	1,855,880	1,138,450	1,505,037	1,231,014	921,530	1,102,149	758,476
Total Tanzania	881,289	28,788,466	11,958,654	17,036,499	23,371,000	9,155,530	12,103,614	12,500,028	4,200,280	5,552,768	6,443,666	2,981,400	3,565,323	3,060,147

	Growth Rate (%)	
	1964-78	1978-84
Cattle	2.3	0.61
Goats	2.2	3.26
Sheep	1.9	0.11

Source: Tanzania Livestock Census, 1964, 1978 and 1988. Statistical Abstract of the Livestock Census, 1984, Mainland Tanzania. Ministry of Agriculture and Livestock Development, November 1988

the participation of 29 range associations and 46 villages. USAID, the Near East Foundation (NEF) and Tanzania Government were jointly charged with the administration and implementation of the project.

USAID through Project 621-11-130-093 spent around US$10 million in loans and grants over a period of ten years, from 1970 to 1980, to implement a number of livestock improvement programmes described in the next section.

PROJECT COMPONENTS

Formation of Ranching Associations

The aim was to divide Maasailand into ranching associations ranging from 300 to 400 thousand acres in size and have them granted rights of occupancy over land in order to create a feeling of responsibility for the land and its development. Ideally, the associations would be corporate bodies able to sue and/or be sued, acquire land under the Land Ordinance or by lease, and conserve and protect the natural resources within the allocated areas.

The original plan envisaged the formation of 21 ranching associations but only 9 were actually formed, and even these did not have real legal rights by the end of the project in 1980. In 3 of the 9 formed associations, demonstration ranches were started to become a nucleus for improved livestock gene pool and modern husbandry practices. For genetic improvement, a consignment of 90 Boran/Mpwapwa bulls from various national livestock breeding stations were brought to the associations' ranches.

Rural Training Centre

To help educate young pastoralists, a centre dealing primarily with pastoral problems was built in Monduli on 480 hectares of land. The centre could accommodate 50 people at any one time and conducted short courses on livestock husbandry and range management principles.

Animal Health

For disease control and vaccination the project built 94 dips, 23 veterinary centres and numerous movable crushes. The movable crushes were primarily used for rinderpest control vaccination campaigns. Likewise, 23 livestock development centres were constructed at ward and divisional levels for closer disease monitoring. These were fairly well provided with veterinary equipment, drugs and personnel.

Livestock Markets and Holding Grounds

Traditional pastoralists are engaged in subsistence livestock production rather than commercial ranching, hence, there is a strong reluctance to sell their animals. Livestock production, management and care is a way of life for Maasai and in this respect livestock play a very significant cultural role. It is however important to note that, deterioration of range resources has assumed significant proportions in some areas due to this attitude. The numbers of cattle, sheep and goats grazing these lands are great, but the cash earnings are pitifully small.

To this end the project embarked on an ambitious livestock market construction and rehabilitation programme. 23 livestock markets and 3 holding grounds were constructed or rehabilitated during the project implementation period but regrettably, only 9 out of 23 markets remained functional after the end of the project. See Table 2 for more details.

Grazing Management Plans

Much of Maasai rangelands is not suitable for agricultural crop production due to low rainfall (350–500 mm), and the only economically viable way of converting this resource into useful products is through grazing animals that are adapted to arid and semi-arid conditions. All range in Maasai land is traditionally owned and used communally, but livestock herds are owned and managed by individuals and families without restrictions as to the number of animals or the intensity of use. Under this combination of low productivity, deterioration and eventual destruction of the land and natural resources, a programme of orderly controlled use is extremely difficult, particularly more when the goal of the people is primarily subsistence ranching rather than commercial livestock production.

Several attempts were made to design appropriate grazing management plans for the area, but unfortunately all these efforts did not bring about the desired effects. The plans were either too complicated to be adhered to by the pastoralists or too simple to bring about a significant impact on range conditions. Between 1974 and 1978, management plans were drawn for Talamai, Sunya and Komolonik Ranching Associations and later (1978–1980) 14 villages were provided simpler versions of the plans.

However, in relation to the potential of the land the present problem is not due to overstocking so much as to a lack of grazing management. In fact, if properly managed, the range resources can carry more livestock and wildlife.

Table 2. Livestock Markets in Maasai Districts

District	Market	State of Activity 1951-1960	1970-1979	1980-1989
Monduli	Engaruka	Active	Weak	Weak
	Mto wa Mbu	Very active	Active	Very active
	Ngarash/Monduli	Very active	Weak	Active
	Duka Mbovu	-	-	Very active
	Kitumbeine	Very active	Weak	Dead
	Longido	Very active	Weak	Dead
	Tingatinga	Very active	Dead	Dead
	Namanga	Active	Dead	Dead
Ngorongoro	Wasso	Very active	Weak	Dead
	Olalaa			
	Malambo	Very active	Weak	Dead
	Nainokanoka	Very active	Active	Weak
	Ngorongoro	Very active	Very active	Weak
	Endulen	Very active	Very active	Active
	Kekesio	Active	Weak	Weak
Kiteto	Dosidosi	Very active	Active	Very active
	Kibaya	Very active	Active	Very active
	Sunya	-	Active	Weak
	Kijungu	Active	Active	Weak
	Ruvu Remiti	-	Active	Weak
	Engasumet	Very active	Active	Weak
	Naberera	Very active	Weak	Dead
	Terat	-	Very active	Very active
	Ngambolo/Ndedo	-	Dead	Dead
	Shambaroi/Lokii	-	Active	Very active
	Msitu wa Tembo	-	Active	Weak

Source: Regional Livestock Development Office, Arusha

Bush Clearing and Tsetse Fly Control

Natural pastures provide the cheapest means of producing animal protein. In their natural environment, pastures, grasses, legumes and browse mixtures

compose a highly palatable and nutritious diet for ruminants. When, however, bush has to be cleared for tsetse fly control or pasture improvement in order to increase productivity, costs become formidable, particularly when funds are borrowed. This is probably one of the main reasons why until recently the traditional livestock sector had received little attention in terms of investment and financing.

About 60 percent of Tanzania's rangelands are infested with tsetse fly and trypanosomiasis is reported to account for 11.1 percent of total livestock deaths. Tick infestation is widespread and tick borne diseases account for one out of every five deaths of indigenous cattle in Maasailand.

Bush clearing and tsetse fly control have been practised in the ranching associations at Amei and Olmoti, both in Kiteto District, and at Tarosero and Embarwai in respectively Monduli and Ngorongoro Districts. This treatment covered a total area of about 25,000 ha. It is important to note here that, except for the Kiteto ranches, where labour was relatively cheap, a good proportion of the tsetse fly control work was done by use of chemicals.

Use of Fire

Traditionally, the Maasai have a great relationship with fire. Apart from using it for daily domestic purposes a Maasai uses it for clearing bush to increase grazing area, to stimulate plant regrowth vigour and to control pests such as tsetse flies, ticks and worm populations before the next rainy season. An old saying goes 'fire is a good servant but a bad master' depending on the use. It is the unsystematic, uncontrolled use of fire that has brought about notable environmental degradation such as is the case in some parts of the Ngorongoro highlands and elsewhere in Maasailand. Wildfires have left vast tracts of the highland in the dry seasons grassless and bare; and when the rains come, thousands of tons of fertile soil are washed away every year leaving behind land that can only support less palatable and more often poisonous plant communities.

Water Development

Indeed water development consumed over one third of project funds. Several water sources were developed throughout Maasailand with the good intention of taking into production the otherwise unused rangelands. It was the intention of the project to provide water points at 8 km intervals to spread range use by livestock. Theoretically, this appears good but in practice,

almost without exception, it never worked. Such improvement is temporary for soon the cattle population again builds up far in excess of the carrying capacity of the range. The result is merely an extension of the overgrazed area e.g the Mfereji/Kitumbeine pipelines. As far as the range resources are concerned, it is wasteful to spend money on a well intended but misguided programme of water development without adequate range management.

During the 10-year period the project constructed or rehabilitated 48 dams and *charcos*, developed 10 springs and drilled or cleaned up 30 boreholes in Maasailand. Although many of the dams breached and many boreholes drilled were unsuccessful due to various technical reasons, their impact on the environment was considerable.

(i) Dams. These were mainly constructed to open up new lands where soil conditions allowed. A large proportion of the dams are found in Kisongo division, Monduli District (see Table 3)

(ii) Springs/Pipelines. Springs provide the cheapest means of water for domestic use. As will be noted later, in the period 1951 – 1966 there were 28 such water projects in Maasailand. In the period 1970 – 1980 only 3 gravity pipelines projects were successfully implemented. This might not be a surprise to many of us today for the availability of natural springs and other natural water sources is scarce in Maasai rangelands. It might therefore require more detailed and extensive investigation and funds to find and develop new springs. However, note must be taken that some effort has been put in the rehabilitation of spring/pipelines schemes by the project.

(iii) Boreholes. As stated earlier, many of the drilled boreholes were unsuccessful not only due to technical problems but also due to logistical implications. More than 65 percent of the holes drilled under the Maasai Project yielded either no water and one was too saline for domestic use. Thus they were abandoned.

SUMMARY AND CONCLUSION

The Maasai Livestock and Range Development Project was laid down on excellent ideas, but foundered upon the lack of really detailed knowledge of the pastoral communities and their resources. For instance, grazing management plans were imposed on the Maasai but were unsuitable to the land conditions and sociologically unsound, and thus were doomed from the start. Excellent water supplies were installed but there were no legal rights

Table 3. Maasailand Water Sources

Period	Sources		
	Dams	Pipelines	Boreholes
1951–1966	21	28	24
1970–1980	48	3	30

Source: District Livestock Development Office, Monduli 1980

to control their use. The result was inevitable: great numbers of livestock converged on the few water points and left all land around them devastated.

Because there was no competent, legal and firm administrative machinery to control the use of associations' lands and resources, correction when mistakes were recognised was difficult. Indeed, because of lack of detailed informed planning, too many people got involved one way or another in the of running the project, though they did not really understand what they were doing. While some failed to admit that there were faults in the traditional Maasai system, others completely refused to admit that there was anything good in it. Consequently, while degradation was allowed to progress unchecked, there was, and still is, great condemnation of the Maasai practices that are intrinsically and thoroughly sound. Yet one basic fact remains obvious since the so called *modern animal husbandry* has been introduced in pastoral societies: environmental degradation has been accelerated mainly due to anthropogenic activities.

DEVELOPMENT LESSONS TO BE LEARNED FROM THE MAASAI LIVESTOCK AND RANGE MANAGEMENT PROJECT

There is good potential, climatically and in terms of grazing resources to substantially increase livestock product offtake with the application of livestock production technologies, thus making a larger contribution to the Tanzanian national economy, and to improve the quality of life of the Maasai.

Additional watering points and control of tick borne diseases made possible by the construction of dips were the project's activities most treasured by the

Maasai and contributed to increased livestock production and improved range utilisation. Further benefits include the construction of 145 miles of drought roads, the training of 28 Tanzanian experts abroad, the eagerness of the Maasai to accept demonstrated improved and adapted technologies, and the establishment of a Rural Training Centre at Monduli to teach Maasai how they could use technologies to increase livestock production and improve their quality of life.

Only a limited number of project goals and objectives were partially achieved, there were no measurable results on some and others like marketing, were abandoned without constructive action.

Some of the major causes contributing to the unsatisfactory achievement of stated goals were:

- The project's design was too ambitious in scope and unrealistic in relation to available personnel and funds.
- Inadequate leadership and personnel orientation and lack of coordination between USAID, NEP and the Tanzania Government, particularly regarding the definition of responsibilities of each organisation for project planning, direction, implementation, monitoring and reporting.
- The working environment was very difficult: lack of transport, communication means, equipment and logistical support at the time and places needed.
- Policy changes by US and Tanzania Governments substantially modified programme emphasis and caused considerable confusion among project implementors. For example, the change of emphasis placed on the organisation of ranching associations and a new Tanzania Government policy of villagisation between 1974 and 1980.
- A failure by project implementors to carry out follow-up actions regarding problems identified in previous project evaluations and project appraisal reports.
- A failure to develop baseline data or make progress reports that could be used to effectively monitor the project and measure its accomplishments.

For future similar development projects, the capability of Tanzania Government to provide and allocate funds and competent staff should be considered carefully before donors assist in launching new projects, including feasibility studies, appraisals, costing, phasing of long-term projects and evaluation of each phase before undertaking the next phase, assessment of

availability of necessary supporting infrastructure such as roads, communications, water and power supply, government and private services, analysis of government policies and procedures, impact of the project on the environment, women, and quality of life of rural people. All principal parties in a project should involve themselves in at least one annual project appraisal.

The scope of the project should be limited to what can be done in an exemplary way, otherwise the project will lose credibility. Work schedules should be carefully planned and organised, and incentives provided to outstanding workers.

RECOMMENDATIONS FOR FUTURE MAASAILAND PROJECTS

The Maasai have an invaluable wealth of experience and knowledge of their environment, grazing lands and animal husbandry. Planners should therefore take full advantage of this valuable resource and request that the Maasai actively participate in the planning, decision making, implementation and financing of any future project in Maasailand, instead of the usual process of planning for them. Plans must be made with the people and not for them by the Government.

Small animals such as goats and sheep are also very valuable to the Maasai and they should be developed. Hides, skins and milk should be made additional sources of income for the Maasai. A cooperative marketing system should be promoted for the sale of livestock, hides, skins and milk in order to secure higher prices.

It is necessary to manufacture locally in Tanzania drugs such as vaccines, acaricides and other medicines and chemicals used by the livestock industry, mainly taking into account that foreign exchange is very scarce.

Calf mortality is a serious problem in Maasailand and since it is the women who care for the young animals, Maasai women should be given training in effective calf care.

There is need for more detailed research projects that would determine:

a) The extent and effects of wildlife such as wildebeests on rangelands. Their competitive use of feed and water, and the extent they are responsible for the transmission of diseases should be assessed.

b) The desirability of selective, controlled burning of rangelands to determine the frequency, time, locations for firebreaks for selected areas

and to more specifically determine the effect of burning on wildlife, ticks and bush control, erosion and forage productivity, nutrition and palatability.

c) Mineral, trace element and vitamin needs of livestock and whether it would be economical to supply them.

d) The advisability of permitting more livestock grazing in game areas.

e) The practicability of range reseeding in badly depleted areas such as Kisongo Division of Monduli District.

f) Whether the spread of buffalo grass could be effectively and economically controlled mechanically, chemically or biologically.

g) Best locations and facility sizes for further water development. This is mainly because water location and size of the structure greatly affect the use of the land around it.

h) Sociological and economic surveys of the Maasai to study changes in their cultural and value systems and determine future trends to respond appropriately to their felt needs.

When land is leased to large-scale farmers, they should be required to return the land at the end of the lease seeded to grass and other palatable plants at the end of the concession period.

There is need for improving rural access roads so that they are passable during the wet season, to facilitate the movement of livestock products and consumer goods. As a means of improving communications in a vast and isolated geographic area vehicles should be equipped with short-wave radios.

In future donor agencies should recruit qualified and experienced staff skilled in their fields of specialisation as well as in leadership and management. Capable and committed leadership is a prerequisite in successful project planning and implementation.

The involvement of the USAID Project Manager was minimal. In eight years he never visited the project site resulting in poor coordination of the project. The system and procedures for supply, procurement of spare parts and repair of vehicles, heavy-duty equipment, research and office equipment should be given careful consideration. The American vehicles and machinery were unsuitable for Maasailand conditions.

The administration and implementation of the project was adversely affected by inadequate coordination, poor working relations between the American

expatriate staff, the Tanzanian and the US Governments on such matters as the basic legislation governing the project (Range Act 1964), the villagisation programme, and the USAID condition that projects should be socially and environmentally sound and should elevate the status of women in society.

The local counterpart training programme emphasised livestock production and animal science rather than hydrology, civil engineering and range management to cope with the problems of water supply and livestock diseases. Moreover, long first degree or graduate studies were given priority instead of short certificate or refresher courses. The expatriate and local staff turnover was unacceptably too high.

The involvement and participation of the local Maasai villagers in planning, decision making, financing and implementation of the project was very little. The Maasai regarded the project as a USAID and Tanzania Government activity although the project was supposedly conceived and designed to improve and transform the quality of life of the Maasai.

The baseline data for project implementation was very limited and research was regarded as a luxury that could not be afforded. For example, no surveys of the ecological, soil, hydrological, climatological and other conditions were carried out. Also no sociological and economic surveys of the target Maasai and their felt needs was conducted. The capabilities of existing local institutions in implementing the project was not assessed.

All in all, very few steps were taken to overcome project's problems, and ensure its success and sustainability. The Tanzanian Government has not been able to continue on its own with the implementation of the project. A zonal Range Development Coordination Unit exists in Arusha Region but it has not been able to maintain even the infrastructure laid down with USAID assistance, let alone undertaking new livestock and range development projects in Maasailand.

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HOLISTIC RESOURCE MANAGEMENT. AN INTRODUCTION

Robert Buzzard*

> What we need then, is a new paradigm - a new vision of reality; a fundamental change in our thoughts, perceptions, and values.
>
> Fritjof Capra, *The Turning Point*, 1982

INTRODUCTION

Current Crisis

By any measure or standard, relationships among humans as well as the resiliency and self-regenerative power of the natural world are under severe stress. In many locales, social and political unions are breaking down completely and the ecosystem's powers of renewal appear to have been lost. Unfortunately, humankind seems unable to reverse these processes of dissolution to any significant degree because the thoughts, perceptions, and belief systems, (**paradigms**/pair-a-dimes), which form the dominant vision of reality, are no longer adequate to explain or find solutions to the ecological, economic, and social problems facing our species today. What makes this such an exciting and stressful time in which to live and work is that new paradigms are emerging to challenge the conventional wisdom. Those who adhere to the dominant order frequently resist the new perceptions of reality. Conflict is inevitable as opposing views confront one another and as beliefs and values begin to change during processes known as **paradigm shifts**. By way of example, some of the values, realities, and practices which are currently in states of flux are presented in Table 1.

Of all the shifts, one of great significance is the transition occurring in beliefs about the organisation of the natural world — the shift from a mechanistic to a holistic view. The 'mainstream' paradigm is based upon a mechanical view of natural organisation, *i.e.* the ecosystem is composed of discrete parts much like an engine. Furthermore, it is believed that 1) the ecosystem may be understood by separating the parts from the whole and by studying them in

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isolation and 2) making such a separation is does nothing to change the characters of the whole or of the part under study.

Table 1. Examples of contrasting paradigms

Dominant order	New order
• sexism/racism	• sexual and racial equality
• advancement by competition/ conquest	• advancement through negotiation
• business management through hierarchies, regulation, 'top down'	• business management based on trust, teamwork, collaboration
• natural resource abundance	• scarcity of non-renewable resources
• use of resources in linear, 'once only' fashion	• recycling of products
• agriculture reliant on mechanical/technical inputs; unsustainable	• agriculture dependant upon biological processes/sustainable
• rampant consumerism, easily manipulated	• self-restraint in consumption, highly discriminating
• mechanistic model of the universe	• holistic view of natural organization

Unquestionably, this reductionist or 'scientific' method of inquiry has driven the incredible advances in human knowledge, standards of living, and technical ability which characterise our current Industrial Age. Unfortunately, concurrent with our technological advances, we are experiencing rates of natural resource depletion and environmental pollution of such massive scales that we are constantly confronted with the limitations set by the carrying capacity of our environment.

Within the 'mechanistic' paradigm the goals of management are very discrete and 'task' oriented, *e.g.* increase production, solve problems, preserve certain habitats, or eradicate specific organisms. In addition, technical applications are generally presented as solutions to environmental problems. For example, riparian areas throughout the world are characterised by widespread erosion,

gully formation, and flooding. One very common set of 'solutions' or prescriptions to deal with these problems is the construction of gully plugs and spreader dikes to slow overland flow and prohibitions on use of the area ('rest') to encourage vegetal recovery. Yet, despite the best efforts of management, the erosion continues, a larger flood 'blows' the structures, and degradation marches on.

HOLISM

In counterpoint to the mechanical view is the holistic paradigm of natural organisation and function. Underlying the holistic theory are the following principles:

- the natural world is organised in a series of 'holons' which are complete systems at one level but which at the same time are parts of larger, indivisible 'wholes';
- one can not understand the 'whole' by studying the components in isolation;
- **disturbance** or 'pressure' on any of the parts **ripples throughout the whole** as the relationships among parts constantly change, evolve, and influence one another;
- the whole and the parts acquire new properties as a result of interactions triggered by the disturbance or 'pressure'.

These principles give rise to certain beliefs about how the ecosystem functions, *i.e.*:

- the various levels ('wholes') of natural and cultural relationships are not organised mechanically as in a spaceship or an engine and the mechanical model of organisation and function is inadequate for understanding and, especially, managing these interactions;
- since there is total interpenetration of parts, one thing done wrong will create numerous (and unanticipated) problems throughout the 'whole'; if something is done right several problems are taken care of at once;
- humans are not separate from nature and our actions (or lack thereof) will always have consequences and will be 'felt' throughout the whole;
- ecological understanding occurs through a merge of the **rational**, scientific method of inquiry with an **intuitive** appreciation for the non-linear nature of our environment.

The process which enables us to put the principles of holism into practical use is known as Holistic Resource Management. This method of resource management directs our attention to and aids our understanding of the social, economic, and biological relationships which compose the 'wholes' we are attempting to manage and it allows us to define clear, sustainable goals.

By way of example, think back to the earlier description of the eroding riparian zone. A holistic approach to management would first of all realise the degradation and erosion were symptoms or effects of a deeper causes. The first of these, the loss of bio-diversity on the surrounding catchment **as a whole**, is physical. The second relates to the interactions among human users and is social. The three words — as a whole — are very important. They relate not only to the natural resources of the catchment soil, vegetation, and animals; but also to the ecological processes of water cycles and nutrient cycles, succession, and the flow of solar energy. Additionally, they encompass the uses (and users) of the catchment *i.e.* stock grazing (farmers and herders), timber or fuel wood harvesting (loggers and villagers), mineral extraction (miners), road construction (contractors) to mention a few. Finally, the 'whole' includes the finances available to the various user groups and institutions (generally government) concerned with the management of the catchment. The process of holistic management is the people (users and government) becoming responsible for and managing the total resources of the watershed. They form a collaborative group which focuses upon the 'whole' — the land, people, and money involved — for only the whole has meaning. At no time is the 'problem', the degrading riparian zone in this case, mentioned in the management goal set by the group. Rather, they define the goal in three parts — the **quality of life desired**, the **forms of production** which will provide the quality of life, and a **description of the landscape** which will support the forms of production long into the future.

FOUR SIGNIFICANT INSIGHTS

Holistic Resource Management developed from four 'insights'. Each of these was a separate discovery or realisation made over the last sixty years, but it has been only during the past 20-25 years that their **combined** significance has become apparent.

Management Must be Holistic

This insight was made possible by the shift in the perception of natural organisation and function mentioned earlier. The jump took place in physics

50-60 years ago. Other disciplines are following more slowly. Nevertheless, old paradigms die hard. The 'reality' which continues to guide the practice of Western agriculture, natural resource management, and development is that unlimited material progress can be achieved through economic and technological growth. The 'goal', quite often, is viewed as a matter of overcoming specific problems with specific solutions. This is the focus of the mechanistic paradigm and most of us were trained in university and technical school with this vision of reality. The mechanical paradigm holds that complex phenomena can always be understood by **reducing** them to their basic building blocks and by allowing interactions to occur under controlled conditions.

However, the worldwide environmental deterioration facing humankind includes cultural, economic, and social elements as well as biological. It is impossible to hold all of these variables still while a few are researched. Yet research continues, technological fixes are produced and applied and soil washes from our fields and rangelands, population climbs, our water is poisoned, and bio-diversity plummets. The ecosystem and human culture, which are best described as a series of relationships, do not behave like machinery with isolated parts. A method whose results depend upon holding variables constant will not provide complete answers when it is applied to variables which constantly wobble.

The alternative is a holistic resource management process — a process which is non-disciplinary, which accounts for the indivisible union of culture, biology, and economics when humans utilise resources, and which operates through a dynamic feedback loop of goal formation, decision/implementation, monitoring, and control — used in **collaboration** with the reductionist model.

The Classification of Environments Along a Brittle/Non-Brittle Continuum

The second key in the development of Holistic Resource Management was the realisation that environments in the ecosystem do not respond to the same forces in the same manner. Environments lie somewhere on a continuum of rainfall and atmospheric humidity which varies from perennial and reliable to extremely erratic and seasonal during the growing season. It is the frequency and periodicity of precipitation acting in concert with temperature during the growing season which influence the rates of succession and determine the prevailing processes of organic decay.

Non-brittle environments are characterised by reliable, perennial rainfall during the growing season. The areas with more erratic, seasonal rainfall are

known as **brittle** environments. Table 2 presents a comparison of characteristics at the extremes of the continuum.

Table 2. Comparison of non-brittle and brittle environments.

Non-Brittle	Brittle
Environmental conditions (moisture, temperature) are generally favourable for plant growth throughout the growing season	Erratic distribution of moisture and wide fluctuations in atmospheric humidity throughout the growing season
No large seasonal buildup and die off of vegetation during the growing season	Massive seasonal buildup of vegetation under favourable growing conditions
Cycles of decay and decomposition are rapid, primarily biological, and are encouraged by moist soil and high humidity	Decay processes are slow and are primarily chemical (oxidation) and physical
Prolonged non-disturbance (rest) tends to advance succession and encourages greater complexity	Prolonged non-disturbance (rest) hinders the establishment of perennial grass and widens plant interspaces; this tends to expose soil, retard succession and simplify the ecosystem

Role of Herding Animals and their Predators in Brittle Environments

Ecosystem stability is dependent upon the cycle of birth-growth-reproduction-death-decay of organisms. In brittle environments there is generally a tremendous annual accumulation of vegetative material (primarily from grass) which must be recycled if the health of the system is to be maintained. 'Health' in this sense means that established plants continue to capture energy year after year with as much photosynthetic material as possible and new plants become established either from seed or vegetatively. The annual regrowth of vigourous green leaves is dependent upon the removal of the vegetative material which accumulated during the previous growing season.

This removal can occur in three ways: with fire, grazing, and animal impact/herding behaviour.

Fire

- Tends to consume large amounts of vegetation over extensive areas;
- Removes litter, nutrients, and exposes soil; and
- On a repeated basis would tend to reduce effectiveness of the water cycle and depress populations of decomposers.

Grazing

- Removes photosynthetic material but leaves some standing crop for soil surface protection;
- Would only occur over large areas if there were vast herds of herbivores moving frequently; and
- Effectively recycles nutrients as organic material is broken down mechanically and biologically (in rumen) and returned to the soil surface; closely tied to animal impact (dunging, urinating, trampling, rubbing)

Animal Impact/Herding Behaviour

Herding Behaviour: is the sort of behaviour exhibited by many species of herbivores indigenous to brittle areas (elephant, wildebeest, antelope, American bison, zebra, etc.). When these animals are 'herding' their movement is excited and bunched. This excited movement provides a vastly different impact upon the ecosystem than when the same animals are grazing or resting. The herding behaviour results from other stimuli — migration, defense of females during breeding, milling around water, and the threat of predation.

The importance of predation in eliciting the herding response is explained by Savory (1988),

> I became convinced that the disturbance created by the hooves of herding natural game populations was vital to the health of the land, and that mankind had lost this benefit when we domesticated cattle, horses, sheep, and goats and protected them from predators. Even where people herded (shepherded) livestock, as opposed to fencing them in, they did not behave as they would if naturally herding (bunching, running) under the threat of predation.
>
> As the brittle environments evolved over millions of years, predators and their herding prey were the only things that could have realistically

> both created the necessary soil disturbance to provide a good seedbed for new plants and protected bare soil by trampling down old plant material. Both functions appear to be critical to the health of brittle environments, and indeed, the world's large populations of herding animals appear to have evolved mainly in such areas. (p. 42)

Animal impact and the herding behaviour have the following effects upon the ecosystem:

- Contribute to effective water and mineral cycles by depositing standing crop upon the soil surface as litter; and
- May accelerate or retard succession on bare soil by breaking sealed surfaces, incorporating seeds, and by compacting and/or pulverising the surface.

The Importance of Time

The significance of controlling time as a variable in grazing management was explained by Voisin (1961) over thirty years ago. Most of his work was performed on planted swards in non-brittle environments. However, from his observations the following general principles have emerged:

- Overgrazing is more a factor of the length of time the plants are exposed to the grazing animals and it has little relationship to the number of grazing animals present; the same can be said for the other impacts of animals on the land (trampling, compacting);
- The growth rates of the plants will determine the length of time the animals should be exposed to them; and
- The time of exposure is based upon the severely grazed plants,whatever their species.

Holistic Resource Management puts the principles of the four insights discussed above into practical use. The framework for this process is the Holistic Resource Management model.

THE HOLISTIC RESOURCE MANAGEMENT MODEL

The Holistic Resource Management model is a road map for putting ideas into operation to achieve a three-part goal. Each action step (or use of a 'tool') under consideration is tested to see how it will effect the whole and whether it will move the people involved toward their goal. If a decision is determined to be sound the model provides a set of guidelines for taking the

action ('using the tool'). Once action is taken the model provides a process or feedback loop for monitoring the result, making corrective adjustments, and replanning future actions if necessary.

In practising Holistic Resource Management there are five critical elements which must be considered: the 'whole' under management, setting the goal, ecosystem processes, 'tools' and the effects their uses tend to produce in the environment, and the testing and management guidelines for the uses of 'tools'.

The 'Minimum Whole'

The 'whole' for any management consideration consists of land, people, and the financial resources available to them managed as an indivisible unit. However, since the world is composed of wholes within wholes, how is the 'right' size arrived at? If the whole is too large it becomes unwieldy, contains too much extraneous information, and too many players to ever achieve agreement of purpose. On the other hand, if it is too small or too exclusive, plans and decisions of the few cannot be expected to bind the many. There is no neat answer to this question. Some general considerations are offered below but bear in mind each management situation is unique. Common sense plus 'trial and adjustment' must prevail.

- Administrative boundaries and political jurisdictions
- Topographic/physical features
- Ease of access and communication
- Ethnic, cultural, regional similarities bearing in mind the idea of inclusion rather than exclusion
- Patterns of use

The Three-Part Goal

Holistic Resource Management cannot be practised without a goal which spells out the **Quality of Life** desired, the various forms of **Production** which will make the quality of life possible, and a futuristic **Landscape Description** which will sustain both the forms of production and the quality of life.

Goal 'ownership' and full commitment are necessary for success. Achieving the goal must be the most important thing to the people involved. As ownership and commitment take considerable time to evolve, the management process usually begins with setting a 'temporary' goal.

HOLISTIC RESOURCE MANAGEMENT MODEL

GOAL

QUALITY OF LIFE
PRODUCTION AND LANDSCAPE DESCRIPTION

ECOSYSTEM BLOCKS

Succession | Water Cycle | Mineral Cycle | Energy Flow

TOOLS

Money & Labor | Rest | Fire | Grazing | Animal Impact | Living Organisms | Technology | **Human Creativity**

GUIDELINES

TESTING

- Whole Eco-System
- Weak Link Gross Margin Analysis
- Cause & Effect
- Marginal Reaction
- Energy/ Wealth Source/ & Use
- Society & Culture

MANAGEMENT

- Time
- Stock Density
- Herd Effect
- Population Management
- Burning
- Flexibility
  - Strategic
  - Tactical
  - Operational
- Biological Plan Monitor Control Replan
- Organization/ Personal Growth
- Financial Plan Monitor Control Replan

Important points to remember are:

- The goal must only mention what people want, not how they will get what they want;
- The goal must not include any mention of 'tools' (other than living organisms which cannot be avoided);
- There must be no reference made to particular 'problems' in the goal;
- The goal must be phrased in three parts.

Quality of Life Statement

This is a statement in brief terms of the quality of life which is sought by the people involved.

Forms of Production

These are brief headings which state the forms of production that are required to support the quality of life outlined. **No mention is made of tools other than living organisms.** This is what has to be produced **not** how anything will be produced.

Description of Future Landscape

This is a description of the land as it would have to look in the future for the forms of production to be sustained. It is **not** a description of the land as it is today. The description should be in writing and it should be supported by a map which shows the features of the future landscape. For example, what today is an eroding field of maize might be shown on the futuristic map as an area divided into many small fields with terraces, bordered by fruit trees and berry bushes. The fields might be described as having high successional complexity achieved through the use of polycultures, with low levels of water run-off, and with rapid turnover of minerals and nutrients.

An example of a three-part goal might be useful at this point.

A temporary **Quality of Life** statement could include a desire for:

- good quality water, free from contaminants and dirt, for ourselves and our livestock;
- high quality education for our children and increased educational opportunities for all residents;
- a feeling of trust and goodwill toward one another so we may conduct our lives without fear of theft and physical attacks;
- strong family ties, stable households where all members — children, adults, and old ones — may remain and thrive with love and affection;

- healthy ranges where our animals may grow fat and provide an abundance of high quality products — meat, milk, wool and mohair, draught power — necessary for our way of life; and
- opportunities for long-term, sustainable employment in the management of our natural resources and livestock.

The next element of the three-part goal is a **Production** statement. A way of opening up this line of thought is to ask, 'What must we have to enable us to enjoy or reach the quality of life we have outlined for ourselves?'. 'If cash is required for our quality of life how do we obtain it?'. 'How do we generate it from the land?'. 'Is there anything else, other than cash, which the land must provide for the quality of life we have defined (plants or animals for ceremonials, medicine, fuel, and construction materials)? 'What about aesthetics — an environment which is pleasing to eye and soul?'

Examples of forms of production are:

- profit from livestock;
- a supply of animal products, vegetables, and plants to meet the needs of household and community consumption;
- profit from tourism;
- profit from wildlife and fish; and
- aesthetically pleasing surroundings.

The temporary **Landscape Description** should be a broad description of the land as the members would like to see it 10-15 years from now and how the four ecosystem processes (succession, water cycle, mineral cycle, and energy flow) would have to function to sustain this landscape.

An example of a temporary landscape description follows:

- all eroded areas will be healed or in the process of healing and soil will remain in place;
- overland flow and sheet wash will be on the decline with more water entering the soil profile;
- the vegetal aspect will be a grassland of high species diversity; grass species density and percentage ground cover will be increasing; the grassland will be interspersed with shrubs;
- succession will be advancing on abandoned cropland toward the establishment of self-sustaining grassland; and
- croplands will be planted to polycultures of grains, legumes, thatch grass, and fruits.

The goal in all of its parts should never be regarded as set in concrete. The people involved must be prepared to modify it as time passes and more knowledge is gained. **No matter how ill-defined it is to start with, some concept of the goal must be developed prior to initiating management with the Holistic Resource Management model.**

The Ecosystem Foundation Blocks

Defining the 'minimum whole' and setting a clear three-part goal are the first steps in practising Holistic Resource Management. However, the foundation of the goal is the ecosystem and the people involved must understand basic ecologic processes for two reasons. First, a knowledge of the limits and potentials of the environment will indicate whether the goal is realistic and attainable. Second, if the condition or 'health' of the ecosystem can be identified then predictions can be made about the effects of certain tools. Remember, the ecosystem processes do not exist in isolation and that the influence of tools will be felt throughout the system.

The four ecosystem processes which support the goal are **water cycle, mineral cycle, succession,** and **energy flow.**

Water Cycle

Water in the forms of vapour, liquid, and solid moves from the atmosphere and into the soil. It is uptaken by plants and consumed by animals. Some is returned to the atmosphere through processes of transpiration and respiration. Another percentage is held in the soil profile while a fraction passes through the soil to recharge underground aquifers. These surface as springs or flow into streams and rivers. Evaporation then returns the water to the atmosphere as a gas. The characteristics of an effective and a poor water cycle are shown in Table 3.

Mineral Cycle

Like water, minerals and nutrients cycle throughout the ecosystem by the processes of decomposition (rocks), weathering and decay (rocks and dead organisms), absorption, biological fixation (nitrogen into useable form), and through the activity of small animals (rodents, earthworms). Table 4 presents the contrast between good and poor mineral cycles.

Succession

Succession is the process of change and development in entire biotic communities — soil, microorganisms, animal and plant life, and micro

Table 3. Contrast between effective and poor water cycles

Effective Water Cycle	Poor Water Cycle
Soil surface permeable	Soil surface exposed, sealed, and capped
Sub-soil well aerated with high infiltration rate	Sub-soil compacted, poorly aerated, slow infiltration
Water run-off low, surface covered with litter	Sheet wash and overland flow widespread
Evaporation losses minimized	Excessive evaporative loss from exposed surface
Percolation to recharge aquifers, field capacity attained quickly	Aquifers being depleted no recharge
Vegetal production high and fast growth rates achievable	Vegetal production low, slow growth rates
Droughts and floods tend to be less severe	Droughts and floods tend to be severe and recurrent

environment. A low **seral stage** or level of community development is characterised by few species but with high numbers within species. Both biomass and environmental factors are subject to wide and erratic fluctuations. A high serial stage tends to exhibit high species diversity, several to many structural layers in the plant community (grasses, low shrubs, taller shrubs and trees), a variety of habitats or niches, and less fluctuations in environmental factors.

The Flow of Solar Energy

The source of nearly all life is the sun. Its energy must flow throughout the ecosystem; first by being captured by a high density of green plants and subsequently by its conversion during passage through each trophic level. The concept of energy flow also extends underground. Here solar energy is stored in plant roots which in turn 'feed' and influence a biologically active subsurface community. A healthy soil, with maximum flow and turnover of energy, drives the other ecosystem processes — water and mineral cycle, and succession. The attainment of most goals will require the capture of the maximum possible amount of solar energy.

Table 4. Characteristics of effective and poor mineral cycles

Effective Mineral Cycle	Poor Mineral Cycle
A porous soil, rich in organic content	Soil compacted, surface sealed and capped, low organic content
Mature, stable mulch on the surface	Sparse mulch/litter and much bare ground
Rapid breakdown and high turnover of litter, dung, and old vegetation	Bottlenecks in the breakdown and decay of organic material; dung bakes hard and dries on the surface
Minimum loss from the land by run-off and wind-blow	High loss to run-off and wind-blow
'Deep' minerals lifted to surface by high volume of plant roots	'Deep' minerals unavailable to cycle through shallow depth and reduced volume of roots
Healthy root systems	Damaged root systems
High diversity and density of insects and microbial populations at surface; intense biological activity	Harsh micro-environment at the surface; reduced populations of insects and micro-organisms

The 'Tools'

The next row in the Holistic Resource Management model consists of eight influences or 'tools' — human creativity, money/labour, rest, fire, grazing, animal impact, living organisms, and technology. These are used by the people involved to influence, change, or modify the ecosystem process to achieve their goal. Each tool, when applied, has a primary tendency or effect upon the ecosystem blocks. However, the primary effect will always 'ripple' throughout the system as interrelated components shift, adjust, and respond to the disturbance.

The Guidelines

'Tools' are often useless or one is prone to make mistakes in their application without instructions or guidelines for their use. The final row of the model consists of seven 'testing' or 'whether to' guidelines and nine management or 'how to' guidelines. A decision on the use of particular tool should first be subjected to the seven tests, *i.e.*:

- What is its effect on the **whole ecosystem**?
- Is the tool directed toward strengthening the **weak link** in the chain which extends from the sun to the quality of life?
- Is it being focused on a **cause** or on an **effect**?
- Is its use giving the greatest kick or drive for each monetary unit or person-hour of labour involved (**marginal reaction**)?
- What forms of **energy** or **wealth** will be consumed and/or produced while using the tool?
- How will its use effect the **cultural values** of the **society** involved?
- If faced with several options of investment which will contribute most to paying overheads (**gross margin analysis**)?

If a proposed action passes all of these tests one can be confident it will be environmentally, financially, and culturally sound and that it will lead toward the goal. In the event it fails some of these tests the management group might still proceed with its application — there might be no choice and the action might be the best of several faulty alternatives. However, the group would act with the knowledge they are making no progress toward the goal and that subsequent, corrective steps would have to be taken.

Once an action or tool is subjected to the tests it is applied with reference to the management guidelines. For example, if the group decided that 'grazing' was necessary to achieve the goal then it would be applied through the management guidelines of:

- Controlling the **timing** of the grazing to the **growth rates** of plants;
- The grazing would applied through the use of a **biological plan** which would be **monitored**, **controlled**, and **replanned**;
- To spread the grazing load over the widest number of plants to improve animal performance and to increase the flow of energy the concept of **stock density** would be applied;
- At the day-to-day operational level the manager has tremendous **flexibility** to control the effects of grazing and he/she can operate in any of four dimensions by manipulating volume (number of animals), time (plant recovery periods), area (size of grazing areas), and animal behaviour (herd effect).

The aforementioned testing and management guidelines are the subjects of several days of explanation in introductory courses in Holistic Resource

Management. In addition, Savory (1988) devotes 23 chapters to them. The reader is referred to his text for extra study.

CONCLUSION

> You are neighbours whether you want to be or not, because the land itself unites you. It links you as you both walk on it today, and you will both lie in it together when you die. Then the plants that grow in the soil you become will infect your children with either your hatred or your affection as you can choose now. If you bless your land, it will return your blessing and your present argument will become insignificant.
>
> Anonymous Navajo medicine man

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SWAZILAND EXPERIENCE TOWARDS UNDERSTANDING RANGE MANAGEMENT PROJECT IMPLEMENTATION AND MANAGEMENT OF COMMUNAL GRAZING LANDS

S. L. Mamba

BACKGROUND

Strategies to combat overstocking and hence overgrazing, have been formulated in the country since the 1940's. An early scheme during the colonial era involved destocking of animals in communal areas and purchasing of land. Initiated in 1946, the scheme made provision for a levy on all herds of Swazi cattle owners to be payed in cattle which would then be sold to purchase land. This scheme did not develop as hoped since in practice destocking did not merge as a major aim.

Ever since then, there has been a series of strategies aimed at reducing the number of cattle from overgrazed lands. These range from the establishment of rural sale yards, introduction of the Fattening and Sisa Ranches Programme, the Rural Development Area Resettlement Programme to the current Grazing Land Management Demonstration (GLMD) Programme.

The GLMD concept, which this paper shall address, was developed after realisation of the weaknesses found in the preceding Rural Development Area (RDA) Programme. The RDA Programme also had the element of land purchase where under-utilised privately owned land had to be purchased for addition to the designated rural development areas. The package mainly focused on the provision of fencing materials to demarcate cropping land from grazing land. This did not solve the overgrazing problem because no specific guidelines were formulated for the fenced rangelands.

Realising that a major weakness of the programme was the lack of education and community involvement in its planning and implementation, the GLMD concept was launched in 1983. Since then these projects have increased to a figure of ten to present date.

PROGRAMME OBJECTIVES

The objectives of GLMD can be summarised as follows:

1. To discourage past procedures for planning and implementation of grazing management practices on communal lands in the rural development areas.
2. To expose the fact that grazing management plans are best developed on site by professionally qualified range management/forage specialist in line with the will and desires of the people.
3. To discourage traditional beliefs and practices by farmers which are detrimental to livestock productivity.
4. To illustrate that with proper range management both range and animal productivity can greatly be enhanced and consequently, raise income in rural areas.
5. To demonstrate the benefits of estimating grazing capacities annually in order to vary stocking rates in accordance with variations in rainfall and forage productivity.

PROGRAMME TARGETS

The target group in the GLMD are communal cattle owners. For simplicity I have chosen the Nyakeni Grazing Demo situated in the middleveld of Swaziland. The demonstration has been named by the local people as Intamakuchubekela Phambili Grazing Demo. At present it consists of 71 cattle owners.

PROCEDURES FOR IMPLEMENTATION

The procedures can be divided into those of motivation and those of actual implementation.

Motivation of Rural Society and Extension Staff

1. The programme starts with the motivation of extension staff by holding meetings and discussing with them about range management strategies, and in the process mutual understanding and respect is built.
2. Education seminars are then arranged with the RDA Management Units, starting with project managers and spreading down to their staff. This creates a stimulus and increases awareness regarding some mistakes previous development activities made.

3. Once motivated, the extension staff engages in a series of meetings in the RDA's involving the chiefs and his closest men (*imisumpe*) as well as others with keen interest.

Actual Implementation

1. Once the chief and his *imisumpe* are convinced, a small piece of land from the grazing area is demarcated by the community and is used as a starting point. The areas usually range from 20 to 250 hectares, which usually represent a quarter to a third of the total grazing area.
2. After demarcation, the area is fenced off with materials being provided by the government as an incentive. Next, the area is divided into four to six camps depending on size and topography of the area. Extension workers will then take grass samples to estimate the carrying capacity of the area.
3. With the advice of the technical staff, the *imisumpe* determines the number of breeding cows each farmer can enter into the demonstration. This body also screens the animals for breeding abnormalities and also contagious abortions.
4. Following, interested members will sign an agreement with the *imisumpe* and pay an annual acceptance fee of E2 per breeding cow, which is renewable at the beginning of each year at the prevailing rate. Every breading cow is also charged a monthly management fee of one Lilangeni, which will contribute to fence maintenance, veterinary services, herding of cattle and other expenses.

EXTENT OF RESOURCES BEING MANAGED

The Intamakuchubekela Phambili Grazing Demo is 230 ha. At its inception the demonstration consisted of 32 animal units; by now the demonstration has 204 animal units (see Tables 1 and 2)

LEVEL OF PARTICIPATION BY TARGET GROUP

As outlined when referring to the objectives of the demonstrations, the main aim of the programme is to educate the community and promote its full involved in the improvement of its resources. The programme therefore struggles for 100 percent involvement by the target group from the motivation and inception stage through implementation and monitoring.

Table 1. Inventory, 1983–1989

Year	Size of GMD (ha)	No. of Owners	No. of Cows	No. of Bulls	No. of Heifers	No. of Steers	No. of H/C	No. of S/C	Total	Total (Animal Units)
1983	230		25	3	–	–	6	5	39	32.20
1984	230	42	47	4	19	5	8	11	94	76.24
1985	230	52	71	4	32	13	10	10	140	114.15
1986	230	50	51	3	24	15	6	10	110	82.00
1987	230	60	51	6	15	24	10	6	112	91.29
1988	230	59	108	5	20	25	24	27	209	165.00
1989	230	71	118	5	42	50	22	25	262	203.90

Source: Range Management Annual Report, 1989

Table 2. Income generated by the project

Sale	Date	Number of cattle sold	Income (E)
1st	5 May 1986	7	2556.00
2nd	2 April 1987	6	2350.00
3rd	6 January 1988	6	5800.00
4th	9 January 1989	56	37720.00
Total		75	48,426.00

Source: Range Management Annual Report, 1989

Once the project has taken roots, the community divides the tasks amongst its members. The money collected from management and acceptance fees is used for purchases and payments to the man who will constantly look after the animals. From the crop of calves harvested, the farmers retain the females and decide on their own where to market the steers. The normal procedure is to take them to fattening ranches or to the feedlot.

PROBLEMS ENCOUNTERED DURING IMPLEMENTATION

If the creation of awareness and the acquisition of knowledge by the community have been adequately covered, no problems are encountered when implementing this programme because the community does all the work with the technicians coming to give advice only.

However, taking into account that not all the chief's subjects may attend the meetings prior to implementation, there are always those who would not understand the essence of the project but once they see good grass developing inside the scheme area they may be tempted to cut the fences to let their animals in.

Since it is the influential or important people within the community who are most likely to bring their animals to the scheme as they are early adopters, the late comers may misinterpret the project as being designed for the benefit of rich ones only.

STEPS TAKEN TO OVERCOME ENCOUNTERED PROBLEMS

The problems outlined above are tackled by the chief by calling meetings and explaining the project even to those who misinterpret it, and imposing fines on culprits. If the project is supported by the chief and the *imisumpe* it is not very likely to be jeopardised in contrast to a project that is imposed on the community by outsiders.

STEPS TO ENSURE PROGRAMME SUSTAINABILITY

The very processes of executing the programme implies the necessary steps to ensure its sustainability. Once the project has been thoroughly conceived by the community, its members automatically become stewards for safeguarding the project's continuity. The revenue generated by the project is good enough incentive to compel the members to stay on. In fact in the Nyakeni project, the programme has stimulated keenness to establish other supporting projects such as poultry and dairy production.

OVERALL EFFECTIVENESS OF THE PROGRAMME

In terms of the stated objectives, the project can rightfully be termed as a very successful one.

In the first place, because badly damaged areas inside these demonstrations have been restored and the basal cover has been increased from 40–50 percent to 79–80 percent. This improvement has in turn raised the calving rate in the demonstration from 30 percent in surrounding areas to 60 percent inside the scheme (see Table 3 for details). The animals have also been able to reach maturity in 24 months which is much shorter compared to the rest of the area.

The second achievement can be seen in the change of attitude on the part of the farmers, who now understand the benefits of appropriate stocking rate and the need to abandon night kraaling. The realisation of the need to cull unproductive stock and to market the male crop have promoted commercialisation in livestock keeping which was greatly lacking before.

Lastly, policy makers and planners are also realising the need to change past range improvement strategies which did not evolve around the desires and will of the community. This is reflected in the government's urge to intensify this kind of efforts.

Table 3. Grazing Management Demonstration Programme (GMDP). Calving rates, 1986/1987

Name of GMD	Breeding cows exposed to bulls	Calves born	No. of deaths	Death rate (%)	Calving rate (%)
Intamakuchubekela	50	30	14	46.6	60.0
Tenteleni Nani	24	18	-	-	76.0
Mayiwane	38	18	2	11.0	47.0
Enkonjaneni	14	5	-	-	35.0
Zandondo	8	7	3	42.8	87.5
Luzamo Lwendzinane	5	-	-	-	-*

Average calving rate of 60.9%, compared to 30% on SNL
Average death rate of 33.5%, compared to 75% on SNL

* No calving recorded due to lack of bull

LESSONS TO BE LEARNED

From every programme that is implemented whether successful or not, there are always lessons to be learnt and this project is no exception to the rule.

The first lesson to be derived is the importance of taking cognizance of the desires and will of the targeted group when implementing a project. Many projects have been implemented against the will of the community and consequently have not received the support they deserve and despite all benefits they offer to the society. In the RDA programme we observed that local development committees were not well conversant with what was happening when they fenced their land nor did they understand the implications of fencing from a range management point of view.

Secondly, the planning of the use of rangelands has been for years assigned to people not very knowledgeable in the subject of range management. The result has been the design of programmes which do not focus on the improvements of range resources. This is a problem that even the developed countries have experienced. For instance, Ross (1977) in the Rangeman's Journal highlights as one of the weakness of the Taylor Grazing Act in the

USA the lack of explicit policy directives and specific management objectives. In the same journal, Colbert is quoted saying that people who planned for the use of range in the Western States of USA were land use planners and such professional were oriented to metropolitan areas and therefore not the best situated to plan for rangelands use. He urged to let rangemen do all the planning for such kind of lands as they have the training and competence to do so.

In Swaziland, the GLMD have been able to restore some of the deteriorated lands based on sound range management principles unlike the RDAP which was merely a perimeter fencing exercise devoid of range management principles.

The third lesson we draw from these demonstrations is that we need to make good stewards from the planners and range users. Applied to both communal and privately owned land, stewardship acknowledges taking care of the land for future generations in full realisation that 'you can't take it with you' (Merril 1983).

There are several logical steps that must be followed in every construction action process and, if short circuited, the results may be disastrous. The process of rangelands improvement and good stewardship starts with. Hence, the first step in the grazing demonstrations has been to create awareness by educating the people in the target group in order for them to conceive the problem in the same light as the technicians. The second step was to develop concern because if no one cares no action will be taken; if concern is real it will then be followed by the acquisition of knowledge. The next step was the development of understanding and judgement. Once knowledge about facts is acquired, farmers are in a position to make judgement and take sound action. The next logical step in this process was the analysis of all alternatives to meeting the desired end and, finally, the decision about or the selection of the most economically sound alternative. If these steps are being followed thoroughly the objectives of the project can be met without problems and the project can be guaranteed to be sustainable.

The fourth lesson refers to the pastoralist concept of man. Having evolved from being a hunter/food gathered to become a pastoralist, we need to understand the biology of man in order to understand some of his actions. This will probably explain why despite all the benefits that these grazing demonstrations offer to the Swazi cattle owners, they have not been able to realise lateral expansion where they are established.

Disregarding the small proportion of the diet obtained by hunting/food gathering techniques, pastoralists depend wholly upon their livestock for food and other necessities. Of the edible products — milk, meat and blood, only milk can be obtainable daily and regularly, others are only available occasionally or when an animal dies.

Because milk is the pastoralist's basic need his herd is composed differently from that of a commercial rancher (who also is a pastoralist depending on the production of meat, like a true carnivore). Since these grazing demonstrations require the animals to remain in the camps even at night it follows that the pastoralist can not get the chance to milk the cows.

He also can not have his male crop to retain for use as oxen because the demonstration encourages him to market them. Thus this places him in a position whereby a larger proportion of the animals must be outside the scheme to cater for these needs. All these factors make the community reluctant to expand the demonstration further than the existing size.

However, Scoones (1989) in his paper, where he compares the economic and ecological capacity implications for livestock development in the communal areas of Zimbabwe, explains this malady to be due to the technician's failure to ascertain the economic carrying capacity necessary to sustain the pastoralist within his production system. Scoones blames present methods to determine carrying capacity because they are based purely on ecological indicators and in most cases do not consider the economies of communal livestock owner.

In conclusion, it can be said that despite all problems the GLMD has been the only programme that has obtained some success in improving communal grazing lands by making the farmer deal with the problems himself.

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MANAGEMENT OF COMMUNAL NATURAL RESOURCES THROUGH COMMUNITY-BASED GRAZING ASSOCIATIONS

L. Chris Weaver

INTRODUCTION

The introduction of effective management on communal natural resources is a difficult and time-consuming process. Numerous constraints must be recognised and overcome, and management objectives must be premised on the multiple needs of the community or communities involved. Community members must be actively involved in the determination of management objectives, and the implementation and enforcement of management plans. Further complicating the implementation of management is the fact that constraints and management objectives can, and generally do, vary distinctly from one part of a country to another, from one community to another, or even within a single community. The ability to unravel the constraints and multiple needs of a cluster of villages, and mould them into management objectives which are acceptable to the communities at large is an art within itself.

Lesotho, like so many other African countries, is confronted by a shortage of land and a rapidly expanding population. This is placing ever-increasing pressure on her already over-utilised communally managed renewable natural resources. Faced with this situation, the government has put considerable effort and resources into developing management approaches which attempt to build and improve upon traditional approaches. This paper highlights the procedures utilised and the effectiveness of an effort initiated by the Government of Lesotho through its Range Management Division, Ministry of Agriculture with the assistance of USAID sponsored funding and technical assistance to improve management upon Lesotho's heavily utilised rangelands. This programme, which to date has met with considerable success, is known as the Range Management Area (RMA) Programme.

BACKGROUND

Though Lesotho is a small country (3,035,000 hectares), more than 70 percent of its land base is utilised exclusively for livestock grazing. Land (inclusive of rangelands) in Lesotho is vested in the King, with management

responsibility belonging to the chieftainship. Hence, rangelands are communally used and managed.

Once highly productive rangelands are now suffering from extensive overgrazing. Soils are eroding, forage productivity is declining, and vegetative and faunal diversity is being reduced. In addition, poor nutrition from overgrazed rangelands, weak genetic pools, and a general lack of livestock culling practices are contributing to a downward trend in livestock productivity and quality.

Opportunities to improve rangelands and livestock are constrained by weak management and free access to communally used rangelands, and competition for limited forage resources is intense. These factors combined with low use costs provide disincentives for individual producers to initiate rangelands or livestock improvement efforts.

RANGE MANAGEMENT AREA (RMA) PROGRAMME

RMA Programme Initiation and Assistance

In 1982, a programme was initiated by the Range Management Division of the Ministry of Agriculture to overcome the ecological and social problems caused by overgrazing and weak management of rangelands. This programme is now known as Range Management Area (RMA) Programme. This programme was initially assisted by the USAID funded Land Conservation and Range Development (LCRD) Project from 1982 to 1988. With the closure of the LCRD Project in 1988, USAID assistance was extended through the on-going Lesotho Agricultural Production and Institutional Support (LAPIS) Project.

The RMA Programme is premised upon the setting aside of an area (RMA) for the exclusive use of a set number of communities. The formal definition of an RMA is: 'a special grazing area declared by a chief for improvement of rangelands and livestock production through application of advanced management practices'. The establishment of an RMA is the first step towards allowing livestock producers to gain a sense of management control and ownership of the rangelands.

RMA Programme Goals

The programme strives to reach three long-term goals. These goals are achieved by pursuing specific management objectives, which are determined

by the members of the communities involved. The long-term goals are to:

a) increase the productivity and income of rural livestock producers;

b) facilitate commercialisation of the extensive livestock industry, while at the same time satisfying the subsistence needs of rural households; and

c) initiate management of renewable natural resources in a manner which is sustainable and sociably acceptable to rural Basotho.

RMA Management Institutions: Grazing Associations

The rangelands falling within the RMA boundaries are managed directly by the livestock producers living in the area. Identification of management objectives and constraints, and implementation and enforcement of management plans is facilitated by forming the livestock producers into a grazing association.

Such grazing associations are community-based, and designed to benefit all livestock producers in a village. It is important that all producers, ranging from the widow with one milk cow to producers owning several hundred animals, perceive the grazing association as providing tangible benefits. For it is only through active inputs and participation on the part of all classes of livestock producers that management objectives acceptable to the community at large can be identified and pursued.

RMA grazing associations receive direction from a grazing association management committee, which is composed of the chief headman and two elected representatives from each village within the RMA. This composition provides legal management credibility to the grazing association, and at the same time, allows livestock producers within the area to freely express their needs and actively participate in management. The ratio of 2/3 livestock producers and 1/3 traditional authority allows livestock producers to control their own management efforts. This has proven beneficial in areas where chiefs/headmen are not interested or active in the enforcement of grazing regulations.

Leadership to the grazing association management committee is provided by an executive committee, which is composed of a chairman, vice-chairman, treasurer, secretary, and three advisors. These officers are nominated from within and elected by the management committee.

Overall technical guidance to the grazing association is provided by a government employed technician, known as an RMA Manager. This technician provides technical advice in relation to range management (grazing systems, carrying capacity estimates, etc.), livestock improvement (animal health, culling, breeding, etc.), and livestock marketing. Though the title of this position is RMA Manager, it should be clarified that this individual does not make decisions for the grazing association. His/her role is to make grazing association members more knowledgeable with regard to technical and management matters, thereby allowing the association to make more informed decisions.

The RMA Manager also fulfils another important function. Experience has shown that on-going quarrels or tenure disputes between villages or even within villages can create roadblocks to introducing cooperative management efforts between villages. The RMA Manager, being from outside the RMA, is a neutral source of authority to grazing association members and chiefs/headmen. As such, he/she is not subject to these quarrels and disputes, and advice rendered by the Manager is viewed as being beneficial to the RMA as a whole. Hence, the presence of the RMA Manager allows the grazing association to be elevated above many local politics that might otherwise impede the grazing association's progress should he/she not be present.

Grazing Association Management Objectives

As stated earlier, the RMA Programme has three basic goals. Examination of these goals shows them to be general in nature and to have no specific quantifiable targets or references to management guidelines or approaches. The goals are simply long-term benefits from which nearly all livestock rearing households in Lesotho will benefit.

In contrast, each grazing association must have defined management objectives. It is imperative that these management objectives be defined and prioritised by grazing association members, as the objectives will provide the basis for the specific types of management to be proposed. If these objectives are precast by government, it is likely that they will not truly reflect the specific needs and desires of the communities for which the grazing association is being proposed. The use of precast management objectives runs the risk of conflict between government and the association, general confusion, or limited participation in management efforts. All of these factors could contribute to or cause the failure of the association.

Steps Utilised to Form Grazing Associations

Successful management of communal natural resources is dependent upon clearly understood goals/objectives, good leadership, and enthusiastic participation in management activities. Over the past eight years the Range Management Division and LCRD/LAPIS Projects have evolved a step-by-step process to instill these institutional attributes into grazing associations. Thus far, they have been successfully applied in four areas having different geographic, resource, and local political settings. This procedure has successfully stimulated participation of community residents at the 'grassroots' level and built strong administrative foundations for initiating community based management efforts. Following is a summary of these steps.

Identification of Potential Sites for RMA Development At the onset of the RMA Programme it was determined that RMA's would initially be developed in areas having the greatest potential for quick response and success. Thus, a scorecard system was developed for evaluating such criteria as:

- Condition of the rangelands in the proposed RMA, and their capacity to respond to management;
- Climate;
- Size of the proposed area for development;
- Number of villages and population of the proposed area;
- Accessibility by road;
- Degree of support provided by the reigning Principal Chief;
- Jurisdictional boundaries of ward and area chiefs;
- Presence of existing livestock handling facilities; and
- Several other lesser factors

The selection of the first four RMA's was premised upon the use of this scorecard system. However, now that several areas have been initiated, opportunities to expand from established RMA's may offer a more efficient and socially acceptable approach to RMA development.

Determination of Community Interest. A prerequisite towards ensuring community participation is having community residents who are desirous of the programme. Thus prior to initiating proposed RMA development activities, an assessment of the level of community interest is carried out. This requires the conduct of a general public meeting (*pitso*) in the area to explain the benefits and costs of initiating an RMA. In some instances, this

pitso is followed up by household surveys to obtain a more representative feel for the level of community support. If responses to the proposed RMA are positive, the grazing association development process is initiated.

Formation of a Grazing Association Management Committee. Following the decision to establish an RMA, an intensive period of extension is initiated. *Pitsos* are held in each village found within the boundaries of the RMA to explain in detail the benefits which may be reaped by the communities if they work cooperatively to improve management of their livestock and rangelands. At the end of a *pitso* residents are asked to elect two village representatives to represent the community's interests in development and management of the grazing association. In addition to elected representatives, the village chief/headman is asked to be a part of the grazing association management committee. The involvement of village leaders cannot be overemphasised, and maximum effort is expended to obtain their support.

Development of Management Committee Administrative Capacities. Basic instruction is given on group leadership and interaction, group identification and prioritisation of problems, and group decision-making procedures. This basic training provides an essential foundation for the development of administrative and management capabilities by the committee. Furthermore, this development phase is an important bonding period between committee members and the RMA Manager and technical support staff, during which time trust and confidence are generated.

Identification of Community Management Constraints. It is essential that committee members themselves identify potential community management constraints. This is an important learning process, and one which allows committee members to consolidate their opinions and understanding of the grazing association's proposed management objectives. This step is often by-passed by governments/projects, as assumptions concerning constraints are easily made. This can result in technical advisory staff seeking solutions to problems that local participants do not consider particularly important, and may contribute to misunderstandings within the committee or between the committee and technical staff.

A simple, but effective procedure has been developed to ensure group participation in the identification of constraints. Properly applied, the procedure generates active group participation and prioritisation of both large and small management constraints. Benefits of this procedure are threefold: 1) community management constraints are identified and ranked according to

their perceived importance; 2) a common understanding is achieved within the committee and between the committee and technical advisory staff; and 3) the common understanding of constraints facilitates the development of specific management objectives to overcome these constraints.

Field Tour of Relevant Management Approaches. Experience has shown that field tours to areas in which similar activities are being conducted can be helpful. A single, well planned field trip for the management committee at this stage of development can contribute in several ways.

The most obvious benefit is exposure to new concepts. Many of these concepts have proven to be applicable to local conditions, whereas many have not. Discussion sessions are held at the end of each day of the field trip to highlight those activities that are applicable to the grazing association's development effort, and just as importantly, those that are not. Detailed notes of these sessions serve as references when the committee members report back to their respective villages.

The field trip also places committee members in each others' company for a concentrated and extended period, and allows members to become better acquainted and to assess one another's capabilities. This knowledge is useful when electing committee officers, and is especially important given the fact that representatives come from several villages in an area and often are not familiar with one another.

An additional benefit of the field trip includes increased enthusiasm, which occurs as a result of speaking directly with successful participants and seeing improvements on the ground.

Election of Grazing Association Executive Committee. The management committee is the decision-making body for the grazing association with regard to development and management. Hence, effective leadership must be provided to this group by the Executive Committee. As discussed earlier, the field trip allows the management committee to gain a better feel for the capabilities of its members and their respective levels of commitment to the grazing association. Thus, following the field tour a general management committee meeting is held to nominate and elect the officers forming the grazing association's Executive Committee.

Group Determination of Management Objectives. The committee session in which management constraints are identified and prioritised provides an excellent starting point for the development of management objectives. The

identified constraints are those issues specified by grazing association members which presently inhibit important management or production efforts in the RMA. Hence, each major constraint in itself provides the basis of a management objective.

In many instances, the solutions to overcome constraints or implement management practices are technical or organisational in nature. Thus, it is necessary for the RMA Manager to provide advice on such issues so the management committee can make informed decisions.

Adoption of a Constitution and By-Laws. The grazing association's goals and management objectives are the core issues around which a constitution and by-laws are formulated. This document outlines the grazing association's goals and management objectives, membership conditions, and the authority under which the grazing association acts. Development and registration of the constitution and by-laws are a prerequisite to legal registration of the association. Furthermore, recording of the grazing association's mandates in written form serves to reduce potential misunderstandings within the grazing association membership.

The drafting of a grazing association constitution and by-laws is a lengthy process. It involves numerous meetings with the management committee to develop a draft document, and once this draft has been developed, it must be presented to grazing association members at *pitsos* conducted in each RMA village. This process in itself can be lengthy, as the number of villages in RMA's ranges from 10 to 35. However, this input by livestock producers at the 'grassroots' level is extremely important to the process of ensuring participation in the grazing association and the management objectives it seeks to achieve.

Following the receipt of inputs by members from all RMA villages, a final edition of the grazing association constitution and by-laws is developed. This edition is registered with the Law Office in Maseru. Upon approval by the Law Office copies of the constitution and by-laws are provided to each member of the management committee. It is the duty of the management committee member to ensure that members of the grazing association from his/her respective village have access to the constitution and by-laws.

Development of a Grazing Management Plan. The introduction of improved rangelands and livestock management within an RMA is facilitated by application of a grazing management plan. This plan is developed by the Management Committee with the assistance of technical advice provided by

the RMA Manager. Advice covers three major areas of concern: range management, livestock production and livestock marketing. Types of advice provided in relation to each of these areas include:

Range Management: information on current rangelands stocking rates, carrying capacity estimates, rangelands condition and trend, grazing systems, rangelands improvements, etc.

Livestock Production: information on livestock culling and breeding, animal health, fodder production, livestock management practices, and the development of a general RMA herd/flock improvement programme.

Livestock Marketing: information on livestock sale prices, background information on how livestock markets operate, and general organisation of livestock sales.

All of the above issues are incorporated into the management plan through interaction between the management committee and RMA Manager.

The importance of the management plan again mandates that a series of *pitsos* be conducted in each RMA community to ensure participation at the 'grassroots' level. Following inputs by all RMA livestock producers the management plan is finalised and implemented.

Development of Management Enforcement Powers. Introduction of the management plan will call for a deviation in historical use patterns in the RMA. Most RMA livestock producers tend to follow the management guidelines as established within the plan. However, no matter how well the plan is explained, a small percentage of the livestock producers (or producers from outside the RMA boundaries) fail to follow the plan. During the initiation period of the plan these transgressors are warned that failure to follow the plan will result in the impoundment of their livestock. If they still refuse to follow the plan (*i.e.* the grazing rotational system, removal of culled livestock, etc.) then it is necessary to impound their livestock; for if they are allowed to continually break the grazing association's management regulations the association will lose its authority in the eyes of the RMA livestock producers. Should this occur the management plan will fail.

Grazing associations have established enforcement capacity in the form of range riders. One Range Rider is appointed from each community, and he is the legal representative of the village chief/headman with respect to enforcement of grazing management regulations. This individual is responsible for ensuring that village livestock producers are adhering to the management plan

in the village grazing area. The Range Riders as a group are responsible for enforcing grazing regulations in the cattlepost areas of the RMA.

Development of Income Generation Capacity for Grazing Associations. Grazing association income is primarily generated from initial membership subscription fees, annual membership fees, livestock breeding fees, and the sale of grazing association livestock and livestock products. In addition, some grazing associations are discussing the possibility of charging members grazing fees.

Presently, no two grazing associations in Lesotho are charging the same fee amounts. The management committee of each grazing association determines the fee level which it feels is applicable to its respective grazing association members. Thus, the capacity to generate income varies from one grazing association to another, depending on the types and levels of fees charged.

The steps outlined above are intended to maximise community participation, and enhance grazing association administrative and management capabilities. The procedure is flexible, as it must effectively address the requirements of different communities with varying interests, needs, institutional developments, political motivations, etc. Implementation of these steps is relatively straightforward, but requires intensive extension efforts.

Costs Grazing Associations Impose on Livestock Producers

Development of and participation in a grazing association imposes certain costs on livestock producers. Such costs include:

- **Financial Costs.** Subscription fees, membership fees, breeding fees, construction costs associated with new cattlepost huts and kraals, and costs related to increased herdboy and management requirements.

- **Costs Associated with Management Changes.** Changes in traditional grazing patterns and management practices also impose costs. Costs come in the form of increased efforts on the part of a livestock producer to understand the proposed changes and to intensify his management approach. Failure to expend this effort may result in the impoundment of his/her livestock; thereby, adding additional financial costs.

- **Time Costs.** Attendance at management committee meetings requires committee members to travel long distances and to meet for several hours each month. Similarly, the general membership gives up time to attend *pitsos* convened by the grazing association. These costs can be

considerable for individuals with busy schedules, especially given that no payment is received for this participation.

- **Land Costs.** Formation of a grazing association requires that land be allocated for an RMA headquarters site and livestock breeding pastures. This reduces grazing areas and, in some instances, croplands available to local residents.

- **Opportunity Costs.** Each of the above involve various opportunity costs. For example: what would a livestock producer do with money he uses to pay subscription and membership fees? How would his time be utilised if he were not using it to attend grazing association meetings or *pitsos*?

- **Social Costs.** When an RMA is established traditional grazing patterns are altered. In some cases, livestock producers who have traditionally utilised RMA cattleposts may lose their grazing rights. This may lead to the development of conflicts and animosities between communities. These conflicts or animosities can be described as social costs to developing an RMA.

It is important to bear in mind that farmers do face real costs as a result of forming an RMA and a grazing association to cooperatively manage it.

Benefits Grazing Associations Provide to Livestock Producers

An examination of the above costs indicates that livestock producers must make substantial sacrifices to form an RMA and develop a grazing association. Active support and participation in grazing association activities requires that livestock producers receive tangible personal benefits. Furthermore, these benefits must be greater than the costs imposed by the sacrifices. Following is a summary of benefits provided to livestock producers by the formation of an RMA and a grazing association in Lesotho:

- **Exclusivity of Use Rights.** The designation of an area as an RMA allocates exclusive use rights to livestock producers residing within the villages found in the RMA. This is especially important, as the livestock producers gain a sense of ownership and control over the grazing resources. This facilitates the introduction of improved management, as the users now, for the first time, have the opportunity to control their own destinies.

- **Improved Rangelands Productivity.** The implementation of planned community-organised grazing systems results in reduced competition for grazing resources, and facilitates improved rangelands management. By working cooperatively, livestock producers are able to strategically rotate their livestock to better satisfy the physiological needs of forage species. Close coordination between communities within the RMA allows many historical tenure conflicts to be resolved and the introduced management system to continually strengthen its weaker aspects. This approach is decidedly more efficient than the 'free-for-all' grazing pattern which exists throughout much of Lesotho.

- **Improved Livestock Productivity.** Grazing associations utilise a number of means to improve livestock productivity:

  - *Establishment of a Grazing Management System.* The introduction of improved rangelands management results in increased rangelands productivity, which in turn, translates to increased livestock productivity (*i.e.* weights, vigour, conception and weaning rates, wool/mohair and milk production, etc.).

  - *Establishment of a Livestock Improvement Programme.* Livestock are improved by culling poor quality animals and by selecting for and introducing more productive breeding stock. Each spring all livestock within an RMA are inspected by the RMA Manager and grazing association representatives. During this inspection old and non-productive animals are culled, low quality bulls are castrated, and all cattle are registered and ear-tagged. The culling process is not imposed upon livestock producers, but rather the RMA Manager and grazing association representatives work closely with the producers to identify non-productive or low quality animals.

    Improved breeding sires are purchased by the grazing association as a basis for a livestock breeding programme, generally through a commercially secured loan. Costs of the breeding animals are covered by breeding fees, which each livestock producer is required to pay on a per head basis. Animals purchased by grazing associations include Drakensberger and Afrikaner bulls, Merino rams, and Angora rams.

  - *Increased Animal Health Services.* The development of an RMA headquarters site and its associated livestock handling facilities increases opportunities for livestock producers to obtain health

services for their animals. Services offered include: vaccinations for diseases, drenching for internal parasites, dipping for external parasites, and treatment of general physical ailments and common injuries.

- **Improved Marketing of Livestock and Livestock Products.** By working cooperatively, grazing association members can coordinate livestock sales and offer more animals to buyers. This arrangement is attractive to producers, buyers and sale organisers, as it increases the total efficiency of marketing channels; thereby, resulting in greater profits to all parties involved.

- **Increased Access to Credit.** Credit to make improvements to livestock enterprises in Lesotho is tight. Legal registration of a grazing association's constitution and by-laws with the Law Office does allow an association to apply to commercial banking institutions for loans.

- **Reduced Stock Theft.** Stock theft is a major concern to all livestock producers in Lesotho. Formation of an RMA and introduction of improved management greatly reduces the incidence of stock theft primarily for two reasons. First, all RMA cattle are registered and ear-tagged. Hence, new cattle registered in the RMA must have legal ownership papers, thus making it is extremely difficult to bring stolen cattle into the RMA.

  Second, the exclusion of non-resident livestock producers from utilising the RMA rangelands reduces the number of potential livestock thieves and makes the presence of strangers to the area more obvious.

- **Increased Knowledge.** Grazing association members are continually offered opportunities to participate in training courses concerning animal health, livestock marketing, fodder production, range management, animal husbandry practices, herdboy training, etc. These courses are complemented by widespread extension campaigns.

- **Improved Management of the RMA's Natural Resources.** Improved rangelands management has many spin-off effects which not only benefit livestock producers, but the community at large. Reduced soil erosion is a by-product of improved rangelands management. This results in lower silt yields in rivers and improved water quality, which in turn, reflects in increased productivity of fish inhabiting RMA rivers. Similarly, improved rangelands management increases vegetative and

faunal diversity. Many bird species dependent upon grass cover for breeding (*i.e.* francolins and quail) also provide sources of food for herdboys. Under poor management, the density of these species is low.

Each of the above identified benefits is significant in itself. Combined, they provide tangible returns to both the entire community and the individual livestock producer which outweigh the sacrifices made to achieve those benefits.

Results of the RMA Programme

Extent of Resources Being Managed

Since the start of the RMA Programme in 1982, four RMA's have been established. These RMA's encompass 131,500 hectares, or approximately 6 percent of all rangelands in Lesotho. Livestock resident within the RMA's include more than 16,000 large stock (cattle, horses and donkeys) and 82,000 small stock (sheep and goats). Table 1 summarises relevant RMA demographic and management information, while Table 2 provides specific information on livestock populations for each RMA.

Effectiveness of the RMA Programme

To-date the management effectiveness of the RMA Programme can only be judged by the performance of the Sehlabathebe and Ha Moshebi/Ha Ramat'seliso RMA's (and their respective grazing associations), as these are the only two RMA's having a long-term history of management. The Pelaneng/Bokong and Sanqebethu/Mokhotlong RMA's were established in 1988. These latter two RMA's are now preparing their own rangelands and livestock management programmes.

Given the lack of management results in the more recently established RMA's, the bulk of the remaining portion of this paper will concentrate primarily on the Sehlabathebe and Ha Moshebi/Ha Ramat'seliso RMA's. Their management systems have been in place long enough to allow at least initial assessment of their effectiveness and acceptance by farmers. However, where relevant, certain issues will be addressed with regard to all four RMA's.

Acceptance of The RMA Concept By Farmers. The RMA concept has proven to be extremely popular with communities in the mountain areas of Lesotho. A driving force behind this popularity is the opportunity to be allocated exclusive grazing use rights for summer cattlepost grazing areas. As stated

earlier, the allocation of exclusive use rights provides livestock producers with a sense of ownership and control over management of the rangelands. Control is the first serious step towards being able to collectively initiate management.

Table 1. RMA Demographic and Management Information

Range Management Area	Size (ha)	Date of establish	No. of villages	Estimated population
Sehlabathebe	33,000	1982	10	3,650
Ha Moshebi/Ha Ramat'seliso	10,000	1986	10	3,309
Pelaneng/Bokong	36,500	1988	17	5,397
Sanqebethu/Mokhotlong	52,000	1988	36	4,744
Totals	131,500		73	17,100

Table 2. RMA Livestock Populations

Range Management Area	Cattle	Sheep	Goats	Horses	Donkeys
Sehlabathebe	1,661	14,603	2,884	526	239
Ha Moshebi/Ha Ramat'seliso	1,597	7,181	1,781	391	308
Pelaneng/Bokong	2,750	15,500	9,500	500	750
Sanqebethu/Mokhotlong	5,135	20,910	10,310	2,169	309
Totals	11,143	58,194	24,475	3,586	1,606

Popularity of the RMA Programme can be demonstrated by the number of livestock producers (and even non-livestock owning households) within an RMA who pay to join its grazing association. In the Sehlabathebe and Ha Moshebi/Ha Ramat'seliso RMA's more than 90 percent of the livestock owning households joined their grazing associations in the first year. In the Pelaneng/Bokong RMA, over 500 households have joined the grazing association during the last three months. Of considerable note in this instance

is the fact that each household has paid M60 to join the grazing association, raising an astounding sum of over M30,000 in membership fees in its first three months of fee collection.

It is obvious that livestock producers recognise shortcomings in the traditional approach to managing rangelands. This recognition has been translated into a willingness on the part of producers to pay out of their own pocket for change. It should also be noted that the desire for change is coming from livestock producers owning all sizes of holdings. Hence, the RMA and its management-directed grazing association appear to be meeting the needs of all strata of livestock producers in the communities involved.

Improvement of Livestock Productivity. Livestock productivity is difficult to quantify because of the lack of detailed baseline data and the time-consuming nature of accurately collecting, analysing and documenting specific types of detailed productivity data. However, an effort has been made to document livestock breeding, selection and culling inputs made by the programme.

- *Sehlabathebe Grazing Association.* The Sehlabathebe livestock breeding programme was started in 1984. Animals purchased for this programme included 9 Drakensberger and 2 Afrikaner bulls, 25 Merino and 10 Dohne Merino rams, and 5 Angora rams. Prior to the purchase of breeding stock, pastures were fenced to hold the breeding stock and conduct controlled breeding.

Since the onset of the breeding programme 1,408 cows, 2,814 Merino ewes, and 580 Angora ewes have been bred by improved breeding sires. Rough estimates are that 35 percent of the present cattle, and 8 percent of the present sheep and goat populations are off-spring of improved breeding stock purchased by the Sehlabathebe Grazing Association.

The cattle breeding programme has been complemented with a bull selection programme. Each spring all new bull off-spring are selected for breeding purposes. Below-standard bulls are castrated. At the onset of this programme in 1984, the percentage of breeding bulls in the RMA composed 8.5 percent of the cattle herd. Through selection of top grade bulls and removal of inferior animals, this percentage now represents only 1.5 percent of the RMA cattle herd.

The cattle breeding and bull selection programmes are further complemented by a general cattle culling programme. Each spring, since the onset of this programme in 1984, all cattle in the RMA are inspected, ear-tagged and

registered with the grazing association. Cattle are ear-tagged according to village of origin, owner, and age. In addition, a coloured ear-tag designates where specific cattle are to graze in relation to the RMA's grazing system. Culled cattle receive a coloured ear-tag which marks them specifically as a cull. Since the initiation of this programme more than 4,000 heads of cattle have been ear-tagged and approximately 500 head culled.

The above three programmes are supported by a general animal health programme which offers vaccinations for diseases, drenching for internal parasites, dipping for external parasites, and treatment of general physical ailments and injuries.

• *Ha Moshebi/Ha Ramat'seliso*. The Ha Moshebi/Ha Ramatseliso Grazing Association offers a livestock improvement programme which is similar to that conducted at Sehlabathebe. This grazing association owns 3 Drakensberger bulls, 7 Merino and 7 Dohne Merino rams, and 5 Angora rams. The livestock breeding programme was initiated in 1989, and has since resulted in the breeding of 140 cows and 536 Merino ewes.

The bull selection programme has reduced breeding age bulls from 8 percent of the total cattle herd to approximately 1.5 percent.

The Ha Moshebi/Ha Ramat'seliso livestock culling programme has been expanded to include sheep and goats, as well as cattle. During the last two years 150 cattle, 142 sheep and 115 goats have been culled from the livestock population.

A general livestock health programme has been jointly initiated by the RMA Manager and resident Livestock Attendant.

Improvement of Rangelands

• *Sehlabathebe RMA*. A deferred rotational grazing system was introduced to the RMA in 1983. This system encompasses two separate three-pasture systems which rotate between village grazing areas in the winter and a low elevation pasture in the first half of the summer and a high elevation pasture in the latter half of the summer. The system is not complex, but does require an additional move in the summer over what had been traditionally utilised in the past.

Prior to the introduction of the RMA Programme, the traditional grazing system of utilising the high elevations in the summer and staying in the villages during the winter had broken down. This was probably a result of

a combination of factors, including intense competition between outside livestock users, stock theft, a lack of resources (herdboys), and breakdowns in the traditional lines of authority to enforce the system.

The introduced system is basically a modification of the traditional approach to grazing (with the exception of the additional summer move to allow increased rest for grasses). However, much greater control over the use and management of the resources has been gained by allocating exclusive use rights to the communities involved, and placing management responsibility directly in the hands of concerned livestock producers rather than disinterested chiefs.

One of the results of this approach has been marked improvement in rangelands condition, particularly around villages (which were previously the heaviest utilised areas). Rangelands productivity and cover are obvious areas of improvement. In village areas which were previously grazed to the ground by late summer, the grasses still stand 30 cm tall in the spring. The increased cover has reduced soil erosion, and rivers run clearer. This has increased trout reproduction rates and lead to dramatic recoveries in quail and francolin populations. Many *dongas* (gullies) above villages which were actively eroding prior to introduction of the system are starting to heal.

The results of increased rangelands productivity are reflected in the condition of livestock, which in turn, has generated increased returns in animals marketed. The increased returns have been documented closely with respect to cattle. In 1985, data collection at Sehlabathebe cattle sales commenced. Data was collected in such a manner that direct comparisons could be made between RMA cattle versus cattle from outside the RMA. It was hoped that sale prices would eventually reflect the improved management of the RMA's rangelands and the benefits derived from the RMA culling and improvement programme. In 1985, one year after the initiation of the grazing management system, the average price offered for an RMA oxen was M385. In contrast, the average price offered for non-RMA oxen was M371, or approximately 3.5 percent less. Thus, values of RMA versus non-RMA oxen were basically the same at that time. During the following two years of drought the values of RMA oxen rapidly exceeded those of non-RMA oxen. By 1986, the last year of severe drought, RMA oxen were being valued at levels 19.4 percent higher than those from outside. With the reappearance of good precipitation this large price disparity was reduced to 14.4 percent in 1987/88 and 9.7 percent in 1988/89 (Figure 1).

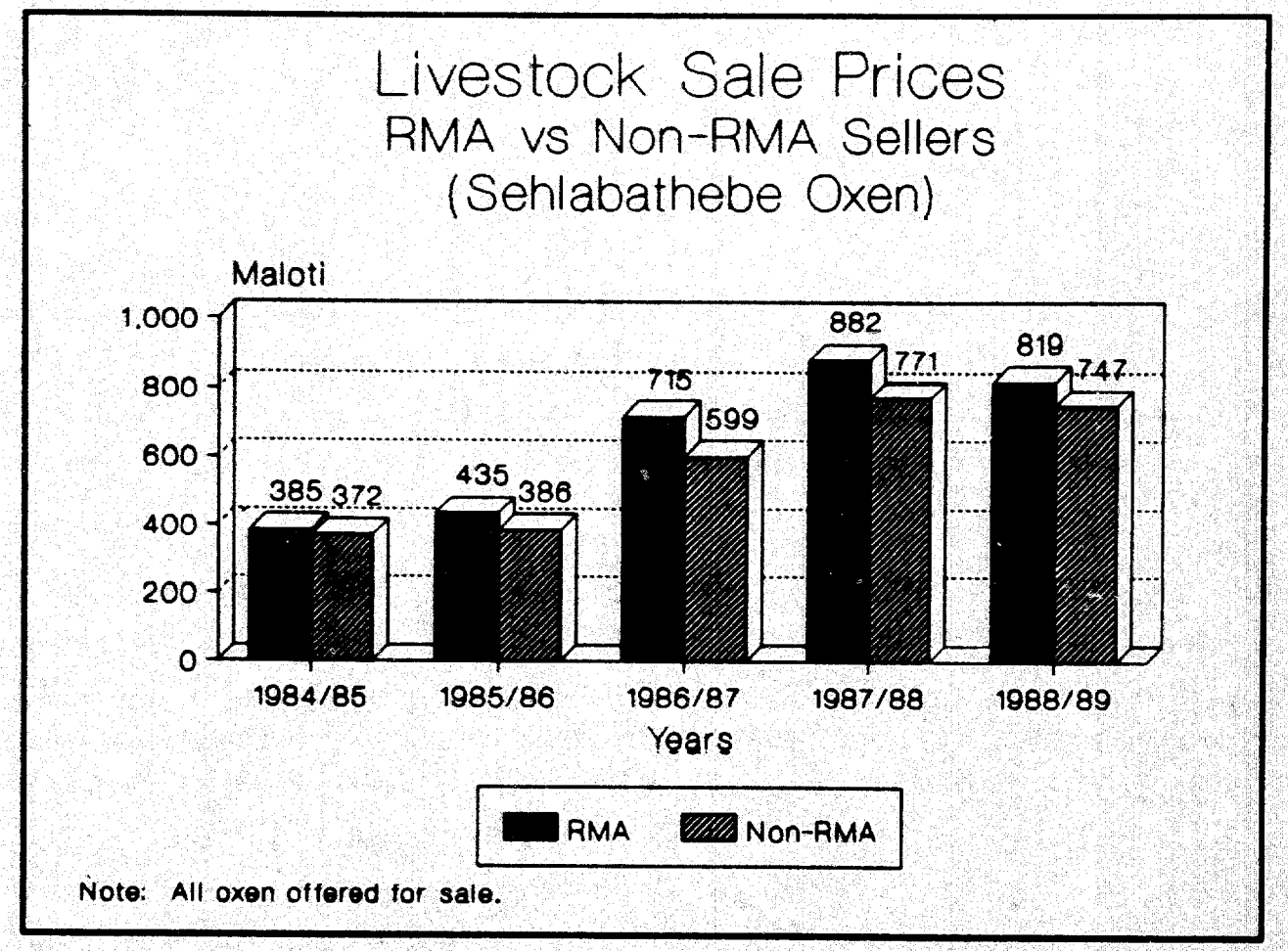


Figure 1. Comparison of Livestock Sale Prices.

The implications of this price trend are that in periods of adverse condition (*i.e.* drought), RMA livestock will continue to maintain good condition and return high prices. In contrast, livestock originating from areas without improved management, appear to be more cyclic in nature. They respond rapidly to both improved and adverse weather conditions, and these responses are reflected in their values. However, even under excellent weather conditions (1988/89) they still are being valued significantly below (9.7 percent) the RMA cattle.

Though no concrete documentation has been made, it is felt that the introduction of improved range conditions and higher quality breeding stock have also resulted in greater wool and mohair returns to small-stock owners.

It is also noteworthy to point out that more than M1,225,000 of livestock sale income has been generated in the Sehlabathebe and Ha Moshebi/Ha Ramat'seliso RMA's since the RMA's introduction in 1982 and 1986, respectively. Many of these animals would have died at no financial benefit to their owners had the grazing associations not successfully organised livestock sales in the area. Thus, the formation of grazing associations has

greatly facilitated livestock marketing and income generation capacities of livestock producers in the RMA's.

• *Ha Moshebi/Ha Ramat'seliso RMA*. The grazing system for the Ha Moshebi/Ha Ramat'seliso RMA was fully initiated during the spring of 1988/89. Given the fact that this RMA is composed predominantly of village grazing areas and only small amounts of cattleposts, the grazing system applied is markedly different than that applied in the Sehlabathebe RMA. A total of three separate grazing systems, each having 3-4 pastures, has been introduced in this RMA. Throughout the year livestock rotate around the village areas, utilising the pastures in a relatively intensive manner.

This system has built upon the traditional grazing use of the area, but requires much greater effort on the part of owners because of the number of movements of livestock from one pasture to another required throughout the year. After 1½ years of application, livestock producers have begun to appreciate the benefits of this more complex grazing system. Forage productivity and cover have increased, and the general participation level in the system appears to be good.

An interesting disparity between this RMA and the neighbouring Sehlabathebe RMA is the major influence which united the area's livestock producers into a grazing association. It is the author's belief that the allocation of exclusive use rights was the major unifying factor for livestock producers in the Sehlabathebe RMA. However, this does not appear to be the major reason in the Ha Moshebi/Ha Ramat'seliso RMA, as competition from outside users was only inhibiting management on the fringe areas of what is now the RMA. A more important factor in this instance is related to the shortage of available grazing lands in relation to the number of resident livestock in the area. In effect, livestock producers recognised the limited nature of the resource and that it was being mismanaged to the detriment of all producers. Thus, the formation of the grazing association was seen as a means of more efficiently utilising a very limited resource.

Sustainability Issues of Grazing Associations

Membership. The level of grazing association membership has been an area of concern with the Sehlabathebe Grazing Association. The association started with 301 members in 1983; this level slowly declined to a low of 201 members in 1987. The collection of membership fees has proven to be a tedious process. This is particularly so given the fact that grazing association representatives are not paid for the amount of time they put forth.

However, while payment of membership fees was declining, there does not appear to be a noticeable decline in participation in the management plan. Livestock producers are still rotating their livestock in accordance to the plan; culling of livestock is participated in by all producers; the livestock breeding programme is as popular, if not more popular than ever, for cattle; and rangelands continue to improve.

It appears as if livestock producers were taking the attitude that there was no point in paying for something that they felt they could continue to receive for free. These 'free' entities being exclusivity of use rights and continued access to improving rangelands.

Nonetheless, reduced membership was detrimental to the economic viability of the grazing association. Hence, in 1988 it was decided that acquisition of grazing permits should be conditional upon being a member in the grazing association. This resulted in a jump of membership to 338.

Membership status and the annual fees paid by members continues to be a concern for the Sehlabathebe Grazing Association. In 1989, membership again dropped to 243 members. This indicates a lack of effective collection procedures and enforcement of the grazing permit system. This area of sustainability still requires additional inputs to overcome time-consuming collection procedures.

Membership in the Ha Moshebi/Ha Ramat'seliso Grazing Association has remained stable during its first three years, ranging from 365 in 1988-88, to 386 the following year, to 364 in the current year. Hence to date, membership and its associated income appears to be fairly sustainable.

Financial. Grazing associations must be economically viable if they are to be sustainable. Grazing associations must bear the costs of purchasing breeding stock and providing for these animals. Such costs include repayment of bank loans, livestock feed and veterinary costs, herdboys, etc. Additional costs include general administrative and travelling costs for management committee members.

Grazing associations rely upon three primary sources of income, which include: 1) annual membership fees; 2) breeding fees paid by farmers for use of association stud stock; and 3) trespass and impoundment fees from illegally grazing livestock. Additional sources of income include wool and mohair receipts from breeding stock and the salvage value of stock once their breeding life has ended.

To-date, the Sehlabathebe and Ha Moshebi/Ha Ramat'seliso Grazing Associations have performed satisfactorily with respect to financial management. The Sehlabathebe Grazing Association has repaid in full a loan for M20,000 and purchased outright an additional M11,000 worth of breeding stock. They owe an outstanding balance of approximately M7,000 for additional breeding stock, and have a current balance of M9,000 between two bank accounts.

The Ha Moshebi/Ha Ramatseliso Grazing Association is ahead of schedule on repayment of a M17,000 loan to procure breeding stock, owing approximately M9,000 on this loan. They have a cash balance of approximately M3,500.

With the initiation of the Pelaneng/Bokong Grazing Association the concept of a one-time subscription fee has been initiated. This was intended to develop a source of capitalization funds to get the association off the ground. A flat fee of M50 is being charged to each livestock owning household. In addition, an annual membership fee of M10 is assessed. This approach has resulted in more than M30,000 being collected in a short three-month period. Obviously, this has added greatly to the economic sustainability of this particular grazing association.

Though the grazing associations have performed satisfactorily, their economic viability must still be improved. With current levels of membership and breeding fees, the associations are not making adequate profits to become financially secure over the long term. They are repaying loans, but ideally, association management would be enhanced considerably if grazing association officers could be paid for their services. This is not possible with the current levels of income.

Several approaches for improving income are being considered. Included amongst these are imposition of grazing fees, increases of membership fees, and development of breeding programmes where association owned offsprings are sold for profit.

Association Leadership. Leadership of grazing associations is a critical area of concern. This leadership is provided by the executive committee, and good leadership appears to be highly correlated with the motivation level of the grazing association chairman. The Sehlabathebe Grazing Association has exhibited a somewhat cyclic nature with respect to overall performance, and the levels of performance have been related to the chairmen in power.

The Ha Moshebi/Ha Ramat'seliso Grazing Association, which in most general management respects has outperformed the Sehlabathebe Grazing Association,

has maintained a fairly even keel. This steadiness is probably related to the presence of the same chairman for two consecutive terms.

Observation of these two grazing associations indicates that the chairman's position is time-consuming and highly demanding. However, since the person filling the position is not financially compensated, any effort expended in performance of his/her duties is voluntary. As a result, it is difficult to entice some of the communities' most capable individuals to fill this role.

It is believed that management quality could be substantially increased if funds were available to compensate the chairman and other key officers for time expended. This will only be possible with an increase in grazing association income.

Grazing association leadership, though somewhat cyclic at Sehlabathebe, has been greatly stabilised by the presence and guidance of the RMA Manager. To date, individuals filling this position have been highly respected by association members. In addition, these individuals are considered neutral with respect to local politics and in-fighting. The presence of RMA Managers, in all four existing RMA's, has been able to elevate the grazing associations above local political strife and greatly facilitate the introduction of coordinated management between villages. This position has proven to be essential to the initial organisation and long-term guidance of grazing associations.

Government Contribution. Government contribution to the RMA Programme comes in several forms, including facilities construction and maintenance; funding of the RMA Manager and his transport; and education and extension. Substantial assistance through donor support has greatly expedited the construction and maintenance of the facilities in the first four RMA's. However, as more RMA's are developed and maintenance costs increase over time, it is not known whether government budget will be adequate to meet the needs of an expanded RMA Programme. The Range Management Division places the RMA Programme at the top of its priority list. However, compliance with rigid IMF-imposed restrictions on governmental spending do not provide leeway for substantially increased budget in the foreseeable future. If the RMA Programme is to be truly supported, it will have to be accorded a priority rating not only by the Ministry of Agriculture, but by Government as a whole.

The RMA Manager, as stated earlier, is critical to the success of a grazing association. These individuals are given large management responsibilities,

and are required to work long hours under remote and harsh living conditions. Yet, they are paid extremely low salaries. The long-term maintenance of high quality personnel in these demanding positions is dependent upon increased compensation commensurate with the level of effort expended. This situation is currently being addressed.

An additional constraint with respect to RMA Managers is the lack of qualified personnel to support additional RMA's. If the RMA Programme is to be seriously expanded, a more formalised means of training prospective Managers will have to be developed.

A final constraint regarding RMA Managers pertains to the funding of the position and transport for the individuals. With only four RMA's, position funding does not appear to represent a constraint. However, given the remoteness of RMA locations and a tight vehicle operation and maintenance budget, the Range Management Division will be pinched just to maintain its current transport support to the RMA Managers. An expansion of the Programme will be retarded by budget constraints. In the absence of a significantly increased budget, it is questionable whether the Range Management Division will be able to support additional RMA's without significant donor support.

Government presently sponsors an extensive education, extension, and training programme for grazing association livestock producers and management committee members. The levels of support to these efforts will be greatly curtailed when donor support terminates. This may be reflected by a drop in grazing association performance.

Grazing System Management. The grazing systems introduced to the RMA's, though more demanding, are basically modifications from traditional approaches to grazing. To-date, these systems have successfully improved management of the rangelands. This success is a result of livestock producers working in a coordinated fashion which has been acceptable and beneficial to the RMA's livestock producers.

From a technical point of view, these systems are sustainable. The applied systems have been accepted by the communities and tangible benefits are being received by the individual livestock producers. Hence, incentives to maintain the system will remain in place.

Threats to the sustainability of the grazing system and the livestock improvement programme, as well, would occur should the grazing association

dissolve or enforcement activities cease. Both of these factors relate closely to the authority under which the system is premised. Without the presence of this authority, it is likely that the grazing system would return to the 'free-for-all' competitive approach being utilised prior to the RMA's development.

An additional threat to the RMA's sustainability could be represented by a lack of support from the traditional lines of authority, particularly Principal Chiefs. The RMA's at Sehlabathebe, Ha Moshebi/Ha Ramat'seliso, and Pelaneng/Bokong have been strongly supported by the residing Principal Chief. As a result, the grazing associations within these RMA's have truly been given management control. In contrast, the Principal Chief in charge of the Sanqebethu/Mokhotlong RMA has more or less tried to appease both RMA resident livestock producers and those originating from outside the RMA. This has greatly frustrated the Sanqebethu/Mokhotlong Grazing Association, as members feel they still have not been provided adequate authority to enforce their grazing plan. This has slowed the introduction of management in this particular RMA.

SUCCESSFUL COMMUNAL RESOURCE MANAGEMENT PRINCIPLES AS LEARNED FROM THE LESOTHO EXPERIENCE

Improving management of communal natural resources of any type is not a simple proposition. For years, the donor community and host African countries have met with little success in their efforts to institute successful range management, livestock management, or wildlife management programmes involving communal resources. Lesotho, as well, has experienced and continues to experience difficulties in this arena.

Over the past eight years, the RMA approach to introducing management to Lesotho's communal rangelands has met with a fair degree of success. From these experiences, a list of eight key communal resource management principles has been developed. The principles are applicable to the introduction of management to any communally managed resource, whether the resource be rangelands, wildlife, forests, etc.

1 The resources being managed must be recognised as **finite**, requiring conservation in order for the community to realise sustainable long-term benefits.

2 The resources being managed should be **restricted resources**. This means that communities participating in communal management efforts should not be allowed to use resources other than those allocated to

them. Non-adherence to this principle is conducive to over-utilisation of communal resources, as it creates the illusion that resources are not finite.

3 Use of resources should be **exclusive** to the community or communities managing it. Thus, if good management is practised, the involved local people benefit directly. Conversely, if poor management is practised, both the resource and its managers will suffer.

4 Successful implementation of community-based management programmes requires the **support of the majority of individuals within the community** and of **both traditional and modern leaders**. Definition of management regulations must come from within the community and be enforced through peer pressure. This can only be accomplished through total community commitment to the management effort.

5 Economic or subsistence benefits resulting from the management effort must be **meaningful to the community as a whole** and not just a fraction of it. If this is not the case, community participation will be lacking, and the 'community management effort' will be perceived as benefitting a select few to the detriment of the remainder of the community. This will ultimately lead to the failure of the programme through subversion or indifference. Further, returns from the programme (management effort) must be comparable or exceed existing alternative incomes derived by present management.

6 Returns from community management efforts must be **distributed directly to the individuals** within the participating community. This provides personal motivation to participate in the management effort.

7 The community must clearly understand management goals and objectives, and the tasks required to attain them. **Management objectives must be determined by the members of the community**, and not imposed upon them from outside by government, donors or other institutions. Goals and objectives forced upon communities quickly lose support. The role of government and donors should be to expose communities to new ideas, to facilitate determination of goals and objectives, and to provide technical advice and institutional support toward attainment of the community's management objectives.

8 Community-based management efforts should **address the multiple needs of the community**. Failure to do so may result in one or more factions of the community not participating in the management programme or even competing against each other. In cases of competing interests, it

is not unlikely for one faction to either directly or indirectly impede the management effort desired by the other faction. Eventually, such efforts may fail from lack of community support.

The above principles are essential to the introduction of management upon any communally used resource. These principles have been recognised and integrated into the Lesotho RMA Programme, and are the basis of much of the success achieved by the programme to-date.

CONSERVING ZAMBIA'S WILDLIFE RESOURCE THROUGH A LOCAL COMMUNITY-BASED APPROACH

H. K. Mwima

INTRODUCTION

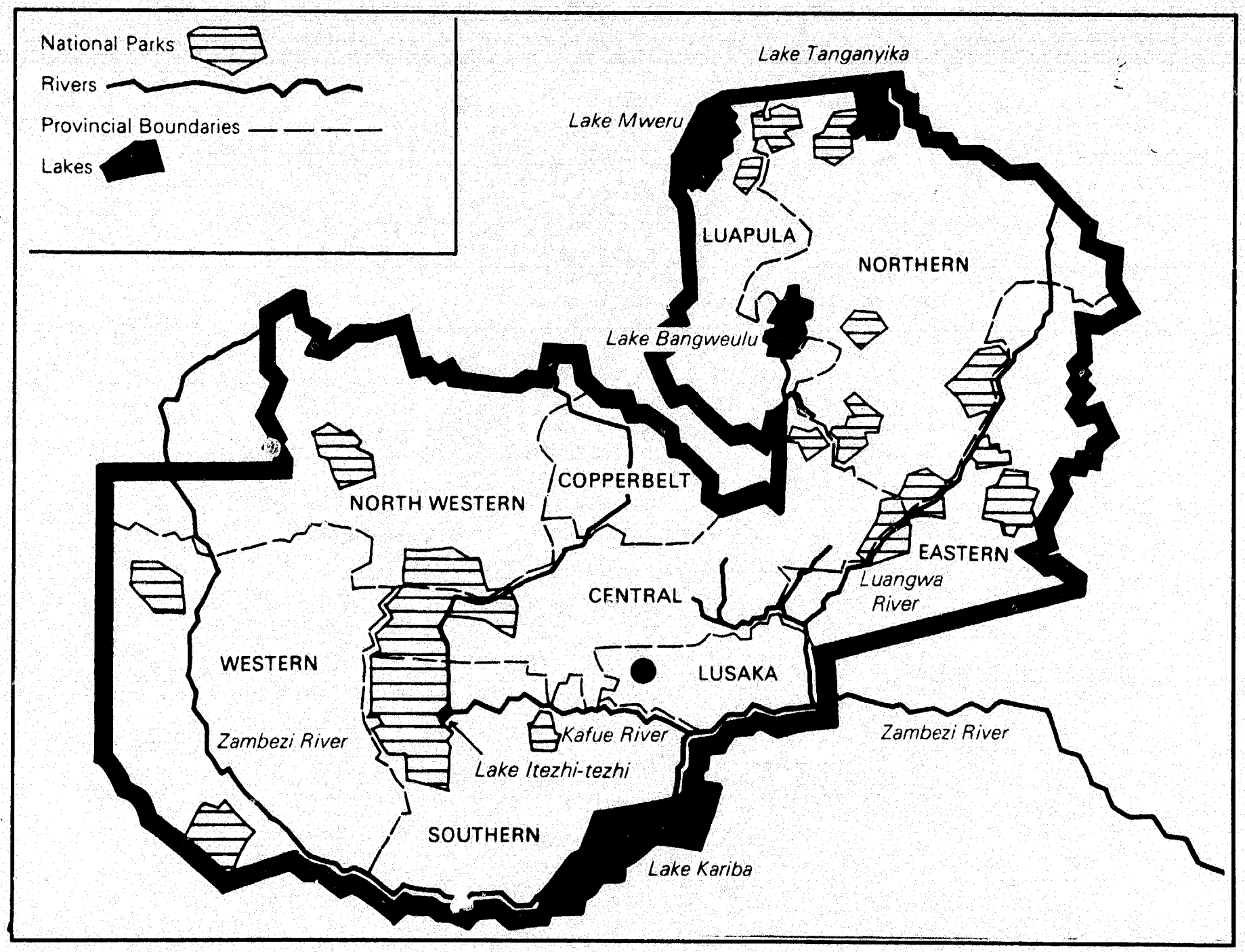
Zambia is approximately 752,614 sq km in size, most of which forms a plateau lying between 1,000 and 1,600 metres of elevation above sea level. The country has 19 national parks and 32 game management areas (GMA's) representing 8.4 percent and 22 percent respectively. National parks are protected areas set aside for their fauna, flora, scenery and geology. GMA's were established around most national parks in order to create buffer zones. Wildlife resources within these areas are under the responsibility of the Department of National Parks and Wildlife Service (NPWS) for conservation, development and not the least, management.

NPWS recognises that previous assumptions that wildlife resources can be conserved in their natural environment without local communities' involvement was a simplistic concept. Therefore, a new programme, Administrative Management Design for Game Management Areas abbreviated as ADMADE, has evolved as a result of research and objective understanding of the socio-economic conditions affecting local communities. ADMADE is now being characterised by the sustained realisation of a complex of objectives as is the case in the Mulobezi and Sichifulo GMA's, which are being administered as a single unit.

REVIEW OF MANAGEMENT MEASURES

About 30 percent of the country, comprising of national parks and GMA's has been set aside under the administration of NPWS on account of these areas being endowed with a wide variety of habitats, abundant wildlife resources and good scenery. See map of showing national parks.

The task of managing wildlife resources had been until 1987 carried out without the involvement of local communities living in close association with these resources. Such a practice alienated local people from wildlife resources right next to them and hostilities against NPWS arose (IUCN, 1985). This made the task of combating poaching extremely difficult because villagers would not cooperate with NPWS personnel.


National Parks
Rivers
Provincial Boundaries
Lakes
Lake Tanganyika
Lake Mweru
LUAPULA
NORTHERN
Lake Bangweulu
COPPERBELT
NORTH WESTERN
EASTERN
Luangwa River
CENTRAL
WESTERN
LUSAKA
Zambezi River
Kafue River
Zambezi River
Lake Itezhi-tezhi
SOUTHERN
Lake Kariba

ADMINISTRATIVE MANAGEMENT DESIGN (ADMADE)

Wildlife regulations promulgated during colonial days overlooked the fact that local communities often have profound and detailed knowledge of the ecosystem with which they are in contact. Local communities had no role to play in the management of wildlife resources in their respective areas and this has had an adverse effect on resources management. ADMADE is reviving the traditional way of involving local communities in management of wildlife resources and at the same time making a contribution to their welfare. The programme involves close collaboration and cooperation between local communities and NPWS professional and technical staff.

ADMADE has evolved as a result of research which emphasised, among other issues, the role of village socio-economic conditions in stabilising the balance between village interests and wildlife conservation (Mwenya, Kaweche and Lewis 1988). Results of this research have developed into guidelines and formed the knowledge base for the ADMADE programme. These results include the reduction of poaching in the test project area (Lower Lupande GMA) of elephants (*Loxodonta Africana*) by over 90 percent in less than three years, generation of gross revenue earnings of over US$35,000, saving local populations of black rhinoceros (*Diceros bicornis*) from extinction and ten-fold increase employment within local communities (NPWS 1988).

The ADMADE programme is now being implemented in most of the GMA's following formal endorsement by the Minister of Tourism in 1988. This strategy with a score of successful results involves three major levels of administration:

a) National Level: Involves four NPWS senior staff (two Co-Administrators, a Wildlife Conservation Revolving Fund (WCRF) Coordinator and ADMADE Coordinator and a World Wildlife Fund (WWF) Technical Advisor, who all work in consultation with the Director of National Parks and Wildlife Service.

b) Provincial/Regional Level: Involves NPWS professional and technical staff, district leadership and top local community leadership. These constitute a Wildlife Management Authority (WMA) whose major responsibility is to guide Wildlife Management Sub-Authorities.

c) Local Community Level: Involves NPWS technical staff, chiefs and other local community leaders. These constitute a Wildlife Management Sub-Authority whose major responsibility is to direct the wildlife

management operations in a GMA (or a set of GMA's collectively) known as Wildlife Management Unit (WMU) which is headed by a Unit Leader, a NPWS technical staff.

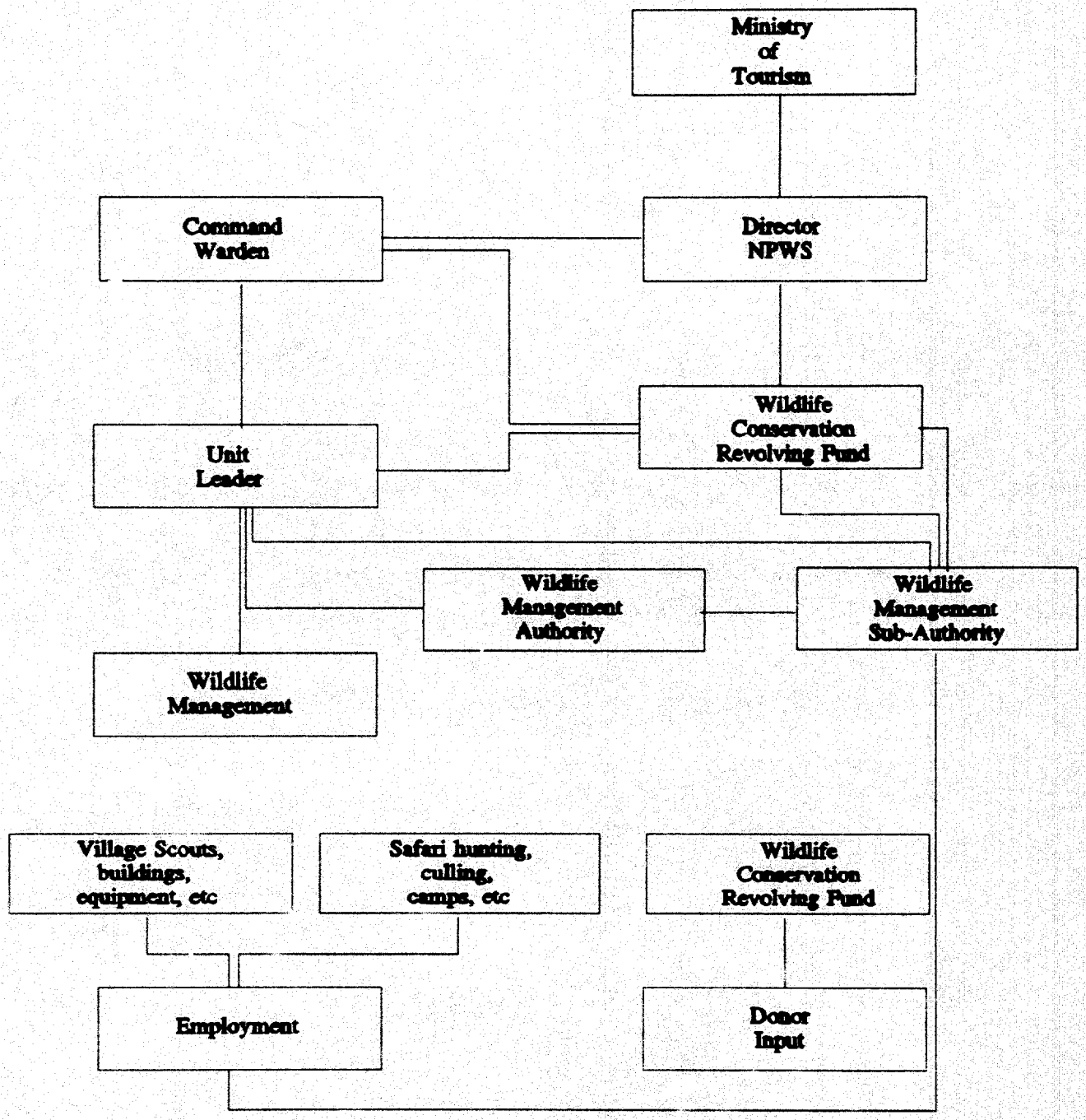


Figure 1. Flow chart of ADMADE administration (after Mwenya et al 1988)

GMA's have primarily been habitat for animals, but now they are also a place for employment and a source of income for local communities, and the country at large. Furthermore, 35 percent of the revenue generated from the WMU is used by the local communities for development while 40 percent is used for management costs (*i.e.* labour, field operational costs, infrastructural

development, etc.). The remaining 15 percent is used for both tourism development and management of the adjacent national park(s).

The ADMADE programme has also introduced utilisation programmes of wildlife resources on a sustained yield basis with the essential component of local community participation (Kapungwe 1990). This has not only made meat available to local populations at affordable prices, but has also improved the revenue earning capacity of the WMU's by means of sales of game meat and associated by-products. In the words of Lewis (1990), the WWF Technical Advisor, 'ADMADE is NPW's way of giving self-determination to local authorities and residents for improving their welfare from sustainable use of wildlife.'

Dr. Michael Wright, Vice-President of WWF, visited Zambia in 1987 and his assessment of ADMADE won Zambia high praise for her creative approach to solving problems of wildlife conservation through socio-economic solutions and local level participation (NPWS 1988). WWF has, following this visit, adopted ADMADE as a model project for its own international programme known as Wildlands and Human Needs Project. Another share of WWF support for ADMADE is derived from a USAID matching funds grants (NPWS 1988). Additional support may come from other agencies including those which have supported the ADMADE programme in the past such as Africare, Barclays Bank, American and Dutch Embassies and not the least, Chibote Safaris (Z) Limited, to mention just a few.

PRACTICAL EXAMPLE OF AN ADMADE PROGRAMME

Mulobezi and Sichifulo GMA's, located south west and south of the Kafue National Park (KNP) are amongst the richest in terms of wild fauna and flora. These GMA's cover an area of 7,202 sq km. By December 1987, the area had only seventeen NPWS staff responsible for anti-poaching patrols and basic field research. The effective patrol area at the time was 143 sq km per person. This made it very difficult to reduce poaching activities and carry out collection of data for research and management purposes, until the introduction of the ADMADE programme at the beginning of 1988.

Four local community chiefs and other leaders helped in the recruitment of field personnel who were trained at the NPWS administered by the Nyamaluma Educational and Research Station. On completion of their training, trainees were given the official title of Village Scouts, and were sent to the Mulobezi/Sichfulo WMU. By December 1989, 23 Village Scouts had

been trained and their assimilation into the programme had improved management and law enforcement. Figure 3 below shows comparative law enforcement trends before and after the introduction of the ADMADE programme.

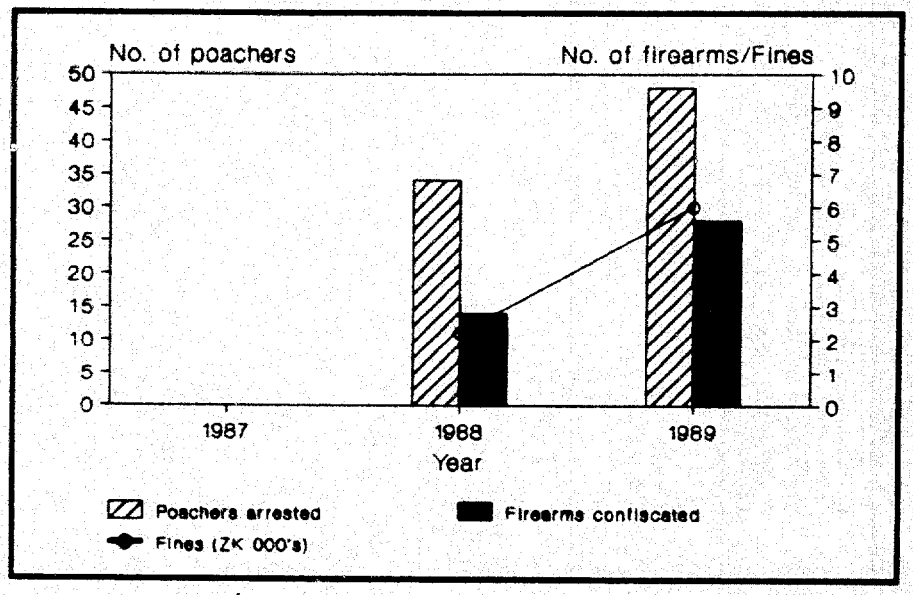


Fig. 2. Comparative law enforcement trends

It is premature to draw strong conclusions about the success of the ADMADE programme, but the experience of Mulobezi/Sichfulo WMU shows that the programme will achieve some positive results. For instance, some villagers who, by no stretch of imagination would previously cooperate with NPWS staff are now reporting poaching incidence to both NPWS regular Wildlife Scouts and Village Scouts. In fact, one of the firearms confiscated in 1989 was retrieved from a poacher by one of the chiefs in the WMA area. More cooperation between NPWS and local communities is expected as the programme develops.

Although poaching is the single most important wildlife conservation problem country-wide (IUCN 1985), encroachment has been defeating the purpose for which GMA's were established. However, major decisions which would have been difficult to adopt without the ADMADE programme have been reached during WMA meetings to control this problem. Local communities are eager and enthusiastic to cooperate with NPWS because they are now deriving benefits from wildlife resources in the form of employment and financial assistance. Rural health centres, schools and bridges being constructed and/or improved are examples of social benefits obtained. In 1988 and 1989 for instance, local communities received ZK434,058 and ZK64,680, respectively, representing approximately 35 percent of their annual revenue earnings.

Aware of the fact that increasing population and technology will determine the course of events, studies in human ecology are being done. Furthermore, recommendations were made at the second ADMADE annual planning workshop in January 1990 to ensure full implementation of the programme.

CONCLUSION

As Giles (1987) puts it, good wildlife management is a sensitive response to the specific needs of an individual area and its inhabitants. ADMADE, although still in its infancy, is a good practical example of a wise approach to wildlife management and is bound to achieve even more successful results.

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CAMPFIRE

Emmanuel Kawadza*

CAMPFIRE is an acronym for Communal Areas Management Programme for Indigenous Resources. These resources include wildlife, forestry, water and grazing. According to the National Conservation Strategy for Zimbabwe, people in communal areas should be encouraged to take stock of their natural resources and manage them in an integrated manner.

Legally speaking, in Zimbabwe wildlife is considered as *res nullius* which implies that it cannot be owned. The Zimbabwe government through the Department of National Parks and Wildlife Management (DNPWLM) has the overall authority on wildlife. Through the Parks and Wildlife Act of 1975 as amended in 1st of January 1982, landowners can conserve and utilise wildlife as long as they realise that final authority rests with the State. Already many commercial farmers have taken advantage of this piece of legislation. They have engaged in game ranching which they have found to be more profitable than cattle ranching, despite high subsidisation of the latter. In many cases commercial farmers have opted to combine both cattle and wildlife in order to maximise production on their farms.

Due to the preservationist legislation enforced by colonial governments, which alienated communal people from wildlife, conflicts were frequent. Crop fields were raided by monkeys, baboons and elephants just to name a few of the culprits. Under the preservationist approach, people would continue to bear the social cost without compensation from the government.

In an attempt to redress this situation, the DNPWLM initiated a new programme, Wildlife Industries New Development for All (WINDFALL). The department kept track of the income realised from animals killed in communal areas. The revenue was passed on to Treasury of the central government and could only be released when the district councils identified projects to which the money could be put to use.

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Although WINDFALL continue to help with the building of schools and clinics, it has failed to address some key factors, namely:

1) The programme does not provide the community with an opportunity to begin their own management.
2) Local communities have not been directly involved in the decision-making process and remain in the status of recipients.
3) There has been some bureaucratic shortcomings in the releasing of money derived from wildlife to the local communities.

There are several advantages that CAMPFIRE might be able to offer the people.

1) Benefits would directly flow to the community.
2) The programme relies on both institutional and administrative structures. Administratively, this can be done through the village development committees (WARDCO's) and district development committee (DDC) up to the provincial and national levels.
3) Participation is voluntary.
4) Responsibility for natural resources is exercised through natural resources cooperatives. Members are therefore expected to be shareholders. Each natural resources cooperative would have its own constitution defining rights and responsibilities of members and the rules governing the cooperative's finances.
5) There is an agency that will negotiate entry of communities into the programme. The agency will also provide technical support and initial starting grants.

CAMPFIRE therefore attempts to put full responsibility for management and utilisation of resources in the hands of the local community or natural resource cooperative so that in the long run this institution will be able to carry out its own census, set its own quota and initiate its own projects.

While the objectives of the programme sound noble and impressive, several problems had to be ironed out before implementation can show noticeable results. One problem to be solved concerns boundaries. Communal areas belong to the state; they cover a considerable area of Zimbabwe; resources of an area are jointly owned; animals recognise no boundaries. If people are to participate in the CAMPFIRE programme, they need to establish an area they can call theirs and this is not possible without the establishment of clear

boundaries to exclude those who are not participating. The question of boundaries is paramount for the operation of the programme. It should be borne in mind that it continues to cause conflicts between people who live next to national parks and those empowered to protect those parks. There are plans to erect electric fences to protect crops from wild animals.

Another problem in the implementation of the programme concerns training of local people. In the past District Councils have sent people to be trained as Game Guards so that they be able to deal with problems caused by animals in their areas. There is also need to educate people in order for them to appreciate new methods of wildlife conservation which are different from the protectionist approach of the colonial governments.

In a CAMPFIRE-type of programme the distribution of the funds is an additional problem. Realised revenues can be used in different development activities such as school buildings and clinics or, on the other hand, the people involved in the programme may opt to have the money shared equally so that they can put it to use as they wish.

Before a CAMPFIRE actually starts, a district council has to apply for an Appropriate Authority from the relevant ministry. This authority will empower the council to utilise and conserve wildlife under its jurisdiction. A district council is made up of a certain number of wards which in turn are comprised of several villages.

The first district council to be granted Appropriate Authority was Nyami Nyami. This was done in November of 1988. The land use plan revealed that wildlife was the most valuable resource in the area. Although CAMPFIRE is a product of Ministry of Natural Resources and Tourism the government had no vacant posts for experts nor funds to implement the programme; hence, other participants were engaged. Zimbabwe Trust has been responsible for much of the institutional building and assists with day-to-day project administration. World Wide Fund for Nature (WWF) assisted with ecological inputs. The European Economic Community (EEC) provided some of the capital inputs. DNPWLM retained all rights to approve every hunting quota in the area for the next few years. The Centre for Applied Social Studies (CASS) was responsible for sociological inputs. Prior to being granted Appropriate Authority the district council had set up a Wildlife Trust in 1987.

In 1989, a profit of Z$252,865 was realised. This was equally divided between the participating wards who received Z$16,500 each. If shared

equally, each household would receive Z$99. Rather than been given to each household the money was allocated to projects at ward level.

In Guruve District, which received its Appropriate Authority in January 1989, each household received Z$200 and put the money to use as it so wished.

So far 11 district councils have been granted Appropriate Authority. They will all implement their wildlife programmes differently.

The bulk of the revenue for Nyami Nyami District came from elephant hunt carried out by safari operators. People also benefitted from meat which was sold at a very low price. Traditionally meat has been the main use of wildlife; it is therefore fitting that they should have access to game meat after many years of prohibition due to colonial legislation.

WORKING GROUPS

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WORKING GROUPS

ORGANISATION AND FUNCTIONING

Introduction

Considering the vastness of the workshop's subject and the wealth of experience and practical knowledge participants to this kind of meetings have in their background, there is always some risk of the group discussions losing their focus. Time constraints, on the other hand, demand from both organisers and participants a concentrated effort to start achieving workshop objectives almost immediately. Hence, there is need to establish a specific framework and *modus operandi* to maximise group work efficiency.

Several steps were devised to optimise group work and plenary sessions. In the first place, as it is usual in workshops, participants were divided into groups. Five groups were formed taking into account the number of main discussion areas and potentially optimum size of each group. Secondly, each group was allocated a distinct recommendation domain or area to which discussions will be directed instead of all groups addressing all issues. Furthermore, groups were provided with terms of reference which listed major discussion topics and outlined steps to be followed in the analysis of papers. Finally, the nomination of group rapporteurs and the constitution of a drafting team would assist in keeping notes of group reports and plenary session discussions.

The next section reproduces the terms of reference distributed to participants.

Terms of Reference

The purpose of this exercise is to provide a common framework for discussion of the papers presented, insuring that the vital issues which cut across all four situations are addressed. The workshop participants will be divided into five groups. Each group will assess the issues outlined under the group heading in relation to the four discussion papers. However, issues discussed should not be limited to those which have already been defined.

Groups should follow a four-step process when discussing papers:

- **Step One.** Each group should address the issues under the group subheading to assess whether the particular issues were conducive,

constricting, or irrelevant to introducing improved management to the programmes/project discussed in each paper.

- **Step Two.** In this step groups should attempt to identify lessons learned from the experience discussed by each paper.
- **Step Three.** Groups should search for commonalities between papers during this step. Common factors between papers which were both conducive or constricting to the introduction of improved management should be prioritised in relation to their degree of impact. This will assist with the development of a communally managed natural resources.
- **Step Four.** In this final step groups should develop a list of recommendations (premised upon the above principles) for the implementation of management for communally managed natural resources in the SADCC region.

Administration and Policy Setting

a) National policies

b) Legislation

c) Political setting

d) Land tenure

e) Roles of local authorities and national government

f) The need for the programme; how critical is the problem

g) Institutions involved and levels of associated authority and strength/weakness

Community Participation

a) Assessment of community interest

b) Process of goal establishment/ownership

c) Process of designing management plans

d) Participant involvement with design, implementation and enforcement of management plans

e) Source of community management authority

Planning for Multiple-Use Considerations

a) Importance of multiple-use planning

b) Identification of competitive use

c) Assessment of relative magnitude of competitive uses

d) Resolving conflicts between competitive uses

Technical and Physical Aspects

a) Size of the area

b) Number of villages and participants involved

c) Historical management of the area versus management introduced

d) Inventory procedures utilised:

   1. Natural resources
   2. Sociological

e) Economics

   1. Market availability
   2. Viability of management approach

      a. From standpoint of participants
      b. From standpoint of government

f) Availability of credit

Sustainability Issues

This group should initiate the discussion session by defining sustainability. This definition will serve as a starting point for discussing the following issues.

a) Financial sustainability

   1. For government
   2. For community

b) Practical sustainability

   1. For government
   2. For community

c) Steps taken to ensure sustainability

d) Additional steps which could have been taken

e) Assessment of programme/project duration in relation to sustainability opportunity

f) Understanding of and acceptance/rejection of the project or programme

Group Headings

Administrative and Policy Setting. When considering national policies, legislation, political setting, land tenure, local authorities and central government, the need for the programme/project described, and institutions involved, the discussion was expected to focus on **why** each of these issues were conducive, constrictive or irrelevant to the introduction of improved management in each case study.

Community Participation. Participants in this group were asked to consider whether the case studies addressed the issues listed in the terms of reference. If one or more issues had not been touched upon in a paper, the group was requested to discuss its/their relevance to the success or failure of the case presented in order to follow the four step process.

Planning for Multiple-Use Considerations. This group had to assess whether the projects/programmes in the papers incorporated multiple-use considerations. If they did not, the group had to discuss what influences their absence had on the overall impact of trying to introduce improved management of communal rangelands.

Technical and Physical Aspects. While analysing size of the area and population involved, existing and introduced management, procedures utilised, and economic factors in each of the papers, the focus had to be on social and physical setting and technical approaches adopted.

Sustainability. A central task for this group was to define sustainability as a concept and according to this definition, assess whether sustainability had been ensured at planning stage, what could have been done to attain sustainability, etc. in each case presented.

WORKSHOP FINDINGS AND RECOMMENDATIONS

General Findings Common to the SADCC Region

Administrative and Policy Setting

- There are few comprehensive national policies which guide the management of common resources.
- Legislation is in place in the nations, but implementation and enforcement of regulations are ineffective.

- If national policies exist they are characterised by a top-down approach and are developed with little public input. The supposed beneficiaries rarely identify themselves with policy goals.
- Confusion exists between modern and traditional approaches of land and use rights allocation.
- Traditional and modern authorities at the local level are present, but are weak and ineffective.
- Extension staff is thin on the ground, inadequately trained and poorly compensated.
- Government bodies (department/divisions) do not coordinate activities and frequently obstruct one another.

Community Participation

- Goals and priorities of the community differ from those of the national government. This hinders local participation and commitment.
- Few attempts are made by governments to understand local needs, perceptions and priorities.
- Project success, in the cases presented at the workshop, is directly related to the degree of local participation.

Multiple-Use Planning

- The concept of 'multiple use' is poorly understood and rarely practised by governments, and projects and project planners.
- The focus of projects is usually on a single use or resource, while the beneficiaries practise multiple use.
- Lack of multiple-use planning leads to user conflicts and ecological degradation.

Technical and Physical Aspects

- Users perceive the resource base as infinite.
- For rangelands, mismanagement rather than overstocking is often the cause of degradation. Nevertheless, governments and donors insist destocking will reverse this trend.
- Biological inventories are typically overemphasised when compared to social analyses, whereas both are of equal importance.
- Economic appraisals of projects directed at communal resources management often show negative returns. This may be due to the

inadequacy of current economic models in valuing renewable natural resources.

- Development planners are not adequately aware of the economic motivations of the resource users.
- Credit may be required by resource users but is often difficult to obtain.

Sustainability

- The sustainability of a renewable natural resource was defined as:

  Use of a communal natural resource that will continuously maintain the ecological balance of the environment (biologically, economically, financially and socially).

- Characteristics of a sustainable management system are:
  - long-term viability without external support; and
  - effectiveness in maintaining resource productivity.
- Governments and communities usually cannot sustain activities after project withdrawal.
- Anticipated financial returns are often not forthcoming.
- Government and community institutions can collapse due to:
  - non-participation;
  - lack of manpower and finances;
  - lack of commitment;
  - lack of training/understanding;
  - lack of legislation and enforcement.
- Project durations are generally too short and projects overambitious.
- Conflicting objectives undermine sustainability.

Recommendations

Administrative and Political Setting

- There is a need for policies and legislation which mandate:
  - resource inventories; land use planning; allocation of use rights;
  - establishment of local management institutions;
  - accountability for assigned tasks;
  - environmental awareness programmes;
  - coordination of efforts of local and national government, private sector and donor organisations involved in rural development;
  - a government accountable to the people;

- There is a need for policies and legislation which:
  - facilitate cross-border cooperation;
  - allow for local enforcement of management regulations;
  - define and incorporate modern and traditional authority and roles at all levels;

Community Participation

- Develop a process which promotes:
  - assessment of community needs, perceptions and objectives;
  - development of community awareness of the limits and potentials of resources;
  - community input in the formation of management plans;
  - development of capabilities of local management institutions;
  - assistance to local management institutions to become legal entities (constitution and by-laws);
- Allow enough time to effectively implement this process.
- Local investment of time and money must be required (to stimulate commitment).
- The users must receive tangible benefits.
- Some quick results should be sought to increase participation.
- Exclusive use rights must be allocated to link management activities with positive outcomes. Likewise the user group should not have access to similar resources outside their management unit.
- The management authority should have enforcement power; enforcement should apply to all (inside and outside) equally.
- A user group should be defined by:
  - social patterns,
  - traditional jurisdiction,
  - administrative and political jurisdiction,

  rather than strictly by technical (geographic) considerations.

Multiple-Use Planning

- Users must consider conflicting and complementary interactions, *e.g.*:
  - wildlife/livestock destruction of crops;
  - human destruction of habitat;
  - spread of diseases between livestock and wildlife;
  - forage competition between wildlife and livestock;

- fuel collection;
- water supply;
- other cases.

Technical and Physical Aspects

- Resource boundaries should not only consider topographic features, but also user group factors, as mentioned earlier.
- Resource inventories must be performed, including:
  - vegetation;
  - soils;
  - water;
  - wildlife;
  - land use systems;
  - recreation/tourism;
  - climate;
  - human population; and
  - livestock

  to establish use opportunities.
- Increased emphasis on social surveys and analyses is required.
- Methods to monitor changes in ecological, economic and social parameters must be built into programmes.
- Financial, economic, social and ecological appraisals of the communal natural resources must be performed before starting projects.
- Economic evaluation methods require further development.
- New techniques should be tested on a smaller scale.
- Incentives and support for field staff must be provided to attract and retain quality personnel.
- Project design, market development opportunities and credit requirements must be based on social and economic appraisals.

Sustainability

- Factors which promote sustainability are:
  - community participation;
  - use of local inputs such as manpower, materials, etc.;
  - long-term impact assessment (financial, social, environmental, economical appraisal);
  - manageable scale;

- long-term commitment from government, donors and beneficiaries;
- agreement at all levels on the management goals and objectives;
- a sound legal basis, including tenure and enforcement rights.

- Relative funding of projects and programmes should resemble the pattern of trends illustrated in the figure below:

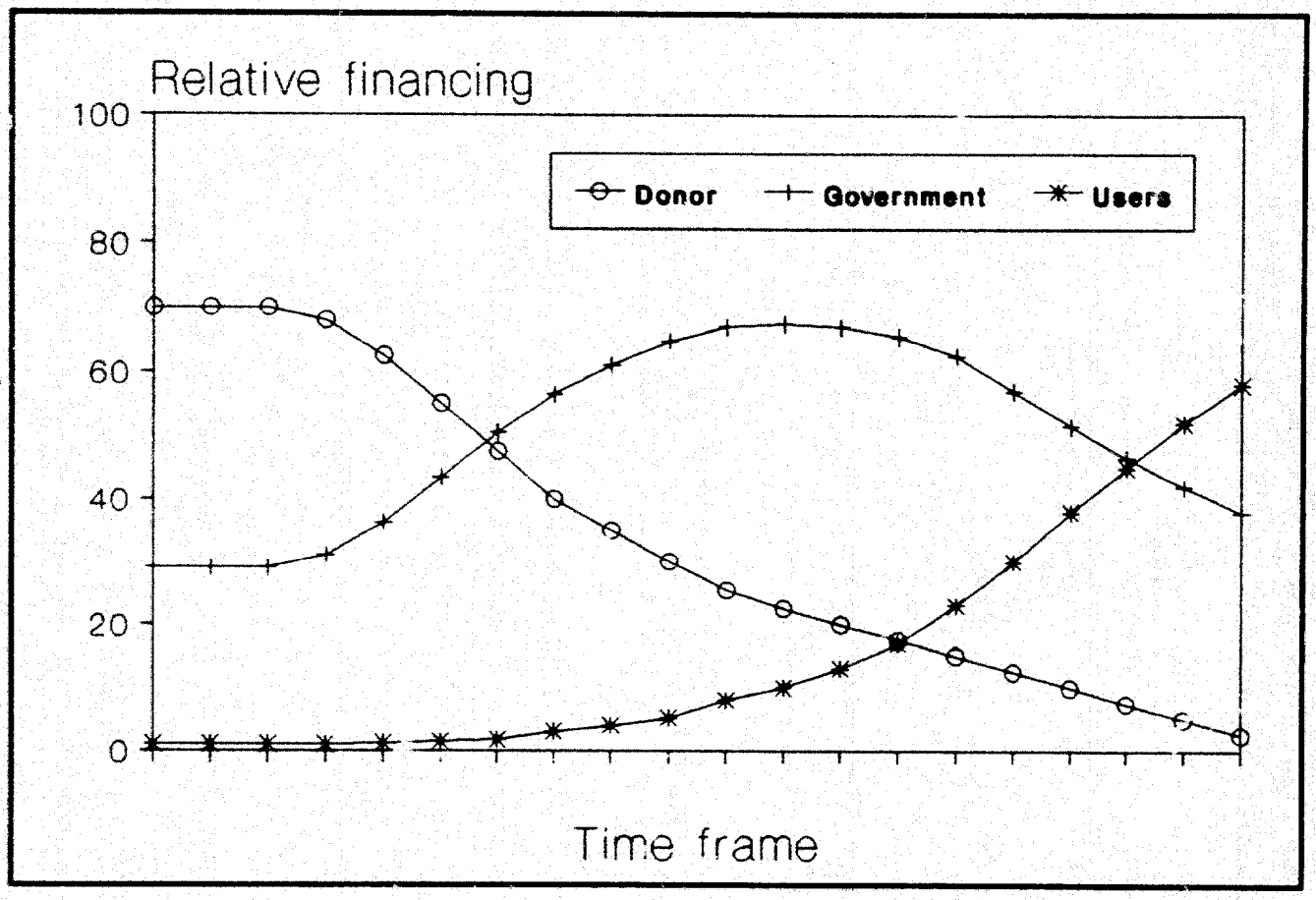

Figure 1. Relative financing over time of local community-based programmes/projects

In most cases, a considerable donor input together with some government contribution will be necessary to initiate community projects. In the medium term, however, donor funding should be phased out, which will require for government to step up its contribution and a greater financial commitment on the part of the local community. In the long term, even government contribution should be phased out while financing by users themselves increases. In the very long term, the local community must achieve financial self-sufficiency in order to ensure the sustainability of projects.