



AGRICULTURAL RESEARCH PRIORITIES:

"Proceedings of SACCAR's first Conference on research priority setting for Agriculture, Forestry, Fisheries and Wildlife"

24 - 28 SEPTEMBER 1990, Francistown, Botswana

Edited by

C.R. Namponya and C.T. Nkwanyana

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Contents

Foreword	1
SECTION I: Presented Papers	
Constraints to Agricultural Development in SADCC	6
Crop and Livestock Research Priorities in Zimbabwe for Decade 1990-2000	12
Crop Research Programmes	20
Future Research Priorities in Forestry: Namibia	26
Research Priorities in Animal Health	31
Forestry Development in Lesotho	34
Fisheries Development Plan for Lesotho	38
SECTION II: Discussion Groups	
Discussion Groups	42
SECTION III: Summary of Recommendations	
Status of Livestock Industry in The SADCC Region	45
Forestry Research Constraints and Proposals 1990 - 2000	51
Wildlife Research Priority Identification	62
List of Participants	65

FOREWORD

SADCC has been in existence for over a decade. During the first decade the organization established the Southern African Centre for Cooperation in Agricultural Research and Training (SACCAR). SACCAR has been developing and implementing agricultural projects and programmes based on the problems identified by the Heads of States and Government and those that were identified jointly by national research systems' experts and Devres international experts through questionnaires and approved by SADCC policy makers.

It is believed that the views expressed in the questionnaires which were distributed to researchers, trainers and extension workers and policy makers reflected the concerns of farmers in the member states.

In addition, SACCAR has been identifying problems and developing projects and programmes to solve them through workshops at which an attempt has been deliberately made to have representations from national agricultural research, training and extension systems.

SADCC's achievements in agricultural research during the first decade include the following:

- i) The Board of SACCAR was established as a forum at which regional common problems are discussed and regional projects are formulated and implemented. The following projects to solve common regional problems are being implemented:
 - a) Sorghum and Millet Improvement Programme;
 - b) Utilization of Sorghum and Millet for beverage, composite flours, animal feed forages;
 - c) Grain Legume Improvement Programme comprising components of beans (*Phaseolus*), groundnuts and cowpeas;
 - d) Agroforestry Research Programme;

- e) SADCC Crops and Forestry Seeds Genebank
- f) Land and Water Management Research Programme
- g) In-service Training in Research Management
- h) Strengthening Faculties of Agriculture, Forestry and Veterinary Medicine. The following masters degree programmes have been developed: Animal Science (Bunda College of Agriculture, University of Malawi), Agricultural Economics (University of Zimbabwe) Agricultural Engineering with emphasis on land use and irrigation (Sokoine University of Agriculture, Tanzania); Crop Science (Zambia).

Other projects which will be implemented as soon as funding has been secured include:

- a) A Collaborative Network for Vegetable Research and Development in the Southern African region;
- b) Wool and mohair production;
- c) Smallholder dairy production;
- d) Smallholder small ruminant production;
- e) Animal traction and mechanization in SADCC

In addition the following projects are being appraised:

- i) A network for maize and wheat improvement.
- ii) Indigenous silkmoth development.

- ii) The Southern African Centre for Cooperation in Agricultural Research and Training was established to coordinate regional agricultural research and training activities. The centre undertakes the following:
- a) Award of Research and Travel Grants
 - b) Publishing of a newsletter
 - c) Publishing of Zimbabwe a journal of Agricultural Research jointly with Department of Research and Specialist Services of the Government of Zimbabwe
 - d) Publishing workshop proceedings
 - e) Developing and maintaining a database for agricultural production, training, extension and research for the region.
 - f) Disseminating old and new technologies.
 - g) Liaising with regional and international institutional institutes/centres with similar mandate.
- c) Expand research in horticulture and add to vegetables, fruit and nuts;
 - d) Give high priority to maximizing the use of surface and underground water for irrigation;
 - e) Integrate disciplines of soil physics, soil chemistry, agronomy, agroclimatology and irrigation - will be one of the main goals;
 - f) Attempt to make SADCC self-sufficient in vegetable oil;
 - g) In training, develop more specialized diploma, BSc., MSc. and PhD. programmes

In addition, the sector will undertake impact studies of agricultural research on farmers and national development.

SACCAR developed a long term strategy for manpower training which was approved by SADCC in August 1990. After the approval of the strategy, the Board of SACCAR felt that it should move very quickly to prepare a similar long term strategy for agricultural research.

This conference was convened to identify constraints to increased agricultural productivity and identify priorities in agricultural research as a first step towards developing the long term strategy for agricultural research.

SACCAR management was happy to welcome to the Francistown conference, the Executive Secretary of SPAAR, Dr. Moctar Toure. Later Dr. Toure explained to the conference the role of SPAAR and how it was gearing itself to supporting specific actionable programmes that will help member states in Sub-Saharan Africa to make agriculture contribute more to socio-economic development and eliminate hunger and poverty. He also briefed the conference on the SPAAR brainstorming meeting that had been concluded just a few days before the Francistown conference.

The purpose during the first decade was to achieve household, national and regional food security - ability to acquire food and ability to have nutritionally adequate diet for every citizen. Agricultural research aimed at developing food and cash crops for increased farmers income, providing a basis for the growth of agro-industries that would create and produce for exports to generate foreign capital.

During the next decade, and beyond, the sector of agricultural research will:

- a) Consolidate projects and programmes identified and implemented during the first decade;
- b) Expand some of the projects such as agroforestry to cover all ecologies in SADCC;

SECTION I: PAPERS PRESENTED

CONSTRAINTS TO AGRICULTURAL DEVELOPMENT IN SADCC

Discussion Points on Concerns in Farming Systems Research

By

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Introduction

Agricultural research in Zambia is organised in teams of researchers addressing specific commodity research teams looking at all aspects of maize like breeding and agronomy and specialist teams looking at soils. In addition to the commodity and specialist teams, there is a Farming Systems Research (FSR) team called the Adaptive Research Planning Team (ARPT). In principle, ARPT follows the mainstreams FSR methodology as given by CIMMYT.

Mainstream FSR begins with the analysis of whole farming systems. Such analysis may be done through a variety of data collection techniques that attempt to elicit farmers' priorities and concerns.

Experimental work is then planned to address key problems, and experiments are planted on farmers field, under their conditions. Finally analysis of the results leads to the development of information or recommendations that are passed to farmers.

ARPT has an area focus in contrast to commodity research teams which have national mandates. Each province has an ARPT.

ARPT is responsible for collection of information on the different farming systems and formulate relevant adaptive and applied research programmes.

- ARPT also undertakes adaptive research especially on farmers field.
- improves link between research and staff through a program of on-farm trials.

- makes information available to relevant institutions eg. extension, input supply, credit marketing etc.

This paper is a collection of discussion points quickly put on paper to form a guide for discussion. It does not pretend to give an exhaustive treatment of a subject, but raises some points that could be of concern to participants of this conference on agricultural research priorities.

History of ARPT Formation

During the late 70s, the research branch underwent a major restructuring. Among the changes was the introduction of ARPT to address the farming system of Zambia particularly to respond to the problems of small scale farmers. ARPT was necessitated by several weaknesses observed within the research branch in relation to technology development and recommendation generation. It was felt that despite the small farmer contributing 70-80% of national production, their benefit from research efforts was not commensurate.

In the early years of ARPT, focus was largely placed on the relevance of recommendations to the small scale farmers and the understanding of why they were not adopted. ARPT was thus often accused of rediscovering the wheel. The team persevered and later it was appreciated that the manner in which recommendations were issued did not completely address the conditions of the small farmers. Aspects like levels of fertiliser application

and methods of application used by farmers were found to differ from the recommendation. On close scrutiny, ARPT was able to explain the rationale behind the variance. The variability in weather was one important factor and so was the returns to the most scarce resource - cash.

During the same period, the most urgent concern was the increase in stabilisation of food production. The search for appropriate cultivars of crops suited to the diverse physical and economic environments that ARPT had unearthed in the provinces became a major activity of the team. In the maize commodity, the search was facilitated by the large selection of cultivars that were being developed by the maize team. The maize development program was a hive of activities in the early 80s. Collaboration in selection of cultivars for the different areas ARPT covered was very strong and quickly paid dividends.

One important environmental factor that led to the focus in food crops in the early 80s was the drought. It put pressure on the farming systems researchers to find quick solutions to the glaring problems of food shortages in the households resulting from drought induced poor yields. An immediate option was to look for drought tolerant and short maturing cereal crops. Crops like sorghum and millets found much currency in the harsh dry environments.

Current Concerns of FSR

1. Increasing the responsibility of farmers for initiating research appropriate to their particular conditions and adjusting technologies to their individual requirements.
 - 1.1. FSR has its important characteristic the appreciation of farmer's circumstances obtained through diagnostic surveys. ARPT was allowed to experiment with the general CIMMYT methodology to adapt it to situations as they are obtained in the provinces.
 - 1.2. An attempt to obtain useful farmer participation was made through yearly farmer field days (Ndiyoi 1984). An opportunity was seen in the field days not

only to evaluate the past season's trial work but also to provide a forum for planning the following season's work. Farmer field days and meetings were also seen to provide the basis for formalising links between research and extension. An attempt was made to extend the thinking that extension was not the link between farmers and researchers. It was desired to look at the farmer, the ultimate reason for the existence of both research and extension, as the link between the two institutions. It is the two that needed linking. Linkage could be achieved by drawing programs (that address farmer's constraints) jointly.

- 1.3. The need to reflect more and more on the circumstances of the small farmers in the activities of ARPT has led to the formation of village groups. These are currently in their initial years of operation in Northern and Luapula Provinces of Zambia. Central province ARPT is also set to emulate the northern province model. This thrust is lead principally by the Sociologist in the teams. Thus from urgent concerns with the food supply, attention is going back to the initial phases of problem and priority identification in the farming community.
- 1.4. We are going into a phase of self re-examination and asking to what degree does our work reflect the concerns and priorities of the small scale farmer. This concern shall not be interpreted to constitute a new direction for agricultural research. It is an improvement for dialogue between farmer and researcher. It strengthens rather than rejects research methods associated with conventional FSR.
- 1.5. Those who write on farmer participation on research are expressing, implicitly, explicitly concern with the conduct and results of FSR. Field days and meetings that follow and village research groups express this concern without rejecting FSR which still remains the guiding paradigm. ARPT researchers are simply saying farmers should have more responsibility for initiating research appropriate to their

particular conditions and adjusting technologies to their individual requirements.

1.6 Justification for Farmers Participation.

Tripp (1986) listed justification for giving more emphasis farmer participation in research.

Firstly farmers have knowledge experience, and an ability to experiment that have been virtually ignored conventional agriculture research. A little respect for experience that farmers developed over a long period save investing research resources on options that farmers already rejected. Many failures in technology development have come about because researchers have not understood the criteria that farmers use for making decisions about varietal selection or crop management techniques.

1.7 Farmers' knowledge of their environment and the nomenclature they use to describe it should be incorporated in the research program. (VRG or such deliberate effort to formally get farmer input provide the platform through which this concern can be addressed). To date, the work on VRG and the like have been focused on the diagnosis phase of FSR. The focus of farmer participation research on diagnostic techniques attempt provide methods whereby farmers can ensure that their own interest and priorities, rather than those of the researchers play the role in the design of a research program.

1.8 Problem identification is not arrived at by a few simple observation by researchers, nor by assuming that farmers can provide a well-articulated list of priorities. The great advantage of VRG is the ability to have farmers and researchers in a dialogue. Regular group meetings are particularly useful if researchers are looking at issues that are complicated, where little previous experience is available or where frequent monitoring is essential as in animal husbandry research, regular group meetings with farmers can serve to assess progress and decide on further steps.

1.9 More important, the work has served as a reminder that the identification of research priorities is an on-going interactive process that builds on a continuing interchange between farmers and researchers. (Tripp 89).

1.10 After all is said on participation, and the important of community organisation as a complement to any stimulus for the effective agricultural research appreciated, it is still fair to say no amount of research methods will help research organisations around the difficult around the difficult but essential task of defining their goals and establishing their commitments.

2 Role of Prices in Farmer Decision Making and Implications on Recommendations

2.1 The wind of change within the political arena will not leave agriculture as we know it. With great liberalisation of the markets, we should expect a change in the ranking of crops in the farmers programs. The concept of flexible recommendations need to be addressed more and thoroughly explained.

3. Low and erratic Distribution of Rainfall and Techniques to Conserve Moisture for Crop Growth.

3.1 ARPT came into being during the drought period in the early 80s. During these formative years, ARPT did not address moisture conservation but focused at the urgent and seemingly solvable problem of providing food quickly to deficit area. Techniques addressing moisture were principally those that evaded the drought spells and the promotion of plants especially those that could survive under the environment. Currently, during the lull in drought, with memories still fresh, moisture conservation is gaining prominence. A screening of the techniques available proved fruitless. These loose sandy soils did not support the techniques suggested - eg. tie ridging. Mulching with grass competed with the quick-drying of

the sand as an alternative. The subject is now a major entry in the programs of ARPT but solutions are still yet to come.

3.2 The need for irrigation is very great although seldom given much emphasis. The systematic introduction of water harvesting techniques as an integral part of farming operations would be valuable in the more arid areas. Technical modifications that would intensify arable production and reduce the need for ox or mechanical modification of the farming systems is required. Modifications that would intensify arable production and reduce the need for ox or mechanical tillage and thus for grazing areas. Such modifications would be available to those areas less well endowed by nature and to all farmers, and could also dramatically raise yields and incomes to make other kinds of improvements possible and economical viable. Ideas in this line of work have passed through the stage of initial translation from paper to field.

4. **Linkages, and the Integration of Research Extension and Training**

4.1 Weaknesses in the links between institutions responsible for agricultural research and those concerned with transferring technology to farmers is a major obstacle to the development and application of beneficial new technologies (World Bank 1985)

4.2 FSR is one possible model for the development of linkages. FSR emphasises the role of constraints diagnosis and on-farm trials.

4.3 It is impossible to come up with a set of recommendations that would be appropriate in all circumstances. It is our duty to address the issue and come up with a model based on the knowledge of our institutions within the SADCC region.

4.4 We need to know what role various interest group (personnel, national policy makers, private companies and farmers) play in the

creation of values, rewards and sanctions which inhibit or facilitate collaboration between research and extension and other institutions involved in serving farmers.

4.5 What policies can SACCAR take to encourage integration or linkages between the institution? A stock needs to be taken of the political, technical and organisation factors which affect linkage mechanisms in the development and transfer of agricultural technology.

4.6 The ISNAR report on linkages uses "technology transfer", instead of "extension" because extension is now usually associated with conversional public sector extension services. "Technology transfer", however can be applied not only to those services but also to those provided by many other institutional organisations, such as private firms, parastatals, NGO, formal education institutions and producers and producers' associations. (D. Kaimowitz et al 1989).

4.7 The same paper also lays down linkage mechanism and puts them on a scale from the least to the most demanding. Mechanisms for facilitating the exchange of information would be at the lower end of this scale, those for implementing joint activities would be at the higher end; and those for the joint planning of independently implemented activities would lie somewhere in between.

4.8 The interaction between institutions afforded by a farmer group will facilitate the planning and implementation of joint activities. Output from discussion with farmers on their constraints and priorities form the cement that binds the research and technology transfer institutions. Extension is now the link between farmers and researchers. On the contrary farmers are the link between research and extension.

4.9 Since the linkage is of concern to SACCAR; perhaps special attention should be paid to the subject. The use of the

ISNAR Linkages Theme Paper No.1 "A Conceptual Framework for Studying the Links Between Agricultural Research and Technology Transfer in Developing Countries" as a resource in the effort to forge integration of our Research Training and Extension Institutions, as intimated by the Director, is suggested.

5. The Integration of Crop-Livestock-Trees Production

5.1 The lack of integration between the two enterprises of crops and livestock has meant low productivity of the system in general and cattle in particular.

5.2 Studies in livestock systems require extended visits to the farmers to allow monitoring of activities.

5.3 Results from such visits are analyzed to reveal the classes of animals and the management they are subjected to. Recommendations on interventions are drawn.

5.4 Integration is to be enhanced by examining the efficient use of manure crops and the crop residues for cattle feed.

5.5 A more "encompassing workshop on the interaction of crops, livestock and trees held in Malawi in 1989 produced recommendations that need follow up.

6. Sustainable Resource Management (R. Tripp, 1989)

6.1 Management technologies proposed often not profitable to farmers over the short run.

6.2 The techniques often interact strongly with either community resource control or differences in resource tenure.

6.3 A system perspective on resource management may lead to research on issues that affect all commodities in the system.

6.4 Sustainability issues are particularly difficult when dealing with resource poor farmers.

6.5 Farmers with uncertain access to resources or a relatively low proportion of income from agriculture are least likely to respond to initiatives to improve resource management.

7. Soil Fertility Maintenance

One important constraint to food production is the low soil fertility of a large part of the areas where small farmers are settled. Various approaches are suggested to try to find the best way the poor soils can be improved. By creating a demand for cowpeas, more of this food legume would be grown. Concurrently, there will be a contribution to the soil N. The hay from the increased cowpea hecterage is available as fodder for the cattle. A better fed herd will be more productive leading to higher numbers of cattle which provide more and more manure for crops. In this way, crop production will be increased. The manure will also be available for those uses like moisture conservation. The food legume would contribute to the nutrition of the household.

8. Introduction and utilisation of social scientists in agricultural research and they could assist in influencing agricultural policy in favour of creating conducive environment for agricultural research.

8.1 CIMMYT (Malawi office) and the SADCC Sorghum Programme (Bulawayo) have already started working with our socio-economists on how to handle and analyze FSR data for policy analysis.

8.2 There is need to discuss how socio-economists can contribute to making agricultural research programmes to best serve the target groups of in the region.

8.3 Responding to the needs of resource poor farmer. Resource poor farmers have rarely benefitted from the efforts of adaptive

research largely due to the continued failure on the part of research and extension organisations to define their TARGETS and GOALS clearly. Community based intervention seem more appropriate to this group.

9. Draught Power

9.1 Animal draft power is the predominant method of ploughing yet not all farmers have oxen and depend on hiring or other forms of access to the resource.

9.2 The cost of hiring and their having to wait for animal power and thus delaying planting till the optimum date is past, reduce the returns of non-cattle owners.

10. Gender

10.1 The small farm sector is greatly differentiated from resource rich to resource poor, other own large tracts of land while other own very little, there are cattle and non-cattle owners.

10.2 One group is especially disadvantaged by virtue of having shortage of labour through migration. These include the many female headed households.

10.3 Often such households have insufficient land to produce subsistence need and have to seek access to oxen to cultivate even their small plots, they do not have resources of labour or regular remittances from migrants with which to get draught power to seek wage employment or small scale commodity production like beer brewing.

11. Seed Supply

11.1 Due to poor roads, farmers in distant areas have difficulty getting agricultural inputs: fertiliser seed.

11.2 With the market liberalisation now on, and the anticipated removal of subsidies on input and transport, such areas are going to get even worse off in terms of supply.

11.3 Mechanisms for the assurance of seed supply to the farmers in such areas needs to be addressed.

12. Systems of Supporting (FS) Research

12.1 In Zambia, the major part of support to FS Research comes from donor agencies. ARPT has been able to get these funds due to the relevance of its work to the national objectives and those of donor countries of supporting national goals and aspirations.

12.2 Donor funds have their limits both in time and space. What options are these for supporting public research institutions in general and FSR in particular.

**PART I: CROP AND LIVESTOCK RESEARCH
PRIORITIES IN ZIMBABWE FOR
DECADE 1990-2000**

By: Mlambo S.S.¹, Mombeshora, B.G.², Hikwa D.³ and Tichagwa J.S.⁴

In spite of the fact that agricultural industry contributes to about 15% of Zimbabwe's Gross Domestic Production (GDP) as compared to 30% and 6.5% by mining and manufacturing industries respectively, it still remains the backbone of the national economy.

The dominance of the agricultural sector in the economy of Zimbabwe is ascribed to five key factors. They are provision of more than 80% of the food requirements, provision of an average of 46% of products exported, largest employer of labour in the economy; more than 70% of Zimbabwe's population live in the rural areas and their main source of livelihood being farming, it functions as the main source of livelihood being farming, it functions as manufacturing main supplier of raw material and finally the agricultural sector is the longest purchaser of industrial consumer goods and input items.

Zimbabwe is one of the few countries in Africa, which at present is not facing food problems. On the other it has a surplus for exports which include cereals, tobacco, horticultural produce, cotton, dairy beef and several others. But at the same time, there is no reason for complacency mainly because of increasing population, high cost of agricultural production, (mainly due to energy dependence) malnutrition specially in rural areas, and land pressure, erosion, erratic rainfall as well as occasional droughts at least in certain areas of the country. The history of the development of agriculture in Zimbabwe has resulted in the establishment of institutionalised, agricultural sectors (Table I).

Table I

Percentage Distribution of Land Area According to Natural Region and Farming Sector.

	Natural Region						Total
	I	I	II	V	X	VII	
National and Unreserved land	0,3	0,9	2,1	6,5	6,0	1,4	17,2
Communal area	0,2	3,1	7,0	18,1	12,8	1,5	42,7
Large scale farms	1,2	9,8	5,6	9,7	5,7	0,1	32,1
Small scale farms	-	0,6	0,7	1,5	0,5	0,2	3,5
Resettlement	0,4	2,4	0,5	1,1	-	4,5	
Total	1,8	14,8	17,8	36,3	26,1	3,2	100

Note: Rainfall (mm): NR1 1000, NRII 750-10000
650-800

Source: Farming Systems Annual Report 1985, Hall

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Large Scale Commercial Farming Sector (LC) It includes over 4500 large scale commercial producers on 15mm hectares under freehold titles. This sector is concentrated in the high potential areas of the country in Nation Region I,II,III,IV and V. This sector utilises advanced agricultural technology resulting in high yields in the main crop and animals namely maize, tobacco, cotton, wheat, coffee, horticulture, soyabean, beef and dairy products.

Small Scale Commercial Sector (SC). About 8 500 small scale commercial farmers mainly of african descent farming 1.5 million hectares of land under tenancy and free title. Farming systems and crop rotations are similar to those in the large scale commercial sector but the crop is considerably less and yields are lower.

Communal and Resettlement Sector: 850-950,000; small scale holder family farmers on 16 million hectares mainly communal areas (formerly the tribal trust based on traditional rights assigned by local chiefs 70% of the rural population lives in communal area which are located in the low rainfall natural region IV, and V. Mixed farming patterns of crops and depending on the region. Production is low as compared to the first two sectors and this is due to poor soils and rainfall.

In addition, since independence Government established several farming estates under agricultural development authority, a parastatal within the Ministry of Lands, Agriculture and Rural Resettlement. It is agricultural estates covering over 450,000 hectares + under utilisation throughout Zimbabwe's provinces. It is engaged in the production of tea, cotton, livestock and is developing a horticultural in apart from its production role on commercial lines, assists the small scale farmers with technology transfer farm planning, land preparation and project planning, addition of ADA is also involved in promoting development around the rural growth points and oriented industries.

All the three agricultural sectors in Zimbabwe, contributing towards the agricultural production in different sectors in selected crops show that capital output of the commercial sector is much higher than the small scale commercial and communal sectors. This disparity is mainly ascribed to small farm holdings, low inputs, infertile, eroded, water starved land etc.

Priorities in Research

Because of the divergent agriculture systems pursued by the different farming sectors in the different natural regions, research priority setting should aim at the development of technologies which are appropriate for sustaining and enhancing production and productivity in each farmer category.

Livestock Research

Animal Nutrient

Nutrition is the single most important factor affecting productivity of livestock in both the commercial and the communal farming sectors. However, it is more critical in the communal sectors where shortage is more acute because of overstocking, and land degradation leading to very low productivity of the grazing lands. Thus research will aim at improving the nutritional status of the animals with more emphasis on the commercial sector. Research will aim at better management of the existing feed resources, reclamation of the degraded areas and efficient feed resources, and efficient utilisation of all available feeds. This will involve:-

Investigations into cheaper and available alternative sources of energy and protein in the formulation of animal diets for specific functions eg. use of indigenous grains like sorghum, millet as substitutes for maize, cowpeas as substitute for soyabeans, forage legumes plus crop residues.

Evaluating and improving the use of crop residues by looking at collection, storage, upgrading and development of feeding systems, for beef, dairy and small ruminant animals.

- Studies of range nutrition; supplementation of various classes of animals and effects on productivity and their management.
- Studies on the fattening/finishing of culled cattle mainly for the communal areas.
- Studies on the requirements of draught animals (oxen, cows, donkeys) and their performances.

- Enhancing the quantity and quality of feed by looking at intercropping forage legumes with traditional crops and also development of appropriate agro-forestry technology.
- Ad hoc feeding trials to evaluate different types of feeds and agricultural by-products and additives.
- Studies on the nutritional requirements of small livestock.

2. Animal Breeding

This will involve studies aimed at both sectors and the main areas of thrust will be:

- Evaluation of the role of indigenous and cross bred cattle for meat, and draught power.
- Development of suitable crosses of cattle for specific production purposes (e.g. meat, milk, draught, meat and milk etc) and systems of management.
- Selection and improvement of local breeds of cattle.
- Studies of factors affecting fertility of livestock, specifically dairy and beef cattle.
- Evaluation of communal area livestock production and development of suitable breeds for specific purposes e.g. goat milk, dual purpose goats etc.
- Establishment of a beef cross breeding program for carcass and production evaluation to identify cow genotypes giving high levels of production (e.g. kg weaner per kg cow) within given environments, and the slaughter beast meets the carcass classification requirements.

- Comparative productivity of indigenous and boar goats.

3. Veld Management and Ecology

- Bush encroachment and control.
- Studies on stocking rates for different species of animals and the effects on veld.
- Studies on use of chemicals in bush control.
- Reclamation techniques of veld and degraded veld.
- Studies on runoff and soil loss on the veld.
- Introduction of new legume species and appropriate management systems.

4. Pastures

Most of this work will be done on stations mainly and aimed at improving the availability, (quantitatively and qualitatively) management and utilisation of available feed resources for beef and dairy cattle and small ruminants in all the farming sectors and will involve:

- Evaluation of stocking rates (with irrigated pastures for beef and dairy production).
- Evaluation of new forage and browse species and the reinforcement of natural grazing lands with the promising and appropriate legumes and grasses in all sectors.
- Evaluation of perennial fodder legumes on fallow lands on soil fertility and fodder yields and also leguminous browse species as live fences and browse for animals.
- Development of appropriate animal management systems under

different systems of pasture management in different areas of the country.

5. Animal Management and Husbandry

- Studies to reduce calving intervals in dairy cattle (oestrous detection, post partum breeding performance, embryo loss etc.)
- Development of simple dairy calf rearing and finishing systems.
- Development of summer finishing systems for mature cull cows and oxen.
- Evaluating the effects of kraaling and stover supplementation systems on cattle performance and manure production.
- Studies on appropriate stocking rates and rotations on reinforced veld.
- Evaluating the impact of traction stress on cows used for draught and development of appropriate management systems.
- Evaluating of milking systems (with/without calf, hand milking, communal system) (on productivity of indigenous cows).

6. Other Areas of Research

As research emphasis is being put more towards the communal areas, the department has been and will continue to carry out diagnostic surveys/studies in these areas to a reliable information on the state of the art in livestock crop production and also testing available technology under specific communal area environments and management systems. Alternative production systems in both communal and commercial farms will have to be developed to meet the specific objectives of each sector and the constraints being

encountered. The productivity of communal livestock-beef, dairy, poultry or pigs is very high and comparable with some developed countries. The main constraint is high costs of inputs.

- Feeds, veterinary drugs and so on - and priority shot directed towards minimising costs. In communal however, productivity in terms of beef or milk is because the objectives of these farmers are not primarily cash. The animals however still play very important role systems, security, meat and cash when needed.

Thus research priority, here should be to fully under the objectives of farmers in this sector and the constraints and to develop techniques of removing these problems. It is a complex mixed system with strong linkages between the livestock, crops, land and human components and multi discipline approach must be used to evaluate and establish the relative importance of these linkages.

Crops

1 Cereals:

A lot of research effort has been channelled into improving the yield potential of cereals and their product technologies with the major emphasis being on maize and wheat. This effort has manifested itself in the adopting many of the agronomical practices at the farm resulting in increased yields of these crops. The same should now embrace the other cereals that are important in Zimbabwe, such as sorghums, millets and barley.

1.1 Maize

A number of hybrids, which are high yielding and resistant to lodging and *Helminthosporium turcicum* have been developed. More research effort should be directly developing hybrids that are resistant to maize streak virus which has become a serious disease due to an increasing winter wheat production.

There is also a need to develop short duration hybrids that are suitable for marginal rainfall areas.

1.2 Wheat

The breeding programme has managed to develop a number of cultivars that are high yielding and has tolerant to both leaf rust (*Puccinia recondita* L.) powdery mildew (*Erysiphegraminis* L.)

In addition, a sizeable amount of research is currently being directed at water-use-efficiency in irrigated wheat. Some research is also being conducted to determine the feasibility of producing wheat on residual moisture in vleis. Depending on the preliminary results, the work could be expanded to develop production technologies for vlei wheat that could be used to augment irrigated wheat production.

Some research is being conducted to determine the economic viability of summer wheat production, if suitable cultivars are made available.

1.3 Sorghums

Quite a number of open pollinated and hybrid sorghum cultivars are currently being developed and will be made available in the near future. These include the white endosperm types, suitable for food products and red endosperm types for brewing.

Research on alternative uses of sorghum should be conducted to ensure that increased production, which is likely to result from improved technology, does not lead to unwanted stockpiles.

1.4 Millets

Research on pearl millet and finger millet is fairly recent. This research is aimed at combining such constraints as early maturity, high yields and good grain quality. One pearl millet cultivar combining all these traits has already been released. Investigations into appropriate production technologies for these crops are also at an advanced stage.

The need to establish alternative uses for these grains is as urgent as, if not more urgent than for sorghums.

1.5 Rice

The emphasis on rice so far, has been on the evaluation of local and introduced material in order to identify genotypes suitable for both upland and paddy production. Two cultivars derived from some of the introduced material have been released for production.

The current and growing demand for rice justifies the establishment of a breeding programme in order to widen and improve the existing germplasm.

1.6 Barley

Current research on barley is geared towards producing high yielding cultivars with good malting qualities. A few cultivars are available on the market.

More effort should be put into increasing the range of suitable cultivars. At the same time, there is need to initiate work on water-use-efficiency, as for wheat.

2. Oilseeds

The most important edible oilseeds in Zimbabwe are soyabeans, Sunflower seed and groundnuts. In addition, substantial amounts of edible oil come from the cotton industry. A considerable amount of research work has been conducted on these oilseeds, particularly on soyabeans and groundnuts. Research on sunflowers is comparatively recent.

2.1 Soyabeans

Cultivar breeding and development has produced a reasonable range of well adapted, high yielding cultivars. Agronomic investigations have promoted suitable technologies for the grower and the establishment of the rhizobium inoculant factory has assured the farmer of the availability of the much needed inoculant.

Breeding is now focused on producing cultivars that have high disease tolerance as diseases are becoming increasingly important. Some work is directed at developing cultivars that will nodulate with natural/cowpea bacteria strains.

2.2 Groundnuts

Breeding work has developed a number of both long and short season cultivars which produce reasonable seed yields under most conditions. In addition to improving the yield potential, a lot of effort is now being directed at developing cultivars that are resistant to diseases, particularly cercospora leafspot and rosette, which are a major constraint to groundnut production.

2.3 Sunflower

Research in sunflower, unlike in the other crops, has not had continuity. Despite this, one open pollinated and two hybrids are now available for production.

There is definitely a need to focus future research on increasing not only the range of cultivars. Both open pollinated and hybrids, but also improving the yield potential and leafspot disease tolerance.

3. Pulses

Pulses which are likely to play an increasingly important role in Zimbabwean Agriculture are field beans, cowpeas and bambara nuts. Research work on these crops has just been initiated.

3.1 Field Beans

A reasonable amount of work has gone into evaluating many exotic field bean lines to determine their suitability for production under local conditions. Selections from locally created breeding populations will soon be evaluated. Simultaneously, production technologies are being investigated in order to establish the most appropriate techniques for bean production under most local conditions.

A lot of breeding work needs to be carried out to develop high yielding cultivars that are resistant to diseases like bacterial blight, leaf rust and common bean mosaic, which are a major constraint to field bean production. Some research should concentrate on developing methods of controlling post harvest pests.

3.2 Cowpeas

In recent years, a number of exotic lines have been evaluated in order to select those suitable for production. Locally created breeding populations will soon be established so that selections can be done from them in the near future.

Research work on production technologies has been focused on finding an acceptable alternative way of fitting the new introduced cowpea cultivars into cropping systems of the small scale grower.

Future research on cowpeas should be directed at developing short duration cultivars that are resistant to diseases and pests. There is also an urgent need to develop better and acceptable methods of controlling post harvest pests in cowpeas.

3.3 Bambara Nuts

Evaluation of local landraces has been carried out for a few years to determine yield potential, disease tolerance and adaptability. A number of exotic lines have also been introduced into the country. Locally constituted breeding populations will be initiated in 1990/91 season.

Although the crop has featured in the small-scale agriculture for a long time, yields have been low. Therefore, new appropriate technologies need to be developed by research.

4. Industrial Crops

4.1 Fibre Crops

The most developed and most important fibre crop in Zimbabwe is cotton. The lint is the basis of the country's clothing industry, while the seed is a major contributor to the edible oil industry. Other potential of hessian products, such as sisal, kenaf and phormium.

4.1.1. Cotton

Most of the research in cotton has been directed at developing suitable upland cultivars. Although suitable cultivars with good yield potential and high quality fibre have been bred, the range should be increased.

The recent outbreak of verticillium wilt underlines the need to develop cultivars that are highly resistant to diseases.

4.1.2 Other Fibre Crops

There is a need to investigate the feasibility of establishing Kenaf, Sisal, and Phormium as important fibre crops.

4.2 Coffee

All the research work that has been carried out was on arabica coffee. There has been a lot of germplasm evaluation and some material has been released for production.

In recent years, some of the research has been channelled towards investigating the feasibility of introducing coffee growing into suitable small-holder farms.

Leaf rust (*Hemilia vastatrix*), coffee berry disease (*Colletotrichum coffea num*) and *Fusarium stilboides* have proved to be a major constraint to production. Hence, future research work should be focused on breeding cultivars that are resistant to these. In addition, integrated pest management, as opposed to the use of chemicals only, should be the main emphasis of pest control.

4.3 Industrial Oilseeds

The potential industrial oilseeds in Zimbabwean agriculture are castor oil and vernonia.

4.3.1 Castor

Research work on castor, which has been directed at developing production technology, was entirely based on exotic cultivars. The availability of a market has led to increased production. This in turn has resulted in the shortage of planting seed. Hence, current research work has focused on evaluating indigenous accessions as an additional seed source.

4.3.2 Vernonia

The main thrust has been to evaluate exotic and indigenous germplasm in order to identify any genotypes that are suitable for production.

Agronomic investigations are also being carried on some of the genotypes to determine fertilisation, time of planting and spacing.

4.3.3 Cassava

Current work has concentrated on evaluating germplasm, time of planting and duration before harvesting. Of the lines that have been evaluated, there are some that have been identified to be high yielding. However, they are prone to mosaic infestation. Therefore, future work should embrace incorporation of resistance to mosaic.

5. Horticultural Crops

In order to determine the diversity of horticultural crops in Zimbabwe, a survey was recently carried out. This will form a data base for future research in horticulture.

Research has been carried out on a number of tropical and subtropical fruit and vegetables. Due to the growing flower industry with good export opportunities, some work has also been initiated on floriculture.

5.1 Fruit

After evaluating a wide range of exotic germplasm, a number of cultivars of both tropical and subtropical fruit were identified and released for production. Research work on developing production technologies has resulted in the provision of appropriate techniques for both large scale and small scale fruit growers.

Work on genetic and chemical control of bud break and fruiting in deciduous fruit trees and vines under mild winter conditions, which started recently, showed some interesting results. This work should continue in order to determine the most appropriate chemical and the correct time of application.

5.2 Vegetables

Traditionally, vegetable production is an enterprise which depends on irrigation and as testimony to that, most of the research work was directed at improving production technologies based on irrigation. There is an option of growing vegetables

on residual moisture on vleis (wet lands) which has not been made use of in the past. Recently, some work has been initiated to exploit this option. This work should continue as some promising results have been obtained.

Most of the seed used to grow vegetables is imported but the availability of this seed has become increasingly difficult. For this reason, it is necessary to develop improved cultivars and establish a viable seed industry. In addition, indigenous vegetables should be improved.

5.3 Flowers

Floriculture has so far been based on imported and adapted technology. The research work that has been initiated is mainly focused on evaluating exotic annuals. This work should be extended to encompass perennials as well as local accessions.

CROP RESEARCH PROGRAMMES

Post-harvest Technology

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SUMMARY

Post-harvest technology as part of the overall crop production system has several objectives. The first of these is the prevention of food or crop losses. A second purpose of processing is to improve the quality of the produce by eliminating the unwanted material. Thirdly, with many crops it is also necessary to undertake processing at the farm to alleviate the effect of post-harvest biochemical changes which are time-dependent and harmful to quality. In this section, the major areas of research in post-harvest technology are summarized here under:-

- (i) Study of harvest and post-harvest practices in Tanzania
- (ii) Study of primary processing of agricultural commodities and marketing outlets
- (iii) Development of storage structures, packaging, and handling techniques for farm use
- (iv) Study of by-products, their current and alternative uses
- (v) Development of drying techniques for various agricultural products
- (vi) Development of agro-processing industrial models for farm consumption
- (vii) Field evaluation of crop conditions storage, agro-processing and by-processing and by-product utilisation of technologies
- (viii) Study of farm power and energy requirement for post-harvest activities
- (ix) Evaluation and development of solar appliances for drying various agricultural products
- (x) Study of adequacies and inadequacies of traditional practices and of new implements and machinery that have been introduced

PROPOSED RESEARCH PROJECTS

Research Subject	Research Component	Research Discipline
CEREALS	. Survey of traditional systems in Tanzania to establish weakest link in the system.	Agric. Economist/Sociologist
	. Design of appropriate storage structures.	Engineering
	. Biological studies of major pests and rodents causing losses.	Entomologist
	. Studies of loss reduction due to fungi & mycotoxins.	Pathologist
	. Development of appropriate drying methods of grain suitable for small farmer.	Engineering
	. Breeding varieties resistant to storage pests and diseases and suitable for milling.	Breeder
	. Assessment of post-harvest losses at various stages of post-harvest system.	Economist Entomologist
	. Development and/or testing appropriate rice harvester suitable for small farmer.	Agric. Engineering
	. Testing mechanical threshers available in market and recommend suitable one for small farmer.	Agric. Engineering

CEREALS	.	Develop and/or test available maize shellers in market and recommend suitable one for adoption	Engineering
	.	Assess the possibility of a maize shelter for use on other commodities e.g legumes	Engineering
	.	Assess the economics of the various technologies proposed above.	Economist
	.	Screen and test suitable pesticides for use against stored products pest.	Entomologist
	.	Testing and development of appropriate rodenticides.	Rodent Biologist
	.	Development of suitable baits for rodent control.	Rodent Biologist
	.	Studies on pesticide residue in food.	Chemist
	.	Assess the efficiency of natural pesticides used by farmers.	Chemist Entomologist
	.	Studies on traditional methods os rice par-boiling.	Food Economist
	.	Analysis of the performance of general mills installed in Tanzania.	Economist
	.	Study of the constraints to the adoption of composite.	Sociology
.	Flour technology in Tanzania.		

<p>ROOT CROPS</p>	<ul style="list-style-type: none"> . Studies of extent post- harvest losses of cassava and sweet potatoes and round potatoes. . Studies of traditional methods of post-handling of cassava and other root crops. . Studying of suitable methods of drying root crops. . Research into simple means of detoxifying cassava. . Studies on traditional methods of curing root crops. . Studies on improved processing and fermentation of cassava into flour. . Studies on alternative uses of cassava. 	<p>Economist/Agronomist</p> <p>Agronomist</p> <p>Agric. Engineering</p> <p>Food Technologist</p> <p>Food Technologist</p> <p>Food Technologist</p> <p>Food Technologist</p>
<p>FRUIT AND VEGETABLES</p>	<p>Assessment of post-harvest losses in vegetables.</p> <p>Studies on traditional methods of fruit and vegetable storage.</p> <p>Studies on simple methods of fruit and vegetable canning.</p> <p>Studies on dehydration of tropical fruit and vegetables.</p> <p>Studies on marketing system of vegetable.</p>	<p>Economist</p> <p>Agronomist/Horticulturist</p> <p>Food Technologist</p> <p>Engineer and Food Technology</p> <p>Economist</p>

<p>COFFEE</p>	<ul style="list-style-type: none"> . Studies on ways and means of synchronising opening of coffee berries. . Studies on alternative uses of coffee byproducts. . Development of pedal operated pulpers. . Studies on roasting and packaging of coffee at small scale. 	<p>Chemist.</p>
<p>TEA</p>	<ul style="list-style-type: none"> . Development of harvesting machinery to cut down the labour cost of harvesting which account for about 40% of tea production. . Studies on harvesting, handling and transportation of tea to factories. 	<p>Agric. Engineering</p>
<p>SUGAR CANE</p>	<ul style="list-style-type: none"> . Studies on utilisation of sugar plant's byproducts especially for animal feed. . Studies on utilisation of sugar plants byproducts for brewing alcohol. . Studies on an integrated programme with sugar factory operated with cattle feedlot. 	<p>Animal Scientist</p> <p>Chemist</p> <p>Economist</p>
<p>OIL CROPS SUNFLOWER & SESAME</p>	<ul style="list-style-type: none"> . Assess the technical feasibility of the various machines now in operation and provide guidelines for future operations. . Study the various rural scale processing technologist and advice on their feasibility or otherwise. . Determine the extraction rates resulting from various processing plants. 	<p>Economist</p> <p>Economist</p> <p>Engineer</p>

GROUNDNUTS	<ul style="list-style-type: none"> . Identify the existing post-production practises. . Development of post-harvest equipment including harvesters, shellers. 	<p>Sociologist</p> <p>Economist</p> <p>Engineer.</p>
SISAL	<ul style="list-style-type: none"> . Development of sisal cutting/harvesting machine to reduce labour cost. . Look into alternative uses of sisal waste/by-products such as production of chemicals, animal feed, fertilisers, alcohol etc. Look into alternative uses of sisal for example; use of sisal in the manufacture of building materials such as tiles, roofing materials, bags, paper etc. 	

FUTURE RESEARCH PRIORITIES OF THE 90'S - NAMIBIAN FORESTRY -*

by

R. Hilbert,
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1. **General Background**
2. **Research Priorities**
 - 2.1 Research into the management of forest savanna
 - 2.2 Research into alternative woodsources to save indigenous woodlands
 - 2.2.1 Plantation
 - 2.2.2 Woodlots
 - 2.2.3 Agroforestry
 - 2.3 Forestry research and training centre farm Brandwag, Grootfontein

3 **Summary and Conclusion**

Appendix 1: Natural zones: suitable areas for artificial forestry activities in Namibia

Appendix 2: Forestry centres, trial plantings, research plots

*Compiled for: SADCC meeting: Research priorities of the 1990's, Francistown, Botswana: 24-28.09.1990; by: R. Hilbert, Forestry Section, Grootfontein, Namibia.

1 **General Background**

20/7/0

Forestry in Namibia is predominantly concentrated on two vegetation types. The dry woodland in the very north of the country (approx. 20% of total area) and on a fairly small extent the thorn tree and mopani savanna (approx. 30%) see appendix 1 + 2).

Until now forestry in Namibia relies mainly on natural forest being the main source for saw and construction timber, for fuel, fencing and other

farming requirements. The demand for further products depends almost completely on importation.

Forestry activities in Namibia are limited mainly due to unfavourable natural conditions. Nevertheless even savanna forests can make enough return being necessary for the establishment of a forestry organisation to achieve a sustained yield of the forest resources. Together with artificial forestry activities further products can be supplied to the market, for a more self-sufficient forestry sector.

There is an urgent need for research on aspects such as enrichment plantings, trial plantings with indigenous and exotic species for commercial afforestation, woodlots and agro-forestry, as well as the need for research and training centre.

In the past, until the beginning of the 1980's, forestry research in Namibia was carried out by the forestry research centres of the Republic of South Africa, while research during recent years by local staff took place on ad hoc basis only. The present forestry structure cannot meet with the needs of an independent country showing a rapidly increasing population of 2,3-2,9% per year. Provision is made for much more adequate research section within the new Directorate of Forestry.

2. **Research Priorities**

Research priorities in the past were mainly concentrated on projects like research plots for increment, regeneration and fire ecology in the indigenous savanna forests. *Furthermore trial plantings with mainly eucalyptus and a few of the exotic and indigenous tree species mainly in Owambo and Kavango. A few of the more recent research activities as well as future research priorities are given in the following:

2.1 Research into Management of Forest Savanna.

Research into management of forest savanna will be one of Namibia's top research priorities dealing with scientific sound management of indigenous savanna forests to achieve sustained yield. Several proposals (unpublished) were drawn up during recent years. One project dealing with that matter is briefly described in the following:

2.1.1 Research into the management of coppice-shoot of *Pterocarpus angolensis* in forest savanna.

Description: At present permanent observations on regrowth and management of kiasat coppice-shoots are carried out in Bushmanland (average distribution of Kiasat) and in Hereroland (margin of Kiasat distribution) are done occasionally.

Main species: *Baikleae plurijuga*, *pterocarpus angolensis*, *burkea africana*, *ricindendron rautanelii*, *guibortea colesperma*.

Results: Final results can be expected at the earliest in two or three years (additional plots have to be established).

First results indicate the following:

* Kiasat seems to produce the highest regrowth (coppice shoots) if exploitation took place before the growing season. Coppice shoots are endangered by fire during first years after felling, specially if dead material is not removed around the stump.

No sufficient answer on the reduction of coppice-shoots as far as size and age concerns can be given in this stage (preliminary results are contrasting).

2.2 Research into alternative wood sources to save indigenous woodlands

Research projects mentioned under this heading are not directly connected with the management of indigenous woodlands. The main reason is to avoid over utilisation or destruction of the natural resources for fuelwood and poles. Most projects are started recently or are planned to start in the

next future. Up to now results are obtained in a small scale only (eg. provenance research on *eucalyptus camadulensis* and *eucalyptus tereticornis* for pole production*, or *leucaena* and *gliricidia sepium* for agroforestry plantings). Final results of most other projects will not be available before five to ten years time.

2.2.1 Plantation (5-10.000 ha):

Trial plantings were started or planned for this growing season with different exotic and indigenous tress species (e.g. Hybrid *eucalyptus grandis/camadulensis*, *agrocarpus fraxinifolus*, *albizia versicolor*, etc). Mainly for pole and - to a certain extent - for converted timber production.

2.2.2 Woodlots:

Trial plantings were planned with different exotic and indigenous tree species (eg. *eucalyptus* species, *casuarian* species, *abizia* etc). Mainly for production of firewood and building materials close to settlements.

2.2.3 Agroforestry:

Trial plantings are established or planned with exotic and indigenous tree species. For improvement of the soil and the supply of food, fodder and wood with the aim to avoid further clear fellings of indigenous woodlands for agriculture, firewood, etc.

In February 1989, first trial plantings for agroforestry were started on farm Ilmenau near Grootfontein. The two tree species being tested are *leucaena leucocephala* (14 provenances) and *Gliricidia sepium* (12 provenances). The latter is part of an international provenance trial of *Gliricidia sepium* by the Oxford Forestry Institute. No crops were planted so far but first results of the plantings of *leucaena* are very promising, while the growth of *Gliricidia* was disappointing. Interplantings with crops like maize, sunflowers or mahango are planted.

A fairly detailed proposal for agroforestry trial plantings for dry savanna forests including horticulture or garden forestry suitable for the former riverine forests along the Okavango river was drawn up in 1987 already. The implementation

in form of small research plots wellspread over the area has highest priority.

2.3 Forestry research and training centre at Farm brandwag, Grootfontein

To coordinate and concentrate forestry research wherever possible and to make it more effective, the establishment of forestry research and training centre near Grootfontein is suggested. The main aim of this centre will be:

Firstly research with its main task such as the establishment of a seed bank, a clone bank, the propagation of improved indigenous and exotic tree species for fodder, pole and timber production as well as for agroforestry. Followed by trial plantings on the farm Brandwag and further sites throughout the country. The establishment of man-made forests. Research on natural forest ecosystems (increment date, sustained yield regulation, enrichment plantings) and erosion control. Furthermore research on utilisation of plants of bush encroachment, charcoal production, establishment of an arboretum, etc.

Secondly, training for forestry staff and information to the public on all forestry aspects will be a further task of the centre.

3. Summary and Conclusion

Forestry in Namibia is predominantly concentrated on two vegetation types, the dry woodland in the very north of the country (20% of total area) and the thorn tree and mopane savanna (30%).

Forestry relies mainly on natural forests as main source for saw and construction timber, for fuel, fencing and other farming requirements. Forestry activities in Namibia are limited mainly due to unfavourable natural conditions, while the demand for many forestry products depends almost completely on importation. Limited research activities like research plots for increment, regeneration on fire ecology in indigenous savanna forestry; research into alternative wood-resources, research into management in savanna forests etc. took place so far. Research priorities in the 1990's have to concentrate on aspects like:

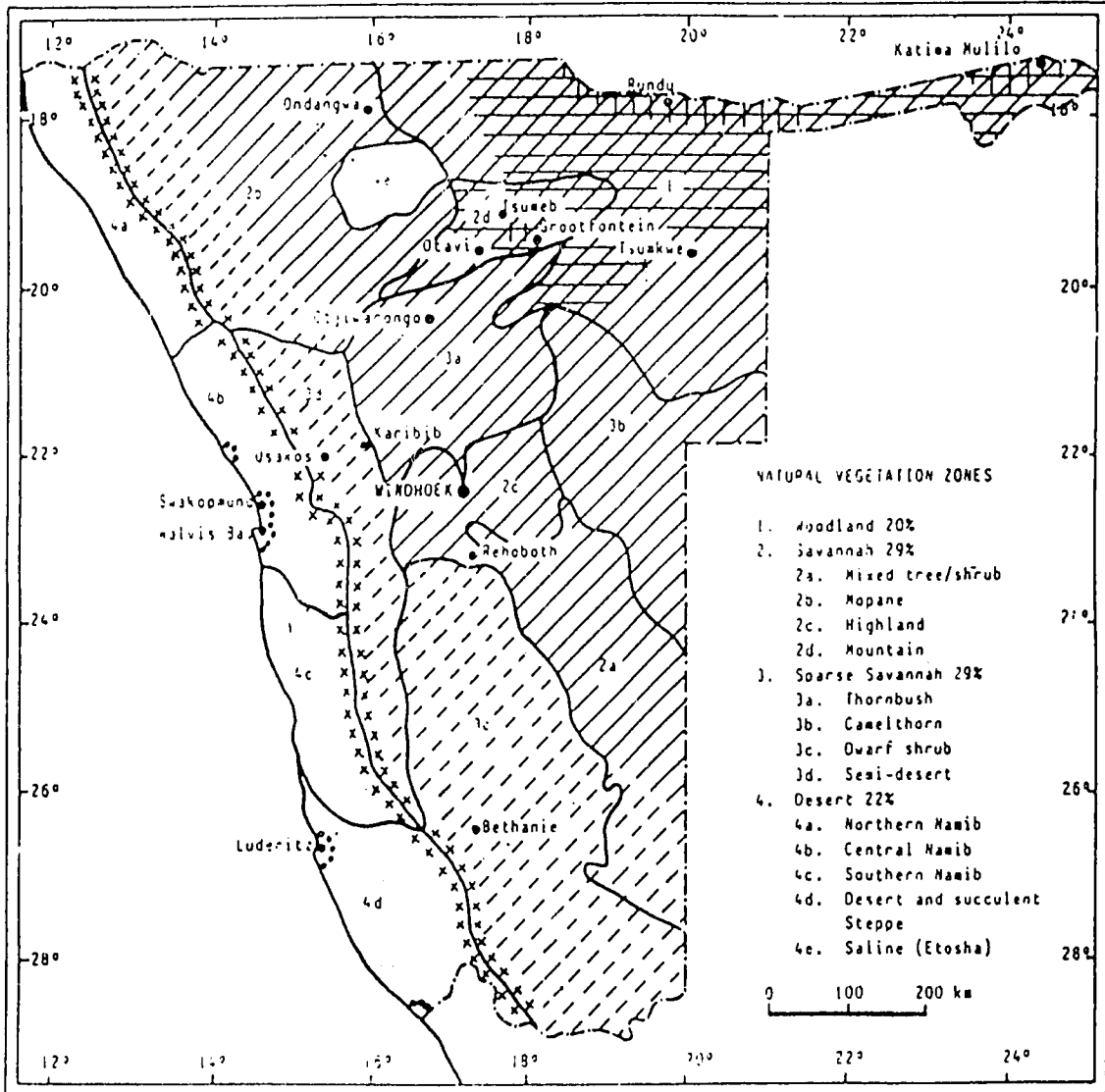
- * Scientific sound management of indigenous savanna forests to achieve sustained yield.
- * Enrichment plantings in degraded forest areas
- * Trialplantings with improved indigenous and exotic tree species for commercial afforestation, woodlots and agroforestry.
- * Establishment of a research and training centre, including the establishment of a seed and clone bank.

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APPENDIX 1:
 NATURAL VEGETATION ZONES AND
 SUITABLE AREAS FOR ARTIFICIAL FORESTRY ACTIVITIES IN NAMIBIA

(very simplified)

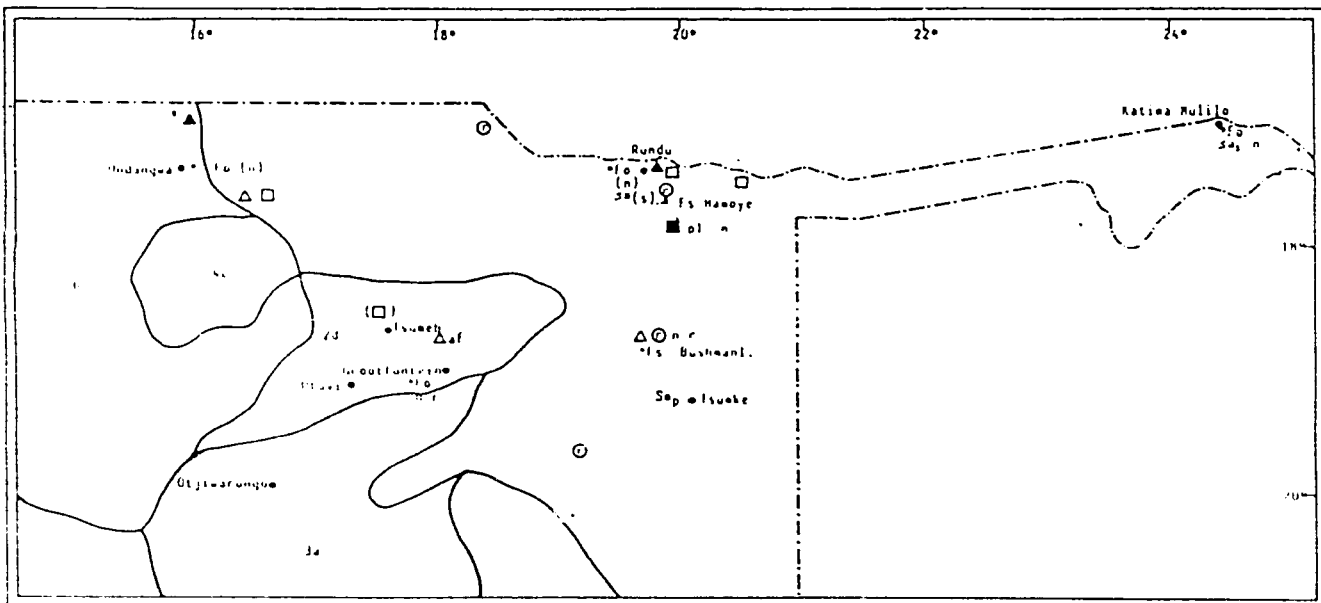


AFFORESTATION TYPES

- Plantation I (high grade timber)
- Plantation II (poles and construction timber)
- Woodlots and agro-forestry (poles, fire wood, fodder, food, soil stabilisation and enrichment)
- Woodlots and agro-forestry (very restricted sites only)
- Protection strip (Preventing further extent of desertification, and tree and tree shrub species only)
- Dune stabilization

*Plantings within afforestation types on selected sites only

APPENDIX 2 : FORESTRY CENTRES, TRIAL PLANTINGS, RESEARCH PLOTS



- | | |
|---------------------|---|
| •Fo Forest Office | □ plantation < 100 ha |
| •Fs Forest station | ■ plantation > 100 ha |
| pl plantation | △ trialplantings (Eucalyptus) |
| n nursery | ▲ trialplantings (indig./exotic species) |
| Sms state sawmill | ○ permanent research plots |
| Smp private sawmill | △ ^{af} af trialpl. agro-forestry |
| r research | () closed down |

RESEARCH PRIORITIES IN ANIMAL HEALTH

by

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Abstract

Although Africa has a large cattle herd of 201 million, its production coefficients are unimpressive. The main constraints to enhanced productivity being animal diseases, nutrition and the genetical make up of the animals. Any meaningful research should therefore be directed to the three constraints.

Introduction

Research has always been one of the primary mandates of the veterinary profession. The first veterinary school which was built by a decree by the council of state at Lyon, France in 1762 was empowered to do research so as to arrest the major livestock epidemics which swept across Europe unchecked between 1700 and 1762.

The history of animal health research in Tanzania is fairly recent. In 1905 the first livestock research station was opened by Germans at Mpwapwa where in 1907 they constructed the first cattle dip in East Africa. During the 1920s and 30s much effort was spent on controlling deadly animal diseases which used to kill large populations of livestock. This responsibility has remained and shall continue to remain valid if livestock productivity is to be enhanced. Thus the future of the veterinary profession and its ability to contribute more to the socio-economic welfare of the livestock farmers in terms of quality and quantity shall depend on efforts put on various aspects of veterinary research.

The wide spread belief that animal diseases no longer constitute a major constraint to livestock productivity in view of the achievement attained in controlling some of the major epidemics such as rinderpest and contagious bovine pleuropneumonia

is misleading. The means available for controlling most of the diseases are still unreliable let alone the number of diseases which still have no effective control measures eg. trypanosomiasis, the tickborne diseases and helminthiasis just to mention a few. This, therefore calls for more concerted efforts for research in animal health. The main thrusts of research should therefore be directed to animal health so as to enhance livestock productivity, public health aspects and sustainable use of environment.

Specific areas of research in animal health

Although the main constraints for livestock productivity are diseases, nutrition and the genetical make up of the animals; these constraints are in every way inter-related and they in one way or the other contribute to animal health since the performance of an individual animal is a function of both the intrinsic (genetical make up) and extrinsic (diseases, nutrition) factors surrounding the animal. Thus research on animal health should give due emphasis on:

1. Animal Diseases

The provision of primary health care is of prime importance, a number of disease conditions would be under reasonable control if only primary health care facilities such as dip tanks etc were made available. Thus strengthening of the extension services is important if the pastoralists are to benefit from research output. However, although a number of diseases have effective control means; there is still need to develop safer and more efficient vaccines in addition to developing vaccines

for diseases which as yet do not have one. To be able to do this one would have to study the epidemiology of the various diseases at molecular level. Such an understanding shall assist in screening for epitomes likely to be used for vaccine production using the recombinant DNA technology.

The other area which requires much attention is livestock infertility. Efficient livestock production, depends to a considerable extent upon maximising the reproductive performance. Thus research into the regulation of ruminant reproduction in the tropics using some of the most sensitive methodologies such as the radio-immunoassays (RIA) or enzyme immunoassay (ELISA) to measure the physiological reproductive parameters through hormonal assay is recommended. Thus more sensitive and easier methods of detecting heat by small farmers so that inseminations could be done in time should be developed.

Research into wildlife diseases and the role played by wildlife in the epidemiology of various livestock diseases has not been given its due emphasis. Numerous wildlife species harbour a number of pathogens without manifesting any clinical manifestations. This innate genetical resistance should be researched and exploited for the benefit of livestock development. There is in addition need to do more research in wildlife management and conservation.

2. Natural Resistance to Diseases

For a long time, efforts have been made to breed animals for improving the genetic quality and productivity of livestock through selective breeding programmes (Witter, 1990). This process has been painfully slow because the selection and breeding for desirable traits had to be based on the genes already present in the breed (Gorham, 1990). On the other hand breeding for disease resistance has received very little attention that crosses that are normally higher yielders; succumb to the numerous tropical diseases.

Disease resistance, directed either to the pathogen or to the host making it more responsive to vaccine has been an area of special interest in recent years. Genes that influence disease resistance have been linked to a family of closely associated genes found in mammals known as the "Major histocompatibility

complex (MHC)". Some of these genes are responsible for the recognition and regulation of the immune response to foreign antigens and expression of resistance to infectious agents (Lunney, 1985) Lunney et al 1986, Davis et al 1985). These genes are divided into two groups:- Those coding for membrane molecules expressed on all cells (class I) and those coding for membrane molecules expressed on antibody producing cells and antigen presenting cells (class II).

In the case of bovine lymphocyte antigens, they are known as Bovine Lymphocyte Antigens, they are known as Bovine Lymphocyte Antigens (BOLA) and they correlate with the genes within the family that control the immune response. They function by producing lymphokines and inter-feron, specific immunoglobulin molecules and molecules which block cellular receptors for replication of specific pathogens. Diseases such as Bovine leukaemia (Lewis & Bernaco, 1986) and porcine trichinosis (Lunney & Murrel, 1978) have already benefitted from this technology. This entails extensive gene mapping and engineering.

3. Nutrition

The state of nutrition of livestock has a direct correlation to the health of animals. The seasonal availability and quality of pasture has had an adverse impact on the health of animals. This is compounded by pastoralists keeping increasingly large but unproductive herds. Pastoralists should be urged to keep fewer but more productive animals.

This will spare the environment while at the same time leaving adequate pasture for the animals to graze. Thus research into sustainable livestock husbandry systems by pastoralists and the use of crop by-products by smallholder farmers should be given priority.

Conclusion

Research should be seen as a necessary tool in any industry if any meaningful development is to be achieved. It should not be seen as a luxury undertaking. Research in animal health should emphasise on the epidemiological studies, livestock infertility of safer but more efficient vaccines, development of disease resistant animals and

sustainable land use livestock husbandry systems.

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FORESTRY DEVELOPMENT IN LESOTHO

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1. Background

Lesotho differs from other SADCC countries in a number of ways, one of which is its forestry history. Lesotho is basically a grassland country with indigenous forest restricted to valleys and some slopes. Tree planting on a formal basis started in the 1930s when grey poplar and pines were planted around the country as a soil conservation measure. This programme had limited success but some trees survived and formed stands which are now mature.

In 1973 the Woodlot Project was established. The aim of this project was to establish village plantations for fuelwood supply. After a slow initial phase demand for "woodlots" took off towards the end of the 1970s and to-date about 350 plantations have been established with a total area approaching 10 000ha. In 1987 the Woodlot Project finished but from it evolved a new government division in charge of forestry - the Forestry Division. The new forestry division has broader responsibilities than the Woodlot Project and a start has been made on diversifying activities eg. school nurseries, community forestry activities, research into potential agroforestry species. However, to-date the main activity has continued to be the establishment of small plantations for fuelwood and pole production.

Thus forestry in Lesotho differs from that in other countries in that there is very little scope for management of indigenous forest, there are no large plantations for industrial use and forestry is still a relatively young and perhaps under rated discipline. In addition of course ecological conditions in Lesotho are such that the species used have more in common with temperate South Africa and Australia than with the SADCC countries.

2. Forestry Research 1980 - 1990

The Woodlot Project which started in 1973 initially borrowed technologies from the neighbouring Republic of South Africa. However, it was realised that many of these technologies were appropriate for Lesotho's conditions so in 1979 the first (expatriate) Forestry Research Officer was recruited. Initially research concentrated, for obvious reasons, on nursery and site preparation techniques and fertilisation regions. Also seed was required from many sources for species trials, mainly of eucalyptus, pinus and cupressus species. This research led to a number of recommendations which were incorporated into forestry practice. By the mid 80s more emphasis was placed on provenance and land race trials of the species which had been proven to have potential in Lesotho, while further species which have not been tested previously were planted. A major activity this time was the National Tree Seed Centre (NTSC) with an adjacent research nursery. Facilities for local tree seed processing, testing and storage were greatly improved.

The late 80s saw an attempt to diversify the special testing, while continuing with provenance trials and special trials of eucalyptus and conifers. This was a response to the increasing interest in community forestry and agroforestry link. Links were developed with various area-based projects active in these fields. The number of data on growth rates at different sites is accumulating.

3. Considerations Affecting Forestry Research in the 1990's

Priorities for forestry research must obviously be decided and a response to the needs of Lesotho,

both at the level of the individual farmer and at the national level (e.g important substitution). At present reasonable predictions can be made about the future direction of forestry in Lesotho - it is likely to become increasingly focused on extension activities to encourage community and agroforestry.

It would be premature though to develop a formal long-term plan at present because the Tropical Forestry Action Plan (TFAP) process is shortly to be launched. This TFAP exercise is a comprehensive forestry sector review to be carried out by the Ministry of Planning with assistance from FAO and the full participation of all interested parties, including NGOs and farmers. It will develop a forestry policy and programme for Lesotho for the next ten years. A forestry research strategy must obviously be placed in the context of this TFAP exercise, which may not be completed until 1992.

Bearing in mind the constraint posed by the TFAP exercise research section of the Forestry Division has drafted a long term research strategy to give some kind of guidance in this interim period. This document is still a draft and so does not constitute an official document. The question of which of the proposed research activities should receive highest priority is not really to be decided by the Forestry Research Section but by policy makers at higher levels. In broad terms though there is a consensus that while plantation forestry will continue to be an activity of the Forestry Division, increasing emphasis will be placed on encouraged people to plant their own trees. The implications for forestry research are quite important. Some of the major implications are listed below:

- * Increased awareness of the socio-economic context in which tree-planting activities are to take place.
- * Greater emphasis on trials of multipurpose species which can be used in agroforestry system design and testing.
- * "Client group" for forestry research changing from the Forestry Division staff to farmers. This has implications for information dissemination and feedback mechanisms.

- * Emphasis on solutions to problems using appropriate technologies.

Despite the enthusiasm of some donors for "community forestry" its widespread adoption is likely to be a slow process due to Lesotho's land tenure system. Also the assumption that farmers will prefer multipurpose species may not be true, as has been found in parts of Kenya where (male) farmers plant eucalyptus seedlings for later sale as poles.

This discussion must be placed in the context of a severe fuelwood shortage in Lesotho, particularly in the mountainous areas. The Lesotho Energy Master Plan, which has been approved at the highest level of Government, recommends a massive increase in tree planting to meet the projected future energy deficit. Implementation of this plan will require substantial research to refine current recommendations and diversify the species planted.

Another factor to be considered when discussing the future of forestry research in Lesotho is the interest in indigenous species. Though these are restricted in distribution they are well known and liked-indeed they form part of Basotho culture. Foresters have tended to ignore these species because of their relatively slow growth, but when grown under the same conditions (weeding, site preparation) as the exotic, their growth may not be so bad. Research is need into propagation and seed storage techniques and studies of phenology.

Lastly, though growing of trees for industrial use may not be very fashionable at present it could well form part of the forestry policy for Lesotho, especially because of its potential for employment creation. Long term research is necessary before any such projects are formulated to determine which trees will grow and how fast so that economic analysis are based on sound data.

Underlying much of this discussion is the rather obvious fact that growing trees is a long term business. Forestry research must not only respond to current needs but also anticipate future needs. It must adopt a balance approach and not lose sight of its long term aims. Whether a tree is planted as part of a community forestry programme, in a plantation or a farmer's field there are certain biological features about it which must be

understood in order for sound recommendations to be made regarding it. On what soils will it grow? What elevation? What is its fodder value? Can it be propagated from cuttings? What treatment do the seeds need? These are the basic type of questions at the heart of a forestry research programme.

4. Outline of Forestry Research Strategy

As mentioned above, a draft forestry research strategy has been prepared by the Forestry Research Section. Though we have attempted to be concise it extends to 18 pages so it is unavoidable that a summary of it will look more like a list than a reasoned paper. An attempt will be made though to outline the main anticipated future activities. These are divided into four Categories: Silviculture (including agroforestry). Mensuration/inventory, seed, protection.

Under silviculture it is anticipated that species and provenance trials will continue to be a major activity. While the progress made so far in identifying the best species and provenances of eucalyptus and pine will be built upon, there will be serious effort to test species from other genera, especially those which can be classed as multipurpose or suitable for land rehabilitation and the indigenous species.

Agroforestry research is another anticipated activity. At present the main thrust is in species trials to identify possible agroforestry trees and shrubs for Lesotho. Because of its unique climatic conditions Lesotho is not able to "borrow" agroforestry technologies from other African countries but must develop them in-country. Coordination of agroforestry research with the agricultural research division and area-based projects involved in agroforestry research will be an important feature of this activity. The Forestry Division would like to see all organisations involved in agroforestry research and development contributing to a computerised database listing which species/seedlots have been planted where. This will ensure that records are kept centrally so that it will be possible to locate these trees in say 10 years time. Steps are being taken to acquire the software for this. In addition to species trials, research will be needed into management of the trees and shrubs, yields, low input establishment methods and other aspects. In the short medium term, a diagnosis and design

type exercise for the main ecological zones in Lesotho will be required. This may be possible through the SADCC/ICRAF AFRENA project if it is extended to other SADCC countries in its next phase.

Research into conservation technology is one area which has not received sufficient attention, partly because of its institutional factors. This is one area where interdisciplinary work is essential. Planting trees in a donga stable and productive. Similarly, planting trees and perennial grasses on terraces amongst fields requires the cooperation of agronomist, foresters and probably sociologists.

Other research will cover nursery techniques, establishment techniques (especially for adverse sites) and fertiliser formulations and dosages.

Under mensuration/inventory the establishment assessment of permanent sample plots in plantations will continue, so as to determine growth rates of trees in field conditions (rather than research trials). Felling of sample tables constructed relating tree biomass to diameter using linear regression techniques. Yield studies will be carried out on species which have not been widely planted by the Forestry Division but which are relatively common such as wattles and certain indigenous species.

Seed, as with most other SADCC countries the National Tree Seed Centre falls under Forestry Research, mainly because of its linkages with tree breeding programmes. It is expected that the SADCC/CIDA National Tree Seed Centre Network project will assist Lesotho in its wish to upgrade its Tree Seed Centre and train its staff. Ultimately the aim is to become self sufficient in tree seed. To this end a tree breeding and seed production programme is to be written shortly, with the assistance of a consultant from Oxford Forestry Institute and its implementation will be a major activity of the forestry Research Section in the coming few years.

Protection. Fortunately Lesotho has not suffered major disasters with pests and diseases of trees but there are certain problems. While at present one could not justify the employment of a specialised pathologist or entomologist, the need may arise in the future. Meanwhile the research section will continue to monitor pests and diseases and rely on

outside help when necessary.

5 . Features of Possible Regional Relevance

Certain features of the above discussion may be worth highlighting for their regional relevance.

Firstly, is the increasing need for multidisciplinary research to address multidisciplinary problems. This need is particularly evident in the fields of agroforestry and soil conservation.,

Secondly, as forestry becomes more oriented to rural people (this term is used deliberately to include more than farmers) the mechanisms of information dissemination and obtaining of feedback will have to adapt to the new "client group". Feedback mechanisms ideally should include field surveys where individuals are interviewed rather than formal meetings of educated farmers and officials.

Thirdly, as forestry moves into the mainstreams of rural development it is becoming a component of more and more area-based projects. With projects importing seed from all over the world there is a risk of weeds or plants becoming introduced so attention must be paid importation mechanisms, while not making them cumbersome that projects will simply slip the seed through by other means. Also mechanisms should be developed whereby information on any project forestry agroforestry research activities is kept centrally, for future reference.

Fourthly, at the risk of repetition, forestry research is long-term activity, requiring long term commitment and continuity. While the current interest in agroforestry is welcome it should not mean that research into fuelwood sawtimber trees or management of plantations abandoned as these will continue to have a part to play in forestry development.

Forestry research is also not very capital intensive: In Lesotho the research section spends about \$3 on recurrence costs such as wages, field allowances, fuel, overheads for every \$1 spent on equipment, seed, fencing and similar items.

Fifthly, though not mentioned directly, full use must be made of the information technology available. In forestry research for instance, databases will be required for tracking of seedlots and storage and analysis of Permanent Sample Plot data. These applications can not be found off-the-shelf but unusually require some adaptation of commercial software. It would make sense for such software to be developed to serve all the SADCC countries rather than each country attempting to do its own thing. Also priority for the 90s must be to facilitate access to databases such as CAB agricultural abstracts. Ideally it should be possible to pay for literature searches in local currency.

Lastly, the most important resource in forestry and other research is people who are interested in their work. Like most other professional jobs, much of the forest researchers time is actually spent managing people, that should be recognised and suitable training after university degrees should be given. Unless researchers feel they are given the facilities to do their job and get adequate financial and professional recognition, they will go over the border to South Africa, where there is a booming forestry industry and very lucrative salaries.

FISHERIES DEVELOPMENT PLAN FOR LESOTHO

by

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Introduction

Lesotho is the major watershed area in Southern Africa and water is one of the country's important natural resources. However, being a landlocked country, its water resources only consist of rivers, man-made lakes and reservoirs. The total runoff from the river catchments is estimated at 141m³ or 4 400 million a m³/year, (SWECO, 1975). The reservoirs have an estimated water surface area 200 ha. Lesotho does not have any large natural or man-made lakes. Many reservoirs are small, 0.5-4.0 ha in size. There are also a few medium size reservoirs (5-10 ha). The Lesotho Highland Water Project (LHWP) is in the process of constructing four large reservoirs in the highlands of the country. The exact water surface area of these reservoirs after flooding is not yet established.

Lesotho lacks capture fishery except for the sport fishery of rainbow trout (*Salmo gairdneri*) and small mouth yellow fish (*Barbus holubi*) in mountain streams. The fishery in the lower reaches of river, foothills and lowlands, also include large yellow fish (*barbus kimberlynsis*), African catfish (*Clarias gariepinus*), mudfish (*Labeo capensis*), mud mullet (*Labeo umbratus*). Some of the lowland reservoirs provide a good fishery of largemouth bass (*Micripterus salmoides*), common carp (*Cyprinus carpio*) and African catfish.

Aquaculture constitutes a major component of fish produced in Lesotho. However, its contribution to the total fish consumed in the country is only 2%. Fish is mostly produced by small scale rural fish farmers. The species produced is mostly common carp. African catfish is produced by a few pilot farms. The production of chinese silver carp (*hypophthalmichthys molitrix*) and grass carp (*ctenopharyngodon idella*) is still at the

experimental stages. Experimental trout farming in raceway and reservoirs was once undertaken in the highlands, Thaba-Tseke (Fisheries, 1981). The results showed good growth rates, indicating the potential for commercial trout farming in the highlands of Lesotho.

Development Plan

The strategy for the development of fisheries in Lesotho is to increase fish production from rivers, reservoirs and farms. Different methods aimed at increasing fish production are discussed below. The list of the methods is not exhaustive but rather discussed on the basis that they are seen to be more appropriate for the country at present and in the near future. The methods are:

- . Management of rivers to maintain fish species diversity and sustainable fisheries.
- . Development of capture fishery in LHWP reservoirs at their completion.
- . Enhanced or culture based fish water fisheries in existing reservoirs.
- . Intensive fish farming in some lowland reservoirs
- . Improvement of rural fish farming to increase its profitability
- . Commercial catfish and trout farming
- . Establishment and improvement of fish seed production facilities.

Management of Rivers to maintain fish species diversity and sustainable fishery.

A river is the project of its catchment and catchment processes, so poor watershed

management can easily affect the riverine ecosystems. Soil erosion in most catchments has destroyed fish habitats and threaten the existence of certain fish species. There is an urgent need to manage river catchments with a view to maintaining fish species diversity rivers. Management of rivers could also include dividing rivers into sections and managing according to the main objective of each river section. For example, some river sections could be managed to maintain high species diversity while others are managed to improve the fishery of certain fish species.

Development of capture fishery in LHWP reservoirs at their completion

LHWP reservoirs are most likely going to be large enough to maintain a sustainable fishery. Development of a fishery could emphasise the use of indigenous fish species. Except species such as rainbow trout and brown trout (*salmo trutta*) could also be used. However, the biology and ecology of all indigenous species will have to be undertaken to avail possible completion.

Enhanced or culture based fresh water fisheries in existing reservoirs

All existing reservoirs are small or medium size. The small for a natural capture fishery to develop. Development of a fishery in these reservoirs can only be possible through enhanced or culture based fresh water fisheries, (Chodoma, 1989;FAO, 1987). This method involves regular stocking and harvesting as well as management. Pimp reservoirs could generate revenue through licensing.

Intensive fish farming in some reservoirs

A preliminary survey by section in the lowlands has revealed that about 100 ha of small reservoirs could be used for intensive fish farming. Integration with ducks or pigs could be practised wherever possible to reduce feeding costs. Facilitation of this activity may reduce feeding costs. Facilitation of this activity may require legal change of ownership of some reservoirs. This would be done to ensure proper management of these reservoirs.

Improvement of rural fish farming to increase profitability

Rural fish farming in Lesotho mainly consists of common carp monoculture. Common carp monoculture has proved not to be profitable in Lesotho because of high feeding costs. Polyculture of common carp, catfish and chinesecarps could be practised in order to increase pond productivity. In addition an integrated livestock aquaculture farming systems could be adopted with the aim of reducing feeding costs.

Commercial catfish and trout production

Rural fish farms are not likely to produce more fish than local communities will consume. Commercial fish farming will therefore be necessary to meet the demand in other areas. Catfish production could have the main objective of supplying the fish and chips industry, presently consuming large quantities of imported frozen fish. Trout production could be aimed at the luxury market of hotels and restaurants as well as export market.

Establishment and improvement of fish seed production facilities

The methods discussed above will need large numbers of fingerlings. At present there is only one fish hatchery in the lowlands. The hatchery supplies farmers with common carp fingerlings. Catfish and chinese carps are produced in very small quantities because the hatchery lack facilities for the spawning of these fish. There is a need to improve the present hatchery to facilitate the production of catfish, largemouth bass and chinese carps fingerlings.

There will also be a need to establish a cold water fish hatchery in the highlands. This would be done to facilitate regular stocking of rivers, reservoirs and farms.

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SECTION II: DISCUSSION GROUPS

DISCUSSION GROUPS

1. Livestock Production and Animal Disease Control.

Mr L. Nshubemuki
Mr C. Phiri

Chairperson: Dr M. Mosienyane
Secretary -

Members Dr A.M. Kalake
Mr W.S. Boitumelo
Mr J.M. Lepen
Dr B. Kessy
Prof P. Msolla

To discuss:

1. The status of livestock industry in SADCC and constraints to production, utilization and other aspects.

Marketing, Processing, Storage etc.

2. Gender issues and how they can be addressed and contribute more to livestock.
3. Specific researchable areas in livestock production and forages.
4. Specific researchable areas in animal health.
5. What are issues that can deal with environmental impact assessment.
6. What policy and socio-economic issues that need to be addressed in these areas.
7. Identify uses of animals e.g. for draught power and how these attributes can be enhanced.

2. Forestry

Chairperson: Mr R.W.S. Nyirenda
Secretary -

Members: Mr F.S. Alidi
Mr L.A. Sitaubi
Mr R. Hilbert
Mr N. Maile

To discuss

1. The status of forestry industry in SADCC and constraints to production, utilization and other aspects.

Marketing, Processing, Storage etc.

2. Contribution of Forestry to sustainable resource basis of soils and water.
3. How sustainable production can be achieved.
4. Gender issues: How women can participate in sustainable forestry production and how the quality of life of women can be enhanced through forestry "farming".
5. Identify researchable topics in forestry.

3. Fisheries

1. The status of fisheries industry in SADCC and constraints to increased production/catch, utilization and other aspects.

Marketing, Processing, Storage etc.

2. Gender issues and how they can be addressed in relation to fisheries production.
3. Identify researchable areas/problems in fisheries production.

- Open fresh water

- Open ocean

- Aquaculture

and other aspects of fish farming

4. How SADCC can achieve sustainable fish production and how misuse of the environment or resource basis of soils and water affect fisheries production.

4. Crop Production and Post Harvest Technology

Chairpersons: Dr K. Munyinda
Alternates: Prof A.N. Mphuru
D.: M. Matli

Secretary: -

Members: Dr N.R. Gata
Mr N.M. Lema
Mr F.V. Bester

To discuss

1. Status of crop production in SADCC including production, utilization post harvest technologies, marketing, etc.
2. The status of the natural resource basis of soil, water and air and how these can be used on a sustainable basis.
3. Gender issues and how they can be addressed and contribute more to crop production industries.
4. Identify priority crops (cereals, root crops, horticulture, oilseeds, etc.)
5. Identify priority areas in draught animal power and mechanization.

6. What issues might deal with environmental impact assessment.

7. Socio-political and economic policies that need to be addressed.

5. Wildlife

Members: Mr E.A. Chiwona
Mr G.N. Pangeti

To discuss

1. The status of wildlife in SADCC including management, cropping, domestication, marketing, processing products, etc. Contribution of wildlife to economies of SADCC member states.
2. How wildlife can be managed on a sustainable basis. i.e. wildlife industry enhancement in relation to carrying capacity of the land and water.
3. Wildlife management in relation to environmental degradation.
4. Identify priorities in research on wildlife.
5. Identify how gender issues might affect or relate to wildlife management and utilization.
6. Policy and socio-economic issues that need to be addressed in relation of management and utilization.

SECTION III: SUMMARY AND RECOMMENDATIONS

STATUS OF LIVESTOCK INDUSTRY IN THE SADCC REGION AND CONSTRAINTS TO PRODUCTION, UTILIZATION AND OTHER RELATIVE ASPECTS

The region has a total of 91.6 livestock the breakdown of which is shown below:
(Livestock refers to all stock e.g. cattle, sheep, goats, pigs, poultry, rabbits etc.)

Country	Population*	Cattle**	Small Stock	Goats	Sheep
Angola	9.2m	3.0m	3.3m	1.5m	1.8m
Botswana	1.3m	2.6m	2.4m	2.1m	0.3m
Lesotho	1.8m	0.6m	2.6m	1.0m	1.6m
Malawi	8.4m	0.8m	1.6m	0.8m	0.8m
Mozambique	14.3m	0.4m	0.3m	-	-
Namibia	1.5m	2.0m	5.0m	1.8m	3.2m
Swaziland	0.7m	0.6m	2.0m	0.2m	0.2m
Tanzania	28.3	13.2m	11.3m	6.6m	4.7m
Zambia	7.2m	2.8m	0.6m	-	-
Zimbabwe	10.0m	5.7m	3.1m	2.4m	0.87m
Total	82.7m	31.7m	30.4m	16.4m	13.1m

Calving rate 40 - 50% Milk 150 litres per lactation

* Source Population Reference Bureau, Inc. World Population Sheets, 1989

** Figures are for 1988-89 except for Botswana where they are for 1990

The group observed that over 80% of livestock in the region is in the hands of small holders and the rest in the sector. The animals in the hands of the small holders were characterised by poor production coefficient.

Age at first calving: 3 years.
Calving interval: 18-24 months.
Age at slaughter: 4-5 years (200 kgs)

This has resulted into malnutrition type related disease to about 15% of children under the age of five because of the low per capita intake of animal protein e.g. beef 7.0 kgs p.a.

Poultry meat: 11.0 kgs p.a.
Eggs: 11.0 Eggs p.a.
Milk: 22.0 litres p.a.

NOTED further that the market offtake was quite low ranging from 1-8% while calf mortality was quite high 15-20%.

INDUSTRY: Noted that livestock plays numerous roles in our community but most outstanding were;

- (i) Employment: Over 85% of our people in the region live in the rural areas and are involved in agriculture of one sort or the other. The majority of them keep various

forms of livestock. Thus livestock is one of the biggest employer of our people in the region.

- (ii) Food: Livestock provides us with the much needed protein such as meat, milk, eggs, etc.
- (iii) Energy: Livestock provides us with draught power, biogas and manure which is also used as a fertilizer. They also provide transportation.
- (iv) Livestock products and by-products support livestock related industries such as mohair, wool, tallow, meat and bone meal etc. industries.
- (v) Livestock plays a role of security and other ceremonial functions within the pastoralists community.
- (vi) Import Substitution: Livestock provides many needed products such as meat, milk etc. which otherwise would have to be ordered from outside thus requiring enormous foreign exchange.

Thus livestock contributes significantly to the GDP e.g. Botswana 11.5%. However, this could even be more.

- Unlike minerals and fuel which are non-renewable resources: Livestock is to some extent a renewable resource and thus requires to have a clear and well defined policy on its exploitation.

1. Constraints:

The important constraints to enhanced livestock productivity were identified to be:

- (i) Nutrition - inadequate and poor nutritive value of our natural pastures as a result of climatological and ecological features (rainfall patterns).

Noted further that total land under permanent pasture in the SADCC region was 196,714 square kilometres only out of a total area of 477,121 square kilometres. The breakdown of the land under

permanent pasture is shown below:

Angola	-	29,000
Botswana	-	43,794
Lesotho	-	-
Malawi	-	1,840
Mozambique	-	44,000
Swaziland	-	1,224
Tanzania	-	35,000
Zambia	-	35,000
Zimbabwe	-	4,856

Figure for Namibia - NOT available.

- (ii) Diseases - Noted that some countries did not have legislation for animal diseases and where legislation are available, they are not observed strictly.
- NOTED that a number of such as trypanosomiasis, tickborne disease, helminthiasis, FMD etc. still did not have effective and safer control methods.
- (iii) Genetics - Noted that although our animals survive well under the harsh climatic conditions their productivity is poor. There was therefore need to improve their environment as well as introducing new genes to make them more productive without losing their good traits.
- There is need to preserve the germ plasm (Gene bank) of the animals which we have.
- (iv) Low prioritisation for livestock programmes in resource allocation by Governments should be urged to allocate more resource to the livestock sector.
- (v) Incentives for researchers and extension workers should be instituted by Governments in order to retain scientists.
- (vi) Training skilled manpower and in particular researchers should be given priority. There is still need to have skilled researchers in the region.

- (vii) Availability of breeding stock e.g. heifers. A lot of people would like to go into livestock keeping but there is an acute shortage of for example dairy heifers in the region.
- (viii) Availability of breeding stock eg. heifers. A lot of people would like to go into livestock keeping but there is an acute shortage of for example, dairy heifers in the region.
- (ix) Marketing, in most countries there does not exist a clean and well defined policy on livestock marketing, pricing and processing systems such that some of the byproducts eg. blood, bones, hoorts, horsn etc are not properly utilised.

2. Gender Issues

Observed that there are more women than men and they form bigger workforce in the region. Thus the role of women in development needed special attention.

NOTED further that women were already involved in livestock industry by keeping poultry, goats, sheep, rabbits and dairy animals. They are also responsible for the making of Ghee, butter etc. by using very primitive tools. Recommended that development of simple technology to make their work easier should be given due emphasis.

Recommended further that women should be encouraged to join the veterinary profession so that ultimately they can become effective researchers and extension personnel.

3. Specific Research areas in Livestock Production and Forages

NOTED that a lot of research has been done by National Agricultural Systems. Urged SACCAR to try and retrieve what has already been done and use it as a baseline for further research in the region.

However, research should concentrate on:

Nutrition: - Rangeland improvement programmes including water

conservation.

- Qualitative analysis of available pasture.

- Pasture - establishment of gene banks of the available pasture as well as production of pasture seeds for farmers. Forage harvest, utilisation, preservation and storage. Use of agro-industry byproducts such as maize, stover, cotton seed, sisal waste, molasses etc. Formulation of livestock feeds using locally available resources.

(ii) Production: Conservation of the indigenous germ plasm.

- Introduction of new germ plasm to enhance productivity without losing good traits.

- Develop clearly defined policy on breeding

- Small stock to be given emphasis.

4. Specific Researchable areas in Animal Health

(i) Diseases - Emphasis to be given to epidemiological studies and control of animal diseases.

- The role of wildlife in the epidemiology of livestock diseases.

- Research into safe and efficient vaccinations and other biologicals.

- Medicinal plant research for veterinary use.

- Toxicological studies.

- Drug resistance e.g. dip wash, trypanocides.

- (ii) Production related problems.
- Infertility - research on the infertility syndrome which may be caused by reproductive diseases e.g. brucellosis, vibriosis, trichomoniasis etc.
 - Hormonal disorders - resulting into silent heat anoestrus etc.
 - Calf mortality - to establish the actual causes viz: diseases, malnutrition.

(iii) Diseases of public health concern i.e. zoonoses. e.g. salmonellosis, tuberculosis etc.

(iv) Use of cows for draught power.

5. Issues that deal with environmental impact assessment

Observed that environmental degradation (desertification) caused by livestock was a result of overstocking, livestock husbandry system under practice, the land tenure system and the impact of chemicals on the environment.

RECOMMENDED that there is need to have a proper assessment of the carrying capacity of our rangelands and that there is need to do research on the livestock husbandry systems and a policy on the land tenure system. Sustainable land use livestock husbandry system was recommended.

6. Policy and Socio-economic issues that need to be addressed to.

- (i) Policy: Recommended livestock in:-
- Animal breeding
 - Livestock husbandry system (sustainable land use)
 - Land tenure system
 - Livestock marketing policy

- (ii) Socio-economic:
- Gender issues - women to join the profession.
 - Culture - need for public education e.g. use of animal products.
 - Religious - beliefs e.g. not to vaccinate animals.

7. Identify uses of animals

- Employment for people
- Food e.g. meat, milk, eggs etc.
- Energy - power, biogas, transportation etc.
- Livestock products support livestock related industries e.g. hides, skins, mohair, wool, dairy products etc.
- Import substitution.
- Security and ceremonial rituals.

8. Biotechnology

NOTED that this was a powerful research and development tool. Recommended that appropriated biotechnology for diseases diagnosis treatment, control and improved productivity should be adopted.

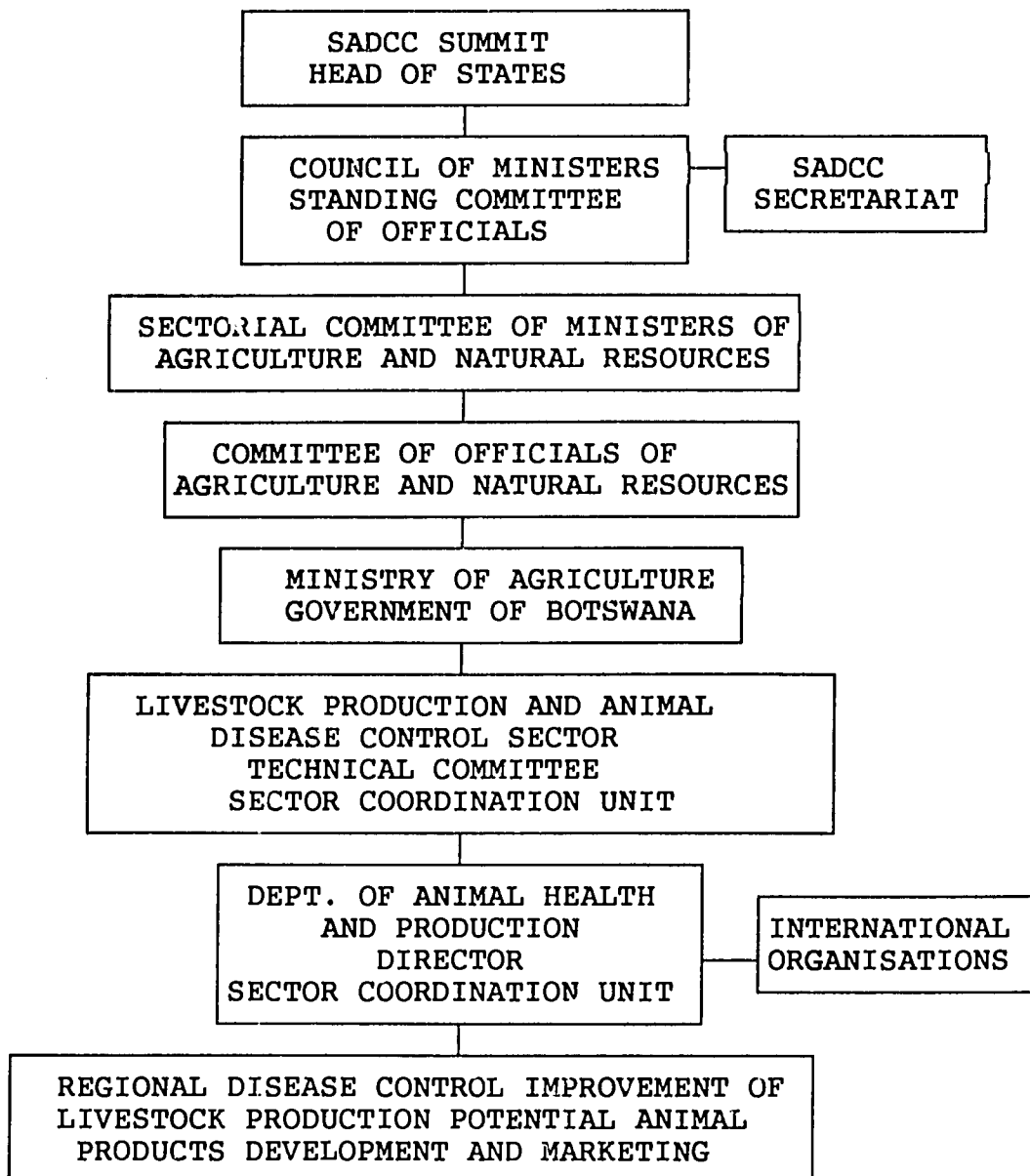
9. Regional Animal Health Projects

RECOMMENDED strongly that there was need to develop regional animal health projects even if it meant a few countries to start with.

10. Recommendations

- (i) Universities to introduce biotechnology courses in the region.
- (ii) Governments to form Ministries of the Environment in the region.

FIGURE 1: ORGANISATIONAL RELATIONSHIPS OF THE LIVESTOCK PRODUCTION AND ANIMAL DISEASE CONTROL SECTOR AND SADCC.



FORESTRY RESEARCH CONSTRAINTS AND PROPOSALS 1990-2000

FORESTRY

ITEM 1: The status of forestry and forestry industry in SADCC and constraints to production, utilization and aspects of marketing, storage and processing etc.

growing stock in comparison with the tropical rain forest. It is difficult to obtain

economic returns from forests.

A. Institutional Constraints

- (i) There is general lack of appreciation on the importance of indigenous forest resources.
- (ii) Political and social support is lacking in some cases. Out of ten SADCC countries, eight have policy statements on forestry which, in some countries appear under other policies, notably agriculture. Furthermore, the policies have not been approved including policy statements on forestry research except in four member states.
- (iii) Manpower is in short supply (at all levels).
- (iv) Forest education institutions are inadequate at professional, technical and vocational level.
- (v) Financial resources are limiting.
- (vi) Unavailability of forestry extension packages.

(iv) Industrial plantations are dominated by exotic softwoods. This has led to concentration of research efforts on their establishment and utilization at the expense of indigenous forests in the region.

(v) Because of high population growth rates in the region, forests face pressure in the form of encroachment and deforestation for agricultural expansion and satisfaction of fuelwood and polewood demand.

B. Forest Related Constraints

- (i) A continuous inventory of indigenous forest resources is lacking and this leads to the unavailability of management plans.
- (ii) Unfavourable natural conditions effect forestry and the forestry industry.
- (iii) The indigenous woodlands of the region (Savanna Woodland) have a relatively poor

C. Research Constraints

- (i) Forestry research in the SADCC region is not well developed to address institutional and forestry related constraints mentioned above.
- (ii) Forestry research has concentrated mainly on exotic species, especially in areas of silviculture.
- (iii) The coverage of utilization research of forest products is also inadequate.

D. Marketing Constraints

- (i) Foreign exchange earning drive does not encourage trade promotion of forest products between SADCC member states.
- (ii) Lack of standardization of forest products produced in the region discourage promotion of trade within the region and between the region and international markets.

E. Processing Constraints

- (i) The region lacks appropriate technologies in wood processing and appropriate technologies in wood storage.

ITEM II. Contribution of forestry to sustainable resource basis of soils and water.

- (ii) Furthermore, the forest protects water catchment areas, reduces the sediment load in streams thereby reducing turbidity and promotes water recycling. All these lead to a substantial water supply for a variety of uses like industrial and domestic.
- (iii) The forest through soil aeration stabilization, nutrient recycling, nitrogen fixation, regulation of water flow, increase in infiltration and water holding capacity of soils, and micro macroclimatic influences, ensures that of soil productivity is sustainable.

ITEM III Achieving Sustainable Forest Production. The working group noted that contributions from two sectors are needed in order to achieve sustainable forest production.

Institutional Strengthening

- (i) Soliciting political and social support.
- (ii) Human Resource Development.
- (iii) Availability of equipment.
- (iv) Provision of a continuous financial support.
- (v) Prevention of bush fires.

Forestry Technical Programmes

- (i) Preparation of continuous forest inventories leading to the preparation and revision of management plans.
- (ii) Protection of forest reserves.
- (iii) Conservation of endangered plants and

tree species.

- (iv) Devising proper extension packages.
- (v) Instituting proper processing, storage, marketing and utilization practices.
- (vi) Mounting proper and coordinated pure applied research.

ITEM IV Gender issues: women in participation in sustainable forestry production and enhancement of the quality of life of women through forestry.

The working group recognized that for effective participation of women in forestry production we need to:

- (i) Ensure effective participation of women at professional, technical and vocational levels.
- (ii) Involve women in planning, implementation and evaluation of social and community forestry programmes.
- (iii) Involve women in planning, implementing and evaluating agro-silvo-pastoral projects.

The working group recognized that the quality of life of women can be enhanced through:

- (i) Establishing plantations and woodlot near the villages for the supply of fuelwood and poles.
- (ii) Involve women in planning, implementation and evaluation of social and community forestry programmes.
- (iii) Involve women in planning, implementing and evaluating agro-silvo-pastoral projects.

The working group recognized that the quality of life of women can be enhanced through:

- (i) Establishing plantations and woodlot near the villages for the supply of fuelwood and poles.

- (ii) Involvement of women in decision making, especially on forestry issues affecting them.
- (iii) Devise wood processing projects involving women.
- (iv) Involve women in the sharing of community forestry benefits.

ITEM V: Identified researchable topics in forestry. The group recognized that current forestry research activities are biased towards exotic tree species. Emphasis must now shift towards total inclusion of indigenous tree species, socio-economic as well as environmental studies in all forestry research programmes. The following were identified researchable topics and classified below:

General

- (i) Continuous forest resource inventory of indigenous and exotic tree species.
- (ii) Site evaluation, both social and physical.
- (iii) Wood demand and supply studies.
- (iv) Natural regeneration studies.
- (v) Rehabilitation of marginal lands (phyto reclamation).
- (vi) Studies on increasing biomass production.
- (vii) Agro-silvo-pastoral research.
- (viii) Studies on environmental forestry including environmental impact assessment.
- (ix) Industrial forestry research notably on processing, utilization, and marketing.
- (x) Research on appropriate research techniques for the region.

- (xi) Forestry industry research management.

Indigenous Tree Species

- (i) Species and provenance trails.
- (ii) Nursery and establishment techniques.
- (iii) Tree/Stand management.
- (iv) Wood properties.
- (v) Wood processing studies.

Wood Energy

- (i) Fuelwood and charcoal production research.
- (ii) Efficient wood utilization by introduction of proved wood stoves.

Protection

- (i) Forest entomology
- (ii) Forestry pathology
- (iii) Forest fire control
- (iv) Ecological studies including vermin damage.

Social Forestry

- (i) Socio-economic studies and policy analysis with special emphasis on gender issues.

For items (ii) and (iii), go to page 55 (top).

Summary of status of agriculture in SADCC and recommendations

STATUS OF CROP PRODUCTION AND POST HARVEST TECHNOLOGY IN SADCC

	<u>FOOD</u>	<u>EXPORT</u>	<u>CASH</u>	<u>EMPLOYMENT/ INDUSTRY</u>
Cereals:				
Maize	X		X	
Rice	X	X	X	
Wheat	X		X	
Barley	X		X	X
Sorghum	X		X	X
Finger Millet	X		X	X
Legumes:				
Cowpeas	X		X	
Beans	X		X	X
Peas	X		X	
Soybeans	X		X	
Bambara Nuts	X		X	
Groundnuts	X		X	
Chickpeas	X		X	
Pigeon Peas	X		X	
Oil Seeds:				
Sunflower			X	X
Sesame			X	X
Castor			X	
Palm Oil	X			
Coconut	X			
Horticulture:				
Traditional				
Vegetables	X		X	
Exotic Fruits	X		X	
Traditional				
Nuts	X		X	
Exotic Nuts	X	X	X	
Floriculture				
		X	X	

- (ii) Moisture is limiting. Apparently the main cycle seems to have changed. In other countries rains come early and end early too. In others rains are late and crops are frost beaten. The change is attributed to the polluted atmosphere - The greenhouse effect.
- (iii) Pest: Pest control is becoming very expensive.

Post harvest Technologies

- (i) Storability of some crops was said to be difficult - dents are soft, hence easily destroyed in storage.
- (ii) Home oil extraction from sunflower was encouraged, and the cake be sold to livestock owners as cake.
- (iii) It was indicated that farmers need to erect better storage facilities if post harvest losses are to be curbed.

Marketing

It was recommended that there should be better marketing structures created; local, national and international marketing structures to act as incentives to farmers.

2. Status of the Natural Resource Bases

- **Soil:** Although the region has good soils, most soils have difficult soils like Verticols and Duplex soils. These soils require good management.
 - **Water:** Water harnessing and harvesting should be a priority especially in areas that are always under dry spells.
 - **Air:** Agroforestry should be practised to ensure the cleansing of the atmosphere.
- #### **3. Gender issues and how they can be addressed**

It was indicated that women play a very important role in crop production. It was, therefore, proposed that:

- (i) Whenever machinery to be used are designed they should be borne in mind.
- (ii) Whenever new crops are introduced, housewives should be consulted first for acceptability.

4. Priority Crops

- Cereals:** Maize, rice, wheat and sorghum.
- Legumes:** Beans, cowpeas, groundnuts and pigeon peas.
- Oilseeds:** Sunflower and sesame.

	<u>FOOD</u>	<u>EXPORT</u>	<u>CASH</u>	<u>EMPLOYMENT/ INDUSTRY</u>
Roots and Tubers:				
Cassava	X	X	X	
Sweet Potatoes	X	X		
Irish Potatoes	X	X		
Yams	X	X		
Livingstone Yams	X	X		
Fibre:				
Cotton		X	X	
Keraf		X	X	
Sisal		X	X	
Beverages:				
Coffee		X	X	X
Tea		X	X	X
Cocoa		X	X	X
Spices:				
Traditional	X	X		
Exotic	X	X	X	
Medicinals:				
Traditional		X	X	X
Exotic		X	X	X
Sugar	X	X	X	X
Tobacco		X	X	X

NB: X indicates the utilization of the crop, whether it is food, it is for export, it is a cash crop or whether it is used to create an industry that employs local people.

PRODUCTION

Technology generation is ahead of extension towards the increased production of most cash crops especially. There, still are production constraints, though:-

- (i) Poor Soil Fertility: Most soils in SADCC

have depleted organic matter, hence lack nutrients. Artificial fertilizers increase primarily by the day.

- Horticulture:** (i) Traditional vegetables, fruits and nuts.

- (ii) Exotic vegetables, fruits and nuts.

Root and Tubers: Cassava, Irish potatoes and sweet potatoes.

Fibres: Cotton

Beverages: Tea

Others: Sugar and tobacco

5. Areas in draft animals and mechanization

Since women do a bulk of crop production work in the SADCC region, machinery used should be light enough for them to be able to use.

6. Others

Crop Production Policy: It was observed that most SADCC countries have clear agricultural policies, but lack specific crop production policies. It was, therefore, proposed that SADCC countries should be solicited to produce them.

Holistic Approach: It was indicated that crop production is systematic. It follows a circular chain; any weak link weakens the whole process.

Additional specific constraints to crop production were high-lighted and discussed as follows:-

(a) Low Soil Fertility

This covers a bigger part of the SADCC region, and hence a most important constraint to increased food production.

(b) Draught Power

Most countries in SADCC use animal power for planting and yet very few farmers possess their own animals. Some will hire and this delays their planting time until after optimum dates are past.

(c) Late Decision Making

SADCC countries that export men to RSA as

migrant labourers face a dilemma of late decision making. Decisions are made by men as to what crop to plant. In most cases, such decisions reach home after optimum planting dates. There is need to give women more power to make decisions.

(d) Input Supplies

Due to poor infrastructure in some SADCC countries, purchased inputs are either hard to come by or reach areas where they are needed very late.

(e) Poor Linkage between Research and Extension

Linkages between research and extension, in most SADCC countries, are very poor. As a result, technology dissemination is also poor.

(f) Human Resource Development

Some countries in the region are very low in needed critical masses. There is still great need to develop skills of their researchers.

(g) Marketing

The marketing infrastructure is still very poor in most countries of the region. There are no clear marketing policies in place.

Major Themes to Investigate

The region already has a lot of generated knowledge and technologies that can be utilized to enhance crop production. However, more work still remains to be done especially in the following areas:

- (i) Adaptability to different agro-ecologies in the region.

- (ii) Pest control techniques:

- Emphasis should be given to common diseases such as maize streak.

- Ways to annihilate insects such as cutworms and stalkborers as well as locusts, should be investigated.

- (iii) Management - Better ways of utilizing social scientists to improve farmers'

- management skills should be investigated.
- (iv) Soil/water/plant relationships: Issues that pertain soil/water/plant productive relationships should be investigated.
 - (v) Integration of trees and crops: Trees and crops be planted together to determine their effect on the environment.
 - (vi) Breed crops that have a better storage quality.
 - (vii) Investigate further possibilities of industrialization in the crop production sector e.g. oil extraction, flour products.
 - (ix) Marketing: In most countries there does not exist a clear and well defined policy on livestock marketing, pricing and processing systems such that some of the by-products e.g. blood, bones, hoorts horus etc. are not properly utilised.

FISHERIES

A. Constraints

1. Captive fisheries (Inland and marine)
 - Inadequate knowledge of resources
 - (i) Fish species composition distribution
 - (ii) Exploited stocks
 - (iii) Unexploited stocks, can lead to over exploitation or under exploitation
- Inadequate knowledge of the best methods of harvesting especially in fresh water fisheries.
- Inadequate knowledge for fish enhancement culture based fisheries and aquaculture.
- Problems in designing methods for data collection and analysis for monitoring fish production.
- Large volumes of by-catches not utilised.

2. Processing

- High losses during handling, processing and storage.
- Rapid deterioration of quality.
- Inefficient traditional fish processing methods.
- Inadequate storage facilities.
- Inadequate knowledge of alternative fish products development.

3. Marketing distribution

- Great distances between production centre and markets.
- Uneven distribution of fish.
- Demand is constrained by tradition.
- Inadequate marketing infrastructure.
- Lack of storage facilities while in transit markets.

4. Other constraints

- Lack of trained manpower.
- Lack of incentives to attract and maintain scientists.
- Land tenure - some.
- Financial constraints.
- Some countries lack well defined fisheries sector and sector plans.

Research areas - not in order of priority capture fisheries.

- Assessment of stocks
- Carry out studies on fish population dynamics with a view to establish:
 - (i) recruitment patterns
 - (ii) natural and/or fishing mortality
 - (iii) growth patterns
 - (iv) maximum biological yield
- establish/design a data collection system to include:
 - (i) catch and/or effort

- (ii) economics of fishery
- carry out socio-economic studies of the fishing industry (commercial/artisanal)
- carry out resource inventory to establish:
 - (i) fish species composition
 - (ii) fish distribution

Develop technologies suitable for harvesting fish by small and large scale fishermen in different types of environment and for different species.

- carry out limnological studies to determine aspects of environment that affect fish population dynamics and establish monitoring programmes.
- carry out studies of noxious aquatic weeds affecting fish production for purpose of:
 - (i) spot fishery
 - (ii) culture - based fresh water fisheries
 - (iii) ornamental fish trade
 - (iv) fish farming
- carry out studies on the performance of these fish species under different culture systems.
- carry out studies on fish feed formulation using local ingredients.
- carry out suitable biotechnological studies on local fish species to enhance:
 - (i) seed production
 - (ii) feed utilisation

- (iii) disease resistance
- (iv) growth performance
 - carry out studies on socio-economic constraints with emphasis on:
 - (i) technological transfer
 - (ii) fish species consumption and utilisation
 - studies on fish pathology especially in intensive fish culture.
 - carry out limnological studies in relation to any aquaculture systems.

Processing, marketing and distribution

Survey of traditional fish processing methods in order to assess:

- efficiency/inefficiency
- economics
- design of methods appropriate for both small and large scale fishermen.
- studies on pests causing spoilage and possible control measures, biological, chemical and physical methods.
- assess the socio-economic impact of various fish processing methods.
- investigate on alternative utilisation of fish catches and by-catch and assess acceptability at the market.

Human resources Development (i.e. at all levels)

Within SADCC there are few trained professionals in fisheries and aquaculture. There is therefore, need to engage in a vigorous training programme in

these areas. We do recognize that SACCAR has recommended a number of institutions to take responsibility for training in forestry. The fisheries group recommends strongly the same institutions should be developed to train people in fisheries (freshwater, marine) and aquaculture disciplines. Other disciplines that can be developed are natural resources economics and wildlife.

Fisheries sector national plans

It is well recognized that not all countries represented at this meeting had natural fisheries plans. Assistance should be given to those countries to generate their own fisheries plans in a view to streamline development. When these fisheries plans are generated, we hope national governments may see where fisheries development fits into the national economy. With such knowledge, institutional support in terms of adequate budgets will be favourably considered.

Gender - issue

In capture fisheries men are involved in fish production while women are involved in the processing marketing and preparation of fish in aquaculture the production, processing, marketing and preparation of fish is done mostly by women.

Gender analysis should be undertaken/included in project formulation to avoid possible over burdening of one sex group (distribution of job assignments between genders). Methods of production, marketing and processing should be assessed on the basis of the sex group mostly involved. Effect of the environment SADCC can only achieve sustainable yields if fishery resources and aquatic environment are utilised to their highest potential. Sustainable yields depend on assured good health of the aquatic environments. Aquatic environment on the other hand depend on good watershed management. Activities within catchment especially use of chemicals in agriculture, deforestation, urbanisation, industrial effluents and bad land use. threaten sustainable yields from aquatic environments. Measures should be taken to minimize and monitor pollutants entering the aquatic environment.

WILDLIFE RESEARCH PRIORITY IDENTIFICATION

Status in Wildlife	Resources and Tourism.
1.1 Wildlife legal status in SADCC states	1.1.7 Zambia: The administration of the Wildlife Estates falls under the Department of National Parks and Wildlife Service in the Ministry of Tourism. The wildlife in Zambia is administered in accordance with the provisions of the National Parks and Wildlife Act and ancillary legislation.
1.1.1 Botswana: The Department of Wildlife and National Parks in the Ministry of Commerce and Industry is responsible for wildlife management. The wildlife management policies are guided by the National Parks Act and Fauna Conservation Act.	1.1.8 Zimbabwe: The wildlife in Zimbabwe falls under the Parks and Wildlife Act, 1975 as amended in 1982. The administration of wildlife is under the Department of National Parks and Wildlife Management in the Ministry of Environment and Tourism.
1.1.2 Lesotho: Despite very limited wildlife resources in Lesotho, there is National Parks Act to guide wildlife management policies.	
1.1.3 Malawi: The wildlife management policies are guided by the National Parks Act and the Game Act both of which are in the Ministry of Forestry and Natural Resources. Department of National Parks and Wildlife is responsible for the administration and control of wildlife matters.	Note There is no information available with respect to Mozambique and Angola.
1.1.4 Namibia: The overall responsibility lies with the Ministry of Wildlife Conservation and Tourism. The Directorate of Wildlife Conservation and Research. Since Namibia is newly independent, a new policy for wildlife management is being formulated.	1.2 Wildlife Population Status in SADCC States Not all SADCC states have up to date population numbers of wildlife species occurring in their countries. This therefore means that the status of wildlife population in the region, particularly outside protected areas is not accurately known. This therefore calls for both regional and national wildlife population inventories in order to determine the potential for utilization.
1.1.5 Swaziland: The Swazi Government recognizes that there is insufficient legislation in protecting and managing the wildlife resource, and, therefore, the Government is currently reviewing the legislation with a view to provide better protection of the resource.	1.2.1 In the absence of accurate wildlife population inventories, SADCC states have not realised the full potential of wildlife both as a source of protein and economic development. In most areas where wildlife occurs, the environments are not suited to conventional agricultural production due to low rainfall, poor soils, occurrence of tsetsefly and seasonally inaccessible. The economic potential of wildlife based tourism is not readily recognised. These
1.1.6 Tanzania: The wildlife management is administered in terms of the Wildlife Conservation Act and the National Parks by a Board of Trustees. These are both under the Ministry of Lands, Natural	

areas could generate substantial foreign currency earnings from hunting safaris, photographic safaris, walking safaris in addition to creating employment for the people who live in the communal lands.

1.2.2 The marketing of wildlife products, particularly venison, to the urban markets as well as the international markets has not been developed to its full potential because of veterinary controls. It is therefore desirable to conduct joint research into livestock and wildlife diseases.

1.2.3 In most SADCC states the preparation techniques of wildlife products is not well developed. This leads to low value goods being put on the market. There is therefore need to develop appropriate technologies for the preparation of hides, skins and curios.

In those countries where tanneries have been established such as Botswana, Zimbabwe, Zambia and Malawi high quality techniques have not been developed to produce skins and hides to internationally acceptable standards particularly those of crocodile, elephant and ostrich. It is therefore desirable to develop techniques that will enable the region to process and export high quality products that compete favourably on the international markets.

2. Wildlife and environmental management for sustainable development in the SADCC states.

In general, the SADCC states have not recognised wildlife as an important sector in national plans for socio-economic development. Most land use plans that have been developed ignore wildlife completely. There has been lack of significant sustained effort to include the evaluation, development, management and utilisation of wildlife in national development plans. Where planning for wildlife in national management utilisation has taken place, the local people have not been fully involved and often have not received a fair share of the benefits that accrue. In order to reduce environmental

degradation, we need to: r) initiate active environmental degradation awareness campaigns to educate the people; b) ensure that the benefits of wildlife resources management accrue to the people who co-exist with the wildlife and c) involve the local communities in the drawing up of land use plans.

3.0 **Priorities in research on wildlife management and conservation for sustained economic development.**

3.1 There is need to conduct in depth research into human/natural resource interactions. These should lead to the evaluation of social, cultural and/or traditional perceptions for improved environmental management.

3.2 There is need to research into mono or multiple wildlife species domestication or ranching programmes in order to determine the economic viabilities and their biomass productive potential.

3.3 In conjunction with veterinary researchers, there is need to research into wildlife/livestock diseases. This is mainly to determine modes of transmissions and make recommendations to limit these depending on research findings.

3.4 There is need to research into the effects of agro-chemicals on the environment in general and wildlife species in particular. These chemicals might have an adverse effect on fish, birds, and mammals.

4. **Human Resources Development and Training**

Major constraint in human resources development is that most Governments in SADCC are not able to retain qualified professional scientists because of low salaries and lack of incentives. Very often these scientists lack the equipment with which to do their work. It is recommended

that researchers working on SADCC projects receive remuneration according to UN or SADCC rates which would have to be worked out and approved by heads of Governments.

With respect to training and manpower requirements, SACCAR is urged to consult with the Sector Coordinator for Forestry, fisheries, and wildlife who have already got detailed requirements for all SADCC member states.

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