REPUBLIC OF NAMIBIA

MINISTRY OF AGRICULTURE, WATER & RURAL DEVELOPMENT

NORTHERN REGIONS DEVELOPMENT PROGRAMME (NRDP)

INTERIM REPORT VOLUME 1
MAIN REPORT

DATE: SEPTEMBER 1993

Funded by: THE AFRICAN DEVELOPMENT FUND
Prepared by: MASDAR ZAMBIA Ltd.
In association with:
BURMEISTER VAN NIEKERK & Partners
8 Eugene Marais Street
9000 WINDHOEK
Tel. (061) 37193
POBox 1496
Fax 34628
PART I  DIAGNOSIS OF THE CURRENT SITUATION

Chapter A  INTRODUCTION TO PART I (CHAPTERS A-J)

1. OBJECTIVES  
2. METHOD  
   2.1 Staff  
   2.2 Literature Review  
   2.3 Consultations  
   2.4 Field Reconnaissance  
   2.5 Aerial Photography  
   2.6 Visits  
   2.7 Attendance  
   2.8 Analysis

Chapter B  OWAMBO

1. CLIMATE  
   1.1 Rainfall  
      1.1.1 Trend  
      1.1.2 Variability  
      1.1.3 Rainfall Distribution  
   1.2 Temperature and Potential Evapotranspiration
   1.3 Discussion

2. DESCRIPTION OF SOILS AND VEGETATION  
   2.1 Physiography  
      2.1.1 The Etaka-Cuvelai Drainage Basin  
      2.1.2 The Western and Southern Plains  
      2.1.3 Grey Loose Sands  
   2.2 Soils  
      2.2.1 Solonetz Soils  
      2.2.2 Aeolian Sands  
      2.2.3 Sandy Soils

3. PRESENT LAND USE AND HUSBANDRY SYSTEMS: CROPS  
   3.1 Land Use  
   3.2 Farming System  
   3.3 Crops  
      3.3.1 Introduction
2.1.3 Mopaneveld

2.2 Soils

3. PRESENT LAND USE AND HUSBANDRY SYSTEMS: CROPS

3.1 Land Use

3.2 Farming System

3.3 Crops

3.4 Mechanisation

3.5 Conclusion

4. LIVESTOCK

4.1 General

4.1.1 Rangeland

4.1.2 The People

4.2 Livestock and Management

4.2.1 Livestock Numbers

4.2.2 Management

4.2.3 Small Stock

4.2.4 Nutrition

4.2.5 Diseases and Losses

4.2.6 Water

4.2.7 Payments for Services

4.2.8 Marketing

4.2.9 Crops

4.3 Agro-support Systems

4.3.1 Namibia National Farmers Union

4.3.2 National Agricultural Union

4.3.3 Cooperatives

4.4 Institutions

4.4.1 Extension Service

4.4.2 Veterinary Services

4.5 Projects and NGOs

4.6 Conclusions

5. AGROFORESTRY

6. WILDLIFE

7. ENVIRONMENTAL IMPACTS

8. ASSESSMENT OF POTENTIAL

8.1 Introduction

8.1.1 Solonetz Soils

8.1.2 Planosols

8.1.3 Red Sands

8.1.4 Brown Sandy Loams

8.2 Determination of Over and Under-used Areas

8.3 Identification of Areas with Potential for Intensification

8.4 Identification of Degraded Areas

Chapter E OKAKARARA DISTRICT

1. CLIMATE

1.1 Rainfall

1.2 Temperature and Potential Evapotranspiration

1.3 Discussion

2. DESCRIPTION OF SOILS AND VEGETATION

2.1 Physiography

2.1.1 The Central Kalahari Sandveld

2.1.2 The Southern Kalahari Sandveld

2.2 Soils

3. PRESENT LAND USE AND HUSBANDRY SYSTEMS: CROPS

4. LIVESTOCK

4.1 General
4.1.1 Rangelands 73
4.1.2 The People 73
4.2 Livestock and Management 74
4.2.1 Livestock Numbers 74
4.2.2 Management 75
4.2.3 Small Stock 77
4.2.4 Nutrition 77
4.2.5 Diseases and Losses 77
4.2.6 Water 78
4.2.7 Payments for Services 79
4.2.8 Marketing 79
4.2.9 Crops 80
4.3 Farmer Categories 81
4.4 Credit 82
4.5 Agro-support Systems 83
4.5.1 Farmers Associations 83
4.5.2 Namibia National Farmers Union 83
4.5.3 National Agricultural Union 83
4.5.4 Cooperatives 83
4.6 Institutions 84
4.6.1 Extension Service 84
4.6.2 Veterinary Services 84
4.6.3 Traditional Authorities 84
4.7 Projects and NGOs 84
4.7.1 SARDEP 85
4.7.2 NGOs 85
4.8 Conclusions 85
4.8.1 Culture 85
4.8.2 Psychology 86
4.8.3 Rangeland and Management Improvements 86
4.8.4 Other Projects 86

Chapter F SOCIAL ECONOMICS OF THE MAIN FARMING SYSTEMS 96
1. DEMOGRAPHY AND HOUSEHOLD STRUCTURE 96
2. OCCUPATION AND INCOME 98
3. SOCIAL ORGANISATION AND LEADERSHIP 100
4. INPUT USE AND CULTURAL PRACTICES 101
4.1 Ownership of Farming Equipment 102
4.2 Use of Draught Animals 102
4.3 Use of Fertilisers 102
4.4 Fencing 103
4.5 Credit 103
5. ACCESS TO LAND, SIZE OF HOLDINGS AND SPATIAL ARRANGEMENTS 103
6. GENDER RELATIONSHIPS AND PRIORITIES 105
7. SEASONAL LABOUR REQUIREMENTS 107
8. RESOURCE ALLOCATION: PRIORITIES AND CONSTRAINTS 108
### Chapter G
**FOOD DEMANDS AND SUPPLY PATTERNS**

1. PATTERNS OF FOOD SUPPLY AND DEMAND
2. GROSS REQUIREMENTS AND REGIONAL PRODUCTION
3. TRADE PATTERNS AND IMPORT SOURCES
4. HOUSEHOLD NUTRITION AND FOOD SECURITY
5. EXISTING MARKETING MECHANISMS

### Chapter H
**TRADITIONAL LAND TENURE SYSTEMS**

1. INTRODUCTION
2. THE LEGAL FRAMEWORK
3. CUSTOMARY LAND TENURE IN THE NORTHERN REGIONS TODAY
4. FEATURES OF TRADITIONAL TENURE
5. ATTITUDES TO LAND REFORM
6. APPROACHES TO LAND REFORM

### Chapter J
**INFRASTRUCTURE**

1. **POWER**
   1.1 Introduction
   1.2 Power Supply in Ovamboland
   1.3 Power Supply in Okavango
   1.4 Power Supply in Caprivi
   1.5 Power Supply in Okakarara District

2. **ROADS, RAILWAYS AND AIRSTRIPS**
   2.1 Introduction
   2.1.1 Basic Background
   2.1.2 Role of Department of Transport
   2.1.3 Definitions
   2.2 Railways
   2.3 Airports
   2.4 Situation in Ovamboland
   2.4.1 Pre-Independence Developments
   2.4.2 Post-Independence Developments
   2.4.3 Current Construction
   2.4.4 Planned Schemes
   2.4.5 Major Problems
   2.5 Situation in Okavango
   2.5.1 Pre-Independence Developments
   2.5.2 Post-Independence Developments
   2.5.3 Current Construction
   2.5.4 Planned Schemes
   2.5.5 Major Problems
   2.6 Situation in Caprivi
   2.6.1 Pre-Independence Developments
   2.6.2 Post-Independence Developments
   2.6.3 Major Problems
   2.7 Situation in Caprivi
   2.7.1 Pre-Independence Developments
   2.7.2 Post-Independence Developments
   2.7.3 Major Problems

3. **WATER SUPPLY**
   3.1 Introduction
   3.2 Ovamboland
   3.3 Okavango
   3.4 Caprivi
   3.5 Okakarara District

4. **POST AND TELECOMMUNICATION SERVICES**
   4.1 Introduction
PART II DEVELOPMENT CONSTRAINTS AND OPTIONS

Chapter K INTRODUCTION
1. OBJECTIVES
2. METHODOLOGY

Chapter L REVIEW OF MAJOR ONGOING AGRICULTURAL DEVELOPMENT PROJECTS AND PROJECTS UNDER CONSIDERATION BY MAWRD
1. ONGOING PROJECTS
2. MAJOR PROJECTS UNDER CONSIDERATION BY MAWRD

Chapter M ALTERNATIVE LAND USE OPTIONS; NORTHERN REGIONS
1. HUSBANDRY SYSTEMS - CROPS
1.1 Introduction
1.2 Traditional Strategies
1.3 Opportunities for Intensification and Diversification
1.3.1 Farm-yard Manure
1.3.2 Draught Power
1.3.3 Planting Configurations
1.3.4 Draught Equipment
1.3.5 Seed Security
1.3.6 Inter-cropping
1.3.7 Cowpeas
1.3.8 Sorghum
1.3.9 Rice
1.3.10 Groundnuts
1.3.11 Sugar Cane
1.3.12 Mango
1.3.13 New Cash Crops
1.4 Supportive Services
1.4.1 Research in the Northern Regions
1.4.2 Present Research Activities - Northern Regions
1.4.3 Research Station Network and Staffing in the Northern Regions in the 1992-3 Season
1.4.4 Issues and Constraints
1.5 Extension Services
1.5.1 Background
1.5.2 Government Strategy
Chapter N

LAND TENURE POLICY OPTIONS

1. INTRODUCTION
2. PRIORITY REQUIREMENTS
3. A PLAN OF ACTION
   3.1 A Direct Commitment Land Reform in the Northern Regions
   3.2 Responsibilities of Central Government
   3.3 Strengthening Local Level Capacity to Support Land Management and Tenure Reform
   3.4 Traditional Leaders
4. REGIONAL LAND USE PLANNING
5. A COMMUNITY-BASED APPROACH TO LAND MANAGEMENT AND TENURE REFORM
6. REDUCTION OF DEPENDENCY ON COMMUNAL RANGELANDS
7. ADOPTION OF AN EXPERIMENTAL APPROACH TO LAND MANAGEMENT AND TENURE REFORM
8. LAND MANAGEMENT AND TENURE REFORM IN THE NORTHERN REGIONS
   8.1 Institutional Support at the Regional Level
   8.2 Development of a Community-Based Land Management Model
   8.3 Partnership with Government

Chapter P

INSTITUTIONAL ARRANGEMENTS, MANPOWER AND TRAINING NEEDS:
DIRECTORATES OF AGRICULTURE, RESEARCH AND TRAINING, AND VETERINARY SERVICES

1. BACKGROUND
2. EXISTING AND PROPOSED INSTITUTIONAL ARRANGEMENTS
   2.1 Department of Agriculture and Rural Development
      2.1.1 Forestry
      2.1.2 Research
Chapter Q  DATABASE NEEDS FOR THE DIRECTORATE OF PLANNING, MARKETING AND COOPERATIVES (DFMC), MAWRD  

1. INTRODUCTION
2. BACKGROUND
3. THE ROLE OF INFORMATION SYSTEMS
   3.1 Management Information Systems
   3.2 Geographic Information Systems
   3.3 Information Systems in Namibia
4. EXISTING INSTITUTIONAL ROLES AND RESPONSIBILITIES WITHIN MAWRD
   4.1 Sub-Division of Agricultural Statistics and Food Information
   4.2 Early Warning and Food Information Unit
   4.3 Department of Agricultural Statistics
   4.4 National Remote Sensing Centre
   4.5 Directorate of Rural Development
5. INSTITUTIONAL ROLES AND RESPONSIBILITIES OUTSIDE MAWRD
   5.1 National Drought Task Force
   5.2 Weather Bureau
   5.3 University of Namibia/NISER
   5.4 National Planning Commission
   5.5 National Development Corporation
   5.6 Ministry of Health and Social Security
   5.7 Regional Development Committees
   5.8 Ministry of Lands, Resettlement and Rehabilitation
6. PROPOSALS FOR TECHNICAL ASSISTANCE
7. POLICIES, OBJECTIVES AND INSTITUTIONAL ARRANGEMENTS OF DPMC
8. EXISTING PROCEDURES WITHIN DPMC
9. CONSTRAINTS AND BOTTLENECKS WITHIN DPMC
10. PRELIMINARY DEVELOPMENT OPTIONS FOR DPMC

Chapter R  THE ROLE OF PARASTATALS, BOARDS AND NGOS  

1. INTRODUCTION
2. THE INSTITUTIONS
   2.1 Parastatals
   2.2 Boards
      2.2.1 Namibian Agronomic Board
      2.2.2 Meat Board
   2.3 Non-governmental Organisations
3. THE ISSUES
   3.1 Finance and Credit
   3.2 Marketing and Input Distribution
   3.3 Technology Transfer
   3.4 Training
4. CONSTRAINTS AND RECOMMENDATIONS
   4.1 Overview
   4.2 Rural Credit
5. CURRENT GRN/MAWRD ACTION PLAN
   5.1 National Credit Committee
   5.2 Agricultural Marketing and Supply Cooperatives
Acknowledgements

The Consultants express their sincere thanks to all those members of GRN who have generously given their time to discussions, advice, searching out documents and making introductions to those members of the public who have an intimate knowledge of the project area. MAWRD field staff were always helpful and many sacrificed their weekends to accompany us in the field, where farmer cooperation was good.

Staff of Boards, Parastatals and cooperatives did their best to improve our understanding of their operations in Namibia. Thank you to all of them.

Our local partners from Burmeister Van Nickerk have given excellent support throughout the study period and we record our thanks to them too.

INTRODUCTION TO INTERIM REPORT

This Interim Report is the product of the two month long, second phase of the African Development Bank (ADB), grant-funded, study of the Northern Regions of Namibia (Ovamboland, Okavango, Caprivi and Okakarara Map. 1). The report comprises two volumes.

Volume I Main Report commences with an Executive Summary which is followed by two main parts: Part I (Chapter A - J) gives a Diagnosis of the Current Situation in the Project Area while Part II (Chapters K - R) addresses Development Constraints and Options. Volume II contains Annexes.

The report aims to give a broad description of the Natural and Human Resources and the State of Development in the Northern Regions, followed by an evaluation of development opportunities to be pursued within the proposed ADB/GRN funded Northern Regions Development Programme (NRDP).

The output of phase I of the Study was an INCEPTION Report which was presented to the Ministry of Agriculture, Water and Rural Development (MAWRD) on 25th June 1993.

Phase III of the Study will culminate at the beginning of November with the presentation of FINAL Reports covering bankable programmes for mixed farming, livestock, small scale irrigation and institutional support.

Following independence in 1990 GRN has been undertaking a major reorganisation of ministries in order to deliver a more equitable share of national development and services to the Northern Region. The process of reorganisation is expected to continue for several more years as the country searches for social and economic equilibrium.

Although the consultants have made every effort to present an accurate picture, it is true to say that MAWRD, in common with some other ministries is in such a state of flux that any diagnosis of the current situation within it, may be rendered inaccurate within a matter of weeks. Nevertheless we consider that the broad outline presented in the two parts of this report provides sufficient information from which to draw conclusions on many of the more important development constraints and options with which the Northern Regions are faced.

The Terms of Reference for the Study require the Consultants to undertake a review of Namibia's present agricultural policy. Significantly, the policy is currently being reformulated by GRN itself, and is not yet public, therefore a review has not been possible. Should the new policy paper be issued during phase III (September - November) of this study, any issues which have a direct bearing on the formulation of the NRDP plan will be taken into consideration.
EXECUTIVE SUMMARY

1. ANALYSIS OF ISSUES

1.1. Introduction

During the third and final phase of this study the consultants will be preparing integrated agricultural development plans for each of the four regions that comprise the project area.

In order to prepare these plans it has been necessary to devote this, the second, phase of the study to not only a detailed review of a wealth of information on the Northern Regions (NR), but also to physical surveys of the natural resources, agricultural support services, and infrastructure.

The socio-economics of the main farming systems, regional food demand and supply patterns and traditional land tenure systems, and the state of infrastructural development have all been examined in detail.

Analysis of the investigations reveals the following information.

1.2. Climate

Rainfall has declined by 25% in the last decade, continuing a trend which commenced in the 1960s. Variability in seasonal rainfall has increased. Rainfall quality has altered with large storms decreasing in number, but contributing a greater proportion of total precipitation. Mid-season droughts of 15 days, or longer, occur more often than before, and Caprivi, higher rainfall than Ovamboland notwithstanding, is the worst affected region. Onset of the planting season commences 2 to 3 weeks later, and growing season length has declined from 120 to less than 90 days.

1.3. Soils

Most of the Northern Region soils are deep fine grained sands varying in colour from white, through grey and brown to red. Fertility ranges from low to very low, as do moisture holding capacity and cation exchange capacity. Both macro and micronutrient deficiencies are normal.

1.4. Identification of Areas with Potential for Intensification

All of the present close settled areas in Ovamboland, Okavango and Caprivi have potential for intensification of their agro-pastoral systems.

Easy availability of drinking water has had a greater influence on present population distribution than has soil fertility. Since virtually the whole of Caprivi, Okavango and the eastern third of Ovamboland are underlain by a continuous primary aquifer, with a rest level ranging from 10-100 metres below ground surface, it would theoretically be feasible to obtain sufficient drinking water from this source to allow increased settlement in large areas which are very sparsely populated at present.

Crop production in these areas would be intensified by using water-harvesting or rainfall multiplying systems.

Pilot settlements designed to test these cropping techniques would need to precede larger settlement programmes. The approach could be initiated during the life of the Northern Regions Development Programme (NRDP).

1.5. Intensification of Areas for Rehabilitation

All of the close settled areas of the Northern Region are in need of rehabilitation from overcropping of soils and from outcutting and overgrazing of vegetation.

1.6. Present Land Utilization

Farming systems are broadly agro-pastoral types which are characterised by production of pearl millet as a staple cereal, minimal use of manure, fertilizer or other inputs and very low crop outputs estimated at 200 kg/ha. Agro forestry is commonly practiced and use of a wide range of wild plant products is normal.

Livestock production is financially far more important than crop production in all regions. The system has been sedentarised in Caprivi, Okavango and Okahandjo for some time and increasing sedentarisation is occurring in Ovamboland.

Livestock numbers are declining in Ovamboland and Okahandjo District due to reduction in rangeland extent and productivity. Considerable scope exists for intensification of the livestock production system which is not complementing crop production to the extent which is possible and desirable.

1.7. Social Economics

1.7.1 Demography and Household Structure

The four regions which comprise the Northern Region are amongst the fastest growing in Namibia and at current rates of growth the population of Ovamboland will double in 24 years, that of Khomas in 33 years and that of Caprivi in 12 years. The impact of such rapid population increases on the existing resource base and on current farming systems will be significant.

1.7.2 Occupation and Income

Although subsistence farming remains the dominant occupation activity of the majority of households in the Northern Region, many households augment their agriculture income with a
range of non-farm activities. A relatively small proportion of household income (both actual and imputed) is derived from agriculture and throughout the crop growing regions no more than 30% of household income is derived from this source. This is because the returns to labour under traditional system of crop production are extremely low when compared to off-farm employment.

There is considerable differentiation in the incomes and welfare of rural households - while some are relatively self-sufficient many are food insecure; recent evidence suggests that up to 40% of households in Ovamboland and Okavango may be classified as food insecure. Variations of this nature imply that different forms of support will need to be extended to differently endowed households.

1.7.3 Social Organisation and Leadership

Despite ethnic diversity, populations in each region can, for development purposes, be considered to be relatively culturally homogenous with similar methods of agricultural production.

Although there are variations in their influence between regions, traditional authorities structures remain the basis for social organisation throughout the Northern Region. In all regions the primary unit of communal organisation is that of the headman or sub-headmen.

1.7.4 Input Use and Cultural Practices

A feature of all three regions in which arable agriculture is practised is the relatively limited household investment in crop production. This can be attributed to the risk averse strategies of rural households and to the fact that crop production represents only one component of household income. Despite the fact that the majority of households are involved in subsistence agriculture, production is largely aimed towards household self-sufficiency rather than surplus.

Most farmers in the Northern Region own relatively little farm equipment. A shortage of draught animals represents one of the major constraints to agricultural production in the Northern Region, and serves to limit the amount of land which many households can cultivate.

Credit facilities in the rural areas are, in general, extremely limited. The universal problems of collateral apply with respect to commercial sources of credit. Credit unions and savings clubs have been established to a limited extent, but the ready availability of credit for purchase of key inputs remains problematic for many farmers.

1.7.5 Access to Land, Size of Holdings and Spatial Arrangements

A shortage of labour and other inputs rather than land appears to be the most serious constraint to production in the Northern Region. Access to land is high (over 90% of households) throughout the Northern Regions and is conditioned more by an individual or household's ability to till the soil rather than by an inability to pay.

1.7.6 Gender Relationships and Priorities

Women in the Northern Region occupy a subordinate position within the social structure despite their central role in agricultural production. According to the Census 64% of subsistence farmers in Ovamboland are women, 59% in Okavango and 64% in Caprivi. The implications of this in the development of extension services and in the introduction of credit schemes will need to be weighed carefully.

Since it is clear that women occupy a pivotal role in the agriculture of the Northern Regions, considerably more attention will need to be paid to their role as farmers.

1.7.7 Seasonal Labour Requirements

Despite a rapid increase in population and growing levels of unemployment, most rural households in the north suffer labour shortages at key times of the productive cycle.

As women assume primary responsibility for farming in addition to their normal domestic chores, they frequently have insufficient time to undertake all the necessary activities.

1.7.8 Resource Allocation: Priorities and Constraints

A distinction between optimal and realisable scenarios is necessary when setting production targets for the project period. At present, the risk averse strategies of farmers in the Northern Region limit prospects for the generation of marketable surpluses and for the introduction of cash crops.

A realistic target would be the achievement of household self-sufficiency in the production of grain. This seemingly modest objective, if realised, would go a considerable way towards ensuring household food security with the associated positive correlates of improved nutrition and health.

However, not all households in the rural areas will be able to sustain themselves purely through agricultural activity. Increasing numbers of rural households will need to find employment in off-farm activities whether in a specific region or elsewhere.

1.8. Food Demand and Supply Patterns

Annual food demand is roughly estimated at 100 kg of cereal per person, or 90,000 tons for the Northern Region. Production varies, according to season, from a low of 17,000 tons to a high of 60,000 tons. The deficit in an average year is therefore around 43,000 tons which is met through maize imports from abroad. Food insecurity at the household (HH) level is widespread. The Government of Namibia (GRN) has indicated that it will simultaneously pursue self-sufficiency at the national level through increased commercial production and food security at the HH level through food aid and support for farm system intensification.
Namibia nationally is well able to cover cereal import requirements at both present and nutritionally-desirable levels of consumption. At 1988/89 selling prices, imports of white maize and wheat are estimated for that year at R16.1 million and R14.7 million respectively, in total R31 million. This amounted to only 1.2% of Namibia's merchandise export earnings. Even in drought years when the demand is high, the grain import bill is unlikely to exceed 5% of the export earnings. Furthermore, the well developed and efficient transport, wholesale and retail infrastructure ensures that grain and other basic food commodities will reach most centres of demand. In Ovamboland, even remote rural communities are connected through the numerous village shops selling maize meal, cooking oil and tinned food.

1.9. Traditional Land Tenure Systems

1.9.1 The Legal Framework

"Customary law" in Namibia does not exist in its own right, and is subsumed under statutory (Roman Dutch) law. The Constitution of the Republic of Namibia (Article 66) retained the status quo and reinforced the subordinate position of customary law.

The colonial legal framework within which communal land tenure operates, is still in place. This is significant, as it enables a wide range of even conflicting actions in regard to land matters to be upheld by one or other 'law'. As a consequence, traditional leaders do still maintain effective control over the allocation of communal land.

1.9.2 Customary Land Tenure in the Northern Region Today

The prevailing system of land tenure in the Northern Region is one of communal tenure with usufructuary rights. Although there are considerable regional variances in access rights, there are also many features which are common to all regions. Perhaps the most pervasive feature of tenure in much of the Northern Region today, is the fact that it is undergoing extensive change.

A characteristic of the current situation in the Northern Region is the effective absence of formal administrative or regulatory authority. In this situation and in the absence of stringently presented national policy on such matters, scope for ad hoc transformations in local land tenure exist.

The concept of usufruct as a system of lifetime use, has almost certainly already shifted towards more stable private 'ownership'. Usufruct is also in practice losing its 'lifetime' connotation through steadily increasing emphasis upon the rights of inheritance (in the face of declining mobility, improvements to land and land pressure in settled areas). The payment of 'allocation fees' is increasingly regarded as having 'bought the land'.

1.9.3 Attitudes to Land Reform

Three concepts appear to have underwritten much of popular thinking about 'land tenure' in post-independence Namibia. These are as follows:

- a) that there is a need for equity in landholding at least to the extent of correcting the wrongs perpetrated by colonial dispossession;
- b) that 'traditional' systems of land tenure are a prime cause of under-development, and must be done away with, in favour of statutorily-managed freehold individual title;
- c) that 'all Namibians have a right to land' and that it is the responsibility of the State to ensure that this 'basic human right' is met.

1.9.4 Approaches to Land Reform

In attempting to generate a consensus on discussions on the land issue a conference on Land Reform and the Land Question took place in June 1991. Twenty-four recommendations in the form of consensus resolutions emerged out of the Conference. These recommendations, inter alia, upheld the integrity of the communal areas as communally owned land, with the subdivision and commercialization of communal land rejected as a short term option. Enclosure of communal rangeland land was also not recommended. Implementation of the Conference's resolutions has been slow.

Emerging out of the Conference a Technical Committee on Commercial Farming (TCCF), was mandated (in the main) to identify which estates could be redistributed and how that should be implemented. The report has been submitted to Cabinet and some policy decisions on land reform policy formulation are expected before the end of 1993.

In the absence of policy guidance and formal policy and programme formulation, a land reform of sorts is taking place at the local level. Thus, fencing of communal rangeland continues under the authority of local leaders.

A further impediment to the formulation of policy on land, has been a lack of clarity on which government agency (or agencies) should assume responsibilities for land tenure matters at national and local level and for 'land reform' in the widest sense. Both The Ministry of Lands, Resettlement and Rehabilitation and the Ministry of Local Government and Housing, in different ways, assume responsibility for land matters in the rural areas.

The formulation of a coherent land tenure policy for the communal areas has yet to take place. The ensuing delays are giving rise to some popular dissatisfaction and, as significantly, a lack of proper land management is contributing to the over-exploitation of the natural resource base.

1.10. Infrastructural Development

Since independence GRN has undertaken an impressive number of infrastructural projects in the Northern Regions, but particularly in Ovamboland. The road networks, water supplies and rural electrification have all benefited, and further work is both on-going and planned. Telecommunication services are improving and by the end of 1994 fourteen rural centres in Ovamboland will have telephones.
The excellent trunk road network, rural electricity, water supplies and communications networks all combine to provide a sound base from which a more intensive agriculture can be serviced. The potential for electrification of small scale agro industrial processes such as millet hulling/milling and oil seed pressing do much to hasten the adoption of these technologies.

2. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations outlined below are tailored specifically to meet the objectives of ensuring that well coordinated agricultural development programmes are proposed for each region.

2.1. Major Projects Under Consideration by MAWRD

MAWRD is presently considering five large projects for the Northern Regions. The first two are 7-8 year, integrated Crop and Livestock Development Projects proposed by IFAD and costed at a total of R125 million. They are broadly similar in design to the third Project, or Programme which is to be known as Northern Regions Development Programme (NRDP) (approximate cost R155 million) which is about to be proposed by the African Development Bank (ADB) through the present study.

The fourth and fifth projects are both proposed by the European Community (EC) and would support the first three mentioned above. They are the 1994-96 Rural Development Support Programme, costed at R36 million, and covering Agricultural and Rural Development Centres (ADCC/RC), construction, credit, training and technical assistance (TA), and the 18 month long Livestock and Meat Marketing Project, costing R83 million, and covering infrastructure and equipment, training and publicity.

The EC projects would be grant-funded and are therefore almost certain to proceed, while implementation of the loan-financed ADB and IFAD projects would depend upon GRN's assessment of its ability to repay the relatively soft loans.

The on-going Sustainable Animal and Range Development Programme (SARDEP) which currently operating in Ovaharara and Ovambwa is seeking possible intervention strategies in the livestock sector. These strategies should be of great benefit to both to IFAD and ADB programmes which will build-in sufficient flexibility to permit changes in interventions to be effected with the minimum of bureaucratic obstruction.

2.1.1. Recommendations on Projects

It is recommended that:

- GRN/MAWRD proceed with all five projects;
- GRN consider the option of targeting the two IFAD projects on Ovambwa and Kaokoland and NRDP on Okavango, Capriv and Okakarara. The EC projects would remain common to all regions;
- GRN invite ADB and IFAD to appraise their respective projects as early in 1994 as possible, with a view to commencing implementation simultaneously in 1995;

2.2. Alternative Land Use Options/Intensification

There is considerable scope for the improvement of existing farming systems. MAWRD has recognised the fundamental importance of research, training and extension to the intensification process, and programmes to reorganise and strengthen these services are well advanced.

The recommendations for improving farming systems are too numerous for all to be mentioned in this summary, but the most important include:

- Mobilisation of Village Extension Groups (VEG) through which interventions can be channelled;
- Emphasis to be placed on release of more, shorter-season millet and cowpea varieties;
- Cowpea/millet intercropping to become standard practice;
- Sesame to be introduced as an oil seed crop;
- A special fertilizer to be mixed locally for universal use;
- Use of manure to be encouraged;
- Turkish tobacco to be introduced;
- Use of animal draught power to be increased to include weeding and haulage;
- Water-harvesting techniques to be developed and tillage practices to be improved to conserve moisture.
- Dry season maintenance feeding of oxen to be fostered through enclosure of common land for common use;
- Millet processing to be mechanised;
- Enclosure of arable land to be fostered through local manufacture of wire netting.
Livestock management, particularly nutrition, to be improved through conservation and rationing of crop residues which will be facilitated by enclosure of arable land;

- Development and training for community based range management systems leading to rangeland rehabilitation;

- Agro forestry to be strongly supported;

- Development of irrigation to be focused on the Zambezi/Chobe floodplain.

2.3 Land Tenure Policy Options

As one of the principal means of production, land remains a key component of the development equation in the Northern Region. Discussion on land issues in the communal areas, however, has thus far tended to be linked to the broader "land question" in Namibia.

While the issue of land in the Northern Region clearly cannot be isolated from the broader national land question, it is important that changes to existing land tenure systems in the Northern Region are not seen to be contingent on changes at the national level. This is because land reform at the national level is likely to be a highly contested and politically protracted exercise, which could extend beyond the life cycle of the Northern Region project.

While the land issue in the Northern Region relates to both arable land holdings and communal rangeland, the latter, presents the more complex set of problems. Evidence from recent surveys suggests that a shortage of arable land, of itself, is not the primary impediment to improved agriculture production in the Northern Region.

Access to and management of communal rangelands, in contrast, does directly influence livestock farming throughout the Northern Region. This is especially apparent in Ovamboland and in the Oshikoto region where enclosure of communal rangelands is disrupting seasonal grazing patterns and is leading to over-exploitation of the commons.

2.3.1 Priority Requirements

Given the socio-legal complexities surrounding the land question in Namibia, it would not be feasible for the NRDP/ADB project to initiate a process of land reform of itself. However, this is not to imply that a broader process of land and agrarian reform should not be pursued by the Government within the Northern Region at the same time, and that NRDP should not support such reform once guidelines have been established.

2.3.2 Recommended Action Plan

The following actions are recommended in order to launch land management and tenure reform in the Northern Region:

i) It is proposed that a Communal Land Tenure Commission or Task Force be established, with responsibility for developing a programme of tenure reform directly appropriate to the communal areas over a 12-18 month period;

ii) An identification of precisely which Ministries should be mandated with responsibility for implementing land reform;

iii) Strengthening of local level capacity to support land management and tenure reform;

iv) The implementation of regional land use planning;

v) Implementation of a community-based approach to land management and tenure reform - a Community Land Authority model;

vi) Reduction of dependency upon communal rangelands; assistance of those with the means to resettle in the commercial zone;

vii) Adoption of an experimental approach to land management and tenure reform - land reform should be treated not as a single decision but rather as a process;

viii) The promotion of a partnership, between the state as technician on the one hand and the community as responsible owners and implementers on the other.

2.4 Manpower and Training Needs: Directorates of Agriculture, Research and Training and Veterinary Services

MAWRD is still awaiting Cabinet approval of its manpower rationalisation proposals, which seek to obtain a large enough 'establishment' to meet most of the staffing requirements of the new programmes to be planned for the Northern Regions. Indications are that the Cabinet will not approve new appointments until specific tasks have been identified for prospective appointees. NRDP should be able to meet most of its staffing needs from the MAWRD establishment, but a few contract staff will also have to be recruited.

The proposed institutional and training arrangements of the new Department of Agriculture and Rural Development have been reviewed and appear to address the immediate needs of the Northern Regions.

2.5 Directorate of Planning, Marketing and Cooperatives (DPMC)

DPMC is responsible for policy formulation, planning, and monitoring and evaluation and has submitted its proposals for rationalisation to GRN. These proposals have yet to be accepted and it is probable that they will be revised.
Although DPMC has a national responsibility it is recommended that support to be provided from ADB/NRDP should be targeted specifically on the NRDP requirements for monitoring and evaluation and MIS. In particular these should focus on support for the establishment of sustainable reporting and dissemination structures for national, regional and district policy and decision making.

Costed proposals will be provided in the final report.

2.6 Role of Parastatals, Boards and NGOs

Parastatals, Boards and NGOs all have valuable supporting service roles to play in the Northern Regions. Some of the most important services include credit delivery, input supply, training, marketing, and vehicle and machinery spares and repairs.

It is recommended that GRN uses some NRDP funds to facilitate such private services. One example of a vitally important service is the establishment of a revolving fund, within the Agronomic Board, to cover purchase of surplus millet.

It is obvious that NRDP funds cannot cover all services, therefore priorities will be set and costed proposals will be presented in the final report.

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

(A)HIE (Assistant) Animal Health Inspector
A&RDC's Agriculture and Rural Development Centres
ADB Agricultural Development Bank
ADP Agricultural Development Fund
AERDD Agricultural Extension and Rural Development Department (at Reading University)
AET Agricultural Extension Technician
AGDP Agricultural Gross Domestic Product
AGRITEX Bovine Contagious Abortion
CA Chief Agricultural Extension Officer
CAEO Centre for Applied Social Sciences
CASS Contagious Bovine Pneumonia
CCN Council of Churches in Namibia
CRIAA Centre for Research Information and Development in Africa
DAS Department of Agricultural Statistics
DED
DERU Division of Planning, Marketing and Co-operatives
DoT Department of Water Affairs
EC European Community
ECU European Currency Unit
EEAN Environmental Evaluation Associates of Namibia
ENDA Environmental and Development Activities
EWFIS Early Warning and Food Information System
EWFIU Early Warning and Food Information Unit
FAO Food and Agriculture Organisation
FINNIDA Finnish Development Authority
FMD Foot and Mouth Disease
FNDC First National Development Corporation
FUA Financial Unit of Account (ADB unit)
FYM Farm-yard manure
GIS Geographic Information Systems
GRN Government of the Republic of Namibia
GTZ
ha hectare
HH Household
IBPAR International Centre for Research in Agro-Forestry
ICRAF International Centre for Research in Semi-Arid Tropics
ICRISAT International Fund for Agricultural Development
ICRISAT Institute for the Study of National Agricultural Research
IFAD
ln kilogram
ISNAR kilometre
kg kg
km
LSU Large Stock Unit
MAWLD  Ministry of Agriculture, Water and Rural Development
MEC  Ministry of Education and Culture
MHSS  Ministry of Health and Social Services
MIS  Management and Information Systems
MLGH  Ministry of Regional and Local Government and Housing
MLRR  Ministry of Lands, Resettlement and Rehabilitation
MWCT  Ministry of Wildlife, Conservation and Tourism
NAB  Namibian Agronomic Board
NAKACO  Namibia Katembe Co-operative
NARC  Namibia Agricultural Union
NCA  Northern Communal Areas
NCC  National Credit Committee
NDC  Namibia Development Corporation
NEPRU  Namibian Economic and Policy Research Unit
NGO  Non-governmental Organization
NISER  Namibia Institute for Social and Economic Research
NNFU  Namibia National Farmers Union
NPC  National Planning Commission
NR  Northern Regions
NRDP  Northern Regions Development Programme
NRM  Natural Resource Management
NRSC  National Remote Sensing Centre
ODA  Overseas Development Authority
SADC  Southern African Development Community
SARDEP  Sustainable Animal and Range Development Program
SIDA  Swedish International Development Authority
SSU  Small Stock Unit
TCCF  Technical Committee on Commercial Farmland
TEG  Transitional Extension Group
UNAM  University of Namibia
UNDP  United Nations Development Programme
UNICEF  United Nations Children's Fund
UNCTAG  United Nations Transitional Authority Group
USAID  United States Agency for International Development
VEG  Village Extension Group
WHO  World Health Organisation
WUS-Denmark  World University Service of Denmark (now Ilos)
WWF  World Wildlife Fund

CURRENCY EQUIVALENTS

<table>
<thead>
<tr>
<th>Currency Unit</th>
<th>Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rand 1.00</td>
<td>0.303 USD</td>
</tr>
<tr>
<td>USD 1.00</td>
<td>0.775 FUA</td>
</tr>
<tr>
<td>FUA 1.00</td>
<td>1.29 USD</td>
</tr>
<tr>
<td>USD 1.00</td>
<td>0.885 ECU</td>
</tr>
<tr>
<td>ECU 1.00</td>
<td>1.13 USD</td>
</tr>
</tbody>
</table>

3.5 R
CHAPTER A. INTRODUCTION TO PART I (CHAPTERS A - J)

1. OBJECTIVES

1.1 General

The objective of Part 1 of the report is to review the following subjects:

- Climate, soils and vegetation and present land use as found in the four regions which make up the Programme Area, i.e. Ovambo, Okavango, Caprivi and Okakarara.
- Social Economies of the Main Farming Systems.
- Food Demand and Supply Patterns.
- Traditional Land Tenure Systems.
- Existing Infrastructure.

2. METHOD

2.1 Staff

The various tasks carried out during the preparation of this report were shared by a multidisciplinary team of local and international specialists covering the following disciplines: Agronomy, Agricultural Economics, Socio Economics, Civil Agricultural Engineering, Agricultural Research, Extension and Training, Animal Husbandry, Climate, Soils and Environment, Agro-forestry, Agro-industry, Land Tenure and Management Information.

2.2 Literature Review

More than two hundred reports and publications covering the following categories of information were collected and critically reviewed:

- Agriculture
- Agriculture: Natural Resources
- Agriculture: Land Tenure
- Agriculture: Rural Development
- Economics
- Environment
- Ethnography
- Geography
- Infrastructure
- Institution
- Institutions and Training
- Land Tenure
- Livestock
- Marketing and Processing
- Natural Resources
- Rural Development
- Savings and Credit
2.3 Consultations

Consultations were carried out in Windhoek with most of the organisations which are directly involved in agricultural development in the Northern Region. Throughout the study period bi-weekly meetings were held with MAWRD staff responsible for supervision of the work. The purpose of these meetings was to keep MAWRD informed of progress and to seek guidance on the feasibility of possible development proposals.

The International Fund for Agricultural Development (IFAD) is the only other agency which has tabled agricultural/livestock development project proposals which are broadly similar to those now under consideration by the AIDB funded team. Discussions were held with IFAD representatives and the possibility of co-financing of Northern Region projects by AIDB/IFAD were explored. Evidently there is no reason, in principle, why such a strategy should not be followed should GRN so wish.

Consultations with individuals, GRN staff, NGOs, and Traditional and Statutory Leaders were held wherever possible in the project area.

2.4 Field Reconnaissance

All members of the study team visited various locations throughout the project area in pursuit of information related to each specific discipline, whether land tenure, socio economy, animal or crop husbandry, soils and vegetation or infrastructure. Both air and vehicle transport were used and the former proved to be of great value in reinforcing knowledge of:

- human population concentration
- the overriding influence of the availability of perennial water on overgrazing and over-cutting of natural vegetation.

2.5 Aerial Photography

Existing recent vertical photography commissioned by GRN for the planning of infrastructural projects was used to support Rapid Rural Appraisal investigations in Ovamboland and Okavango. Since no recent photography for the Caprivi or Okavango regions could be traced, the Consultants commissioned both oblique and vertical colour aerial photography of limited areas of each of the latter regions. The objective of this exercise was to test the feasibility of using village specific photo mosaics for training Extension Staff and farmers in land planning and improved use. Such training would form an important base from which to launch many of the chosen project interventions.

2.6 Visits

Training Institutes, Research Stations, large commercial farms and agro industrial centres were visited by one or more of the study team over a ten week period.

2.7 Attendance

Attendance at Workshops, conferences and meetings: Owing to the extended duration of the study, team members were able to attend some of the above activities. As a result, it has been possible for them to acquire a deeper than usual understanding of the complexities and constraints confronting the Namibian small farm sector.

2.8 Analysis

Analyses of raw data collected by other institutions: Research into the socio-economics of the main farming systems necessitated the analysis of raw data which had remained unused hitherto.
1. CLIMATE

1.1 Rainfall

Annual rainfall increases across Ovamboland from 300 mm in the southwest to 550 in the northeast (Map 2 - all maps are at the end of Volume I). The dividing line between arid and semi-arid areas in summer rainfall areas is 500 mm annual rainfall; although there may be great variations from year to year. 80% of the observed rainfall falls from December through to March.

1.1.1 Trend

An examination of long-term rainfall records from Ombalantu and Oshigambo indicates a downward trend in the average 10-year rainfall in Ovamboland since the 1960s (Table 1 - see end of Section). Figure 1 (see end of Section) shows the rainfall in western Ovamboland during the last decades have been 60-75% that of the previous decade. The 300 mm isohyet has since shifted eastwards from Kaokoland into Ovamboland running through a point midway between Ombalantu and Okahandja in a south-easterly direction through Oshakati and Ondangwa. In the 1960s, this area received an average of 500 mm rainfall per season. The 300 mm isohyet now lies to the east of Oshigambo.

1.1.2 Variability

Arid and semi-arid regions are characterised by considerable variability in the annual amounts of rainfall and its distribution in time. For example, 342.6 mm recorded in 1957/58 with 1239.8 mm in 1958/59.

In 1983 the National Atlas of South West Africa put the rainfall variability, i.e. the average deviation as a percentage of the seasonal average. West of Ondangwa at 35-40%. The seasonal mean has not been reached since 1976/77, implying an increase in variability.

1.1.3 Rainfall distribution

A study of daily rainfall records for the past decade indicates a shift in the distribution of rainfall. Between 1981/82 and 1985/86 just 41% of the rainfall occurred at Ombalantu, whereas the 15 mm or heavier. The 30% of the seasonal rainfall fell in storm sizes of 15-25 9 mm.

Since 1987/88 there has been an increase in the number of small storms (<15 mm) with the result that large storms (>15 mm) totalled just under 9 percent of all rainfall events. Nonetheless, they contributed 42 percent of all rainfall (cf. Arnon (1972). 50% of the rainfall in arid regions can occur on 10-15% of the rainy days. Of the 384 storms (excluding traces) recorded at Ombalantu since the 1981/82 season only 14 (4.9%) were 10 mm or heavier. However, these few storms provided 31% of the total rainfall for the 12-year period. The daily rainfall figures reveal long periods, often 15 days or more, during the rainy season without any significant rainfall.

1.2 Temperature and Potential Evapotranspiration

The hottest months are October and November when mean daily temperature can exceed 35°C prior to the onset of the rains. The winters are mild with mean daily minimum temperatures of 7°C during June to August. The diurnal range varies between 20°C in mid-winter to about 13°C in mid-summer. Frost is an insignificant factor in agricultural production.

Mean annual evaporation has been estimated as 2750 mm per month. Rainfall and losses ranging from 138 mm during the winter months to 330 mm during the summer months. Maximum water losses occur in October.

1.3 Discussion

Climatic factors such as low and erratic rainfall, periodic drought, occasional concentrated rainfall and high evapotranspiration rates, severely limit the reliability of dry land crop production. Variability in the amount of seasonal rainfall and poor distribution of the individual storms are the greatest hazards to reliable crop production in Ovamboland.

The increased proportion of the rainfall falling as light showers has serious implications for crop production. Light rainfall often only wets the soil surface and evaporates without any appreciable benefit to the crop. To be reasonably safe from evaporation, the rain must penetrate to a depth of at least 10-12 cm. This requires a storm of 15-25 mm.

Rain frequently comes in a few heavy showers (e.g. 249 mm fell on 3rd February, 1986). If these are of short duration they can cause considerable run-off.

The period just before the start of the rains (October/November) is the most severe with high temperatures and low humidities. These conditions can be expected to extend to the early part of the rainy season, creating difficult conditions for germination and crop establishment.

Table 2 summarises how weather conditions during the week after planting can effect the emergence of sorghum seedlings.

Table 2 Emergence of sorghum seed versus depth of planting in Botswana 1975/76 (Hillcokcs 1980)

<table>
<thead>
<tr>
<th>Depth of seed placement</th>
<th>Weather conditions during week after planting</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 to 50 mm</td>
<td>Heat and dry</td>
</tr>
<tr>
<td>50 to 100 mm</td>
<td>Seedling dries up and dies</td>
</tr>
<tr>
<td>100 to 150 mm</td>
<td>At this depth moisture and insolation allow emergence</td>
</tr>
<tr>
<td>200 to 250 mm</td>
<td>Seedling rarely emerges due to formation of soil surface cap or crust</td>
</tr>
</tbody>
</table>
The mean period between storms is of significance. With high evapotranspiration (Eti) rates (approximately 6 or 7 mm/day) the amount of water stored in the soil is critical if the crop is to survive long gaps between storms. The water-holding capacity of the sands is only 6-10 mm per decimetre. A 50 cm depth of sandy topsoil will only store 30-50 mm of water - enough for 6-10 days growth. The risk of crop failure may be high even in seasons of high rainfall.

The distribution of rainfall and the coincidence of a plentiful supply of soil moisture at periods of maximum crop requirement have a bearing on crop yields. A period of drought at the time of earing of cereals will have a more adverse effect on yields than if it occurs earlier or later in the growing period.

Excess moisture after sowing may reduce germination; heavy rainfall during earing may cause lodging and impair pollination.

The daily alternation of high and low temperatures, a characteristic feature of arid climates, may affect plant production. For example, certain weeds such as Johnson Grass (Sorghum halepense) and Bermuda Grass (Cynodon dactylon) germinate better under conditions of temperature alternations than under a constant temperature.

Under the prevailing rainfall it is apparent that arable cultivation in Owanbo is rain-starved rather than rainfed. This limits the range of crops to xerophytic types such as millet and sorghum (i.e. species adapted to low and erratic rainfall conditions).

Livestock production systems are better able to withstand long dry periods, provided the animals are able to exploit perennial browse species (which draw on deep reserves of soil moisture beyond the reach of annual grasses and herbs to continue production). Fencing off large tracts of range land is likely to inhibit local migration to areas where isolated storms have produced fresh grazing. Stocking rates become critical as these affect the availability of fall back areas.

2. DESCRIPTION OF SOILS AND VEGETATION

2.1 Physiography

Owanbo can be divided into three main physiographic regions: the Etaka-Cuvelai Drainage Basin, the Western and Southern plains, and the Grey Loose Sands (Map 3 - at the end of Volume I). A schematic description of each of these three regions and their sub-divisions is given in Table 3 (see end of Section).

2.1.1 The Etaka-Cuvelai Drainage Basin (11,550 sq km)

The Etaka-Cuvelai drainage basin is the only region of Owanbo with a defined system of through drainage. Interconnected oshanas drain into Lake Oponono with an outlet through the Oshana Ekuma to the Etosha Pan. Arable and pastoral agricultural development is concentrated to this drainage basin.

Solonetz soils dominate with some areas of Red Brown and Grey Sands Palm savannah and mopane-acacia woodland/scrub are the main vegetation types. An extensive area of seasonally waterlogged grassland separates the mopane-acacia associations of the Grey Sand Plains from the Palm Savannah around Ondanga and Oshakati.

Ekuma grassland replaces the palmweld west of the Etaka-Oponono drainage system in southern Owanbo. This mainly Arisptes spp. grassland contains a few shrubs such as Peltophorum africanaum and Combretum spp. It occurs exclusively on duplex soils (i.e. soils with a relatively permeable topsoil overlying a very slowly permeable diagnostic horizon, such as a solonetz B, which is not a hard pan).

2.1.2 The Western and Southern Plains (15,200 sq km)

Level and nearly featureless sandy plains extending along the northern boundary of the Etosha Game Reserve westwards to the Kalkrand border. Except for the severely dissected escarpment of the Cunene River and its drainage system no clearly defined drainage systems exist.

Red and Brown Sands and Greyish Brown Sandy Loams dominate the western plains while Grey sands and deep solonetz soils characterise the Southern Plains mopane-acacia Tree Bush, Bush Savannah, and Scrub associations occur throughout this physiographic region. In western Owanbo, acacia spp. are most common where the aeolian sand mantle overlies calcere within 1 to 3 metres.

2.1.3 Grey Loose Sands (15,250 sq km)

A vast monotonous plain of loose Grey Sands covering the whole of the eastern part of Owanbo and extending without interruption through Okavango. Four sub-zones can be identified, an area of parallel self dunes in the south; then moving northwards a band of featureless grey sands with no pans, an area with pans with abrupt margins and, either side of the Eemilana to Mungu road, a zone with pans with sloping margins.

Grey sands dominate the landscape though there are patches of Red and Brown Sands on slightly elevated ridges. Brown solonetz soils are found in pan margins. The main vegetation is mixed woodland (Burkea-Terminalia associations).

Within this physiographic region the presence of termitaria appears to indicate the most favourable sites for cultivation, presumably because they show soil with a higher clay content. Such sites are patchy, of extremely limited area, and usually associated with a water supply. In remoter areas land with termite mounds is being fenced off, presumably in anticipation of boreholes being put in at some future date. Patches of red sands are also cultivated if there is water nearby.

2.2 Soils

Detailed descriptions of some of the soils can be obtained from the report "A Preliminary Survey of the Natural Environment and the Agricultural Resources of Ovamboland" by AOC
2.2.1 Solonetz Soils

This group of soils is characterised by the formation a very slowly permeable solonetz 'B' horizon of variable depth (30 or more cm) with high bulk density (>1.6 g/cm²), high sodium activity (5.1-10.3 EC10/cm 25°C in the B2 horizon, and 6.3-19.7 for the C horizon) and an abrupt separation from the overlying leached sand which may be between 10-70 cm deep. Well-developed Mopane Woodland or Savannah is indicative of a prominent solonetz 'B' horizon.

2.2.2 Aeolian Sands

Three distinct types have been recognised:

Red Sands
Moderately well leached though not highly weathered soils characteristic of the crests of self dunes. The clay content, which is highly active in terms of exchange capacity, varies between 3% and 8%. Soil reaction is slightly acid to neutral. Low water holding capacity and excessive internal drainage. Low fertility.

Brown Sands
Characteristics of the mid-slopes of self dunes and inter-dune areas. Similar to Red Sands except for colour and a slightly less active colloid content.

Grey Sands
Strongly leached soils with a clay content of 3% or less occupying the lower slopes of self dunes, the lower lying inter-self dune areas and a very large area on the eastern border of Ovamboland where they continue into Okavango.

An inverse relationship between inherent soil potential and tree development apparently exists in the sandveld areas. Better stands of trees are usually found on those aeolian sands which have the lowest agricultural potential. Because of the low water-holding capacity and nutrient status of the sands a less luxuriant grass cover develops which is less subject to hot burns than the denser sward on more fertile soils. Better tree growth results because fire damage is less frequent occurrence and less damaging.

2.2.3 Sandy Soils

The clay percentage increases with depth from a sand or loamy sand at the surface to a loamy sand or sandy loam at depth. Some forms are slightly saline and slightly sodic at depth with a very weak indication of a solonetz 'B' development. There is no horizon limiting to the movement of either roots or water.

3. PRESENT LAND USE AND HUSBANDRY SYSTEMS: CROPS

3.1 Land Use

Human population density and availability of drinking water have a greater influence on land use patterns across Ovamboland than actual land capability for subsistence agriculture. Several small surveys of land use have been conducted in the past three years, but much more survey work is needed to produce an accurate assessment of the various production systems.

Current information is that more than 50% of households own cattle and goats, while most households have access to arable land. Cultivated area is estimated at about 2 ha per household, with arable farm size at 6.5 ha. This figure was obtained by planimetric measurements of farm enclosures as demarcated on a random sample of aerial photographs dating from 1991. Field observation revealed that the area cultivated within an enclosure varies considerably according to season, availability of draught power, labour, and alternative employment opportunities. In sum, an estimated 90,000 households cultivate a total area in Ovamboland of approximately 180,000 ha.

3.2 Farming System

The system is one of agro-pastoralism, with the latter contributing much more to income than the former. Cropping is now almost entirely sedentary, except in eastern Ovamboland where some shifting cultivation is practised. Sedentarisation of livestock is also common.

3.3 Crops

3.3.1 Introduction

Fairy large areas of solonetz soils are cultivated due to population pressure and the absence of better soils on adjacent land. The higher elevated land is favoured for millet cultivation. The surface sand cover is only 15-20 cm above a very hard, but moist and plastic, solonetz B-horizon at the top of the ridge, but is over 30 cm deep further down the slope. The deeper the sand cover, the higher the yields tend to be.

In the oshana areas farmers haddigitised their fields along the contour to “stop the water running off the land”. However, despite the low rainfall the millet was planted on the ridge because the furrows became waterlogged due to the relatively impermeable solonetz B-horizon.

The aeolian sandy soils are preferentially cultivated by the Ovambos due to better moisture relations and working properties of these soils relative to the commonly occurring solonetz soils which surround them on the alluvial plain.

Lithosols are found principally on the Ruacana Plateau. These soils are usually too shallow or stony for crop production.
3.3.2 Pearl Millet

Pearl millet is the staple food crop grown in Owambow. Hundreds of local varieties of millet have been collected, but the first improved variety was only released three years ago. Local types have a yield potential of 1.5-2 tons under good management, yet on-farm yields average only 200-300 kg/ha. The new variety, Okashana I, is similar to local land races in terms of yield, but it is superior in grain size and maturation period. Okashana I requires only 90 days to mature compared to the usual 120 days. The climatic trend to shorter, later growing seasons has stimulated public interest in Okashana I. Demand for seed now exceeds supply, with less than 10% of farmers using improved seed.

Very little on-farm research into millet research has been carried out in the Northern Regions; therefore, the preliminary results of the 1992-93 ICRISAT On-Farm Research Programme are particularly welcome. Some of the results are summarised below:

**Variety adaptation**

Six new millet varieties were tested against farmers' local varieties across the Northern Regions. Okashana I remained the most adaptable variety for all regions. Yield ranged from 0.92 tonnes/ha to 1.93 tonnes/ha across six test sites.

**Variety performance**

Okashana I averaged 1.56 tonnes/ha across 12 trial sites. As such, it performed significantly better than farmers' locals which averaged 1.38 tonnes/ha.

**Fertiliser trials**

Responses were variable across the regions, but in Owambow, responses to applications of up to 20P and 20K per hectare were significant.

**Husbandry practices**

A recent farm survey explored current practices and assessed the level of adoption of certain improved practices among 200 Owambow households. Results of the survey are presented in Table 4 at the end of this chapter. Analysis of the data shows that, although some practices are well established, households could benefit from improvements in the following areas:

- Early weeding after crop emergence
- Use of animal draught power for weeding
- Crop residue utilisation
- Inter-cropping with legumes
- Crop rotation
- Use of manure
- Use of fertiliser

3.3.3 Other Crops

All other crops occupy less than 10% of cultivated land. Cowpea, although widely distributed, is used far below its potential. It is not inter-cropped in a systematic way and therefore contributes much less to soil fertility improvement than it could. A large increase in area planted to cowpea would do more to improve household nutrition than any other feasible intervention. The local cowpea type is a decumbent, dual purpose vine producing both seed and leaf for human consumption and fodder for livestock.

Sorghum, pumpkins, melons and groundnuts are inter-cropped in millet fields in scattered patches. Research into cowpeas and groundnuts is in progress. New varieties should be released within the next two years.

3.4 Land Preparation, Planting and Weeding

Most land is ploughed with oxen or donkeys. Recent droughts have reduced ox numbers, and oxen are reportedly in poor condition by the start of the ploughing season in November/December. Donkeys are better able to retain their condition through the dry season, and are therefore more fit to undertake heavy work when the rains break. The use of tractors to prepare land is in demand, but it is not a viable option for the majority of farmers.

Planting is done by hand, and broadcasting has given way to crude line-sowing. However, spacing between lines is too irregular to permit inter-row cultivation with ox-drawn equipment. As a result, weeding is carried out manually with a short handled hoe.

3.5 Soil Fertility Maintenance

Most Owambow households are now using manure. Households who do not own livestock are reported to be herding stock owned by absentee owners in order to obtain manure. Indications suggest that despite lower rainfall, Owambow has higher millet yields than Ovahonga. It is likely that use of manure is one of the main contributing factors.

3.6 Conclusion

Land scarcity is forcing households in Owambow to farm more intensively. This trend is likely to accelerate as the population increases. Further intensification could entail the following:

- Zero-grazing of livestock and production of more compost
- Greater use of grain and forage legumes
- Use of chemical fertilisers and improved seeds
- Adoption of agro-forestry using multipurpose trees
- Greater use of animal power
- Diversification into cash cropping, once adaptive research has identified suitable alternative crops.

The compelling need for intensification is likely to make Owambow a much more receptive area for extension action than any of the other regions.
4. **LIVESTOCK**

4.1 **General**

4.1.1 **Rangeland**

The populated area of Owambo land is the central region around the oshanas of the Cuvellai Delta and the water pipeline from Rucusca to Otjivelo, which has intensified the population of both people and livestock. The oshana villages have three categories of land: 1) the cultivated enclosures of the HHs on the higher land, 2) the oshana pans in the lowest areas, which sometime hold water throughout the year, and 3) the parts in between which furnish grazing for livestock and can be seasonally flooded.

The tree cover has been largely removed; the (Colophospermum mopane) mopane woodlands arewaist high stumps which are now coppicing. The grasses have retrogressed to annuals and to the less palatable and valuable *Aristida* spp., the poorer *Eragrostis* spp. and similar species.

The eastern side of the delta is an extensive woodland area, with mostly broad leaved species but with some *Acacia* spp. mixed in. Tree types include *Terminalia* spp., *Pterocarpus angolensis*, shrubs and bush species such as *Grewia* spp., etc. Mopane woodland is also present. Soil types vary throughout, from red to grey sands. Tree cover is often heavy with limited grass cover in between, including *Bracharia* spp., *Aristida* and *Eragrostis* spp. This area seems to be relatively under-utilised on the higher ground (the poorer soils). However, in the valleys and occasional water pans, where some settlement is found, overgrazing occurs. In addition, there are areas dominated by groves of Mangetti trees (*Ricinodendron latifolium*).

To the west lies mopane and thorn woodland, which includes *Commiphora* spp. The grazing is fairly heavily utilised particularly around the cattle post and kraals. Nearby, where enclosures occurred, good regrowth of both annual and perennial grasses was seen.

To the south along the VCF, there are open plains of grassland with salt tolerant grasses. These plants support large numbers of cattle. They are dinked to the east (along the main carmic road) by undulating land supporting thorn tree woodland and well utilised grazing.

Summer or wet season grazing is usually in the oshanas. In the dry season, cattle are moved in a semi-nomadic fashion (see Map 4).

4.1.2 **The People**

The population is approximately 618,108 people on a land area of 51,800 sq km. On average, there are 11.9 people per sq km or 328 ha per person. The 1992 census indicates a total of 99,976 households (HH), with an average of 8.2 persons in each (see Table E1). As stated above, the population is concentrated in the Cuvellai Delta and pipeline in the centre of the Region. Like other groups in the Northern Regions, the Owamboos regard themselves as cattle people, but as shown in Table E2, the actual ownership of cattle is marginal: 50.7% of HHs do not own any cattle. Of the 49.3% (or 49,238 HHs) that do, the average herd size is only nine head per HH.

In consequence, individual HHs in the village communities rely heavily on cropping for subsistence. The HHs and cropping areas occupy the highest ground (see section 4.1.1) and are enclosed with wood cut from live trees. A cluster of such dwellings make up a village. As a result, most trees have been cut down for building, fencing or fuel.

The region lacks a tradition of substantial cooperation among households. This may be one of the reasons for the lack of development of Farmers' Associations. However, the traditional Chiefs seem to have considerable power, if not respect. Chiefs operate with the aid of advisory committees.

4.2 **Livestock and Management**

4.2.1 **Livestock Numbers**

Livestock numbers in Table E1 and Table E2 indicate the trends in cattle and goat numbers. Estimated cattle numbers were 451,114 in 1992. Although numbers rose from 1962 to 1969, latter years reflect a downward movement (see Figure 3 below). Total numbers of goats in 1992 were 53,525, again suggestive of a slight falling trend. Sheep numbered 12,000 and horses 4,000. The number of donkeys are estimated to be about 90,000 (in 1991 the estimate was 120,000, but many reportedly died off in the 1992 drought). The figures for donkeys are calculated and not counted. Nevertheless, the large number of donkeys observed in the area suggests too great a population. Finally, chickens are also kept in the area.

Stock densities in Owambo are an estimated 8.4 large stock units (LSU) per square kilometre -- higher than in any other region in the study area. This figure does not consider cultivated or unused land and so offers no insights into management issues, however, if an estimate of grazing area is made, the stocking rate appears to be carrying 50% more than it should (see Table E1). This carrying capacity is made possible by the transhumant movement of cattle into Angola and into Cuanza (see Map 5, and Management paragraphs below).

Farmers see the production of oxen for ploughing as one of the key functions of cattle. As shown in Table E4, over 50% of HHs do not have any cattle. Clearly a serious short fall! The average herd composition of the HH is estimated to 40% cows and 20% oxen (see Table E3). With an average of 9 head per HH, the 49.3% of HHs owning cattle have 2 or less oxen per household.

Cattle numbers per HH are clearly insufficient to sustain most HHs. Interviews with villagers revealed that many people have no cattle, only a few goats. In contrast, the largest owner has 130 head of cattle, 130 goats, 3 sheep, 4 pigs, 7 horses and 5 donkeys. Most HHs also have chickens for eggs and meat.
and grazing area, spreading out like the spokes of a wheel. This separate grazing, it was said, is done to prevent overgrazing. However, a dispute over water payments has made it difficult to reach agreements on communal grazing (see paragraph on water below).

Some illegal cattle enclosures were observed near the cattle post. Grass growth inside these enclosures was extremely good. It appears that, for the time being, the villagers are accepting these enclosures. Unlike the usual -- and more wasteful -- log or lug and thorn-branch fences, these enclosures were constructed with fence posts and wire.

The Eunda village cattle movements are comparatively localized, although during serious drought they might move up to Angola. Crossing into Angola requires an administrative permit, which specifies a number of days after which they must return. In other areas of Ovamboland, there is a broad sweep of irreplaceable movement to the south and then to the east (see Map 5). The team observed large herds of cattle just to the north of the Eiusha pan and the VCF. The herds had arrived less than three weeks earlier, and in due course they would move eastwards when the grazing in that area runs out.

Stocking Rates
As stated in section 4.2.1 above, overall stocking rates appear to be about 50% higher than they should be, in spite of the small reduction in the cattle population. Stocking rates are destined to get worse. The Eunda village Chief reported that their nearest cattle post area has already been invaded by people from outside their traditional circle of neighbouring village communities who also share the communal grazing. These invaders are trying to crop the area. This type of movement will clearly squeeze the grazing areas.

The Chief and his council wish to preserve the cattle post grazing for their traditional group of villages. To this end, they asked GRN to help make a cut line to demarcate the area. They want to build a fence to control the movement of cattle into the area. They seem to have broad agreement from the nearby villages and their Chiefs, but GRN has given them no feedback.

Milk Production
Milk production is limited by the short time period available. As mentioned above, milking is done in the morning, but if the HH has a newly-born baby, then some cows would be milked in the evening as well. Milk production is not regarded as an economic activity. In fact, selling milk goes against tradition, because it is regarded as depriving the calves. Most HH's consume milk in the form of sour milk.

Breeding
The perception was that the drought has seriously affected breeding and calving rates. Calving rates in a good year were said to be about 50%. Observations from village interviews indicated a rate of 46%.

Two methods of bull calf selection are used. For example, one big farmer selects on conformation and weight at weaning. However, the traditional and most common method is to select at one to one and a half years. Bull calves are selected on horn size and on colour as well as on conformation and weight. Castration reportedly is carried out using the Burdizzo in
both cases. If Burdzizos are not available, knives are used, but no infections result in either case. Castration is only carried out in the cool weather, if there is also sufficient grass.

Breeding bulls are run with the herds year round. With the loose herding of cattle within communal grazing areas, there is generally little control over breeding and in turn, breeding diseases. The breeding of heifers too early is encouraging the spread of disease and leading to some inbreeding. Most cattle breeds observed were Sanger type. The Regional Veterinary Service reported that Brahman and Simmental bulls have been bought from the commercial areas in order to upgrade the local cattle.

Work Oxen
Oxen are valued for ploughing and crop work and they are frequently lent for free to relations and friends to plough their fields. Other farmers hired out their oxen at a cost of about R20 per hour; the cost per hectare works out to be R100 to R150. The rental cost includes the operator.

The village reported that they are usually short of oxen for the rush of ploughing when the rains come. In any case, the oxen are often too weak at the end of the dry weather for this task. The oxen generally need a few weeks of new grass before they are strong enough for work. The ploughing operation therefore is usually started with donkeys until the oxen regain their strength. Many villagers would prefer GRN to bring in tractors for hire to replace the oxen.

Culling
As in other communal regions, possession of cattle in numbers is important, and so culling is not generally undertaken. Selling or the slaughter of cattle is done if absolutely necessary. Marketing of cattle is therefore not well developed. As a result, only Angolan cattle were observed in the markets.

4.2.3 Small Stock

Most HH have some small stock, mainly goats. Many died from the recent droughts, and many were slaughtered for food before they died. The cost of a goat is reportedly about R15 per head alive.

Small stock wander about the villages/ana area and are not herded except when jackals are about. Males and females are not separated. HHs that do not have cattle, milk their goats for the house in the wet weather. Children usually do the milking.

Castration is carried out with a knife, usually within a few months of birth.

Pigs are kept for HH food security. Usually between one and four are housed near the HH and they were fed on the bran from millet, sometimes some grain, water melons and other wastes, such as the left-overs from the secondary school. Pigs were usually bred by one farmer in the village who sold piglets to HHs for R20 per head.

4.2.4 Fish

Fishing is extensive in the ana area, and fish stocks are reducing. The Rural Development Centre at Ongwediva is trying to fill this gap by selling fingerlings of tilapia. So far in 1993 they have distributed 200,000.

4.2.5 Nutrition

Farmers recognise the value of supplementary licks, stating that they would buy supplements if they were available in the region. The wealthier cattle owners purchase rock salt, bone meal and licks from Tsumeb.

Little other supplementation is carried out. Many of the villagers do out their millet stalls and cart them back to the HHs. At the end of the dry season, these fed to sick or weak cattle and to goats and, if the supply is sufficient, to the most valuable cattle.

4.2.6 Diseases and Losses

Village interviews revealed the main disease problems to be lung-sickness and anaplasmosis. Ticks also seem to be a problem. The team observed ticks on some cattle during an August visit - the dry time of the year. The people confirmed that they have them all the year round. A few farmers spray some of their cattle as necessary, particularly before cattle move to the post. Small stock are often put in a small plunge dip.

Liver fluke and stomach worms were said to be present, but clinical symptoms have not been reported. Lumpy skin disease in cattle has also been observed.

Diagnosis of diseases is difficult because carcasses are often eaten when a cow dies, even though it may have died of anthrax.

Jackals take unattended small stock. The village has reported this problem to the Ministry of Wildlife and Conservation but has received no response to date. In addition, theft of wire from the VCF has resulted in lions killing cattle in the herds that move south in the dry weather.

4.2.7 Payments for Services

Payments for services include those for water and for some vaccinations. The annual compulsory inoculations are free. Drugs are purchased from the pharmacy (see Veterinary Service below). No grazing fee is paid.

Water

It was reported that villagers make two payments for water: a collection to purchase diesel, and a R2 payment per head to cover the cost of maintenance by GRN. The people of the village have agreed to these payments. However, non-payment by some leads to disagreement on communal grazing (see section 4.2.2).
4.2.8 Marketing

A detailed description of livestock marketing and the constraints, etc., can be found in the report commissioned by the EC.1

**General**

In all the Northern Regions, cattle are generally not sold, except out of necessity, when money is needed. For the most part, cattle are regarded as part of the family.

The Veterinary Cordon Fence constrains marketing in the Northern Regions by preventing the shipment of cattle to abattoirs in the commercial areas of Namibia, to South Africa (the major market for Namibia) or to Europe. This restriction aims to check the spread of serious cattle diseases which are not present to the south. Marketing of the end product outside the Northern Regions is restricted to canned meat only. More recently, strict quarantine has enabled the sale of deboned and chilled meat to the south. (For additional details on the VCF, see the Appendix to this Chapter.) A summary of marketing in the Northern Regions follows:

(a) Sales and exchanges between HHs -- large numbers change hands for cultural, social and economic reasons;

(b) Informal sector meat traders -- farmers generally prefer to sell in this market because prices are higher (except in Caprivi -- see Chapter D below). The more remote the area, the better the informal market;

(c) Formal market through the abattoirs -- delivery direct to the slaughter house is the least expensive and gives the best price. Meato buys over the scales and deducts a transport levy, and Meato buyers purchase at auctions, also taking off a small transport levy. Sometimes Farmers' Associations or other agents are paid a commission for identifying and reporting stock available for sale. The transport to the holding ground, the quarantine stations or the abattoirs is paid by Meato and is usually carried out by a hired private contractor.

Turnover of cattle in the market is difficult to assess. As noted above, most cattle sold come in from Angola. However, some indication of throughput is given in the section below, although numbers of small stock slaughtered are not known. Large numbers of small stock might well be slaughtered in the villages for home consumption. Ovambo and Kavango are less likely to sell cattle than Caprivians or Hereros.

The formal market in the Northern Regions was developed between the Meato and private traders. The informal sector had dominated the markets until Meato took over the abattoirs in 1991 and introduced the grading and pricing system used in the commercial areas. Nevertheless, farmers found buying to be too sporadic. Farmers have been leery of the grading and pricing system because Meato could not and cannot bargain, which is what people prefer. Bargaining is impossible with fixed grades and prices. Yet, the spin-off of this system has forced traders to pay better prices based on Meato standards. To understand grading and pricing, the farmers need to be educated on market needs, such as the preference for younger better quality animals.

Nevertheless some farmers have responded to the formal market. Large breeds of bulls are now being purchased (e.g. Simmental) in response to the grading needs of high carcass weights.

GRN has tried to encourage off-take and a reduction in the breeding herd by providing a drought subsidy for the seller of R 120 for each female sold. This does not appear to have encouraged sales, although the drought does seem to have marginally increased overall numbers in the markets. In some cases, prices at auctions were discounted by buyers to compensate for this extra money paid, thereby defeating the purpose of the subsidy.

**Livestock Marketing in Ovambo**

Most of the slaughter stock for the Ovambo markets comes from either Kaokoland or from Angola (in spite of a duty of up to 30% which Angolans reportedly pay on cattle imported for slaughter). The formal sector marketing in Ovambo is not well-organised, lacks retail buying points and relies on the voluntary delivery of cattle to the abattoir -- commission agents do not appear to be accepted by the villagers. Moreover, people wish to see formal facilities for markets before they bring forward their cattle. The local cattle off-take is therefore low.

The Oshakati abattoir has a capacity of up to 200 head per day, a chilling capacity of 170 carcasses and the canner has a capacity of 118 carcasses. Much of this capacity is filled from Ovamboland and Caprivi as well as from Angola. There is a small stock and big abattoir and a small butchery at Etunda with a capacity of 30 head per week.

Local bush markets are operated in the traditional way, but in Ovambo the FNDC rents market stalls to butchery traders. In the informal sector as a whole an estimated 290 bush markets turn over approximately 150 to 200 head daily.

4.3 Farmer Categories

There are four basic types of farmers in Ovambo:

i) Village farmers (who might be large or small stock owners);

ii) Illegally enclosed farmers;

iii) The absentee farmers, and

iv) Legally enclosed farmers.

The farm management systems discussed above generally apply to farmers in the first three categories. The illegally enclosed farms differ merely by fencing off an area of communal grazing land between the village and cattle post for their own use. Their herds are only put into these areas when the communal grazing has run out.

---

1 KPMG Pest Marvick Namibia Consulting Team, June 1993. "Livestock and meat marketing in the Northern Commercial Areas of Namibia", Commissioned by the Commission of the European Communities.
The legally enclosed farmers consist of a group who have GRN-established farms of 1,000 ha. They have a legal agreement with GRN which, among other things, requires farmers to limit their carrying capacity to 120 LSU maximum, or 8 ha per LSU. In addition, the farmers may not cut down any trees. These farms are situated in the south-east or Mangeti area of Ovamboland where attempts are being made to move the VCF north. However, these farmers are cutting the fence in order to gain access from the communal area to their own farms.

4.4 Agro Support Systems

4.4.1 Farmers' Associations

Farmers' Associations are difficult to set up, due in part to the traditional lack of cooperation among households. Considerable conflict of opinion and disagreement appears to exist among the villagers.

4.4.2 Namibia National Farmers Union; (NNFU)

Little NNFU activity has taken place in the region because it is a comparatively new organisation. One of the largest farmers had become a member and was to be the local organiser but he said that they were only just starting up. The NNFU recently held its first annual congress in Ovamboland.

4.4.3 National Agricultural Union; (NAU)

NAU is not yet very active in the region. Its training arm, Agrifutura, is expected to establish and run training courses in Ovamboland.

4.4.4 Co-operatives

AGRA does not operate in Ovamboland, and no other agricultural co-operatives were identified.

4.5 Institutions

4.5.1 Extension and Veterinary Services

Extension and Veterinary Services are addressed in Part II, Chapter P.

The situation of the Assistant Animal Health Inspector (AAHI) serving Eunda village is typical. He serves many other villages in addition to Eunda. His responsibility covers nine crush pens in the area, each of which might serve as many as four villages. The AAHI has a bicycle for transport. Drugs are generally obtained from Ruacana, and they are not handed out to the AAHI.

4.6 Projects and NGOs

International and national NGOs, as well as GRN ministries, are active in Ovamboland. A regional network serves as a forum for discussion and co-ordination of projects among NGOs and ministry staff in the region. Chapters L and R in Part II discuss these further.

4.7 Conclusions

Human population pressures are the greatest threat to livestock production. The priority among households in Ovamboland to own cattle brings additional pressure on the reserves.

Farming systems are on retreat, and rangelands, however marginal, are being invaded by subsistence farmers who have no other prospects of finding work. The degradation of the range and the environment -- particularly deforestation -- is already extreme. Fortunately, the effects are tempered by the flat topography which results in little or no erosion, although wind erosion could become a factor.

Overstocking and degradation of the rangeland is exacerbated by donkeys which have been increasing in population in recent years. They pull up grass by the roots and destroy the sward. Some way must be found to substitute other animals or methods to take over the work that donkeys do.

Enclosure of cropland will of necessity continue, but more efficient methods of achieving this must be developed with the farmers. Similarly, enclosure of rangeland demonstrably brings benefits in terms of better grass production. This idea should be exploited for the benefit of as many of the farmers in the community as possible.

Farmers must develop better management to ensure that the provision of any new inputs, such as a new borehole, does not further degrade the environment. Improved management should also reduce the drought losses among domestic stock and protect the smaller farmers from the catastrophic effects that such losses have upon food security and livelihood.

Villagers are asking for help with community-based management systems for their rangelands. They want demarcation and even enclosure. These calls for help need to be addressed.

4.8 Appendix to Livestock Section

The following pages are essential reference material for the above section on livestock and provide a useful link with sections on marketing.

The Cordon Sanitaire and Stock Control

1. The issues and perceptions in respect of the Veterinary Cordon Fence (VCF) have changed over the years since independence. The main purpose of the fence was and is still to control the spread of animal diseases, particularly those of cattle, in Namibia, which relies on the disease-free nature of the majority of its land area to maintain its important export markets. (The rural sector accounts for 10% of the GDP and provides employment for 70% of the human population; livestock: directly
or indirectly, contributes about 90% to agricultural incomes.) Some viewed the VCF as a political tool of the colonial administration, which separated the communal from the commercial livestock farming areas. Nevertheless, both foot-and-mouth disease (FMD) and Contagious Bovine Pleuropneumonia (CBPP) are endemic in the communal areas, a problem exacerbated by the open border with Angola to the north. Seasonal movement of cattle takes herds north into Angola. They mix with herds there and return bringing the diseases with them. Angolan cattle are brought south to be sold in the Northern Region markets and to the slaughter houses. In southern Angola vaccination of cattle is rare, in contrast to the annual free vaccination campaigns and regular inspections offered in Namibia. These diseases pose a serious threat to the economy of Namibia if the VCF is removed and disease spreads southwards.

2. Moreover, because of the presence of these serious diseases in the Northern Regions, fresh carcasses produced there could not, for health reasons, be sold on international markets where prices are better. Meat could only be sold as manufactured and canned meats in the export markets, which command lower prices than fresh meat.

3. At independence, the Government of Namibia rightly decided to institute changes which would bring the livestock of the Northern Regions within the mainstream commercial life of the country. Two major policy changes were undertaken: one was to try and even out price differentials between the Northern Regions and the commercial areas, and the other was to build another fence in the north along the Angolan border, in order to remove the VCF and open the Northern Regions to the commercial areas. This proposal does have implications for Okavango, where fencing the river would be difficult and fencing the Okavango-Owambua border unacceptable.

4. After independence, the First National Development Corporation (FNDC) ran the abattoirs and formal meat marketing sector in the Northern Regions. It had no access to export markets except for canned meat. Thus, cattle prices were lower than those of the commercial areas. This differential was unacceptable to the people, who were also suspicious of FNDC because it had operated in colonial times. On 1st February 1992 the Meat Corporation (meatco), a corporation run by a producer dominated board, took over control. They introduced the same grading systems and prices as were operating in the commercial areas south of the VCF in order to meet the policy of equal market opportunity. However, some differences still remain today. Cattle in the Northern Regions are bought and paid for on the hoof, making grading more subjective than it is in the commercial areas, where payment is made only after slaughter and grading. Nevertheless, prices improved in spite of the price fixing by the Meat Board (see Part I, section 7.8.9 and 10.C).

Fencing the Angolan Border

5. In 1992, the government also commenced the fencing of the northern border between Owambu and Angola, an operation funded by the EC. The operation is an inter-

ministry exercise headed by the Ministry of Foreign Affairs and involving both MAWRD and the Ministry of Industry. To date, the operation has completed about two-thirds of the 400 km fence, which runs between Kuacana in the west and the Katango river in the east.

6. Clearly the original purpose of this fence was to control movement of stock across the international border and so contain the risk of CBPP, FMD and other diseases from the un-vaccinated Angolan livestock. In due course, the VCF to the south of the Northern Regions could be removed, leaving no difference between the marketing opportunities in the communal and commercial areas. It is felt that removal of the VCF would also defuse political issues.

7. The Angolan border fence has, however, created some controversy because it divides families, livestock herd holdings and restricts cly season movements north where under-utilised grazing and water can be found. Cutting the fence for access has occurred.

8. Meanwhile, in south-east Owambu (in the Marangate area) the VCF is being moved north in order to take some of the disease free communal lands into the commercial areas, thus opening up wider marketing possibilities, for example, to the EC. While fence cutting is going on the Angolan border, it is reported that the movement of livestock is much more controversial than it has been completely demilitarised on a number of occasions. As a result, the Veterinary Service has stated that it will only take responsibility for rebuilding once more. Apparently, newly installed farmers on these enclosures wish to have access to their own farms from the communal area where they lived before. Veterinary requirements preclude the movement of livestock in this way.

Changing Attitudes

9. The reason for the decimation of the new VCF, then, is the separation of cattle herds in the communal area from their traditional dry weather cattle-post grazing. This symptom points to a general change in attitudes. The VCF was objected to in the past on the grounds of discrimination. Now objections stem from the concern over the loss of communal and traditional grazing, and the possible encroachment of the commercial areas.

10. A new dimension to the building of the Angolan border fence is emerging. All openings in the fence for crossing points now have customs, immigration and veterinary guard controls. There has reportedly been a substantial increase in revenue, for instance, through import duties. This revenue, coupled with the much more controversial issue of the movement of the VCF in the Marangate area (see paragraph 8 above), has hardened attitudes and influenced policy in favour of retaining the VCF where it is.

11. Moreover, it is becoming increasingly accepted that the Angolan border fence (even though it is a double fence) will not be sufficient for total disease exclusion. At least a ten kilometre buffer zone might be required with another fence, which would be
7. ENVIRONMENTAL IMPACT

Agriculture forms the basis of the regional economy of Owambo. As the population of the region has increased so has the demand on agricultural land. More and more people are dependent on smaller and smaller parcels of land and as a result there has been a marked increase in inappropriate land-use practices associated with agriculture.

The most visible impacts of the current agricultural system are overgrazing and deforestation. Livestock numbers are escalating in the region (Cunningham et al. 1992) and are becoming increasingly sedentarised as the traditional systems of transhumance break down. The central oshanas region is severely overgrazed and soil loss through wind-erosion during the dry season is a source of concern. As the upper layers of soil are lost from the surface so the deeper hardpan layers rich in salts become exposed. These sodium-rich soils are poor for both cultivated crops and grazing. Illegal fencing by semi-commercial farmers is increasing over a wide area exacerbating the problems of overgrazing. The small-scale farmers is becoming increasingly marginalised as they no longer have access to the wide range of grazing options previously available to them but nonetheless retain their livestock. The result is severe overgrazing in the "corridors" between fenced areas.

As communities become marginalised with regard to livestock management, so their dependence on natural plant resources has increased in certain instances. People are unable to buy many commodities and so use natural resources for both home use and commercial gain. Woody species are cut for construction materials (Owambo homesteads use more wood than anywhere else in Africa), fuelwood and craft materials. The increasing urban populations have placed a high demand on certain wood products, especially fuelwood. This has resulted in widespread deforestation in the region. The traditional controls over rational use have been eroded through time and as many of the resources are regarded as "free" they are overused and environmental degradation has taken place.

Uncontrolled burning of the woodlands in eastern Owambo has a number of negative impacts. Grazing resources are degraded as palatable grasses (generally not tolerant of frequent fires) are replaced by unpalatable species. Woody species recruitment is severely depressed by frequent fires, which also kill large numbers of mature trees.

8. ASSESSMENT OF POTENTIAL

8.1 Introduction

AOC Technical Services Limited (1967) concluded that the expansion of arable agricultural production could only be effected by intensification within the existing pattern of land use. As nearly all the arable land in potential (i.e. with soil productivity ranging from moderate to very low) had been settled and developed there was little scope for the settlement and cultivation of undeveloped areas. There was even a case for withdrawing some of the poorer soils from cultivation altogether. This view is endorsed by the project.

Despite high infiltration rates AOC Technical Services considered some of the sands of the Western Plains as suitable for irrigation using sprinklers - but a supply of water is the main problem.

A brief description of the limitations and potential for improvement of the main soil types is given below.

8.1.1 Solonetz Soils

The potential for irrigation in the Etuka-Cuvelai Basin is limited by unsatisfactory internal drainage and severe salinity of the vast majority of the soils.

The potential of dryland farming on solonetz soils is limited by:
- shallow effective depth (10-30 cm) of cultivable soil above the solonetz 'B' horizon with limited capacity to store moisture;
- a very sandy and highly leached 'A' horizon extremely deficient in essential plant nutrients;
- the dense, slowly permeable, saline solonetz 'B' horizon which restricts root growth, impedes drainage, causes water-logging after heavy rain and is said to be "poisonous" to germinating seedlings.

**Improvements for Dryland Farming**

Options include: deep ploughing to fracture the impeding 'B' horizon; a temporary improvement but there is the danger of bringing saline subsoil to the surface; and increasing topsoil depth by scraping it into broad-based ridges.

**Development of Solonetz Soils for Irrigation**

This will require: mechanical destruction of the solonetz 'B' horizon; leaching to remove the soluble salts; provision of drainage for the disposal of saline drainage water; and addition of calcium salts to prevent the formation of further solonetz conditions. This is not a viable proposition.

8.1.2 Aqualtic Sands

Because of dryness and lack of cohesiveness there is a danger of wind erosion if the natural vegetation cover is removed and the land subject to excessive cultivation.

However, with their high permeability sandy soils rapidly absorb rainfall even from light precipitation, and run-off is minimal even after heavy storms. At 20 to 30 cm depth water may remain to form a layer of moist if unsaturated zone between dry layers of sand, for long periods.

8.1.3 Brown Sandy Loams

AOC Technical Services Ltd (1967) considered brown sandy loams potentially highly productive under sprinkler irrigation. However, Amon (1972) points out that when irrigated...
they are easily leached if the drainage is good, but if the drainage is poor, they are easily salinized.

8.1.4 Lithosols

They may have some agricultural potential, e.g. growing vines.

8.2 Determination of Over and Under-utilised Areas

8.2.1 Aquifers and Groundwater in Northern Namibia

In response to a request from Messrs. Burmeister van Niekerk & Partners the following brief description of groundwater occurrence in former Ovamboland, Kavango, Caprivi and Hereroiland West has been prepared by Interconsult Namibia Ltd. It should be noted that within the scope of this study the information presented is abridged.

Much information on groundwater in these regions has been accumulated by the Department of Water Affairs and the Namibian Geological Survey and is available on open file. During recent years, mainly post independence, major investigations have been carried out in parts of northern Namibia which have added considerably to the body of groundwater knowledge. The regions covered by these studies include Eastern Caprivi (excluding the flood-plain area east of the Katima Mulilo Ngoma-road); Kavango and central northern Ovamboland. Supplementary information has been gathered from recent investigations and drought relief drilling operations carried out in all regions.

Hydrogeological Setting

Fundamental to an understanding of the occurrence of groundwater in the northern part of Namibia is an appreciation of the geology of the aquifer formations (Maps 6 and 9). A sub-division into primary and secondary aquifers, with their distinct hydraulic characteristics and spatial distribution, forms the basis for further discussion of groundwater occurrence.

The east and central parts of northern Namibia are underlain by Cretaceous to Miocene, semi- to fully-consolidated arenaceous sediments of the Kalahari Formation. In places this formation exceeds 450 metres thick and east of ± 16°30'E the northern part forms a relatively continuous primary aquifer. South of ± 19°30'S this formation is less reliable as an aquifer and becomes drier further south.

The Kalahari sand and sandstone aquifers are relatively easy to locate by drilling and water quality is as a rule good, although areas of poor quality water can place limitations on exploitation.

Below the Kalahari Formation various bedrock formations exist. Bedrock lithologies are invariably impermeable and form secondary aquifers along contacts between rock types of contrasting composition and competence and along fault and fracture zones. These secondary aquifers are by nature discontinuous and difficult to locate by drilling.

In the area under discussion, secondary aquifers are exploited throughout much of Hereroiland West and in the western part of Ovamboland. In these areas the Kalahari aquifers are absent.

Groundwater Quality

Notable features relating to the groundwater quality of the study area can be summarised as follows:

- groundwaters throughout Kavango and Caprivi are predominantly of good quality
- the central Ovamboland groundwaters are exceedingly saline, commonly with total dissolved solids concentrations exceeding 20,000 g/l
- in central Ovamboland shallow fresh groundwater exists as thin discontinuous perched lenses that are exploited from hand dug wells where problems are encountered as a result of sub-aerial pollution
- with the exception of the above, Kalahari groundwaters are generally of poor quality with localised exceptions where total dissolved solids concentrations reach several thousand g/l
- groundwater from secondary bedrock aquifers is of more variable quality than that from the Kalahari.

Water Rest Levels (Depth from Surface)

It may be stated that water rest levels in northern Namibia increase from predominantly shallow levels in the east to greater depths in the west and south. This conclusion is based on the following observations:

- in Eastern Caprivi the area east of the Katima Mulilo - Ngoma road, which lies on the flood-plain of the Zambezi and Chobe Rivers, water levels are generally very shallow (5-10m)
- areas proximal to the Chobe and Kwando Rivers, other than on the floodplain described above, have rest levels of less than 20m
- in the central western part of Eastern Caprivi, distant from the perennial rivers, water rest level of 20-50m have been recorded. No levels of greater than 50m have been recorded in Eastern Caprivi
- although hard information is generally lacking for Western Caprivi, it is understood that a decline in water rest levels away from the perennial rivers occurs, reaching a maximum of approximately 30m below surface
- the Kavango region is relatively simply divided east and west of longitude 19°30'E. In the eastern part rest water levels of less than ±30m have been reported, whereas in the west levels drop to in excess of 80m depth
- Ovamboland rest water levels in the fresh groundwater area of the east, average around 50-100m below surface. The Cuvelai region (Oshana) is characterised by deeper saline groundwater overlain by shallow less than 5m, thin and discontinuous perched water lenses. To the west water levels range from 30-50m in both bedrock and Kalahari aquifers
Hereroland West is generally underlain by rest water levels deeper than 80m. The information on which this is based is scant and of questionable reliability.

**Borehole Yields**

Yield information is available for the whole of the study area, in the form of blow test from borehole completion forms or as records of pumping rates collected during water point surveys. Pumping test information is only available for limited areas of Caprivi, Owambo, and Kavango therefore the full yield information. As a result the information of limited practical value. The available information is summarised as follows:

- borehole yields in Eastern Caprivi are generally much less than 10m³/h (say 2-3m³/h) with occasional exceptions reaching 30-40m³/h
- Western Caprivi yields of up to 20m³/h have been recorded, although a realistic average would be in the region of 5m³/h
- Kavango is also characterised by highly variable yields, with an average of less than 5m³/h and occasional boreholes exceeding 20m³/h
- yield statements for Owambo are fairly meaningless as much abstraction is by hand from shallow dug wells. Borehole yields vary and average approximately 2m³/h
- Western Hereroland borehole yields are generally low, less than 2m³/h although there are some well defined areas in the extreme west have yields of 2-5m³/h

**Groundwater Utilisation**

Groundwater abstraction is mainly carried out on the basis of single water points per community supplying stock and people. Abstraction rates are not excessive and aquifers are not over stressed. On average daily usage does not exceed 20-30m³/d. In the case of dug wells abstraction is less than 2m³/d.

**Groundwater Exploration**

In the areas underlain by Kalahari sand and sandstone’s groundwater exploration is relatively straightforward; the aquifer is continuous and the only variations are vertical and horizontal changes in permeability which influence borehole yield potential. This and possible salinity problems, have been indicated by geoelectrical exploration methods.

Bedrock aquifers require more specific approaches aimed at the identification of linear fractures and contacts. These have been identified with the aid of aerial photographs and ground truthed in the field by geological and geophysical methods.

### 8.2.2 The Etosha-Cavelai Basin

Virtually all the sandy crests of the higher land between the oshanas has been brought into cultivation. There appears to be a gradual lowering in depth of the sandy A-horizon by water and wind which is reducing the amount of water stored in the soil for crop use and increases the risk of crop failure during long gaps between rainstorms.

### 8.3.3 The Western and Southern Plains

Extensive areas of seemingly under-used land were seen in the Western and Southern Plains in July. However, the limited use of such areas is apparently based on sound ecological considerations.

The land in the Western Plains is extremely flat with no sign of drainage lines, and only a few minor depressions. Except for one reasonably extensive ridge with slopes up to 3-6% centred on a cultivated area at Omaheke little other sign of cultivation was seen. The further west (and hence the drier the environment) the browner the leaves of the Mopane shrub (mid-July). There were several wind-operated boreholes, but motor pumps had been installed as the wind was not frequent enough to provide water when needed.

According to the Senior Agriculturalist at Ombalamu, the previous king (who died in 1959) decreed that the area was not to be settled but should be reserved for grazing only. In view of the paucity of rainfall and poor soils this sound policy should be continued.

There was plenty of ungrazed grass on the seasonally flooded grasslands of the Southern Plains. Land enclosure and cultivation of millet is in progress but saline groundwater within 2 metres of the surface and the long distance to sweet water (up to 20 km) may be factors slowing occupation of these lands. Most sand, apparently from late rains, was noted at a depth of 50 cm in the millet fields. The millet crop failed due to a gap in the rains. There is a danger of wind erosion if millet cultivation becomes widespread on these grasslands. Removal of the leached surface sand will bring saline sub-soil within the root zone and may lead to desertification of this vegetation type.

By mid-July the grass land towards the eastern end of the Etosha Game Fence had not been grazed, but there were camps and cattle trails in the Mopane scrub further west. This situation had changed by August when heavy grazing was in progress.

### 8.3.4 The Grey Loose Sands

The Grey Loose Sands are not cultivated because of low fertility and their poor moisture-holding capacity. One farmer did say that he managed to get a crop of sorghum in the first season of cultivation but nothing worthwhile afterwards. Paradoxically, they seem to support good tree cover but little grass. There are some areas which are subject to water-logging - but these have a sporty distribution and are not extensive.

In the featureless grey sands area pans are absent and there is little change in relief. The main concern voiced by the people we spoke to was the distance some communities have to travel for water - up to 26 km. Provision of boreholes would give them more time to work their farms, and enable the scattered patches of cultivable land to be developed. However, they must be sited so the present equilibrium is not disturbed (i.e. at about 24 km so that livestock continue to return for water every other day).
8.3 Identification of Areas with Potential for Intensification

Areas with potential for irrigation, regardless of an available water supply, constitute a small proportion of Ovamboland. 2,319 ha have high potential for irrigation development, 1,557,749 ha have reasonable potential and 846,862 ha marginal for irrigation development (Lewton et al 1971). However, most of these areas are a long way from any water source restricting irrigation to a very small area along the Cunene River.

However, increased yields and diversification of crops can be achieved by promoting water harvesting (sometimes called rainfall multiplying systems) to boost the supply of water for the crop with run-off. This is made more effective when combined with improvements to cultural practices which promote infiltration and conservation of rain water in the soil.

Water-harvesting involves the interception and concentration of rainfall run-off and its storage in the soil profile for the production of crops, fodder and trees.

It requires gentle slopes (2-6%), crust-forming ability of the soil surface (capping) to increase run-off, and soils at least 1.5 to 2 m deep on the cultivated area to store the harvested run-off.

Areas where water-harvesting trials would be worthwhile include the zone of Loose Grey Sands with (non-saline) pans with sloping margins along the Eenhana-Mpungu road. Further west along the Angola border a road grader could form gently sloping catchments on the flat plains.

Sites suitable for intensification are often too small to be mapped at 1:50,000 scale. However, their locations within a given landform can be targeted with land systems mapping in conjunction with 3-dimensional block diagrams (see Annexes, Volume III).

Improved cultural practices, such as more appropriate tillage techniques (e.g. chisel ploughing) and strip-cropping to reduce the crop's demand for water, are discussed in more detail in Part II, Section 3 B.

8.4 Identification of Degraded Areas

Environmental degradation is most advanced along the Ruacana-Oshikango pipeline approximately 2 km either side, and a 1 km radius around boreholes and settlements.

The Cunvela (Oshanas) drainage system in central Ovamboland is severely degraded in parts, with overgrazing and deforestation being the most noticeable features. The demand for land and agricultural resources is unlikely to decrease, which will hamper rehabilitation programmes unless benefits are accrued in the short term. The promotion of tree planting, live hedging, water harvesting techniques and introduction of fodder crops will all improve general environmental conditions, but are medium to long-term interventions.

The development of boreholes for drought relief schemes and resettlement has caused areas to become degraded largely through overgrazing. There is a need to develop support structures for resettled communities such that these impacts are lessened on future schemes. The potential for rehabilitation of these areas is low.
### OWAMBO: Monthly and Seasonal Rainfall Data

#### a) Ombalantu: 10 Year Mean Monthly and Seasonal Rainfall.

<table>
<thead>
<tr>
<th>M</th>
<th>J</th>
<th>A</th>
<th>S</th>
<th>O</th>
<th>N</th>
<th>D</th>
<th>J</th>
<th>F</th>
<th>M</th>
<th>A</th>
<th>SEASON (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AVERAGE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MIN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MAX</td>
</tr>
<tr>
<td>42/41 - 51/52</td>
<td>8.6</td>
<td>4.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>14.2</td>
<td>7.9</td>
<td>118.2</td>
<td>101.6</td>
<td>132.4</td>
<td>108.2</td>
</tr>
<tr>
<td>52/51 - 61/62</td>
<td>1.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.8</td>
<td>10.5</td>
<td>7.3</td>
<td>143.6</td>
<td>88.1</td>
<td>137.9</td>
<td>113.5</td>
</tr>
<tr>
<td>62/61 - 71/72</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.6</td>
<td>4.9</td>
<td>2.1</td>
<td>7.8</td>
<td>51.9</td>
<td>138.0</td>
<td>108.2</td>
<td>108.4</td>
</tr>
<tr>
<td>72/71 - 81/82</td>
<td>1.1</td>
<td>0.2</td>
<td>0.1</td>
<td>0.4</td>
<td>0.1</td>
<td>11.0</td>
<td>3.9</td>
<td>42.0</td>
<td>105.7</td>
<td>77.1</td>
<td>116.5</td>
</tr>
<tr>
<td>82/81 - 91/92</td>
<td>0.0</td>
<td>0.2</td>
<td>0.0</td>
<td>0.4</td>
<td>8.0</td>
<td>2.1</td>
<td>31.4</td>
<td>59.6</td>
<td>78.4</td>
<td>32.6</td>
<td>7.5</td>
</tr>
<tr>
<td>Monthly Minimum</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Monthly Maximum</td>
<td>86.1</td>
<td>2.0</td>
<td>1.0</td>
<td>5.5</td>
<td>35.0</td>
<td>57.1</td>
<td>201.5</td>
<td>107.0</td>
<td>314.6</td>
<td>163.3</td>
<td>123.5</td>
</tr>
</tbody>
</table>

### OSHAKATE: 10 Year Mean Monthly and Seasonal Rainfall.

<table>
<thead>
<tr>
<th>M</th>
<th>J</th>
<th>A</th>
<th>S</th>
<th>O</th>
<th>N</th>
<th>D</th>
<th>J</th>
<th>F</th>
<th>M</th>
<th>A</th>
<th>SEASON (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AVERAGE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MIN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MAX</td>
</tr>
<tr>
<td>72/71 - 81/82</td>
<td>3.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.4</td>
<td>11.3</td>
<td>7.6</td>
<td>129.9</td>
<td>118.0</td>
<td>135.7</td>
<td>110.6</td>
</tr>
<tr>
<td>82/81 - 91/92</td>
<td>3.4</td>
<td>1.2</td>
<td>0.0</td>
<td>1.1</td>
<td>0.3</td>
<td>16.6</td>
<td>38.1</td>
<td>75.3</td>
<td>75.9</td>
<td>60.3</td>
<td>12.3</td>
</tr>
<tr>
<td>Monthly Minimum</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Monthly Maximum</td>
<td>18.0</td>
<td>11.5</td>
<td>0.1</td>
<td>2.5</td>
<td>14.0</td>
<td>10.4</td>
<td>171.1</td>
<td>219.2</td>
<td>246.5</td>
<td>187.0</td>
<td>92.5</td>
</tr>
</tbody>
</table>

### OSHIGAMBO: 10 Year Mean Monthly and Seasonal Rainfall.

<table>
<thead>
<tr>
<th>M</th>
<th>J</th>
<th>A</th>
<th>S</th>
<th>O</th>
<th>N</th>
<th>D</th>
<th>J</th>
<th>F</th>
<th>M</th>
<th>A</th>
<th>SEASON (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AVERAGE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MIN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MAX</td>
</tr>
<tr>
<td>42/41 - 51/52</td>
<td>2.3</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>7.5</td>
<td>30.8</td>
<td>99.0</td>
<td>90.4</td>
<td>151.7</td>
<td>91.8</td>
</tr>
<tr>
<td>52/51 - 61/62</td>
<td>5.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.1</td>
<td>12.9</td>
<td>44.9</td>
<td>57.9</td>
<td>90.1</td>
<td>80.1</td>
<td>82.5</td>
</tr>
<tr>
<td>62/61 - 71/72</td>
<td>1.0</td>
<td>0.3</td>
<td>0.0</td>
<td>0.5</td>
<td>2.7</td>
<td>4.7</td>
<td>48.4</td>
<td>48.0</td>
<td>116.2</td>
<td>101.8</td>
<td>90.5</td>
</tr>
<tr>
<td>72/71 - 81/82</td>
<td>1.4</td>
<td>0.5</td>
<td>0.1</td>
<td>0.8</td>
<td>17.4</td>
<td>43.3</td>
<td>28.5</td>
<td>109.5</td>
<td>128.7</td>
<td>102.5</td>
<td>72.8</td>
</tr>
<tr>
<td>82/81 - 91/92</td>
<td>0.4</td>
<td>2.2</td>
<td>0.0</td>
<td>0.1</td>
<td>14.9</td>
<td>15.3</td>
<td>51.7</td>
<td>92.3</td>
<td>74.5</td>
<td>68.5</td>
<td>11.3</td>
</tr>
<tr>
<td>Monthly Minimum</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Monthly Maximum</td>
<td>11.8</td>
<td>23.0</td>
<td>1.4</td>
<td>5.5</td>
<td>21.2</td>
<td>60.0</td>
<td>261.6</td>
<td>176.5</td>
<td>354.3</td>
<td>213.3</td>
<td>345.3</td>
</tr>
</tbody>
</table>

### Footnote:
- **SEASON**: AVERAGE, MIN, MAX
  - **AVERAGE** represents the average rainfall for the season.
  - **MIN** represents the minimum rainfall for the season.
  - **MAX** represents the maximum rainfall for the season.
THE LAKES DISTRICT BASIN

PHYSIOGRAPHIC REGIONS

Upper Section - Western Highlands

Very typical mountainous relief with a receding pattern of prominent peaks and relatively subcontinuous moraine ridges. This region contains the major part of the Colorado drainage system. The extensive flat moraine areas of the previous region are very small in this region as the drainage system is developed.

Vegetation

The dominant vegetation is spruce, fir, and aspen with some willows and alders. The understory consists mainly of sedges and grasses.

Lower Section - Eastern Highlands

This region contains the major part of the Colorado drainage, system. The extensive flat moraine areas of the previous region are very small in this region as the drainage system is developed.

Vegetation

The dominant vegetation is spruce, fir, and aspen with some willows and alders. The understory consists mainly of sedges and grasses.

Vegetation

The dominant vegetation is spruce, fir, and aspen with some willows and alders. The understory consists mainly of sedges and grasses.

Vegetation

The dominant vegetation is spruce, fir, and aspen with some willows and alders. The understory consists mainly of sedges and grasses.

Vegetation

The dominant vegetation is spruce, fir, and aspen with some willows and alders. The understory consists mainly of sedges and grasses.

Vegetation

The dominant vegetation is spruce, fir, and aspen with some willows and alders. The understory consists mainly of sedges and grasses.
PHYSIOGRAPHIC REGIONS

The Western and Northern Plains - Physiographic Regions

**Physiographic Regions**

**The Western and Northern Plains**

**Forested Development**

This area includes the western and northern regions characterized by the presence of small, scattered forests.

**Bare Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Red Sand Plateau**

Predominantly red sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Vegetation**

**Red Sand Plateau**

Predominantly bare sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.

**Grey Sand Plateau**

Predominantly grey sand, with scattered vegetation. This region is characterized by a flat surface with sparse vegetation. The landscape is dominated by sand dunes and small mesas.
Table 4: Existing Millet Husbandry Practices

<table>
<thead>
<tr>
<th>REGION</th>
<th>OMBUSATI</th>
<th>OWAMBO</th>
<th>OKAVANGO</th>
<th>CAPRIVI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OSHIKOTO</td>
<td>ONDANGWA</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>APPROX NUMBER IN SAMPLE</td>
<td>100</td>
<td>60</td>
<td>35</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRACTICE / OPERATION</th>
<th>OMUSATI</th>
<th>OWAMBO</th>
<th>OKAVANGO</th>
<th>CAPRIVI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14</td>
<td>53</td>
<td>52</td>
<td>42</td>
</tr>
<tr>
<td>Line fully stumped</td>
<td>13</td>
<td>11</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Sowing method</td>
<td>47</td>
<td>40</td>
<td>60</td>
<td>46</td>
</tr>
<tr>
<td>Broad cast</td>
<td>5</td>
<td>22</td>
<td>26</td>
<td>28</td>
</tr>
<tr>
<td>Hilling on row</td>
<td>79</td>
<td>50</td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td>Sowing rate per hill</td>
<td>10 - 15</td>
<td>14</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>Seed number</td>
<td>5 - 10</td>
<td>14</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Thinning</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Leave 2-5 seedlings</td>
<td>Yes</td>
<td>95</td>
<td>98</td>
<td>71</td>
</tr>
<tr>
<td>Time of thinning</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>(Days after emergence)</td>
<td>42</td>
<td>27</td>
<td>54</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>&lt; 14</td>
<td>27</td>
<td>54</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>14 - 21</td>
<td>55</td>
<td>27</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>21 - 28</td>
<td>3</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>22</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Time of first weeding</td>
<td>&lt; 2</td>
<td>45</td>
<td>44</td>
<td>71</td>
</tr>
<tr>
<td>(weeks after emergence)</td>
<td>&lt; 2</td>
<td>55</td>
<td>21</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>&gt; 2</td>
<td>19</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td>Number of weedicings</td>
<td>&gt; 4</td>
<td>1</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Weeding method</td>
<td>30</td>
<td>56</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>Hand hoe</td>
<td>48</td>
<td>51</td>
<td>72</td>
<td>22</td>
</tr>
<tr>
<td>Animal crew</td>
<td>48</td>
<td>44</td>
<td>100</td>
<td>75</td>
</tr>
<tr>
<td>Sprayed configuration:</td>
<td>4</td>
<td>67</td>
<td>19</td>
<td>93</td>
</tr>
<tr>
<td>Sprayed</td>
<td>34</td>
<td>67</td>
<td>19</td>
<td>93</td>
</tr>
<tr>
<td>Coop Riresco</td>
<td>50</td>
<td>31</td>
<td>73</td>
<td>22</td>
</tr>
<tr>
<td>Grass &amp; plough</td>
<td>50</td>
<td>31</td>
<td>73</td>
<td>22</td>
</tr>
<tr>
<td>(management)</td>
<td>50</td>
<td>31</td>
<td>73</td>
<td>22</td>
</tr>
<tr>
<td>Grass &amp; rieoso</td>
<td>5</td>
<td>64</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>Cowrie &amp; food residue</td>
<td>5</td>
<td>64</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>Grass &amp; barn</td>
<td>5</td>
<td>64</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>Follow to measure facility:</td>
<td>97</td>
<td>97</td>
<td>92</td>
<td>11</td>
</tr>
<tr>
<td>Never</td>
<td>97</td>
<td>97</td>
<td>92</td>
<td>11</td>
</tr>
<tr>
<td>Sometimes</td>
<td>97</td>
<td>97</td>
<td>92</td>
<td>11</td>
</tr>
<tr>
<td>Use Legumes for intercropping:</td>
<td>97</td>
<td>97</td>
<td>92</td>
<td>11</td>
</tr>
<tr>
<td>Never</td>
<td>97</td>
<td>97</td>
<td>92</td>
<td>11</td>
</tr>
<tr>
<td>Sometimes</td>
<td>97</td>
<td>97</td>
<td>92</td>
<td>11</td>
</tr>
<tr>
<td>Roast maizes with legumes:</td>
<td>97</td>
<td>97</td>
<td>92</td>
<td>11</td>
</tr>
<tr>
<td>Never</td>
<td>97</td>
<td>97</td>
<td>92</td>
<td>11</td>
</tr>
<tr>
<td>Sometimes</td>
<td>97</td>
<td>97</td>
<td>92</td>
<td>11</td>
</tr>
<tr>
<td>Use manure:</td>
<td>97</td>
<td>97</td>
<td>92</td>
<td>11</td>
</tr>
<tr>
<td>Sometimes</td>
<td>97</td>
<td>97</td>
<td>92</td>
<td>11</td>
</tr>
<tr>
<td>Use bag fertilizer:</td>
<td>97</td>
<td>97</td>
<td>92</td>
<td>11</td>
</tr>
<tr>
<td>Sometimes</td>
<td>97</td>
<td>97</td>
<td>92</td>
<td>11</td>
</tr>
</tbody>
</table>

CHAPTER C. OKAVANGO

1. CLIMATE

1.1 Rainfall

The average annual rainfall is about 500 mm decreasing slightly from north-east to south-west (Map 7). Figure 3 (see end of Section) shows that rainfall has been below the mean in 8 out of the last 11 years.

Daily rainfall figures for the period 1982/83 to 1992/93 show that 29 out of 588 measurable rainfalls were greater than 30 mm, but accounted for 21% of the total rainfall for that period. 15-29.9 mm storms (10% of the rainfall events) provided 29% of the rain.

In every year, usually in January to March, there were periods of 15 to 38 days when no rain falls.

1.2 Temperature and Evapotranspiration

The average annual temperature is 22.5°C with daily variations of up to 20°C during the winter months and up to 12°C during the summer.

Relative humidity ranges from 30% during the dry season to 60-70% during the rainy season. Frosts can occur on a few days during June. Potential evapotranspiration ranges between 2690-2850 mm per annum.

1.3 Discussion

The long gaps between rainstorms is of concern, particularly as they occur in January to March when the crop is growing. Lack of soil moisture at the time of heading is disastrous for grain production. A considerable amount of water could be lost to crop growth due to heavy storms of more than 30 mm, if run-off or ponding on the surface occur. The risk of crop failures could be minimised if much of the water from these storms could be encouraged to penetrate rapidly into the soil.

2. DESCRIPTION OF SOILS AND VEGETATION

2.1 Physiography

There are two main physiographic regions: the River Terrace System of the Okavango River and the vast Inland Sand Plateau (see Map 8). The monotony of the sand mantle is relieved by depressions in the form of omiramba, pans and flat depressions. Superficial drainage is absent due to the well-drained soils. Deep horizontal drainage occurs in the well-defined omiramba, which hold temporarily hold water after heavy rains.

A schematic outline of these regions and their sub-divisions is given in Table 5 (see end of chapter). For greater detail and a map of the vegetation of Okavango refer to Carreira and Breidenkamp (1967).

2.1.1 The River Terrace System (1,356 sq km)

This comprises a flood plain, showing evidence of a braided river system and a prominent gently sloping alluvial terrace at a mean elevation of about 6 metres above the river.

A selection of scattered, well-grown individual trees of Acacia giffa and Combretum imberbe comprises the vegetation of the cultivated river terrace. Other common species include Sclerocarya (marula), Boscia albitrunca, Albizia spp., Lonchocephalus spp., and Ficus spp.

2.1.2 The Inland Sand Plateau (44,395 sq km)

This is a monotonous plain of recent aeolian sand with a relief varying from flat to gently undulating in regions of self dune formation. A prominent feature in the south central parts of Okavango are parallel self dunes and intervening omiramba (the current drainage courses).

Within the Inland Sand Plateau are two physiographic units: the Self dunes and the Featureless Plains.

The Omiramba Omataka, and other tributaries of the Okavango River (totaling about 6,000 km in length) flow through the Sand Plateau. Minor alluvial terraces are present.

The Self Dunes (11,855 sq km)

The soils are predominantly Grey Sands but areas of more favourable Red and Brown sands occur on the crests of the dunes.

Acacia giffa Bush Savannah normally occurs on the Brown Aeolian Sands where termite mounds indicate more favourable soil conditions. Although of medium density it is sufficient to effectively suppress grass growth.

Fremmaha sericeo-Burkea africana Woodland Savannah dominates the deep aeolian sands in association with Guibourtia coleaspermum, Bakassia plurijuga and Rhinostachyum ramnani. There is a sparse cover of Aristida spp.

The vegetation of the omiramba is essentially an open grassland. The more favourable soils are indicated by scattered well-grown A. giffa trees within a dense grass cover characterised by Schmidia bulbosa. The areas of Grey Sands, usually onto calcrites at shallow depths, carry a tall sour grass cover of mainly Loudetia superba.

The Featureless Plains (32,540 sq km)

The soils are predominantly Grey Sands with isolated patches of Red and Brown Sands. There is an area in the south west corner where these latter soils are more extensive.
2.2 Soils

The characteristics of the sandy soils of the Inland Sand Plateau are the same as similar soils in Owambo (see Section 3) i.e. generally of low fertility and low water-holding capacity.

3. PRESENT LAND USE AND EXISTING HUSBANDRY SYSTEMS: CROPS

3.1 Land Use

Most of the rural population is concentrated along the 400 km long South bank of the Okavango River. Cultivated land is mainly located within 3 km of the river, but may be up to 10 km inland.

The average size of arable land-holding is reported to be about 4 ha. Field observation, together with air photo interpretation, indicates some fragmentation of holdings into two or more fields. The causes of fragmentation are not well understood, but inheritance arrangements and the exhaustion of soil fertility on land close to the dwelling are two probable causes.

Unlike Owambo, where arable land is located around individual homesteads, lands in Okavango are typically further away from the dwelling, more regularly shaped, and grouped together, on a family or village basis. In addition, lands in Okavango have far fewer communally grazed 'corridors' between them. Therefore, in contrast to Owambo, perimeter fencing of arable lands on a group or communal basis is feasible in Okavango.

The total area under cultivation annually may be as high as 54,000 ha (at 18,000 households with 3 ha each). The figure for cultivated land per household is postulated on the basis of greater access to land and better availability of animal power.

3.2 Farming System

The system is sedentaried, mixed subsistence farming compressing the continuous cultivation of millet as a staple crop, coupled with extensive beef production. Complementarity of crop and livestock production is not fully developed. Some shifting cultivation is still practised at ever-increasing distances from the Okavango River. The depletion of soil fertility is virtually universal, because soil improvement practices, such as manuring and inter-cropping with grain and forage legumes, are uncommon.

3.3 Crops

3.3.1 Introduction

Most settlement and cultivation is along the River Terrace although there is some movement away from the river. Very small vegetable gardens have been established in the minor alluvial

valleys and some maize and sorghum had been grown on the brown loams. The Inland Sand Plateau is mainly used for extensive grazing but there is some dryland arable production on suitable soils in the omiramba.

The most important omiramba with regard to size and human settlement are: the Omunako, Mpuungu, Dikulela, Namungundu, Mpuku, Matabe, Makena, Kanakuk, Kaudum and the Bome. In the south west corner of Okavango there are no omiramba so water drains into numerous pans.

3.3.2 Pearl Millet

Millet is the staple food crop grown by most rural households. Many local land races occur, and variability amongst them is high. Adoption of the newly introduced Okashana I is only just beginning. Less than 3% of cultivated land was sown to it in 1992-3.

Table 4 in Chapter B presents the results of the ICRISAT On-farm Research Programme Survey covering 100 households. The results reveal low levels of adoption of some of the most important crop husbandry practices. Most notably:

- Less than 50% of farmers thin their millet in time
- 60% do not weed early enough
- 75% weed by hand, when ox-drawn cultivation could be used
- Only 1% collect crop residues for stall feeding of oxen. This practice should be commonplace
- 75% of farmers never follow their land to restore fertility. Given the dry climate and nutrient-deficient soils, restoration of fertility is likely to be a very slow process, requiring ten years or more to show significant results
- 50% seldom use legumes for inter-cropping
- 70% never rotate millet with legumes
- 84% never use kraal manure
- 73% never use any chemical fertiliser

Clearly, the promotion of feasible and cost-effective extension packages could considerably boost millet production.

3.3.3 Other Crops

Very small areas of sorghum and maize are grown. The former is grown principally on the slightly heavier soils of the Omunambas in the hinterland. Maize is grown close to homesteads as a green vegetable. Sorghum and maize grain yields are low, at below 100 kg ha. Cowpeas are quite widely grown. However, because use is not systematic, their potential is under-utilised.

Groundnut growing is spreading very slowly through the stimulus provided by NDC commercial operations, which stress irrigated production. However, the requisite high seeding rate of over 50 kg/ha leads to logistical and storage difficulties. This factor strictly limits the potential for expansion of rainfed groundnut production.
3.4 Land Preparation, Planting and Weeding

Ownership of ox ploughs is common, but access to trained oxen is less so. Most farmers rely on oxen for land preparation. Unfortunately, GRN has raised unrealistic expectations about the availability of tractor hire services. Very few farmers have obtained these subsidised - and unsustainable - services. However, scope exists in the development of cropping techniques that require less frequent major tillage.

Manual planting is normal, and ICRISAT research indicates that millet plant populations are within an acceptable range. Planting is seldom a major constraint in subsistence farming. In fact, mechanisation of the process in the absence of other improved techniques often leads to yield reductions rather than increases. 75% of farmers rely on manual weeding but, compared to the regions, a higher proportion combine animal powered cultivation with manual methods.

3.5 Soil Fertility Maintenance

This aspect of crop husbandry is virtually ignored in Okavango. As such, the improvement of soil fertility maintenance offers a valuable opportunity for research, innovation and extension.

3.6 Conclusion

Crop husbandry in Okavango is very basic. The choice of crops suited to the dry environment is narrow. Poor soil management is universal. However, very good opportunities exist for intensifying crop production. The population is concentrated along the river but is served by a good road system which can facilitate the provision of services needed to bring about change. Although livestock ownership is relatively low, the full potential complementarity of crop and livestock enterprises has yet to be exploited.

4. LIVESTOCK

4.1 General

4.1.1 Rangeland

Agriculture and livestock keeping in Okavango take place in six different areas:

i) The cultivated settlements along the Okavango River;
ii) The cultivated settlements along the "in land" water courses omiramba;
iii) The cultivated settlements along the main roads south (particularly the Rundu-Grootfontein road);
iv) The central rangelands;
v) The Mangetti area enclosures; and
vi) The Kadom Game Park.

An August 1993 visit revealed that the pastures along the river were already grazed flat, making it difficult to assess the value of the grasses. However, Paspalum maximum and Hyparrhenia rufa were among the grasses identified.

Adjacent to the cultivated areas and away from the river, the basic vegetation type is tree savannah and woodland. Tree types varied but included mopane, Colophospermum mopane, Baikiaea plurijuga, Pterocarpus angolensis, Combretum imberbe, Terminalia sericea and Acacia spp. The under lying grasses included Erargastris and Aristida spp. In mid-winter cattle rely to a great extent on sorghum and millet stalks and stover in the harvested fields.

Along the omiramba Omakota (a seasonal river only), Acacia and mopane woodland are found, as well as Dactylolimon gigantea, Eragrostis superba and E. trienophora grasses.

The open savannah grasslands can also be divided into three sections:

1) To the east, the poor grey/white soil supports equally poor, often annual grasses;
2) The central portion is a transition area of improving red soils up to the Grootfontein-Rundu road;
3) To the western side lies a dune-land formation again of red soils. This area comprises the best of the grazing, with mopane woodland on the dune crests and climax grass sward in the valleys or omiramba. Grasses include Brachiaria spp., Cenchrus ciliaris, Anthephora pubescens, Eragrostis spp., Digastris spp., Schinidia pappophoridae and Urochloa bolleaelae.

The Mangetti area in south-western Okavango has been divided into self contained farms distributed to individuals. The Veterinary Cordon Fence (VCF) may be moved north of this area as is being done in Owamblo. It is more akin to the commercial areas, although the new owners might benefit from training and extension support in rational grazing systems and good farming practice.

Overstocking in general is not apparent, except around the Okavango riverside settlements where the households are concentrated. Farmers tend to graze cattle there, rather than driving them further afield to the better inland grazing. Large areas of rangeland in the hinterland are empty and unused with good climax vegetation, although some Owamblo herds encroach into western Okavango.

4.1.2 The People

The population is approximately 136,220 people on a land area of 59,935 sq km, averaging about 2.7 people per sq km or 37 ha per person. The 1992 census indicates a total of 30,892 households (HH). Map 10 shows the settlements to be a type of ribbon development along the Okavango river and along the road that parallels the river. They both run from the border with Owamboland in the west to the Caprivip strip in the east. Farming communities have also spread south along the water courses that flow north into the Okavango River. These water courses, such as the Omakota, are dry for most of the year and only flow in the rainy season. Nevertheless, the land has attracted energetic farmers because it is less exhausted. In addition,
hand dug wells only 1.5 m deep yield adequate drinking water. Alluvial soils in the river beds make crop production possible even in the dry winter season.

Map 10 also reveals some borehole development and associated enclosures in south-west Okavango, just north of the FNDC developments in the Mangezi area, as well as a few other scattered enclosures. These narrowly focused settlements leave large areas of rangeland empty and unused. Despite the relative shallowness and abundance of the water bearing aquifers, a lack of drinking water for man and animals has kept farmers from grazing these areas.

People in Okavango rely more extensively on crops for their livelihood; nevertheless, they regard themselves as cattle people because crops occupy them for a very short time during the year, while livestock are a year round commitment. Many Kavangos aspire to be owners of larger herds. Moreover, cattle survive the drought periods better than crops, and crops cannot be grown without livestock to prepare the land and cart the produce. On average, however, the Kavangos own only a fifth of the livestock numbers that the Hereros own. With cropping as their mainstay, they use livestock as their "savings bank" and insurance against famine and drought.

4.2. Livestock and Management

4.2.1 Livestock Numbers

Table E1 (in Chapter E) gives basic livestock numbers as compared with other regions in the study. Table E2 shows the trends in numbers in Okavango Region. Cattle numbered 88,700 in 1992 and 98,000 in July 1993, while goats were 33,500 and 34,780 in 1992 and 1993 respectively. Practically no sheep were kept because it is said to be too hot for them (only 100 were recorded). Trend calculations show that all classes of livestock have been increasing in recent years, with the exception of horses which have been very declining slightly.

Herd composition figures, shown in Table E3, estimate a composition of 38% breeding cows and as many as 20% oxen. The number of oxen reflects the cultivation needs of the Kavangos.

Tables E1 and E4 indicate that only 34% of households own any cattle, ie. 66% of families do not own any cattle. Based on these figures average numbers of cattle per HHI are about 10. In addition, households owning cattle own only two oxen. Clearly the number of oxen in the community is not sufficient to cover all the cultivation needs. According to estimates, a HHI needs a minimum of 25 head of cattle plus the normal ratio of small stock to be able to survive as a livestock farming enterprise. Very few households can do that.

4.2.2 Management

Because the numbers of animals per household (or per farmer) are much lower than those in Hereroiland, crops play a greater role in survival strategies. Consequently, livestock feeding during the dry season relies more on the grazing of crop residues in the field.

Herding Practices

Cattle are shut into kraals at night, the calves being separated from their dams. The cows are let out first in the morning and are taken off to graze. Once they are far enough away, the calves are driven in a different direction. When both groups are well away from the HHI, they are left to find their own way back, grazing through the harvested fields as they go. The cows always return to the HHI in the afternoon to re-unite with their calves and to return to the river for water. On their return, the cows are usually milked in the late afternoon.

Continuous herding is a problem. The herders are usually the children of the HHI. They are encouraged to attend school and so are away at school during the morning. Herding is not undertaken except while the crops are growing. Some HHI do employ herders, such as Bushmen, who earn upkeep and a minimal wage (R30-100 per month). Thus, during the crop growing season (the rains) cattle grazing hours are often few. As mentioned above, post harvest grazing takes place all day because the herding requirements are minimal, amounting only to driving the cattle out to the grazing area in the morning. Cattle can be sent to cattle poas in the dry weather, particularly if relations live in the hinterland or by the dry water courses (omirambas).

Stocking Rates

The region has excess rangeland available for its stock. There is more under or unutilized rangeland than in any of the Northern regions. Using the gross figures from Table E1, the availability of rangeland is 75.4 ha per LSU. However, the stock count from the 10 km wide strip along the 410 km length of the Okavango River indicates actual stocking rates of 4 to 5 LSU per ha. The Okavango River area, where the majority of the population lives, sustains excessive overgrazing, leaving even more of the hinterland grazing unused. The better grazing areas are too far from the homesteads for cattle to walk and get back as night to be watered, milked and kraaled. Waiting every two to three days is feasible but is apparently unacceptable.

The group of farmers that live along the omirambas have a more flexible grazing pattern because the range is much closer to the homesteads, in fact, the kraal may be closer to the range than it is to the crop fields. They also have very good water supplies both from boreholes and from their own hand dug wells. Field observations indicate that cattle were clearly in better condition in these areas.

Milk Production

All members of the HHI drink milk, but according to some field interviews, milk production is limited by management practices. Surprisingly, people stated that there is milk production in general as milk production only once a day increases milk production at that single milking time. Cattle may once succumb briefly at the afternoon milking time in order to stimulate let down. Milking is a wet season activity, when there is enough good grass to support it. The men of the HHI do the milking. Cows soon dry off after the rains.

Breeding

Calving percentages were reported to be about 40%. However, a high mortality rate of calves -- significantly higher than in Hereroiland -- offsets this figure.
It was very noticeable that most HHs did not have bulls. Farmers tend to castrate all their male stock because of the paramount need for oxen to plough. Castration is usually carried out with a knife in June each year, when the calves are 18 months old. These practices lead to a lack of bulls for breeding (described below) and to infections from which young males die.

Households rely on casual service for their cattle from chance encounters in the grazing areas. Interviewed farmers often did not know another farmer who owned a non-castrated bull. Breeding was not organised and appeared to be a hit and miss affair. Interviewees who kept bulls always kept younger ones, which were run with the herd all the time. They sold the old bulls because they were worth more money.

Castrating percentages are low. Precocious bull calves can serve the herd cows, resulting in the conspicuous dangers of inbreeding, and the high transmission of breeding disease. A relatively high mortality rate from disease and infection exacerbates this situation. In addition, castrating intervals are long and castration of non-productive cows is not normal practice, in part because farmers do not wish to lose their hard won cattle numbers.

Breeds
Cattle were observed to be of mixed blood. Kavango farmers are much less aware of any need to improve or select breeds than their counterparts in Okakarara District. The predominant breed seemed quite the Sanga type, with a variety of overlying imported breeds.

Transport
Sleds and canoes are towed behind oxen to provide transport at harvest time, etc. This type of transport is not efficient enough for hauling manure. Farmers generally do not put manure on fields, and the problem of transport is one possible factor.

4.2.3 Small Stock
Almost all small stock are goats (see paragraph on livestock numbers above). Goats are slaughtered for HH use or sold when small amounts of cash are needed. The management, grazing and herding system is similar to that of cattle.

Many households also keep pigs in a small kraal near the house, usually in ones or twos. Again, they enhance the savings and food security of the family. They are fed on millet bran and other HH wastes.

Households also keep chickens to breed more chickens. Eggs are hatched, not eaten, so that surplus chickens can be sold (R.10 for a two year chicken) or eaten. Chickens are kept free range about the HH, where they live on scraps from grain reaping from the table and on insects.

4.2.4 Nutrition
Feeding is dependent on grazing alone. Even the crop residues are grazed. There is little evidence of cutting and carrying, except for building cane/straw fences or wall for the compound or house. The group of farmers who were interviewed never fed stock any supplements or licks.

The team was unable to visit the enclosed farms and so lacks information on their feeding and supplementation practices. However, some of them have had advice on setting up their farms and it is anticipated that some supplementation is given.

Mineral supplementation will improve the health of livestock.

4.2.5 Diseases and Losses
It was reported by the Veterinary Department in Rundu that Contagious Bovine Pleuropneumonia (CBPP or lung sickness) and foot-and-mouth disease (FMD) are the two major diseases in the Region. No Anthrax has ever been reported in this Region. The farmers interviewed identified only CBPP as a significant threat, and losses fluctuated wildly from one year to another. In spite of the vaccination campaign, which generally covers between 75% and 78% of the cattle population, most farmers have sustained serious losses within the last few years. Vaccination takes place in June each year.

On the other hand, liver fluke and roundworm infections near the Kavango river are particularly bad, but they are of little consequence in the hinterland on the dry water courses.

No breeding diseases were reported, but given the uncontrolled breeding methods, they most likely pose a serious problem.

Castration by knife on animals as old as eighteen months coupled with the low number of male two-year olds and mature oxen, suggests that infection is taking a toll on the male cattle. This is having a knock-on effect on cropping acreage, and, in turn, HH subsistence surplus levels.

Mortality rates of cattle are difficult to estimate, but losses due to CBPP, infection from castration and any other casual losses indicate a 15% mortality rate.

4.2.6 Water
Water is not a major problem except in the under-utilised grazing areas. Along the river, water is unlimited, while hand-dug wells are commonplace along the water courses (ommmambas). In addition, the GRN and others have sunk boreholes on the higher ground above these omnambas. The rest of the region has a few scattered boreholes on the rangeland grazing areas. As part of a drought relief programme, GRN and NGOs are increasing these numbers. Much of the water-bearing aquifers can provide plenty of sweet water and they are not excessively deep. In an area in central eastern Kavango near the Kaudom Game Park and near the Etosha pan the boreholes yield brackish water.

Short-term expediency should not direct borehole establishment. Farmer training and development must be a central component of borehole programmes. Environmental protection in the immediate vicinity of the borehole must be given a much higher priority.
4.2.7 Payments for Services

At the present time, grazing fees are not levied and there appear to be no plans to do so. Moreover, GRN bears the costs of borehole diesel and maintenance costs. For example, a pump attendant stated that two drums of diesel had lasted them for three months and that they had just run out. He planned to visit Rundu and inform the GRN department responsible. Meanwhile, water from hand dug wells was being used for both cattle and HHs.

4.2.8 Marketing

For a general description of marketing see under Owambo (Chapter B). There are three main avenues for the sale of livestock: sale to the Meaco for slaughter, to the informal "bush" butcheries, and to other farmers.

Meaco is obliged to take all animals offered. They grade and buy them on the hoof. Grade payments are the same as those paid in abattoirs in the commercial areas, but the meat is usually sent to Oshakati for manufacturing and canning. Headmen appoint agents who organise livestock for market. The agents inform the Meaco buyers who come to purchase the cattle and pay the agent 1.5% commission.

Bush markets are less regulated than in other regions and off-take is impossible to assess. In some areas, the bush butcheries need permission from the headman before slaughtering.

4.2.9 Crops

The staple crops grown were millet, sorghum, cowpeas, pumpkins and a small amount of groundnuts. Melons and some waste products are fed to livestock.

4.3 Farmer Categories

Although varied, Kavango has four main types of farmers:

i) The farmer in the Okavango River belt;

ii) The farmer on the omiramba.

iii) The small specialised farmer supported by FNDC.

iv) The large enclosure cattle farmer.

Availability of land is not a factor in Kavango. There is plenty of empty or under-utilised land, but the lack of water limits its use. In addition, local people do not practice migration of cattle herds, except on a limited scale.

The Okavango River Belt

The majority of the population are aggregated in this zone, which features a permanent water source and the nearby main road that runs parallel to the river and provides excellent transportation. Farmers maintain their homesteads/households beside the river and road, and they have a scattering of fields within a 5 kilometre range of the river. Their fields are not usually contiguous, but have been built up as a patchwork separated by other farmers' fields.

This land has been farmed for many years. Rotational cultivation within the confines of the riverine area was practised in former times. Population increase and congestion now force farmers to crop the same fields continuously every year. Productivity is, as expected, low. Similarly, livestock are mainly confined to a narrow strip of river bank for grazing (see herding practice above).

These farmers have small herds of cattle that provide oxen for ploughing, cultivation and transport. Mortality of cattle is relatively high due to proximity to the river (see disease and losses above), and to the serious challenge from Angolan cattle which bring in CRPP (lung-sickness).

The Dry River Bed (Oniramba) Farmers

These farmers are away from the main road, making transportation more difficult in the wet weather. However, they have far better scis, unused rangeland with plenty of grass, and water (both borehole and shallow hand dug wells). Crops are grown even in the dry season in the dry river beds where the water table is near the surface.

Cattle in this area face less risk of disease and of worm and fluke. In consequence, oxen are better able to cope with the ploughing window at the beginning of the rains. In any case, there are more of them (one farmer talked of four pairs of ploughing oxen - three working and one standby pair).

Specialised Farmers

There are 12 farmers each with 300 ha who are growing cotton and millet (50 ha each) under the supervision of FNDC. These farms have been started up using loans from GRN. Input costs have to be paid back through FNDC at harvest time. They also keep a few livestock. They receive training and management advice.

The Large Enclosed Farms

North of the Manyeza area in the south-west of Okavango Region some 34 enclosures, each of 5,000 ha have been sold to individual purchasers, many of whom are not Kavango. These are primarily cattle ranches, which GRN has supplied with demarcation beacons, a borehole and perimeter fence lines. Only four are being farmed, with only one serious, full-time farmer.

In other areas, for instance, to the east of the Oshiwalo-Rundu road, boreholes have been sunk and enclosures have been marked, but few are as yet settled. Many of these boreholes were sunk as part of drought relief programmes; however, their use has not been properly planned.

4.4 Agro-Support Systems

4.4.1 Farmers' Associations

Farmers Associations are newly emergent in Kavango.
4.4.2 Namibia National Farmers Union (NNFU)

Little NNFU activity has taken place in the region because it is a comparatively new organisation. They are starting activities and they are trying to set up Farmers' Associations.

4.4.3 National Agricultural Union (NAU)

This organisation does not seem to be active at the present although its training arm, Agritutria, is supposedly taking over the Agricultural College at Mashi to establish and run training courses in due course.

4.4.4 Co-operatives

AGRA does not operate in Okavango. However, an organisation called the Namibia Katima Co-operative (NAKACO) operates as an inputs and crop marketing cooperative.

4.5 Institutions

4.5.1 Extension Service

The Extension Services are based in Rundu which administers five districts. Each District has a Principle Agricultural Officer and two or three Agricultural Officers. Currently the establishment is at two-thirds strength, but some of the extension activities are undertaken by personnel from the Council of Churches in Namibia. For more details, see Chapter F in Part II.

4.5.2 Veterinary Services

The Veterinary Department is organised into 19 areas each with an Assistant Animal Health Inspector (AAHI) who carries a box of basic equipment and medicines. The AAHI is responsible for inspection, reporting, vaccination and a small amount of extension work. Currently they have a full establishment except for a Chief Animal Health Inspector whose post remains vacant at the present time.

4.6 Projects and NGOs

A variety of major projects and NGO activities are underway in Okavango, focusing on crops and rural development. These are discussed in Part II, Chapters L and R respectively.

4.7 Conclusions

Livestock development must go hand in hand with crop development. The most pressing issue is to provide more oxen or by means of credit or by improving management and breeding practices.

Proper extension advice, through the appropriate field based organisation, is essential to develop communities, settlements and enclosed farms. This development should be along proper management lines, with grazing management as a central plank.

Wheeled carts would make ox transport vastly more efficient, except in very sandy areas.

Community grazing and farm management schemes could be set up along the new road, but only under strict conditions starting with a consultation process. Similarly the individually-owned enclosed farms and areas near newly sunk boreholes, should be developed under the same process of consultation, training and grazing management implementation.

5. AGROFORESTRY

The Okavango Region has an agricultural system much the same as that in Owambo. Most farmers run small scale enterprises, with millet and livestock as their main outputs. Traditional tree and plant foods are important components of this system, but few formal studies have been conducted to evaluate this.

The increased demand for land and for fuelwood, construction materials and grazing has resulted in a local denudation of these resources where traditional control measures have been eroded. Tree tenure is, however, well established and traditional taboos regarding cutting food trees conserve these resources for the most part.

Urbanisation of the population has caused a decline in acceptance of wild plants in traditional recipes and foods. There is also a social stigma against the gathering or conservation of wild foods, resulting in a decreased value being placed on wild fruit-bearing trees which are then no longer conserved as a communal resource.

Species important in the agro-forestry systems of Okavango are:

- a variety of pot-herbs, the most important of which are indigenous and exotic species of *Amaranthus* (Amaranthaceae), and *Gynandropsis* (Capparaceae). These plants are eaten fresh as a relish, but unlike Owambo are not traded widely. Markets and infrastructure in Okavango are lacking and so consumption is usually at the village level only. A notable exception to this is the trade in *Hibiscus sabdariffa* [mureere], which is cultivated around homes and in fields. The swollen calyx of this species is highly prized as a relish and can be stored once dried. There is considerable barter and trade for this commodity, especially in eastern Okavango.

- fruit- and nut-bearing trees, such as *Ricinocandron ramatamia* [ugungu] (Euphorbiaceae), *Gmelina calophylla* [utivi] (Fabaceae), *Puntia spp* [sinsansi] (Chrysobalanaceae) and *Strychnos spp.* [utivi/ugungu] (Loganiaceae). These trees are widely conserved in cultivated lands and are recognised as valuable dietary supplements, especially in times of drought. There is some cutting (against traditional laws) of *G. calophylla* as this is a high quality fuelwood. Shrub of the genus *Grewia* [rupundu/ugungu] (Tiliaceae) are particularly important as dietary supplements for children. The mondu *Schecorea burra* [uwongo] (Anacardiaceae) has a pachy distribution within
the Okavango region but is highly prized for the fresh fruit, the kernels and for making alcoholic beverages.

- melons and squashes (Cucurbitaeae) are widely inter-cropped in millets and sorghum fields. Certain varieties (?) have long storage qualities and others have commercialisation potential as watermelon hybrids.

- grain legumes such as Vigna spp. are widely used. They are not cultivated, but are often found within fields.

- the palm Hyphaene venulosa [ngone] (Arecacea) is in high demand in the Mubuku area of Okavango as a basketry resource but has been over utilised and is consequently rare in the area. There is considerable trade in the young leaves favoured for basketry, which are generally harvested in the Giciku tribal area. A number of women's groups have expressed interest in establishing palm growing co-operatives using the saline river margin soils favoured by this species.

6. WILDLIFE

Wildlife populations are restricted in their distribution within the Okavango and so are largely unimportant in the regional economy. There are three proclaimed reserves within the Okavango to which access is restricted. Wildlife is "state property" under the Nature Conservation Ordinance and few Okavango residents have ever been able to legally utilise game, with the consequence that the value of wildlife to most people (as a communal resource) is nil.

There is considerable conflict between wildlife and farmers around the Nalhango Game Reserve, where crop raiding elephant and stock raiding lions are a constant problem in the surrounding villages. As people are not able to legally hunt game and have to carry the costs of stock and crop losses without recompense, wildlife is viewed as a liability. Game reserves as wasted grazing lands and seldom viewed as a positive resource or source of potential income.

The Ministry of Wildlife, Conservation and Tourism is currently working on new legislation that will give game ownership rights to individuals with land rights within communal lands in much the same way as farmers on commercial farms. This may open the way to positive developments in the field of nature conservation in the Okavango, as avenues will certainly develop where individuals and communities will be able to benefit directly from game populations in their area.

Details of wildlife and fish species along the Okavango river are available from Hines (1986), Bethune (1991) and van der Waal (1991).

7. ENVIRONMENTAL IMPACTS

Approximately 90% of the population of Okavango lives within 10 km of the Okavango River. There is consequently a high demand for land and natural resources in this narrow belt. The rapid population expansion since the start of the Angolan civil war and the increased sedentarisation of livestock combined with poor agricultural practices along the river margin has led to a general loss of productivity of the riverine system. The resource base supporting the high population density is being compromised and there is a need to address the management issues involved if utilisation is to be sustainable. There is an urgent need to manage the river as a system (rather than separate components under sectoral responsibilities) such that the overall productivity is maintained, even in the face of increasing pressure.

Clearing for cultivation within the riverine strip has resulted in the loss of considerable tracts of riparian forests, riverine woodland and vegetation important in stabilising the river banks. Erosion of up-slope sites, dune slumping and topsoil loss are all a feature of cultivated lands along the river. Most of the material lost is deposited in the river or on the floodplains, resulting in increased sediment loads (poor quality water), siltation of flood plain areas (loss of fish breeding sites, loss of grazing areas course which floods its banks less and less and loss of the fisheries of the region as these provide a protein base for the local diet.

The increasing numbers of livestock along visibility of the system. Overgrazing of the floodplains leads to decreased nutrient inputs which are vital for fish breeding during the annual floods. Trampling and consequent erosion of access routes has led to siltation of the floodplains.

The low fertility of Okavango soils is a factor leading towards the clearing of larger and larger tracts of land in marginal areas, with a consequent large scale loss of forest resources. The only way to increase crop production per household is to intensify production per unit under cultivation through encouraging fertilisation practices.

The long term viability of the forest resources to the south of the river are threatened by two additional factors: fire and overgrazing. Fires are an integral part of the ecology of the woodlands of northern Namibia but the frequency (annual) and timing (early dry season through to onset of rains) of burns tends to have negative effects on the vegetation. The indiscriminate setting of fires during the dry season severely affects recruitment of woody species (important as construction materials), as well as causing the loss of palatable grass species (Geitenhuys 1977). The negative effects of fires are recognised by most livestock farmers in Okavango.
8. ASSESSMENT OF POTENTIAL

8.1 Introduction

8.1.1 The Inland Sand Plateau

The marginal nature of the rainfall and the nature of the soils limit the potential for dryland arable farming. Some soils in the omiramba and pan areas of the self-dunes show a tendency to cap under rainfall impact and lower infiltration into the soil. As a result, a significant proportion of the rainfall is lost through evaporation. Forming broad-based ridges can turn this adverse quality to advantage in the following way. Rippling of the furrows with a time of chisel plough will promote deep penetration of the run-off water minimising evaporation losses and effectively boosting the amount of rainfall reaching the root zone. There are some sloping areas of loamy soils adjacent to the omiramba nearer the Okavango river which might be suited to more permanent water-harvesting structures (see Part II, Chapter M Section 5 - Conservation Measures).

8.1.2 The River Terrace

The climatic environment is suitable for growing a wide range of tropical and sub-tropical crops under irrigation - particularly during the dry season. 3,350 ha of the River Terrace are suitable for irrigation with another 34,970 ha classified as marginal (AOC Technical Services, 1967b). Some of this latter land is gently sloping and some form of water-harvesting could be developed on these soils with a tendency to cap.

8.2 Determination of Over and Under-utilised Areas

There were some fairly extensive areas in the minor alluvial valleys of the Omuramba Omatanga, to the south and south east of Rundu where expansion of agriculture was reportedly limited by lack of drinking water and transport. Other areas included land at the edge of the River Terrace to the west of Rundu (e.g. in the vicinity of Kluiva and Muteende).

8.3 Identification of Areas with Potential for Intensification

Ovamboland has 58,458 ha of soils recommended for irrigation and 1,277,707 marginal for irrigation. Much of this land is remote from an exploitable water supply. There is limited scope for boosting the supply of water to the root zone using water harvesting (see Section 3 F (Ovamboland)) in some of the larger omirambas (e.g. in alluvial valleys of Omuramba Omatanga to the south and south east of Rundu, and to the west of Rundu). Lack of a supply of drinking water and transport seemed to be the limiting factor to expanding agriculture along these minor valleys.

An ideal micro-catchment in the form of a hard, smooth compact surface, had been formed by a grade along the road from Rundu through the Omuramba Omatanga. Trials are needed to determine whether this is an economic way of improving the reliability of cropping. Collectively large areas of soils, probably exceeding 20 ha, around the large pans to the south of Mbumurumu amongst the parallel dunes show evidence of strong capping, indicating potential for water harvesting in the area.

Some soils near Ngone, 20-30 km east of Rundu, have capping properties and could also be developed if for water-harvesting is used.

There was no evidence of people exploiting the moist soil around water-filled pans for recession agriculture (in which vegetables are planted progressively towards the middle of the pan as the soil dries out). Some chisel ploughing and deep ripping of the pans may be necessary.

8.4 Identification of Degraded Areas

The heavily settled ten kilometre wide strip along the Okavango River is severely degraded in parts and there is an urgent need to develop rehabilitation programmes where the degradation is affecting river functioning.

The most urgent need is to stabilise river side dunes and to develop erosion control measures on these dunes. The construction of vegetated contours, stabilised through planting of grass and trees is likely to be the simplest rehabilitation intervention.

Grazing patterns, tree cutting, thaching contribute to the degradation of the riverine strip. These problems are localised and can only be redressed through the development of a regional extension programme promoting the tree planting, rational exploitation and communal responsibility towards these resources. Direct rehabilitation techniques are unlikely to provide controlled usage of resources.

The borehole development programmes in the Okavango have led to much the same type of degradation as seen in Ovamboland. Points raised in Chapter B above are relevant here.

Estimates of degraded areas have not been feasible but they are considered insignificant in relation to the Region.
CHAPTER D. CAPRIVI

1. CLIMATE

1.1 Rainfall

The annual rainfall of Eastern Caprivi ranges from 500 to 700 mm, the north-east being much wetter than the south west (Map 11).

1.1.1 Trend

The long term average rainfall at Katima Mulilo is 632 mm per year. However, since 1987/88 the seasonal average has dropped to 554.0 mm with a maximum of 710.4 mm and a minimum of 415.6 mm (see Figure 4).

1.1.2 Rainfall distribution

Analysis of daily rainfall records shows that 7% of all rainfall events were in storms of 30 mm or more yet they accounted for one-third of all the rainfall for the 1987/88-1992/93 seasons. 78% of storms were less than 15 mm but provided just under 30% of the rainfall.

Long gaps between significant storms seem to be a feature: 39 days in Feb/Mar 1990, 32 days in Feb/Mar 1991 and 37 days in Jan/Feb 1992.

1.2 Temperature and Potential Evapotranspiration

Potential evapotranspiration at Katima Mulilo is 2530 mm per annum - evapotranspiration during the summer months being higher than the winter months.

1.3 Discussion

Although the rainfall in Eastern Caprivi is much higher than the other regions the risks of the grain crop failing are similar:

- a high proportion of the rain falling in exceeding 30 mm is probably lost to crop use through run-off or ponding on the surface and evaporation; and
- long gaps between rain storms increase the risk of crop failure and the need to replant.
2. SCHEMATIC DESCRIPTION OF SOILS AND VEGETATION

2.1 Physiography

Eastern Caprivi is composed of three distinct physiographic regions: The flood plains of the Zambezi, Kwando, Linyanti and Chobe rivers: a belt of Sandveld; and Mopaneveld (see Map 12 at end of Volume and Table 6 at end of Chapter).

2.1.1 Floodplains (3,455 sq km)

These are extensive areas of alluvium enriched with organic matter with patches of dark alluvial sands and loams and solonetzic and planosolic soils with sandy A-horizons. Grasslands dominate the mosaic of vegetation types with species varying according to inundation levels and other factors. Cymbopogon excavatus, Digiaria spp. Eleusine indica, Eragrostis lehmanniana, E. superba, Setaria sphacelata and Vetivaria nigritana occur in seasonally flooded swamps. with Cyperus papyrus, Phragmites australis occurring in permanently flooded swamps. Scattered amongst the plains are hummocks and termittaria supporting trees like Combretum imberbe, Garcinia livingstonei and Phoenix reclinata.

2.1.2 Kalahari Sandveld (4,399 sq km)

Red sands and litoral sands dominate this region, but scattered patches of dark alluvial sands and loams occur in low-lying areas. Medium to Tall Open Woodland and Woodland cover this region. Associations include: Burkea africana with Terminalia sericea. Combretum zeyheri and Acacia erioloba with dense stands of Colophospermum mopane shrub rarely more than 2 metres high; Baikiaea plurijuga. Combretum zeyheri, Lonchocarpus capassa and T. sericea with Baphia sp. and Bauhinia sp. forming a dense under scrub. In the north-west of Eastern Caprivi a large tract of Kalahari sandveld has been demarcated as a forestry area where no human settlement is allowed.

2.1.3 Mopaneveld (3.679 sq km)

This physiographic region covers the southern, central and eastern parts of Eastern Caprivi. The soils are sandy, mainly solonetz and planosols and greyish sands with isolated patches of sandy loams. Colophospermum mopane. T. sericea and Burkea africana dominate. The woodland adjacent to the southern and eastern swamp systems is dominated by Acacia erioloba and Combretum imberbe. with Mopane. T. sericea, Bauhinia sp. as common shrubs. The dense stands of Dichrostachys cinerea in this area are indicative of overgrazing and uncontrolled fires.

2.2 Soils

Except for planosols that may have been former solonetz soils which have lost most of their sodium by leaching, the characteristics of all the major soil types are described under Chapter B (Owambo).
3. PRESENT LAND USE AND HUSBANDRY SYSTEMS: CROPS

3.1 Land Use

Cultivated area is estimated at 3 ha per household, arable farm size at 10 ha. These figures are not reliable and cannot be verified unless physical measurements are made. With approximately 12,000 rural households in Caprivi, total area under cultivation in any one year is about 30-40,000 ha. Arable land falls into two broad classes. First is the open grassland on the margins of the river flood plains. This land has an uneven micro-relief, with darker sandy loam soils in the depressions and pale fine-grained sands on the ridges. Second is the Kalahari sand soils in the hinterland. These soils are tree covered and difficult to develop. Until 1975, they remained largely uncultivated due to the lack of drinking water. Since then, they have been settled in proximity to the Trans-Caprivi Highway water pipeline and to boreholes developed by GRN.

3.2 Farming System

The system is mainly sedentary, with minor incidence of shifting cultivation.

3.3 Crops

Most farmers grow sorghum, maize, millet and melons. 30% of farmers also grow groundnuts, cowpeas, cassava and sweet potatoes. Fewer grow tobacco, sugar cane and sunflower.

Only millet cultivation has been studied in any detail, but the survey sample consisted of only 20 farmers. Nevertheless, the findings shown in Chapter B, Table 4 are interesting. The data reveals that two-thirds of arable land is not yet stumped. Moreover, 40% of farmers never fallow their land to restore fertility, while only 53% use fallow on occasion. Crop rotation with legumes is the exception, not the rule. Half the farmers occasionally inter-crop with legumes. They grow their crops on the flat, and none of them use manure, although all use fertiliser sometimes. Ox ploughing is used for land preparation. Weeding, however, is done manually. Crop residues are grazed in situ, but these are seldom saved for stall feeding to livestock. Cereal yields average 300-500 kg/ha.

Rainfed maize production is carried out on the heavier flood plain-margin soils in the November to April season. Recently, production from September to January has increased within the Zambezi/Chobe flood plain. Tractor tillage is used after the flood recedes, and maize is sown into the soil, which is high in residual moisture. Crop growth is completed with rain falling in December/January. The maize is harvested before the arrival of the next flood in February. The area under this cultivation practice probably amounts to less than a few hundred hectares at most. Interestingly, though, this practice indicates the potential to use supplementary irrigation to intensify further crop production practices. For example, rice, onions, or sweet potatoes could be grown effectively under these conditions, if irrigation water were supplied from adjacent shallow tubewells.

There is some expansion into the Mopane belt and the Forestry Department's main concern is controlling fires illegally started to clear the land for cultivation.
3.4 Mechanisation

Over 60% of households own oxen and ploughs. A handful of bigger farmers have had access to MAWRD tractor hire services, but for the majority, expectations have not been met. There are only two privately owned tractors in the whole of Caprivi.

3.5 Conclusion

The present system uses very low inputs. As a result, it can be improved in almost every respect to double yields without heavy capital and recurrent investment. Maize is not well-suited to the environment, and farmers would probably place greater emphasis on sorghum if extension promoted suitable varieties.

4. LIVESTOCK

4.1 General

Eastern Caprivi is the smallest region in the Northern Region. It is better off for water availability and soils than the three other regions. Except for the northern boundary with Zambia, which runs from the border with Caprivi West up to the Regional Capital, Katima Mulilo, the whole area is surrounded by permanent rivers. To the west is the Kwando River and to the south is the Linyanti, which becomes the Chobe River. To the north-east and east is the Zambezi River. The general slope of the land is from the north-west towards the south-east.

4.1.1 Rangeland

The main vegetation type is woodland dominated by mopane (Colopnospermum mopane). Other woodland species include Terminalia, Burkea and Acacia. The woodland areas are surrounded by swamps along the courses of the rivers which provide green grazing for much of the year. Even away from the swamps in some of the woodland areas, green grass was available for livestock in August. Some of the Terminalia/Acacia/mopane woodland areas along the margins show signs of overgrazing.

Some floods are seasonal, some permanent. Species of grasses found in the woodland veld include Cymbopogon, Digitaria, Eragrostis and Setaria spp.

4.1.2 The People

The population is approximately 71,000 people on a land area of 11,533 sq km, averaging about 6.2 people per sq km. or 1.620 ha per person. The 1992 census indicates a total of 14,948 households (HH), of which 10,460 own livestock. Settlements tend to be on the margins of the swamps and rivers or along the roads. An area in the centre of the region is unpopulated and is under-utilised for grazing and agriculture.

The people are oriented towards cultivation, which is actively encouraged by GRN. Returnees and other immigrants are welcomed only if they do not bring any livestock with them. New
settlers are also coming in from Hereroland. New farmers select their 400 ha of land, and the GRN provides water either by pipeline or by borehole at heavily subsidised rates.

The climate favours cultivation, so people are disinclined to move away to find new grazing. It was reported that 80% of farmers cultivate with 70% having cattle. Caprivians have hierarchical authority structures — the Chiefs own the most cattle. Dignitaries do not work on the farms. Cattle ownership is primarily for prestige not production but, as is the case elsewhere, increasing cash requirements have effected sales and off-take. This is demonstrated by the fact that livestock still provide 55% of the cash income to the HH.

4.2 Livestock and Management

4.2.1 Livestock Numbers

Table E1 shows that cattle numbered 95,859 in 1992. Very few other types of stock were kept other than chickens (23,850). Goats numbered about 2,550. There are no sheep in the area. Cattle numbers are increasing slightly (see Table E2). A few horse, donkeys and pigs have been introduced, but these seem to have died out.

Herd size per household averaged six. Only an estimated 20% of HH had herds bigger than 30 head, leaving 40% owning between 1 and 30 head (see Table E4). Data on herd composition showed that breeding cows comprise 37%, and oxen about 17% per herd, i.e. one ox per HH. These figures indicate a shortage of oxen, and other reports confirm this likelihood; for example, over 31% of the people in one community reported a shortage of oxen.

4.2.2 Management

Because of the emphasis on cultivation, livestock husbandry is based around the household (HH) and village. The herding and management patterns are similar to those in Kavango.

Herding Patterns

The grazing is usually away from the village in the savannah or in the flood plains. Cultivated fields are generally fenced to prevent damage to the crops by livestock, particularly small stock when they graze near the HH. During the rains, the cattle are moved to upland areas where water is supplied by borehole or from small scooped-out catchment areas. In the dry, winter season the cattle return as the floods recede from the flood plains. Here green grass is available for much of the year and water is available from the rivers. This transhumant movement is illustrated in Map 13. Once the harvest is in, the cattle also graze on the crop residues. Children do most of the herding.

---

1 All Tables can be found at the back of the Livestock section, section 4 of Chapter F.
2
3
Although some herds reportedly move fair distances from the HH, farmers readily make their stock available for regular short-term veterinary inspections (see diseases below).

**Veal Management**
Between September and November, uncontrolled bush and veld fires occur yearly in the woodland areas near the flood plains. Grazing in the centre of the region is under-utilised, with long grass available even at the end of August. Water is a limiting factor; the few pans water quickly dry up. Small areas of overgrazing are evident only near villages, water points and on the edges of the flood plains.

**Milk Production**
Cattle are kraaled at night and the small stock are kraaled separately. As in Kavango the cattle tend to be milked the afternoon or evening. Cattle are not milked in the morning. Since the predominant breed is Sanga the milk yields are low, usually about 4 to 5 l per day. Milk is normally consumed as sour milk.

**Breeds and Breeding**
Sanga is the main breed of cattle used, but breed improvement has been initiated through the importation of exotic stock and such breeds as the Africander. Exotic cattle have not readily adapted to the conditions. Many suffered from tick borne diseases and many died from such problems as poisonous plants. Diseases management and prevention play a much higher role in farming strategies than in other regions of the Northern Region.

Selection and castration is carried out often. Local AAHIs assist using burdizzos for this operation.

4.2.3 **Small Stock**
Small stock are very limited in number. Goats are the only small stock kept (see livestock numbers above). Goats are occasionally herded inland with the cattle in the wet weather, but they generally graze near the HH.

Pigs were introduced in the past, primarily by missionaries and the parastatal bodies such as FNDC. In any case, none remain.

4.2.4 **Nutrition**
As a general rule, grazing supplies all the feeding requirements for livestock. Licks and supplements are being tried and are in demand, but there are no suppliers or outlets in the region.

Crop residues are not carted, nor are they treated in any way. Normally they are grazed off in the field.
4.2.5 Diseases and Losses

Because of risks posed by FMD and CBPP and uninoculated cattle that come in illegally from Zambia and Botswana, the Veterinary Service carries out stock inspections twice a month. Annual inoculation campaigns for CBPP take place in May/June whilst FMD vaccinations are carried out twice per year in January and September. These vaccinations are free of charge.

Blackwater, lumpy skin and contagious abortion vaccinations are also given for a fee of 37 cents, 53 cents and 46 cents respectively. Biting flies are present, although tsetse fly are only found in Caprivi West. Ticks and tick borne diseases are an additional problem against which farmers spray, hand dress or use pour-on chemicals.

Cattle grazing close to the river also suffer from eye diseases and parasites such as liver fluke. Poisonous plants are also present. Predators, lion and cheetahs also cause losses from time to time. In slaughter cattle, measles in the meat is not a concern.

4.2.6 Water

Water is not as great a problem as elsewhere. The rainfall is higher than in any of the other Northern Regions. The rivers supply water all the year round. However, water is needed in the centre of the region. Some boreholes have been sunk there, but they are insufficient. As mentioned above, new settlers have been sunk there, but they are insufficient. As mentioned above, new settlers receive either piped water or a borehole for their farms, but these are generally nearer to the river and the flood plains. As the aquifers are not deep, borehole water would be easy to provide if required.

4.2.7 Payments for Services

Farmers do not pay grazing fees, nor do they pay for water. GRN supplies diesel and maintenance for all water pumps. Farmers do pay for some vaccines (see Diseases and losses above).

4.2.8 Marketing

There are two main markets in Caprivi: the bush butcheries and the formal market through Meatco. Chiefs control the bush or informal markets in Caprivi by setting prices with based on Meatco prices and by levying R20 per head. The approximate 15 informal markets in Caprivi sell a total of 15-20 head of stock per day.

In the formal markets, the Likwama Farmers' Union is the official buying agent for Meatco. This Union is made up of representatives from the 23 Farmers Associations (FAs) set up by the Union with the aid of a local NGO and with the support of local Chiefs. In practice, the Union appoints agents from the FAs who take 40% of the commission whilst the Union retains 60%. This system is reasonably efficient and successful. However, announcements of sales days do not always reach everyone, as the Union relies solely on the radio. Likwama would like to have higher prices.
The agents notify buyers from the abattoir in Katima Mulilo, which has a capacity of 50 head per day. Much of their production is sent by truck to Oshakati for canning. Meatco also runs the Ngwezi Butchery, the local meat and processed meat retail outlet in Katima.

Transport to the abattoir is not needed because the region is quite small in area and the cattle can be walked to the slaughterhouse.

4.2.9 Crops

A wide variety of crops are grown including maize, millet, sorghum, cassava, groundnuts, etc. Two potential projects aim to start large scale sugar production with out-growers, as well as smallholder rice production. Both initiatives would provide valuable supplementary feeds for livestock.

4.3 Agro-Support Systems

4.3.1 Namibia National Farmers Union (NNFU)

Likwama is affiliated to the NNFU, and carries out most activities in the region.

4.3.2 National Agricultural Union (NAU)

This organisation does not seem to be active in Caprivi, but, as noted in the discussion of Okavango, its training arm, Agrifutura, is arranging and running training courses.

4.3.3 Cooperatives

AGRA

As in most of the Northern Regions, AGRA does not operate in Caprivi yet.

Farmers' Cooperative

The Likwama Farmers' Union is a farmers' co-operative that was formed some 20 years ago. Today it is made up of 23 representatives from 23 Farmers' Associations (see Map 14). The Farmers' Associations have management committees made up of district representatives from their areas. The Union is the official cattle agent for Meatco, and they also appoint people from the Farmers' Associations to act for them.

4.4 Institutions

4.4.1 Extension Service

There are 14 agricultural stations, each with a senior Agricultural Officer at diploma level. Headquarters has four senior staff. The establishment in Caprivi is better staffed than elsewhere. In addition, there are plans to build six Agricultural Development Centres (ADCs) as extension and input supply posts.
4.4.2 Veterinary Services

One State Vet and one chief animal health inspector run the Veterinary Service. Four other staff supervise ten Assistant Animal Health Inspectors (AAHIs). Each AAHI is responsible for 9 crush pens where he carries out vaccinations, inspections (often on a fortnightly basis), castrations and minor operations. He also gives some extension help and advice.

4.5 Projects and NGOs

There are a variety of major projects proposed, and some NGOs are active in Caprivi. (See Part II, Chapters D and H respectively.)

4.6 Conclusions

In common other regions, the priority need is to provide sufficient oxen, in good condition at the start of the ploughing season. This requires better management to help improve cattle breeding, selection, and breeding practice and to reduce the susceptibility to disease. Better feeding and improved nutrition of the oxen, particularly at the end of the dry weather, are essential to ensure that oxen are in condition to plough at the beginning of the rains.

GRN should explore methods of community stock management and rotational grazing, including the judicious use of shutting off of boreholes.

The rice and sugar projects, if started and successful, could provide supplementary feeds. The available of these feeds might also encourage local entrepreneurs to start a pig breeding and fattening industry.

The availability of better grazing and water suggest that Caprivi, unlike other Northern Regions, could support milk production from cattle.

These types of innovation will require detailed village consultations and the development of appropriate techniques by the villagers themselves. This strategy necessitates a dedicated extension service. Private organisations or long term established NGOs, such as church groups, could enhance this process.

5. AGROFORESTRY

Compared to Owambo and Okavango, traditional agroforestry is not well developed in the Caprivi. Due to higher rainfall and more productive soils the subsistence economy is less reliant on wild plant foods. Species such as Ricinodendron rautanenii are scarce as much of the area is not covered by dystrophic sands.

A great variety of plant species are used by the local people which provide important dietary supplements and cash incomes during periods when crop yields are depressed. As with Owambo and Okavango, there is a tendency amongst many of the local people to discredit or play down the value of traditional plant foods. Similarly the patterns of usage and degree of reliance of subsistence farmers on traditional plant foods has not been extensively researched.
Important groups of plants are:

- a variety of pot-herbs [gagara/kasho/dimbutu/kanyambara] (genera unknown) which grow wild in sorghum and maize fields. Although widely used these are not dried and traded as they are in Ovamboland.
- fruit- and nut-bearing trees, the most important of which is the marorela Sclerocarya birrea [mulula] (Anacardiaceae) which is widely distributed in the region. The fruits are eaten fresh and are used for brewing alcoholic beverages. Other widely used species include Berchemia discolor [muzinzila] (Rhamnaceae), Garcinia livingstonei [mukononga] (Clusiaceae), Vangueria spp. [mubilo] (Rubiaceae), Paranari curatellifolia [mubulawa] (Chrysobalanaceae) and several species of Grewia [namuloma] (Tiliaceae).
- melons and squashes are widely grown as inter-cropping plants. There a variety of species grown, the most important being watermelons (Citrus spp. [mahapu]) which are an important dietary supplement for people and are also used as feed for livestock.
- a wide variety of trees and shrubs are used for the manufacture of crafts, particularly basketry. Hyphaene palms [mukulwani] (Arecaceae) provide the most important source of basketry fibres, but a wide variety of sedges (Cyperaceae) are also used. Dyes are derived from Diospyros spp., Euclea spp. (Ebenaceae) and Berchemia discolor (Rhamnaceae).
- naturalised exotics such as Manihot esculenta [mwanja] and Hibiscus sabdarafa [ngulu] are both widely grown around homesteads and in small gardens.

6. WILDLIFE

The Caprivi still contains a wide variety of large game species and has the highest diversity of birds in Namibia. There are two officially proclaimed National Parks in the Caprivi (Mamili and Mudumu). However, as in the other Northern Regions, local people derive few benefits from wildlife as there is no legal framework in which they are allowed to tap into this resource. The Ministry of Wildlife. Conservation and Tourism is currently working on legislation which will allow people in communal areas to utilise game and to derive economic benefits from tourism.

7. ENVIRONMENTAL IMPACT

The human population of the Caprivi is relatively low with settlement mainly near the floodplain. Within the agricultural sector the relatively high fertility of the soils precludes the demand for large land holdings to produce crops for subsistence purposes and livestock numbers are also relatively low. Natural resources are not as heavily used in the Caprivi as in Ovamboland and Okavango and as a consequence negative environmental impacts are few.

Probably the most important environmental impacts are: localised deforestation around new settlements where the demand for construction materials is high; uncontrolled fires in forest
areas, leading to loss of commercially important timber trees. Both these problems could be effectively addressed through carefully formulated extension programmes.

8. ASSESSMENT OF POTENTIAL

The higher rainfall and relatively more fertile soils indicate a higher potential for crop production than the other Northern Regions. However, the biggest constraint is potential is the excessively long gaps of 30 days or more between storms in January to March and the high proportion of rain (30%) falling in a few very intensive storms which either runs off or ponds on the surface and is lost by evaporation. Replanting is often necessary when the crop dies during the gaps. In fact the farmers contacted said they needed tractors with planters to rapidly resow the crop when such failures occur.

Deep ripping of the soils, some of which have very hard B-horizons, would increase the depth of infiltration of rainfall, particularly during heavy rains, and provide the crop roots with a greater volume of moist soil to exploit during the dry periods.

8.1 Soils

8.1.1 Solonetz Soils

See under Chapter B (Owambo). By mid-August the grasses were still greenish on these soils, probably due to Caprivi's higher rainfall. During the rainy season they are said to be quite soggy underfoot.

8.1.2 Planosols

These could be quite productive if the hard B-horizon is fractured by chisel ploughing to promote infiltration of rainfall. After heavy storms water either lies on the surface for some time and is lost by evaporation, or runs off.

8.1.3 Red sands

See Chapter B (Owambo).

8.1.4 Brown Sandy Loams

See Chapter B (Owambo). Due to limited capping on these soils there may be some potential for increasing the amount of water in the root zone by concentrating the water in furrows through broad-based ridging. There is limited potential for larger scale water-harvesting, using conservation bench terraces on areas of brown sandy loams along the Golden Highway.

8.2 Determination of Over and Under-utilised Areas

With a population of around 55,000 there is little apparent pressure for land in Caprivi. However, farmers asked for tractors, with ploughs and planters, to be made available for hire
so they could expand their existing farms (e.g. east of Salimbi). They appreciated the need for speedy resowing when gaps in the rainfall kill the young crop.

8.3 Identification of Areas with Potential for Intensification

All the cultivated areas have potential for intensification through improved cultural practices (see Chapter B (Owambo). However, a constraint to introducing physical structures (e.g. for water-harvesting) is flooding of the Chobe and Zambezi rivers which have been known to wash away up to 20% of crops planted in eastern areas of Caprivi. Most of the farmers could benefit from advice on how to grow and manage sorghum and maize. For example, they were largely unaware of sorghum’s ratooning ability. See also Part II, Chapter M, Section 5 (Conservation Measures).

8.4 Identification of Degraded Areas

Land degradation is not widespread but is most obvious around settlements. Local overgrazing and uncontrolled fires are affecting the woodland adjacent to the swamps. No areas of abandoned land were observed. Due to the small areas concerned no areal estimates of degraded land have been attempted but their extent in Caprivi Region can be considered insignificant at present. However, extension, training and farmer support programmes should be developed to prevent any large scale degradation taking place.
### The Physiographic Regions of Caprivi

<table>
<thead>
<tr>
<th>Physiographic Region</th>
<th>Soils</th>
<th>Vegetation</th>
<th>Present Land Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mopaneveld</strong></td>
<td>In the southern, central and eastern parts of Eastern Caprivi the soils are sandy, mainly solonetiz and planosols and greyish sands with isolated patches of sandy loams.</td>
<td>Woodland associations include: Burkea africana with Terminalia sericea, Combretum zeyheri and Acacia erioloba with dense stands of low Mopane shrub rarely more: Baikiaea plurijuga, C. zeyheri, Lonchocarpus capassa and T. sericea with Baphia sp. and Bauhinia sp. forming a dense underscrub.</td>
<td>Scattered sorghum cultivation. Seasonal grazing.</td>
</tr>
</tbody>
</table>
CHAPTER E. OKAKARARARA DISTRICT

1. CLIMATE

1.1 Rainfall

Analysis of daily rainfall for Okakarara District is based on records from Omatjene Research Station near Otjiwarongo (80 km west of Okakarara). Mean seasonal rainfall is 437.4 mm (range since 1982/83 is 317.0–666.3 mm) (see Figure 5). The extreme south west part of the District often has the same amount of rainfall as the eastern parts (Map 15).

19% of the storms (15 mm per event) since 1982/83 accounted for just over half the rainfall. Spells of 13-37 days without rain have occurred in every growing season since 1982/83. In seven out of the eleven years gaps of 13 to 23 days happened in February or February/March.

1.2 Temperature and Potential Evapotranspiration

The hottest months are October to December with an average daily maximum temperature of 34°C. The coldest month is July (average daily minimum of 3°C).

Evapotranspiration rates are 2750 mm/yr in the north and 3000 mm/yr in the south. Potential monthly losses range from 4-5 mm per day during the winter months to 10-11 mm per day during the summer months. Wind speeds are generally below 30 km/hr but gusts up to 50 km/hr have been recorded.

1.3 Discussion

Assuming the rainfall figures from Omatjene are representative of Okakarara District, then rainfall production must be considered impractical for the following reasons: less than 450 mm of rain, the effective limit for dryland arable crop production, has fallen in seven out of the past eleven years; and long gaps between effective rainstorms tend to occur in February to March when the grain crop would be at the heading stage (See Chapter D (Ovamboland) for further discussion).

2. DESCRIPTION OF SOILS AND VEGETATION

2.1 Physiography

Okakarara District has two main physiographic regions (Map 16): the Central Kalahari Sandveld which includes an area of large, stable linear sand dunes; and a stretch of Southern Kalahari Sandveld with depressions and pans (Table 7, see end of Chapter). Information on soils and vegetation is limited but similarities with Okavango are apparent.

2.1.1 The Central Kalahari Sandveld (14,169 sq km)

Immediately to the east of the Omatake Omuramba is a broad belt of Kalahari sandveld in which surface drainage is imperceptible or non-existent. The eastward direction of the omuramba is consistent with the east-west orientation of the parallel dune system. Average surface gradients vary from 1:600 to 1:400 along quite uniform slopes. This physiographic region covers about 90% of the District.

The sandveld vegetation of most of Okakarara District is typified by a mixture ranging from Short Shrub Savanna to Tall Open Woodland of 12 m height. Fire has played a role in the determination of the current physiognomy and successional stage of the vegetation in any one locality. Combretum spp and Terminalia sericea are commonly associated with Grewia spp, Ziziphus mucronata, Bougainvillea macrocarpa and Acacia spp. Associations dominated by T. sericea tend to occur on the lighter, grey sands, whereas Combretum spp. are often co-dominant with Terminalia on yellow-brown and red sands. Acacia patches of dune cres in are usually indicative of red sands.

Camel Thorn (A. erioloba) Savanna covers the southern half of this region. Tall trees are confined to water courses although isolated stands occur in the west and among the dunes in the east. The remainder is covered with low scrub trees and bushes of varying density becoming sparser towards the east.

2.1.2 The Southern Kalahari Sandveld (2,331 sq km)

The soils of the Southern Kalahari Sandveld are dominantly light textured. Red, yellow, grey and brown sands to sandy loams occur along the eastern and southwestern fringes of the District between Okakarara and Ojijene. Here, Thorn Bush Savanna (Acacia spp) dominates the heavier more fertile soils on bottom land sites and slight depressions such as omuramba, pans and incipient pans. Common upper storey species are A. guerrisia and T. sericea, while second storey species include C. acutissimum, Grewia spp. and A. retinens. Pure stands of A. milliformis distans usually indicate local overstocking.

2.2 Soils

The soils are mainly sandy with low fertility and low water-holding capacities (See descriptions under Chapter D (Ovamboland)).

3. PRESENT LAND USE AND EXISTING HUSBANDRY SYSTEMS: CROPS

There are isolated areas of cultivation but they seem to be the exception rather than the norm. Most of the District is used for extensive livestock grazing due to its arid climate.

4. LIVESTOCK

4.1 General

The recent readjustment of reservation boundaries means that Hereroland West is now known as Okakarara District within the Region of Ojozondjupa. Its land area and population size are approximately 16,500 sq km and 19,440 respectively. Geographically the District is situated between 17° 20' to 19° 30' East, and 19° 30' to 21° 5' South.
The topography of the District is generally flat and it forms part of Namibia's central plateau. The plateau slopes gently in a north-easterly direction with a maximum elevation of 1,450 metres above sea level. Drainage lines consist of shallow depressions forming wide seasonal rivers which there are three major ones: the Omatako on the western border, the Gumb in the centre and the Ojosondjou which forms the eastern boundary of Okakarara District. The resultant soil types, together with the climate, are the major factors that determine the farming and husbandry systems.

The soils, climate and wildlife of the district are covered in the sections above.

4.1.1 Rangelands

The prevailing conditions have given rise to vegetation mainly of the camel-thorn savannah type. Some forest savannah and woodland, and some thorn-bush savannah are also found on the northern and western borders respectively. Grazing and existing husbandry systems have modified this vegetation. In the south the communal areas are heavily grazed leaving mature trees with grass beneath and few or no bushes. As a result, the savannah has a parkland appearance. In an adjacent area good grazing was observed, while in the centre of the District, there is very serious encroachment of *Terminalia sericea*. To the east there are mixed shrubs and bushes, including *Lanocarpus capensis*, *Grewia* spp. and *Acacia* spp. as well as *Acacia erioloba*.

In many of the settled communal areas it was difficult to identify the grass species because they had already been grazed to the earth. The roadsides yielded mostly annuals of *Eragrostis* and *Brachiaria* species; some perennials such as *Diggaria* spp. and *Alopecurus aequalis* were noted. To the east very little grass was evident in spite of the fact that the soil was available. Cattle cannot graze there when it is dry. Nevertheless some *Cynodon dactylon* and *Cynodon nlemfuensis* were seen in small areas.

Overall, the team noted some heavily grazed areas though where pastures were in an excellent regrowth and regeneration had been achieved, some with very serious bush encroachment and, to the east, compacted soils with bushes and, where not grass. However, the rangeland production is very dependent on the annual rainfall from November to February. At this time it is not the average that counts, but the variation and the spread of the rain. The eastern part of the District received only about 165 mm last year while the south had nearer the average of 200 mm. This variation must account for the wide differences in available grass.

4.1.2 The People

The population is reported to be about 19,441 divided into 3,246 households (HH) with an average of 6 persons in each. The vast majority are *hout fide* farmers making their living from livestock farming. They are concentrated mostly along the western and southern borders of the district, where they are reliant mainly on borehole water. The centre of the District has been opened by a pipeline fed from the Eastern National Water Carrier.

The Herero people are cattle farmers through choice, and cattle are an integral part of their culture. They are also excellent stock farmers. The cultural customs vary within the District.

For example, some insist that their cattle must have horns (and they will only milk those cattle with horns), others dehorn. Some insist that their cattle must be of a particular colour configuration; others believe that breeding with imported bulls is best. Many still maintain the traditional Holy Fire, which is kept all day and night between the homestead and the cattle kraal; in such HFs, the door of the head of the family must face to the west and it must also face the cattle kraal with the Holy Fire in between. Some Hereros adhere to many traditional beliefs, others do not.

Culture dictates -- and economics motivate -- each family or individual to build up as many head of cattle as possible. These values seem to be changing. Population pressure is one cause of change, as is the consequent decline in the availability of grazing land per household. Future young men and their families will have difficulty in finding space for their herds, except when they inherit. A nice house, a car, a television, etc are increasingly recognized as status assets in place of large numbers of cattle. Similarly, the attitude to enclosure (Map 17 shows the extent of enclosure) has changed. The vast majority of all types of people (large and small farmers, headmen, administrators, association officials, etc.) want enclosed farms, which suggests that eventually all available land will be fenced.

If a family owns only goats and no cattle, they are regarded as extremely poor. Usually cattle owners will also own goats and a few sheep, both of which are kept for domestic meat consumption. HHs also keep horses and donkeys for draught and for transporting household requirements (e.g. water and fuel) respectively. Most HHs keep a few chickens for the eggs (to sell, goad and cattle meat are preferred for eating).

The Hereros live in household (HH) groupings around the kraal and the holy fire. These groupings are usually associated with a borehole or water source together with other HHs, which may be some distance apart. For the purpose of this report, the groupings dependent on a particular water source will be called a "village".

4.2 Livestock and Management

4.2.1 Livestock Numbers

Overall numbers of livestock are given in Table E1, while trends in livestock numbers in the District are shown in Table E2 and the graph below. Cattle numbers dropped substantially last year due to the drought and now are estimated to be about 82,550. This downward trend is probably attributable to the reduction of rangeland carrying capacity. Goats numbered 47,400, sheep 19,000. Horses and donkeys number 2,350 and 2,580 respectively. Average calculated LSL per HH is approximately 59, which compares with an overall average of 9 or 10 for the other Northern Regions in the study area. Survey estimates suggest that 24% of HH do not have any tradable cattle.
These figures indicate the relative wealth of the Herero in terms of livestock as compared with other regions. Local planners and administrators regard a herd of 35 head of cattle with associated small stock as the smallest number that can sustain a HH dependent on livestock farming. This amount is greater than the average number owned. In field interviews, some farmers had as few as 25 head of cattle; these farmers maintained their livelihood by draying and other enterprises or by becoming wage-earners.

There are no accurate figures to demonstrate herd composition. As shown in Table E3, a test survey conducted by the Veterinary Department estimated that 49% of the herd are cows. Oxen and bulls are significantly fewer, at 8% and 3% respectively. Figures collected in the field confirmed the percentage of herd composition.

4.2.2 Management

Cattle feeding is based almost entirely on grazing, and therefore grazing patterns form the basis of their management. A number of different systems are evident. These differences will be discussed later, but the underlying methods are still based on the communal grazing system. There are two seasonal patterns: one for the wet season and one for the dry or winter season.

Herding Pattern

In the rainy or summer season, cattle graze out during the day and they return to the kraal at night. When they are released in the morning, the cows are driven in one direction. The calves are taken in the opposite way so that the newly born calves cannot suckle their mothers. They are not herded as such but are driven out. They then find their own way back grazing all the while. Cattle have several reasons to return. The homestead is placed near the water point, and they want to return to their mothers/calves. They also want the licks or supplements, which, when offered, are fed in the kraals.

In the winter cattle are often grazed out at night. Again the cows and calves are pushed in different directions, although separation is not so critical as milk cows are drying off by this time.

Cattle and cows that are not being milked may be grazed in the eastern waterless areas during the rains, when there are some water pools in the veld. This practice gives the land a rest around the homesteads and village until the water pools are dry. At the time of droughts, overgrazing in the immediate vicinity forces HHS to take individual herds some distance from the homestead. Some communal use of grazing has resulted on the hitherto under-utilised areas. The extension of the government water pipe system under the drought relief programme has also encouraged communal use. This mini-migration does not usually include the milking cattle or the horses, which are still kept close to the homestead as possible. Normally only about two-thirds of the District is grazed regularly because of the lack of water in the north-eastern area. If this is the case, then overstocking is likely to be 33% - 40% (see Table E1).

Milk Production

Milk production is purely a HH and not a business activity (economic milk production is difficult on the relatively poor feed available); however, Hereros drink a lot of milk and also make butter (69% of HHS provide milk from their own stock). In the wet weather, milking is undertaken twice a day -- in the morning when cows are released from the kraal, and when they return at night. Calves are either allowed to suckle briefly to stimulate let-down, or sometimes they are given two quarters. In the winter, HHS only milk in the evenings, if the cows have not dried up by this time. Women normally do the milking into wooden containers. Additional milk can be bought in Okakarara town that is produced on commercial farms in the Grootefontein area.

Breeding

Traditionally there is no separation of the sexes within the two breeding groups of animals. Bulls are sometimes put in a small enclosure that may be village owned, but are usually individually organised. Castration takes place between six months and one year. At this time, bulls are selected on conformation and weaning weight. Castration is usually by Burditzo because the knife causes too much infection. Apart from the few bull enclosures, breeding bulls run with the cow herds all the year round. There is therefore no limited breeding control. Breeding diseases are said to be rare within the herds. Such diseases are often a minor hazard in communal areas but remain unchecked because of the casual mixing of cattle on the range. Breeding diseases probably contribute to low fertility rates (see below).

Culling of breeding cows is not generally practised, but the drought and excess cattle on grazing lands are inducing farmers to weed out progressively old cows and those with poor breeding records. The order of priority for selling animals are first the oxen and steers and then the heifers. Cows tend to be the last because they have a breeding record which the heifers do not, although old cows that have missed two calves are culled.
Calving Rates
Calving percentages reported during field interviews averaged about 57%, ranging from 27% up to 100% (averages were said to be between 60% and 75%). The Veterinary Department survey figures in Table E3 suggest a calving percentage of 41%.

A wide variety of breeds are present in the Okakarara District, including very few Sanga, the traditional breed. The market encourages larger animals by paying higher prices for well finished animals of higher weights and at younger ages. The best prices are for grades A2-W at >260 kg cold dressed weight (CDW), and A2-X for 220 - 260 kg CDW. A bigger animal than the Sanga is required to develop market finished animals at eighteen months old, with a live weight of 300 kg. Moreover, the Hereros have become oriented towards producing quality cattle. Brahman, Bonin, and Simmental have therefore become the popular breeding bulls.

4.2.3 Small Stock
Sheep and, in particular, goats are regarded as being valuable for bush control on a limited scale but are too small in size and number for control most of the bush. Goats and sheep are separated from cattle in their own kraals at night and are often herded out during the day by a dog. In the past it was not necessary to herd sheep and goats but now, due to the increasing ravages of jackals, it is essential to give them human or canine protection.

Most HHs keep some free range chickens and they supply eggs to the family, in contrast to the Kavangos who prefer to produce chicken rather than eggs. Near Okakarara Township a group of returnees own and run a unit for intensive egg production, although the operation appears to have difficulties.

4.2.4 Nutrition
Not much supplementary feed is offered to ruminants on individual farms, although the AGRA Co-operative reported that a fair range of licks and supplements are sold through their shop in Okakarara. These include energy mixes, dicalcium phosphate, lucerne and maize based feeds. Although supplements are not sold in great quantities, sales do reflect an awareness of their value. In the rainy season rock salt is offered. The widest range of licks sold were the molasses/bagasse/mineral products.

Detailed survey work suggests that some deficiencies may occur in calcium, phosphorus, iodine and selenium. Copper is close to critical concentrations, while other minerals seem to be adequate to abundant. Although no information regarding sulphur and potassium was available.

4.2.5 Disease and Losses
The area is remarkably disease free. Inoculations are carried out for Anthrax (95.4% cover was achieved in 1991) and for Brucellosis with a 4.7% cover. The majority of losses reported for cattle are from the eating of poisonous plants, e.g. Danaeplexum cymosum, and from theft. In drought years lack of grazing and water also cause some losses. Recently a spate of abortions have been noted, though the cause is as yet unknown. In spite of its infrequency, the very risk of breeding disease, difficult to control in communal rangelands, prevents commercial farmers from buying breeding stock from Herero farmers. The seriousness of this problem is difficult to gauge. Control of breeding animals would be the only way to determine and reduce the problem.

During the rainy season ticks can be a problem, infecting the cattle with Anaplasmiosis. Hand dressing of cows under the tail and in the ears, or the use of pour-on chemicals are standard tick control methods, although the latter is said to be costly. Hand dressing is only needed once or twice per year. Another reported — but limited — method of tick control is chickens, which are encouraged to peck and pick up ticks in the kraals.

As mentioned, jackals seriously threaten goats, taking them in daylight unless they are tended.

4.2.6 Water
No permanent rivers flow in the District. They therefore only provide water in the rainy season when rangeland pools are also available. Otherwise wells, dams, boreholes and piped water from the Eastern National Water Carrier, are the main water sources used. There are only a few hand dug wells because the water table is generally too deep. Dams are also few because the soil in general does not retain water efficiently. Coupled with the high rate of evaporation, this results in the rapid loss of water. However, some gravel pits, created by road construction work, have been effective water reservoirs. In other cases, villagers have built small and reasonably efficient dams.

The relative importance of the various sources of water that are used to water cattle in the wet and dry seasons is indicated in Table 8 below. Ephemeral water is the most important in the wet season. Pipeline troughs and boreholes supply 83% of water in the dry season.

<table>
<thead>
<tr>
<th>Water Source</th>
<th>Wet</th>
<th>Dry</th>
</tr>
</thead>
<tbody>
<tr>
<td>OKAKARARA DISTRICT</td>
<td>46</td>
<td>24</td>
</tr>
<tr>
<td>Outside pipe</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>River Lake Spring_Pond</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Bore-hole pump</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Borehole-Winamill</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Rain Catchment</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hand dug well</td>
<td>54</td>
<td>26</td>
</tr>
<tr>
<td>Trough</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

GRN runs the pipeline that is laid between Okakarara in the south-west, Okamatenapitse in the centre and Ojitumuo in the north. GRN staff in permanent residence maintain the pipeline, the reservoirs and the booster pumps. 300 cu m/hr are supplied through Okakarara and 100 cu m/hr are supplied through Ojitumuo. Water points are set at seven kilometre intervals for the communal farmer, although the enclosures created by government have been supplied with their own water points and reservoirs (usually corrugated iron tanks). Despite plans to extend the pipeline network, water in the mines and boreholes near Grooteboom is insufficient to undertake this expansion, which could only be boosted by a pipe link to the Kavango river.

Boreholes are found mostly along the eastern and southern border rangelands. Borehole drilling operations in the area to the east and north-east of the District have not been successful. Water is very deep, and quantities prove very small, uneconomic and, at times, saline. Operating boreholes are supplied with diesel engines and pumps usually maintained by the GRN, who also supplies the fuel.

4.2.7 Payments for Services

In return for water supplies and other services, cattle owners are supposed to pay a grazing fee to cover costs. The fees are on a sliding scale, favouring the small farmer. However, these are generally not paid on the grounds that farmers in the Northern Communal Areas (Northern Regions) do not pay. Furthermore, some boreholes have not been supplied with minor spares which communal farmers have bought. In other cases, GRN has stopped providing diesel for the borehole pumps. Farmers consider these purchases to be in lieu of the grazing fees.

Where there are three or more HHU using a borehole, the GRN is encouraging the formation of water committees to collect fees and to manage the water point; yet, these points and their management remain subject to tradition and the decisions of local Chiefs. As a result, cost recovery is not yet a general rule.

When grazing fees were collected, even large cattle owners only paid the minimum rate. This was achieved by legitimate registration of brand numbers for all members of the family. After all, cattle ownership is a family affair, with each member certainly owning some animals.

Brands are official and registered with the Agricultural Department. All cattle are supposed to be branded. Indeed no animal may be put up for auction without a registered brand number on it, a measure to control theft.

4.2.8 Marketing

For many years Okakarara District has had a major advantage over the other three regions in the study area for marketing their cattle: they are not affected by the cordon fence. Thus they face far less restrictions on selling their cattle for export markets than the Northern Regions. However, under the "red cross" movement permit system, cattle have to be quarantined on any buyers’ farm for 28 days before exporting. Otherwise there are no restrictions.

The Hereros have already developed a number of different markets for their cattle:

- Quotas directly with Meacho abattoirs
- Auction sales in four centres
- "Permit" sales - selling over scales at a fixed price in the auction yards
- Direct private sales
- Sales to butchers

Auction yards were built many years ago at the main centres: Okakarara, Okamatenapitse, Ongongoro, Ojitumuo and Okondjatu. They are constructed with wooden posts and rails and comprise an auction ring, an auctioneer's stand, a sellers' and buyers' stand, as well as 20 kraals/paddocks or so. The state of repair is variable, though in most cases they are serviceable. The main defect is the lack of gates. Certainly some general repairs and provision of additional water points are necessary. Cattle do occasionally jump out of the auction rings, which require extra height.

Small stock are also presented at the sales, but there is less demand and less sales for them.

Auction sales have just resumed after a break, because the Hereros thought that there were better more profitable ways of selling their livestock, including avoiding commission payment. These payments used to be deducted from the buyer but are now the responsibility of the seller, as in the commercial areas. Recent auctions conducted by AGRA have been a great success in spite of the 5% commission (plus 11% on the 5%, for tax - a total of 6.2%). A portion of this (1%) goes to the Farmers' Association in the area. Similarly, with permit sales, R1 per head goes to the Association. Recent prices at these sales have risen and are stated to be very good. Prices average at around R2.90 per kg live weight as compared with an average of R2.50 before.

Auctions can be slow because each seller has to be paid in cash before his animal leaves the ring. At each knock down, there may be ten animals or more, each belonging to a different owner. The calculation and pay-out take time.

Direct sales to butchers have so far failed due to lack of coordination, but this avenue might offer more potential.

The Herero people believe that the markets in which they sell their cattle do not give them the fully perform for them. Prices observed at "permit sales" did not seem low compared with Meacho prices. Clearly, farmers in the region need more information about the marketing systems, prices and the alternatives open to them.

4.2.9 Crops

The climate and soils of Okakarara District are unsuitable for sustained crop production although many try raising crops. GRN has recently subsidised arable cropping of small areas, at a cost to the farmer of R1 per ha for ploughing, seed and fertiliser. People have historically cropped small areas and will continue to do so, particularly small vegetable gardens and possibly maize or sorghum. Therefore, farmers are seeking some skills in using simple irrigation techniques and irriamane.
4.3 Farmer Categories

The pattern of management outlined above is the norm, but four principal farming systems exist:

i) Communal farmer (more often than not a small farmer);

ii) "Legally" enclosed farmer (either a larger farmer, or a group of smaller farmers);

iii) The large farmers with wild-cat enclosures;

iv) The absentee farmer (usually a large farmer who is in either category ii or iii above);

v) Commercial area farmers (Hereros).

The basis of all farms is the household (HH) and the family - husbandry systems are based on family ownership. Decision-making may or may not be a family affair, depending upon the individual family. Generally, though, the senior member of the family in age is regarded as the head for family celebrations and usually for decision-making as well.

The Communal Farmer

This farmer uses the communal grazing lands and is based around a water point alongside other farmers in the "village" (see above). There is little or no control over individual herds, which may mingle with those of the neighbours. Communal farmers typically have small numbers of livestock (66% of farmers own less than 30 head of cattle - see Table E.4). Large farmers are by no means outside this category, but such farmers will often try to enclose their own area as a farm unit.

Each village has a known boundary, usually about half way between neighbouring villages. Within these "village boundaries," a form of village management may be present. Councillors are appointed and discussions held when issues arise that affect the village. In this sense, a form of village management already exists in some villages. Villages thus have a measure of control over grazing, but without fencing, they cannot control cattle from villages HH outside their management area from poaching their grazing. Similarly, villagers feel that they cannot control stock theft without fences.

"Legally" Enclosed Farmer

In 1978 the government fenced off 34 farms of about 4,900 ha each in the Okakarara sub-district. These units were based on, and watered by, the pipeline in the central part of Okakarara District. They were divided into two or four camps. Some of these farms were settled by individuals with about 300 LSU of stock and some were settled by groups of three to five HHs. In each case, management was supposed to be as a single unit with rotational grazing.

Several management problems arose. First, camps tended to be grazed flat before being closed, giving the grass less chance of recovery. Second, the group farms did not always agree on management. For example, individual HHs needed their milk cows or horses near to the homestead and refused to move out of a closed paddock. They also refused to reduce stock numbers pro rata, leading in one case to as many as 1,200 LSU on 4,900 ha. The lack of a meaningful on-farm extension service exacerbated these differences.

Large Farmers with Wild-cat Enclosures

These farmers have financed and erected their own enclosures within the communal areas with the approval of the local chief. Some have based their farms on the pipeline, while others have even used their own boreholes. Often these farmers will keep these enclosures for winter grazing and use the communal grasslands until it runs out. Basically, they are operating a rotational grazing system but without the effect of preserving and improving the grazing; rather, they are grazing their own areas too hard and put extra pressure on the communal lands at inappropriate times.

An individual on a 4,900 ha farm will carry between 245 and 325 LSU (15-20 LSU/ha) mainly cattle but with a significant amount of small stock. Some farmers are said to have as many as 3,000 head of cattle, but not just within these enclosures.

Absentee Farmers

These are people whose main occupations and methods of support are not farming and whose farms are managed by family members. They take up jobs in the capital or elsewhere, often well-paying senior posts in government or business. Consequently, they have large herds of cattle and fall into either of the last two groups above. They frequently retain control of decision-making, which makes day to day management slow and difficult because no one on the farm is empowered to make basic decisions.

Commercial Area Farmers

Some of the large Herero farmers have already bought farms in the commercial areas. Others still aspire to do so. Yet, unlike in the communal areas, the GRN does not bear the costs of water production, maintenance, fuel, etc. Farmers are naturally tempted to keep some of their cattle in the communal areas as well as on the commercial farm, although this is against the rules. Indeed an individual may only purchase one farm, which might not accommodate all of the cattle.

There is a subsidised credit scheme for purchasing commercial farms already in operation (see Credit below) which requires a 10% deposit. The deposit seems to prevent many of the aspiring owners from buying.

4.4 Credit

The Agricultural Bank administers the credit schemes under the affirmative action plan. Credit is available for: a) the purchase of land in communal areas, b) small farmer development of infrastructure, c) stock loans and d) house loans. Similar schemes are also available for cropping units. Loans are secured against a mortgage bond on continuously occupied land, and land purchases entail a 10% down payment. Interest rates pertaining are set out in Table 9 below.
Table 9. Interest Rates on Livestock Directed Credit Schemes.

<table>
<thead>
<tr>
<th>Type of Loan</th>
<th>Land</th>
<th>Infrastructure</th>
<th>Stock</th>
<th>House</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term of loan (Yrs.)</td>
<td>25</td>
<td>15</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Interest</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Years 1 &amp; 2</td>
<td>Nil</td>
<td>Nil</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Years 3 - 5</td>
<td>4</td>
<td>3</td>
<td>Years 3 &amp; 4</td>
<td>6</td>
</tr>
<tr>
<td>Years 6 - 8</td>
<td>6</td>
<td>4</td>
<td>Year 5</td>
<td>8</td>
</tr>
<tr>
<td>Years 9 - 11</td>
<td>8</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years 12 - 14</td>
<td>10</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 15</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years 15 - 25</td>
<td>14</td>
<td>15 year loan</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

4.5 Agro-Support Systems

4.5.1 Farmers’ Associations

These associations are embryonic. The best organised is the Okamatapati Association (Ongombe Association) which has been nurtured by SARDEP (see below). It has a Community Management Committee (CMC) and has recently built offices at the Okamatapati auction yard. The next best organised seems to be the Ojituma Association, though they would benefit from some extension input. The purpose of the associations is to promote extension and marketing, and to act as a local forum for management, marketing and input supplies.

4.5.2 Namibia National Farmers Union (NNFU)

This is a new organisation whose recruiting in the communal areas for representatives has only just started. They are currently working with the Farmers’ Associations.

4.5.3 National Agricultural Union (NAL)

This union has been operational for many years and its activities and support have been concentrated in the commercial areas. NAL now wants to expand into the Northern Regions. They have started a training unit, Agrifutura, which is running training courses for village people. They also plan to take over Mabian College in Okavango as a farmer training centre (see NGOs below).

4.5.4 Co-operatives

AGRA appears to be the only farmers’ co-operative working in the field. Its operations in the communal areas are fairly new, with one small shop in the District, based in Okakarara town. Membership requirements include the payment of a joining fee of R50 and proof of a minimum turnover based on a farming enterprise. Few communal farmers have the kind of accounts that can demonstrate this requirement.

AGRA also runs the auctions sales in the district, for which they take a commission (see marketing above).

4.6 Institutions

4.6.1 Extension Service

Currently three Extension Officers serve Okakarara District, answering to the Agricultural Department in Gobabis. Their duties appear to be full time administration, enrolling duties such as brand registration, demographic information (i.e. HFs per village and people per HF), dissemination of Departmental information and planning. These duties leave little time for work on farms. In addition, GRN has imposed a ban on recruiting at the present time.

4.6.2 Veterinary Services

In contrast to the Agricultural Department, the Veterinary Services of Okakarara District report to Ojiwarongo in Otjozondjupa Region. Four Animal Health Inspectors (AHIs) report to the State Veterinary Officer in Ojiwarongo.

The AHIs are supposed to visit farmers eight times per year. The purpose is to monitor disease incidence and livestock numbers, to carry out moulting inspections when necessary, and to supply some extension input. They are supplied with a basic box of medicines and complete veterinary report forms on a regular basis. Reports of cattle numbers are somewhat subjective, in part because Hereros do not like to count their cattle - it is regarded as bad luck.

Livestock throughout the country require a movement permit from the local Veterinary office when stock are to be moved out of the area or off the farm. The red cross permit (so called because the paper has a large red cross imposed on it) requires the buyer to quarantine the animals for 48 days (see Marketing above). Psychologically the Hereros feel discriminated against, although in practice this permit does not limit their access to the markets.

4.6.3 Traditional Authorities

The Chiefs in the different areas still seem to have a considerable role in land allocation, water usage and village disputes. Both the official Administration and the villagers refer questions and disputes to the local Chief or headman. Those Chiefs with whom discussions were held were clearly anxious to push for the development of the villages within their jurisdiction. They were particularly interested in enclosure, management, training and relevant extension.

4.7 Projects and NGOs

A number of small projects and NGOs operate in Okakarara District, primarily supporting small scale garden projects or training and education. SARDEP is the only major project that is being developed.
4.7.1 SARDEP

GTZ is financing SARDEP -- the "Sustainable Animal and Range Development Programme". They have three technical assistants and a National Co-ordinator supplied by the MAWRD and based in Windhoek. This project covers not only the whole of Hereroland but also Namaland and Ovamboland. They have identified two areas in Okakarara District where they are working through the Farmers' Associations: Okakarara area, adjacent to the town; and Okanasiapit, which is now the most advanced, in terms of local committee organization. The project is presently emphasizing consultation with the farmers to develop a course of action. Decisions on major financial inputs by GTZ to farms will not be undertaken until 1995. They are addressing management and rangeland issues, kitchen gardens and social questions.

The SARDEP stepwise consultative approach has been very successful in stimulating interest in Okakarara but some of the Chiefs are becoming impatient for faster progress towards enclosure which would be financed by SARDEP. However, SARDEP cannot finance enclosure unless the current statutory law prohibiting enclosure of communal grazing land is changed. The Chief and the villagers cannot see why SARDEP should be constrained by the law when "illegal" enclosure is common place. The enclosure issue constrains the successful introduction of other management techniques.

GTZ will not be developing agricultural development centres (ADCs) but are exploring farm-level extension through the Farmers' Associations.

4.7.2 NGOs

The NGOs involved in training are IMIL (Institute for Management and Leadership Training), funded by a German foundation. IMIL provides monthly training for up to 25 people in various skills from accountancy to welding. They have been participating in the development of a 5,000 ha demonstration farm near Oshiku which was being managed in conjunction with the owner's tenants. But, due to the lack of funds to develop it and because the owner wishes to take the farm back, they have decided to abandon the project.

Agritutura is an NGO funded by the Konrad Adenauer Stiftung through the NALF. It is involved in training but has a lower input in terms of people trained per year. Agritutura provides classroom training as well as practical training.

In addition both the Rossing Institute and CCN (Council of Churches for Namibia) both offer training, although CCN has also financed inputs into the Okakarara garden project.

4.8 Conclusions

4.8.1 Culture

Some of the traditional practices of the Herero people are clearly at odds with good management (See above, Section 4.1.2). A tension exists between commercial and ceremonial/traditional needs. However, population pressure and the resultant shortage of land for expansion are prompting farmers to move towards a more commercially-oriented philosophy. Examples of constraints on good production practices include: lack of control of breeding females in the open veld; poor grazing control through lack of communal responsibility; lack of responsibility for bush encroachment; and unnecessary horns.

4.8.2 Psychology

Two major psychological points arise. First, while it is logical to develop the eastern under-utilized areas of Okakarara District (practically difficult at the present time because of lack of water resources to develop - see Water above), it is also historically -- and therefore psychologically -- a regressive step. The Hereros wish to move westwards into what are now known as commercial lands, land they regarded as their own, even though that land may have been bought in the past. Clearly, westward movement would be better received.

The second psychological point is that of the veterinary red cross permit: this may not be an actual constraint, but it is perceived as one.

4.8.3 Rangeland and Management Improvements

Smaller farmers can only expand and develop good management systems if they have room to do so. Bigger farmers should therefore be encouraged to a greater extent to move to commercial farms. Revising the rules governing credit is the first step. The present rules are inappropriate, difficult to enforce, and they discourage rather than encourage movement.

Consultations must take place to help villages develop improved management techniques as their own innovations. An on-farm based extension service with a private sector input would support this process, including the development of community management systems and Farmers' Associations. These institutions would lay down and enforce rules based on good herding and husbandry practices.

They would also address issues such as rotational grazing, enclosure, breed selection and breeding management, herd levels and carrying capacities, supplementation and nutrition, market strategy, etc.

Finally, these groups would explore with villages new ideas to improve peasant livelihoods. Research should address poisonous plant control and bush control, extending millet suitability for the family, and improving traction power by bringing camels and many other adaptive animal production techniques. Because the rainfall is too low and unpredictable for larger scale cropping, the development of kitchen gardens should also be researched and encouraged.

4.8.4 Other Projects

Consensus on development methods and procedures for inputs amongst agencies and coordination and cooperation between them must take place in order to achieve good progress for the farmers, the people and the District.
5. **AGROFORESTRY**

The Herero peoples of this region are essentially pastoralists and although they use wild plant resources for food, cosmetic and medicinal purposes, traditional agroforestry is not an important aspect of the farming systems in the area.

6. **WILDLIFE**

The Okakarara District is largely devoid of large game, uncontrolled hunting having taken its toll in the past. Birds are less heavily hunted and the area has a relatively rich avifauna with some 300 species recorded.

7. **ENVIRONMENTAL IMPACT**

Together with the high commercial value of cattle, the importance of livestock in Okakarara District has led to the development of livestock being kept in the Okakarara district. Numbers have been maintained above the sustainable carrying capacity of the grazing resources for many years and this has resulted in severe overgrazing (particularly around water points) and bush encroachment. Encroaching species such as *Acacia mellifera*, *Dichrostachys cinerea* and *Rhigozum brevipes* form dense thickets which are largely impenetrable to livestock. Soil capping is a feature of the region near the Omuramba Omasako.

There is a need to develop extension programmes dealing with the management of grazing resources, effective control measures for bush encroachment, improved marketing strategies and incentives for livestock owners, and soil conservation techniques.

8. **ASSESSMENT OF POTENTIAL**

Adverse soil and climatic factors impose severe constraints to agricultural development. Sprinkler irrigation is possible on some of the sandy soils, subject to the costs of providing sufficient water and the limitations outlined under Chapter B (Ovambo).

8.1 **Determination of Over and Under-utilised Areas**

An extensive tract of land east of the Omuramba Gubh seems to be little used - probably due to lack of accessible water. Otherwise extensive grazing seems to be the most appropriate land use.

8.2 **Identification of Areas with Potential for Intensification**

Along the western and south-western fringes of Okakarara District patches of 1.5 to 2 metre deep soils liable to capping offer limited opportunities for water-harvesting trials. For example, on an extensive stretch of very gently sloping land (1-2% slope) near Okakopake, 5-10 km north-east of Okakarara road graders could be used to form 10-20 metre wide micro-catchments to boost the moisture supply onto 5 metre-wide strips where a range of vegetable and oil seed crops could be tested.

Seasonal pans offer potential for recession agriculture in which vegetables are planted around the edges of the pans as the soil dries out. Some chisel ploughing and deep ripping of the pans may be necessary. Alternatively they could be ripped, re-seeded with perennial grasses, and fenced off to act as seed sources for surrounding areas.

See Chapter B, Section 6 (Ovambo) and Part II Chapter M Section 5 (Conservation Measures) for other improved cultural practices.

8.3 **Identification of Degraded Areas**

In Okakarara the general paucity of grass cover coupled with rising *Acacia mellifera* populations testify to increasing degradation of the rangeland. It is doubtful if any economic means of (reversing) bush encroachment can be found unless enclosure is used to improve grass cover which in turn would be used to fuel hot fires.
<table>
<thead>
<tr>
<th>PHYSIOGRAPHIC REGIONS</th>
<th>SOILS</th>
<th>VEGETATION</th>
<th>PRESENT LAND USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Kalahari Sandveld</td>
<td>Grey, Yellow-brown and Red Sands</td>
<td>Short Shrub Open Woodland less than a metre tall to Tall Open Woodland 1.2m height. <em>Combretum spp</em> and <em>Terminalia sericea</em> are commonly associated with <em>Grewia spp</em>, <em>Ziziphus mucronata</em>, <em>Bauhinia madagascariensis</em> and <em>Acacia spp</em>. Associations dominated by <em>T. sericea</em> tend to occur on the lighter, grey sands, whereas <em>Combretum spp</em> are often co-dominant with <em>Terminalia</em> on yellow-brown and red sands. Acacia patches on dune crests are usually indicative of red sands.</td>
<td>Grazing</td>
</tr>
<tr>
<td>Southern Kalahari Sandveld</td>
<td>Dominantly light textured red, yellow, grey and brown sands in sandy loams.</td>
<td>Thorn Bush Savanna (<em>Acacia spp.</em>) on heavier soils of oxinamba and pans. Common upper storey species are <em>A. giraffae</em> and <em>T. senegalensis</em>. <em>C. apiculatum</em>, <em>Grewia spp</em> and <em>A. reficiens</em> occur in the lower storey. Some pure stands of <em>A. mellifera</em> ascend to <em>Tricholaena monoschene and perennial Cynodon dactylon</em>, <em>Cenchrus ciliaris</em>, <em>Eragrostis echinocladea</em>, <em>E. trichophora</em>. <em>Dichanthium</em> occurs frequently in these areas.</td>
<td>Grazing</td>
</tr>
<tr>
<td></td>
<td>Övamb</td>
<td>Kavango</td>
<td>Caprivi</td>
</tr>
<tr>
<td>--------</td>
<td>-------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Area (sq km)</td>
<td>51,830</td>
<td>50,955</td>
<td>11,533</td>
</tr>
<tr>
<td>Human Population</td>
<td>618,108</td>
<td>136,219</td>
<td>71,027</td>
</tr>
<tr>
<td>Livestock Population</td>
<td>151,114</td>
<td>88,716</td>
<td>95,859</td>
</tr>
<tr>
<td>Cattle</td>
<td>151,114</td>
<td>88,716</td>
<td>95,859</td>
</tr>
<tr>
<td>Sheep</td>
<td>12,468</td>
<td>104</td>
<td>0</td>
</tr>
<tr>
<td>Goats</td>
<td>348,158</td>
<td>33,525</td>
<td>2,551</td>
</tr>
<tr>
<td>Pigs</td>
<td>2,000</td>
<td>2,558</td>
<td>0</td>
</tr>
<tr>
<td>Chickens</td>
<td>20,200</td>
<td>40,406</td>
<td>23,848</td>
</tr>
<tr>
<td>Donkeys</td>
<td>90,000</td>
<td>454</td>
<td>11</td>
</tr>
<tr>
<td>Horses</td>
<td>4,000</td>
<td>437</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total LSU (450 kg)</strong></td>
<td>432,341</td>
<td>67,580</td>
<td>67,529</td>
</tr>
<tr>
<td><strong>Stock Density (LSU/sq.km)</strong></td>
<td>8.4</td>
<td>1.3</td>
<td>5.9</td>
</tr>
</tbody>
</table>

Sources: 1 / Census, National Planning Commission, Windhoek.
2 / Veterinary Service, Windhoek.
Table E2. Household, Stocking and Grazing Figures.

<table>
<thead>
<tr>
<th>1992</th>
<th>Owambo</th>
<th>Okavango</th>
<th>Caprivi</th>
<th>Okakarara</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total LSU (450 kg)</td>
<td>a /</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock Density (LSU/sq km)</td>
<td>8.4</td>
<td>1.3</td>
<td>5.9</td>
<td>4.3</td>
<td>4.9</td>
</tr>
<tr>
<td>Numbers of Households</td>
<td>99,976</td>
<td>20,892</td>
<td>14,948</td>
<td>3,246</td>
<td>34,766</td>
</tr>
<tr>
<td>Nos. Rural Households</td>
<td>92,895</td>
<td>17,922</td>
<td>12,133</td>
<td>3,246</td>
<td>126,196</td>
</tr>
<tr>
<td>(calculated)</td>
<td>3 /</td>
<td>2. /</td>
<td>5 /</td>
<td>4 /</td>
<td></td>
</tr>
<tr>
<td>HIs owning cattle %</td>
<td>49.3</td>
<td>31.0</td>
<td>70.0</td>
<td>76.0</td>
<td></td>
</tr>
<tr>
<td>Not HHI with cattle</td>
<td>49,288</td>
<td>7,103</td>
<td>10,464</td>
<td>2,467</td>
<td>69,322</td>
</tr>
<tr>
<td>LSU per HHI</td>
<td>9</td>
<td>10</td>
<td>6</td>
<td>29</td>
<td>9</td>
</tr>
<tr>
<td>Grazing area (km2)</td>
<td>49,300</td>
<td>39,500</td>
<td>8,800</td>
<td>10,500</td>
<td>108,100</td>
</tr>
<tr>
<td>Mean stocking density (ha/LSU)</td>
<td>11</td>
<td>58</td>
<td>13</td>
<td>15</td>
<td>17</td>
</tr>
<tr>
<td>Estimated carrying capacity ha/</td>
<td>18</td>
<td>15</td>
<td>10</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>Stocking rate as % of carrying capacity</td>
<td>136</td>
<td>26</td>
<td>77</td>
<td>136</td>
<td>93</td>
</tr>
</tbody>
</table>

---

**Notes:**
- a / Figures derived from Table E1
- b / National carrying capacity (LSU/ha) with a safety margin
- c / This figure reflects the farming HHI who are also based in towns in Okakarara

**Sources:**
2. Veterinary Service, Windhoek.
5. Private communication from the Agricultural Officer, Caprivi.
**Table E3. Long Term Trends in Livestock Numbers In the NCAs.**

<table>
<thead>
<tr>
<th>Year/Region</th>
<th>Cattle</th>
<th>Goats</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OWAMBO</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1962</td>
<td>379.542</td>
<td>420.198</td>
</tr>
<tr>
<td>1969</td>
<td>367.283</td>
<td>337.672</td>
</tr>
<tr>
<td>1972</td>
<td>481.410</td>
<td>304.673</td>
</tr>
<tr>
<td>1989</td>
<td>356.311</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>356.791</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>406.257</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>451.114</td>
<td>348.158</td>
</tr>
<tr>
<td>Trend % per annum  +/(-)</td>
<td>0.58</td>
<td>0.62</td>
</tr>
<tr>
<td><strong>KAVANGO</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1962</td>
<td>50.300</td>
<td>9.950</td>
</tr>
<tr>
<td>1972</td>
<td>73.231</td>
<td>19.110</td>
</tr>
<tr>
<td>1982</td>
<td>105.634</td>
<td>27.358</td>
</tr>
<tr>
<td>1987</td>
<td>83.881</td>
<td>28.160</td>
</tr>
<tr>
<td>1992</td>
<td>88.716</td>
<td>33.523</td>
</tr>
<tr>
<td>Trend % per annum  +/(-)</td>
<td>0.64</td>
<td>1.89</td>
</tr>
<tr>
<td><strong>CAPRIVI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1962</td>
<td>12.312</td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>39.254</td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>76.101</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>95.859</td>
<td></td>
</tr>
<tr>
<td>Trend % per annum  +/(-)</td>
<td>7.08</td>
<td></td>
</tr>
<tr>
<td><strong>OKAKARARA DISTRICT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>104.612</td>
<td>39.095</td>
</tr>
<tr>
<td>1982</td>
<td>98.874</td>
<td>32.964</td>
</tr>
<tr>
<td>1987</td>
<td>99.386</td>
<td>49.622</td>
</tr>
<tr>
<td>1992</td>
<td>82.347</td>
<td>47.398</td>
</tr>
<tr>
<td>Trend % per annum  +/(-)</td>
<td>(1.57)</td>
<td>1.29</td>
</tr>
</tbody>
</table>

Sources: Veterinary Services, Windhoek, Odendaal Report
Table E4. Herd Composition Data (%) for the Northern Regions.

<table>
<thead>
<tr>
<th>Class</th>
<th>Ovambo</th>
<th>Kavango</th>
<th>Caprivi</th>
<th>Okakarara</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows</td>
<td>40</td>
<td>38</td>
<td>37</td>
<td>49</td>
<td>41</td>
</tr>
<tr>
<td>Bulls</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Oxen</td>
<td>25</td>
<td>20</td>
<td>17</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>Steers</td>
<td>11</td>
<td>NR</td>
<td>11</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Heifers</td>
<td>NR</td>
<td>18</td>
<td>14</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>Calves</td>
<td>21</td>
<td>18</td>
<td>20</td>
<td>20</td>
<td>100</td>
</tr>
</tbody>
</table>

NR = Not recorded


B = Data supplied by Directorate of Veterinary Services.
### Table E3. Households and Herd Sizes

<table>
<thead>
<tr>
<th></th>
<th>Ovambo</th>
<th>Kavango</th>
<th>Caprivi</th>
<th>Okakarara</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1992</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CATTLE</strong></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>HH holding, percent:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>50.7</td>
<td>66.0</td>
<td>30.0</td>
<td>24.0</td>
</tr>
<tr>
<td>1 - 10</td>
<td>15.9</td>
<td>15.1</td>
<td>11.8</td>
<td>20.0</td>
</tr>
<tr>
<td>11 - 30</td>
<td>18.4</td>
<td>12.7</td>
<td>39.2</td>
<td>22.0</td>
</tr>
<tr>
<td>&gt; 30</td>
<td>15.0</td>
<td>6.2</td>
<td>19.0</td>
<td>34.0</td>
</tr>
<tr>
<td>Total (%)</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>GOATS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HH holding, percent:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>43.3</td>
<td>77.3</td>
<td></td>
<td>29.6</td>
</tr>
<tr>
<td>1 - 10</td>
<td>19.1</td>
<td>11.4</td>
<td></td>
<td>22.9</td>
</tr>
<tr>
<td>11 - 30</td>
<td>25.7</td>
<td>8.1</td>
<td></td>
<td>22.6</td>
</tr>
<tr>
<td>&gt; 30</td>
<td>11.9</td>
<td>2.7</td>
<td></td>
<td>24.9</td>
</tr>
<tr>
<td>Total (%)</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Note: These figures should be treated with caution. HH without cattle are probably low. Estimates vary widely.

Sources:
1. FAO/IFAD Livestock Project Preparation Report.
2. Veterinary Services, Windhoek.
3. Calculated based on personal communication from Agricultural Officer.
CHAPTER F. SOCIAL ECONOMICS OF THE MAIN FARMING SYSTEMS

In the section which follows, the social economies of the Northern Regions are discussed with respect to their impact on the prevailing farming systems. While regional diversity is a feature of the project area, this section attempts to illustrate that broad similarities exist in the productive patterns of the three crop growing regions (in particular) and that general inferences may be drawn about the Northern Regions when formulating development strategies.

1. DEMOGRAPHY AND HOUSEHOLD STRUCTURE

The four regions which comprise the Northern Regions project area together comprise 60% of the national population. With the exception of the Okakarara District (1.97% per annum), the populations of the Northern Regions are amongst the fastest growing in Namibia with annual growth rates of 3.03%, 3.08% and 4.76% for Ovamboland, Okavango and Caprivi respectively. At these rates of growth the population of Ovamboland will double in 24 years, that of Okavango in 23 years and that of Caprivi in 15 years. The impact of such rapid population increases on the existing resource base and on current farming systems will need to be borne in mind in assessing the future carrying capacity of the land.

According to the 1991 National Census, the population of the Northern Regions remains predominantly rural (with the exception of Okakarara which has an urban population exaggerated by the presence of a number of boarding schools). Evidence, however, indicates that rates of urbanisation have been rapid in the inter-census period since 1981: during this time the urban population of Ovamboland grew by 22% per annum, Okavango by 14% and Caprivi by 11% and Okakarara by 8%. While this trend was accelerated by the independence war, by drought and by various modernising influences education in particular), it is also symptomatic of a secular decline in per capita production in the rural areas. As rural households are increasingly incapable of meeting their domestic needs through agriculture, household members are compelled to seek employment in the formal sector and in informal activities on the urban peripheries.

The population of the Northern Regions as a whole is extremely youthful. The percentage of the rural population less than 14 years of age varies from 43% in Caprivi to a high of 48% in Okavango. The rural dependency ratios (the proportion of people potentially economically active compared to those classified as economically inactive - children younger than 15 and those older than 60 years of age) likewise is high, ranging from 31% in Caprivi to 56% in Ovamboland. When all children of potential school-going age and younger (0 to 19 years) are taken into account together with those of pensionable age, the dependency ratio is even higher, ranging from 61% in Oshakati to 63% in Okavango. These statistics imply that less than 40% of the total rural population are potentially available for work. At the same time, the statistics also provide clues to an understanding of the labour shortages which are endemic to crop production in the Northern Regions.

Further evidence of the extent of labour shortage is to be found in the sex ratios (the number of men to women) of the Northern Regions. While there is relative gender parity across the younger age cohorts, there are marked gender imbalances in the primary working age cohorts (20 to 44 years of age) in Ovamboland and Okavango. In rural Ovamboland women outnumber men by nearly two to one in the 20 to 44 age cohorts (6:100), with marginally more equal ratios in rural Okavango (74:100). This pattern is further reflected in the number of rural households headed by women, which ranges from a low of 35% in Okavango to a high of 55% in Ovamboland. In part (but not exclusively) as a consequence of this, women have become the primary farmers in the rural areas. However, as will be discussed below, over and above their productive functions, women have also to assume responsibility for a wide range of domestic duties including that of child rearing. These responsibilities inevitably limit the amount of their time that is available for agricultural activities.

Gender imbalances in Ovamboland and to a lesser extent in Okavango, reflect the outcome of extensive migration from the rural areas (both seasonal and permanent). As a consequence of the exodus of younger men (and increasingly of young women) the structure of households has been seriously distorted in recent decades. Characteristically rural households have a predominance of old people, of women and of children, a pattern which is reinforced by the system of extended households which is prevalent, in different forms, throughout the Northern Regions.

The extended family network, usually comprising three generations, provides social and economic support and serves as a mechanism for child rearing. Although the mean rural household sizes range from 4.3 in Caprivi to 6.3 in Okavango, these statistics disguise the fact that many households are considerably larger. 50% of households in Okavango and 48% in Ovamboland have more than 8 members, and 32% and 22% respectively have more than 10 members. Although large households hold the potential for generating household labour, large numbers of very young and very old people, as consumers rather than producers, inevitably represent a drain on domestic resources.

Existing evidence suggests that the fertility of the population of the Northern Regions is still at the high level of communities in the initial phases of demographic transition. Fertility preferences remain high and among rural women surveyed in 1992, the optimal number of children desired was consistently lower than the actual number given birth to in Ovamboland 6.2 as opposed to 4.5 in Okavango and 5.8 as opposed to 3.8 in Caprivi. This trend is exacerbated by low incomes, poor living standards and low levels of education, all of which are known to correlate inversely with population growth. It is also evident that women enter the reproductive process at a youthful age, adding reproductive responsibilities to their existing productive chores.

Educational levels throughout the Northern Regions are extremely low with many adults never having attended school. Levels of functional literacy (defined as having attained standard 4/grade 6 or higher) range from 17% in Okavango to 28% in Caprivi. Few school children complete their schooling (less than 0.7% of school children in the entire Northern Regions were in matriculation in 1991) and drop out rates are high.
2. OCCUPATION AND INCOME

Despite low returns from agriculture, subsistence farming remains the dominant employment activity of the majority of households in the Northern Regions. Although problematic from a definitional perspective, the 1991 Census reveals that subsistence farming is the principal occupation of 60% of adults in Ovamboland, 68% in Caprivi, 66% in Okavango and 86% in the Okakarara district. Census data, however, does not record details on informal sector activity which constitutes an important source of income for households both within the urban and rural areas. Many households augment their agriculture income with a range of non-farm activities, including the making of local beer, basket work, wood artefacts etc., as well as the provision of a variety of services including thatching, grass cutting, traditional healing etc.

As a consequence of the limited resource base of the Northern Regions, "formal" employment opportunities are confined to the public service and to the small commercial sector in the urban centres. Demand for employment in this sector is high, particularly among the young who, it is evident, are finding subsistence agriculture increasingly unattractive as an occupation.

Despite the fact that a large majority of rural households throughout the Northern Regions are engaged in subsistence agriculture, a relatively small proportion of household income (both actual and imputed) is derived from this source. Available evidence indicates that probably less than 20% of household income is derived from agriculture in Ovamboland (less than 1% is derived from crops), 16% in Okavango (68% of which derives from livestock sales and just 6% from crop sales - 1% of total income), 24% in Caprivi (85% from livestock and 15% from crops - 5% of total income) and 50% in the Okakarara district (virtually all of which is derived from livestock).

In their efforts to minimise the risks of an uncertain climate and the vagaries of a declining physical resource base, rural households throughout the Northern Regions, and in Ovamboland in particular, have developed multiple income sources as part of their survival strategy. In general, cash income is generated from remittances and from wage salaries earned by family members in nearby towns, from old age pensions and from informal sector activity rather than from agriculture.

This state of affairs can perhaps best be understood when a hypothetical comparison is made between the returns from agricultural labour and that from alternative forms of employment. The primary agricultural activity in the crop producing Northern Regions is the cultivation of millet, with the cultivation of sorghum and maize as secondary cereals. In years of normal to high rainfall local farmers produce yields of 250-400 kg/ha but these fall to as little as 70-100 kg/ha in years of low rainfall. The average yield for a household with two hectares of land in a year of normal rain is thus between 500 and 800 kg of millet; at a retail price of R1.50 per kg, this amounts to an annual return of R750 to R1200. Labour input requirements are estimated to be around 80 to 100 adult working days (AWD) per hectare or 160 to 200 AWD per 2 ha field, so that income is equivalent to R4.58 to R6.00 per adult working day.

The returns to labour under the traditional system of millet production are thus extremely unattractive to anyone in the rural areas who is economically mobile. This is especially so when prospective returns to off-farm labour are of the order of R10-15 per adult working day.

There are insufficient data to estimate returns to traditional livestock production, but although low, they are likely to be more attractive than those of crop production. The value of sales from even a medium size herd of 20, operating at present levels of productivity with a maximum off-take of 10% per annum would yield sales worth up to R2 000 annually. A considerably higher return for labour compared to the R750 - R1200 earned from an average farm holding. Significantly, however, not all rural households possess cattle, and ownership levels vary from community to community. Available data suggests that the percentage of households owning cattle ranges from 30% to 70% in Ovamboland and Okavango and is slightly higher in Caprivi.

While cattle clearly do have some intrinsic value in socio-cultural terms, they also represent an immediately realisable economic asset ("money in the bank") for all rural households. While most household herds (varying from 7 to 12 in Ovamboland, 15 to 20 in Okavango and 20 to 30 in Caprivi and excluding the Okakarara district with 60 to 80 per household), are too small to be considered economically viable, farmers will in any event only sell or slaughter when a pressing need arises (either for cash or for ceremonial purposes). Since cattle do, in a very real sense, represent wealth, household attempt as far as possible to maximise the size of their herds. According to the increase of herds comes from households' needs for cash, from death through disease and drought and from theft. Goats, pigs and poultry, in as far as they are consumed, represent the principal source of meat for most households.

When cattle are sold, they are generally disposed of in ones and twos and generally through informal markets (the exception being the Okakarara district where livestock are sold through formal auctions). Although not well quantified, studies have suggested that the returns from cattle sold individually to informal butchers or through slaughter and sale, are higher than those that are likely to be realised through formal markets. This observation suggests that the lifting of the veterinary cordon and the opening of markets to the south would do little to stimulate increased off-take among the majority of cattle owning households, although a limited number of larger farmers might benefit from such an eventuality.

The contribution of old age pensions to household security among rural households has been underestimated, particularly among resource poor and food insecure households. Pensions, which are paid in monthly sums of R150, contribute significantly to the cash incomes of many poor households. Surveys undertaken throughout the Northern Regions suggest that food insecure households, which constitute up to 40% of all households, rely on pensions for between 30% and 40% of their income. At present not all those eligible for pensions are receiving them. According to the 1991 Census the number of rural households which could hypothetically (assuming the unlikely, one pensioner per household), receive pensions range from 26% in Caprivi, 41% in Okavango, 48% in Okakarara to 36% in Ovamboland.

While the old age pension system undoubtedly provides a safety net for many poor households, it also has some drawbacks. In addition to the obvious drain on the Treasury, it may also serve to reinforce patterns of dependency among rural households. This is because
old age pensions might be reinforcing the characteristic composition of rural households: that of old and very young people. With a measure of income security achieved in the household through pensions, it is possible that younger, more physically active members might feel less inclined to remain on the farm and seek wage employment elsewhere. To that extent, it might be speculated, old age pensions could conceivably be acting as a disincentive to greater agricultural productivity in some households. Nevertheless, removal or modification of the present pension system under present farming conditions is likely to create more problems than it resolves.

From the above, it is evident that the primary determinants of wealth among rural communities in the Northern Regions are not to be found in the rural-areas themselves, but depend on the extent of inputs from people elsewhere. Variations in the affluence of rural households, thus, often lie more in the success with which family members secure employment in the urban areas and the extent to which they maintain links with home, than with differences in agricultural performance between rural households.

Most surveys conducted in the Northern Regions during the past three years reveal considerable differentiation in the incomes and welfare of rural households. Some households are relatively self-sufficient and have sufficient means, finance, stock and farming equipment, to achieve relative food security while others clearly do not. Although rural incomes are notoriously difficult to quantify, recent evidence suggests that up to 40% of households in Ovamboland and Okavango may be classified as food insecure. Varieties of this nature imply that different forms of support will need to be extended to differently endowed households.

3. SOCIAL ORGANISATION AND LEADERSHIP

While the four project regions tend to be treated as socially undifferentiated entities, there is considerable ethnic diversity within them. Thus, the population of Ovamboland is comprised of seven principle ethnic sub-groups (the Ndonga, Kwanu, Ngandjera, Mikubu, Kwambi and Kwadzhi), the Okavango of five (Kwakali, Mbanza, Neboli, Geikiti and Mhokusho), the Caprivit of five (NaFwe, Masubu, Maswane, and small numbers of Khoi and !Kung) while the Okakarara District has just one. In past years there were significant differences in the culture and customs of sub-groups within each region.

With the effects of the independence war, of modernisation and of greater economic and social integration within regions, however, the most explicit differences have diminished and apart from variances in dialect and a number of minor social practices, populations in each region can, for development purposes, be considered to be relatively culturally homogenous, even if not socio-politically harmonious (as in the case of the NaFwe and Masubu in the Caprivi). The similarities that exist between ethnic sub-groups within a region, moreover, generally extend to methods of agricultural production.

Significant differences, however, do occur in social organisation between regions. This relates both to the hierarchical structure of traditional authorities and to their influence and legitimacy within the community. Within the Ovamboland each ethnic sub-group is ruled by a chief, who is served by a number of headmen and sub-headmen. While the position of chief is hereditary, that of headmen and sub-headmen is not always so. An individual (or, in general, always a man) may buy control over an area through the payment of a fee to the chief. This might apply to an uninhabited area in which settlement is likely to take place, or one in which a vacancy has occurred due to the death (succession by sons is not always automatic) or displacement of a headman.

During the 1970's the influence of traditional leaders in Ovamboland was considerable. This was due to the fact that many chiefs and headmen implicitly or explicitly collaborated with the colonial government and thereby alienated the support of some of their subjects. Formal allegiance to chiefs and headmen thus varies from area to area as does the extent of their influence. Nevertheless, chiefs and headmen do still exercise a significant degree of influence, not least through their control over the allocation of land and their arbitration over traditional courts, where they retain the right to impose fines for various misdemeanours. Since independence, moreover, the position of traditional leaders appears to have strengthened in the region rather than weakened. This is because the institution of traditional leadership has been formalised and is represented in all echelons of government.

In Okavango traditional authority structures are more formalised than in Ovamboland and their influence is stronger. In Caprivian chieftaincy and their chieftain councillors ("prime ministers") exert considerable influence in all spheres of social activity. They enjoy wide spread legitimacy and support and little if any formal intervention in community activities can take place without their endorsement.

In all regions in the Northern Regions the primary unit of communal organisation is that of the headman or sub-headman. These individuals, who are generally men (there are a few exceptions in Okavango) assume immediate responsibility for the affairs of a given community (which may vary in size from a dozen to two households to several hundred). They assume responsibility for a given area (with recognised boundaries) and generally have a reasonable knowledge of the welfare of their subjects. The headman or sub-headman's ward, thus, presents probably the most coherent unit for community mobilisation in the Northern Regions although the existing leadership structures would need to be integrated with more democratic and accountable community organisations.

The government's attempts to set up Development Committees to coordinate community activities have been uneven in their spread and take-up. It is evident that they have been mostly successful when they have operated through or in close interaction with traditional structures.

4. INPUT USE AND CULTURAL PRACTICES

A feature of all three regions in which arable agriculture is practised is the relatively limited household investment in crop production. This can be attributed not to lack of funds (in the Okavango and Caprivi especially) for the purchase of equipment and inputs, but on the other hand to the role which crop production plays in the rural household economy. It can also in part, be attributed to the risks of investing heavily in rainfed agriculture in areas of unreliable rainfall - in western Ovamboland, for example, the average
rainfall of 380 mm per annum is insufficient for crop production. Thus, despite the fact that the majority of households are involved in subsistence agriculture, as indicated, production is largely aimed towards household self-sufficiency rather than surplus. On available evidence, it appears that wage remittances and other non-agricultural income go mainly to sustain household consumption, to replenish or build up herds or to invest in off-farm enterprises.

4.1 Ownership of Farming Equipment

Most farmers in the Northern Regions own relatively little farm equipment. While virtually all households own hoes, ownership of equipment such as ploughs, ox sleds, donkey carts is variable and limited. Ownership of ploughs ranges between 55% (Ovamboland) and 70% (Caprivi), sleds between 25% (Ovamboland) and 80% (Caprivi) and donkey carts from 0% to 25% (Ovamboland). The availability of tractors is extremely limited and most households must rely on oxen or donkeys for their ploughing.

4.2 Use of Draught Animals

A shortage of draught animals represents one of the major constraints to agricultural production in the Northern Regions. Oxen and donkeys are used for ploughing, hauling, water and wood and various other forms of transport. Ownership of oxen is variéd and ranges from 10% or less in parts of Ovamboland to 60% or more in Caprivi. In Ovamboland, a decline in the number of oxen (principally through drought) has seen a progressive shift to the usage of donkeys and in many areas household ownership exceeds 50%.

The shortage of draught animals, which includes those animals too weak to plough after the dry season, combined with the relatively short growing season in the Northern Regions, serves to limit the amount of land which many households can cultivate.

4.3 Use of Fertilisers

With the exception of a very small number of affluent farmers, commercial fertilisers are not used by farmers in the north and cattle manure is used only in Ovamboland and to a very limited extent in Caprivi. In Okavango there is a widely held perception that the application of manure encourages the growth of weeds. This is of particular concern in that no animal drawn cultivators are used and all weeding is done by hand. Problems of haulage to distant fields serve as a further disincentive to the use of manure.

Although dung is used as a fertiliser on millet fields in Ovamboland there is evidence that it is not used to the best effect. The practice of spreading manure in September, and ploughing it before the first rains in November to January, wastes manure as winds in October and November may totally remove it from fields or at best lower its nutrient value.

Natural deposition of manure on arable lands in all Northern Regions is negligible and makes no contribution to sustaining fertility. Although cattle graze on millet stubble immediately after the harvest, they do not remain long in the vicinity of the homestead before they are moved to seasonal pastures. Cattle are kraaled during the night (both in the vicinity of the homesteads and in the seasonal pastures) for periods of 10 to 12 hours, limiting manure deposits on available grazing.

4.4 Fencing

In all regions farmers express the desire to enclose arable land, but only in Ovamboland is fencing widespread. In many parts of this region the entire land owned by a household is enclosed, usually with a stockade of branches or thorn bushes. However, while it is the aim of every household to enclose arable land, this process may take many years to complete. In the southern districts, fencing is used to enclose communal rangelands. In Okavango there is little fencing and plots are frequently separated with little more than a narrow. Some fencing, usually thorn bushes, is used in Caprivi but it is by no means used by all households. Farmers in the Okakarara district usually make use of wire fences to enclose some, but not all, grazing areas. The absence of fencing generates additional demands for labour in Okavango and Caprivi, as livestock must be closely herded during the growing season.

4.5 Credit

Credit facilities in the rural areas are, in general, extremely limited. The universal problems of collateral apply with respect to commercial sources of credit, and while seasonal credit is theoretically available through NAWRD, as an "advance", this is seldom utilised, in part because the disbursement mechanisms are too cumbersome. Credit unions and savings clubs have been established to a limited extent and are likely to grow in importance. The ready availability of credit for purchase of such key inputs as ploughing, seed and labour, nevertheless, remains problematic for most farmers.

5. ACCESS TO LAND, SIZE OF HOLDINGS AND SPATIAL ARRANGEMENTS

Settlement patterns throughout the Northern Regions have been shaped, in different ways, by rainfall and the availability of water for livestock and domestic consumption. In Ovamboland, the heaviest settlement historically occurred within the Cuvellia delta, where the availability of seasonal flood water and nutrient enriched soil encouraged cultivation. This pattern was subsequently reinforced by the availability of piped water in settled areas. In Okavango and Caprivi settlement has predominantly been along the perennial rivers and latterly, in Caprivi in particular, along primary roads where water is available. In the Okakarara district settlement patterns have been shaped by the installation of reticulated water systems in the 1970s and 1980s, and by the availability of boreholes.

Conventional wisdom, supported by some quantitative research, has suggested that a lack of land represents a constraint to crop production in the north. While there is some evidence to suggest a shortage of well watered arable land in certain parts of Ovamboland which fall outside of the Cuvellia flood plain, this does not appear to be the case in Okavango or Caprivi, where a shortage of labour and other inputs appear to be the most serious constraint to production. In the Okakarara district, a shortage of viable grazing land is apparent but this, as indicated, is determined as much by the availability of boreholes and reticulated water systems.
The prevailing system of land tenure throughout the Northern Regions is one of communal tenure with usufructuary rights. Rights of access to arable land, however, differ according to region (this will be discussed in more detail under Section 9). In Owambo, households acquire the right to use arable land in their own "tribal" areas through the head of the household who makes a payment to the local headman or chief. In Caprivi and Okavango little or no payment is required although the tacit approval of the surrounding community and the headman is sought before land is occupied. In Owambo extended households tend to farm their fields as one unit, and although historically men and women's produce was stored in separate granaries, storage is now family based. In Okavango, members of an extended family maintain separate (and often fragmented) fields and granaries, although labour and resource inputs and even food consumption is shared.

Irrespective of fee payments, access to land is high throughout the Northern Regions and is conditioned more by an individual or household's ability to till the soil rather than by an inability to pay. Even in Owambo, where there is some evidence that land in congested areas is assumed by market values, surveys have repeatedly reflected access rates of over 90% among rural households. Grazing lands, with some limited qualifications, are open to all, while grazing around individual homesteads is loosely regulated by traditional codes of conduct.

Plots sizes vary considerably from region to region, and lie within the range of 1 to 3 hectares in Owambo, 2 to 3 hectares in Caprivi and average 1 hectare in Okavango. There is little crop production in the Okakarara district, but enclosure of rangelands, both official and unofficial, has occurred to a significant degree - the implications of this process of enclosure are discussed elsewhere. In Owambo and Caprivi the majority of households own just one arable field, although a small number of wealthier farmers (in Owambo in particular) own or have access to additional land, much of which is situated in newly developed areas in the south of the region. This also includes the enclosure of communal rangelands into private ranches, sometimes covering several thousand hectares. In Okavango, where a form of slash-and-burn rotation was historically practised, households typically have access to two or more plots. Following of land is common in all three crop growing regions; in Owambo half the enclosed land may be cultivated each year.

Land size appears to be determined by the productivity of the land and the relative importance of crops in the household economy - where alternative sources of income (remittances, pensions etc.) are readily available, and where labor is a constraint, there is less incentive to cultivate large fields. In Owambo, despite low yields, plots sizes remain relatively small in part because crop production represents a relatively small input to household income. Households rely on crop production to meet the immediate needs of domestic consumption and regulate their inputs to this goal, but rely on external income sources both to supplement food shortfalls and to secure cash.

In Okavango, where there is less access to external sources of funding (migrant remittances and local employment opportunities in particular), households are more reliant on farm production for their domestic consumption, although they too look to off-farm activities for cash. With declining soil fertility in this region, and with little or no mechanization, innovation and limited resource input, households are compelled to clear and cultivate new land in order to sustain existing levels of production.

The dearth of virgin land close to the river, however, obliges households to clear additional lands away from their homesteads in bushveld to the south. While yields in the new lands are significantly higher, their cultivation gives rise to a range of problems including those of labour, equipment (the availability of oxen especially), transport, security etc. Resettlement of homesteads closer to new fields is constrained by the availability of water and by the lack of facilities (schools, clinics, shops etc.) all of which are located in the vicinity of the river.

In Caprivi plot sizes are similar to those in Owambo, but yields appear to be somewhat higher. This is in part due to the fact that, in many areas, settlement on the land has not been as continuous as in Okavango and shifting cultivation is still an option while population densities remain low. The fertility of the soil, in consequence, while far from ideal, at present, yields sufficient to meet immediate household consumption needs. The size of arable holdings, however, is to a considerable extent dictated by the availability of draught power whether owned or hired. Despite the relatively more fertile soil, however, off-farm activities remain an important source of income throughout the region.

6. GENDER RELATIONSHIPS AND PRIORITIES

As in so many other developing communities, women in the Northern Regions occupy a subordinate position within the social structure despite their central role in agricultural production. Evidence from the 1991 Census and numerous other surveys confirms that women, rather than men are the principal farmers in the north. According to the Census 64% of subsistence farmers in Owambo are women, 59% in Okavango and 64% in Caprivi; only in the Okakarara district do women have little involvement in farming activities. It is of interest, moreover, that the predominance of women in agriculture appears to operate independently of prevailing gender ratios. Thus, women's participation in agriculture is found to be similar across regions, despite a gender imbalance of nearly two women for every man in rural Owambo and a virtual gender parity in the rural areas of Caprivi. The implications of this in the development of extension services and in the introduction of credit schemes will need to be weighed carefully.

In common with rural communities throughout Southern Africa, the basic survival needs of rural households in the Northern Regions are supported for the most part by the domestic and productive activities of their female members. Women's ability to carry out these tasks is defined not only by the relative availability of resources, but also by the mechanisms of management and control which determine their interaction with the resource base.

Changes in the sexual division of labour have implications for women's ability to adequately undertake domestic tasks, particularly in circumstances where routine household activities (collecting water and firewood, food processing and preparation) are already time-consuming and burdensome. Processing of the staple crops (millet, sorghum and maize) is done by hand since there are few labour and time-saving technologies for food processing and preparation available. Beer brewing is also undertaken by women, but as grain stocks are seldom adequate
Traditionally younger men and boys were responsible for herding cattle and, in Owambo, for movement and management of the herd to seasonal grazing grounds. With the migration of older men and with an increasing number of boys in school, many households have experienced difficulties in securing minders for their herds. This has led to changes in herding patterns, and around the homesteads cattle are now often not herded except in the growing season. Throughout the Northern Regions there is evidence of households hiring herders to look after their stock. These are often members of the San community or refugees (or illegal immigrants) from Angola and Zambia.

8. RESOURCE ALLOCATION: PRIORITIES AND CONSTRAINTS

The social economy of the Northern Regions has been shaped by powerful historical forces and many of the existing trends are irreversible both from an economic and socio-cultural perspective. Thus, movement off the land by the young is likely to increase rather than decrease and a stabilisation of the existing rural population is perhaps the most that could be aimed for during lifespan of the ADB project. A distinction between optimal and realisable scenarios is further necessary when setting production targets for the project period. At present, the risk adverse strategies of farmers in the Northern Regions limit prospects for the generation of marketable surpluses and for the introduction of cash crops.

Since the minimisation of risk is an overriding concern for most farmers in the Northern Regions, this will need to be given considerable attention in the formulation of agrarian policy. As a point of departure, greater security for farmers can be assured by the development of more effective extension services (which would encourage greater technological innovation and provide a range of support services) and by the establishment of efficient mechanisms for the disbursement of rural credit. Given existing production shortfalls, however, these improvements alone are unlikely to be sufficient to produce significant surpluses among the majority of farmers.

In view of the above, a more realistic target would be the achievement of household self-sufficiency in the production of grains. Since it is possible to determine existing crop yields and expenditures at the level of individual households, it will also be possible to project how much output must be increased to achieve self-sufficiency. This seemingly modest objective, if realised, would go a considerable way towards securing household food security with the associated positive correlates of improved nutrition and health.

While there are considerable variations in the productive capacities of farmers in the Northern Regions, and there is considerable room for improved productivity, the inescapable conclusion must be drawn that not all households in the rural areas will be able to sustain themselves purely through agricultural activity. This points to the fact that increasing numbers of rural households will need to find employment in off-farm activities whether in a specific region or elsewhere. With a conservatively estimated 12,000 to 15,000 new job seekers entering the market in the Northern Regions every year, the extent of the problem becomes more apparent.
CHAPTER G. FOOD DEMANDS AND SUPPLY PATTERNS

1. PATTERNS OF FOOD SUPPLY AND DEMAND

Any attempt to assess the overall patterns of food demand and supply in the study area is necessarily compromised by continuing shortages of primary data and baseline research. Between the early 1970s and mid-1989, much of the north and especially Owanbo was a war zone in which independent data-gathering and research effort, where not actively discouraged, was usually not feasible. Nor was it a priority of the regional civil and military structures to promote such effort on their own behalf or through independent or commissioned projects. Such data as was gathered was geared mainly to narrow administrative requirements and was neither compiled nor used for analytical purposes.

Prior to independence virtually no socio-economic data or research on the Northern Regions was published. Departmental reports of any empirical or analytical weight were also very few in number.

This inheritance remains influential in the continuing absence of in-depth research amongst the rural societies of the northern mixed farming zone. Since mid-1989, a number of short-term consultancy studies have highlighted key issues and for the first time have brought valuable comparative insights from other countries and international scholarship to bear on the Namibian context. They have nevertheless not been able to substitute for the more sustained effort that is required in establishing a regular agricultural data-gathering infrastructure and in generating in particular farming systems research on smallholder peasant societies. Such exercises as an annual census of agricultural production are still some distance from implementation and little farming systems research is under way or planned.

Time-series data of any depth on production, marketing and consumption indicators from the Northern Regions are virtually non-existent at any level of reliability. This absence severely handicaps attempts to establish 'patterns' of any kind, especially in view of the marginality of agricultural production in all the Northern Regions except Caprivi and the high inter- and intra-seasonal variability of rainfall. In most instances caution is needed in drawing general or average inferences from one season's experience, from short-term survey data or from the results for one locality.

Nonetheless, a number of consultancy studies and reports have offered 'best guess' aggregations from analyses and micro-data. while several socio-economic surveys in the Northern Regions, undertaken mainly by NISER, have generated primary data for particular localities. Most recently, the National Drought Task Force and the Early Warning and Food Information System, using satellite imagery and institutional data, have produced data on agricultural production and supply. It is on these mainly secondary sources that any assessment of the overall patterns must for the most part rely.

1. Only food products are considered in this section, which covers the mixed farming zone and thus excludes Okakarara District.
2. **GROSS REQUIREMENTS AND REGIONAL PRODUCTION**

It must be stressed at the outset that there are strong relative and dynamic aspects to the assessment of gross food requirements in the Northern Regions. The composition of local consumption, by far the largest component of aggregate demand, varies sharply with the level of household cash income, which is heavily biased towards processed foodstuffs imported from outside the Northern Regions. Thus a rising trend in rural household income from agricultural sales is likely to generate a much slower rise in market demand for locally produced foodstuffs and correspondingly on finding urban outlets for such sales both in and beyond the Northern Regions. Similarly the growing urban population within the Northern Regions has accounted for much of the increase in local demand for imported food products. At the other end of the scale, rural households with little cash income can afford only limited purchases of a few staple products whatever their nutritional needs.

This section considers food production and requirements within the rural communities of the Northern Regions. At the national level, as the driest country in Sub-Saharan Africa Namibia has long suffered a deficit in all main branches of arable production, in particular cereals and other basic foodstuffs such as vegetables, fruit and dairy products. "Normal" levels of cereal production, in non-drought years, are of the order of 80-100 000 tonnes. Of this, some 20-25 000 tonnes is white maize and 5 000 tonnes irrigated wheat, produced mainly on commercial farms in the Otjihaenena valley, the Hardap irrigation scheme and a few smaller irrigated farms elsewhere. The output is sold to private milling companies and/or the Agronomic Board for consumption within national borders.

Considerably more grain, roughly 50,000 tonnes of millet and sorghum and 8-10,000 tonnes of maize, is produced for household and local consumption on small family farms in the Northern Regions. Virtually none of this cereal production is marketed outside the region. Millet is grown throughout the region and is the staple crop in Ovambo and Kavango. Maize and sorghum alternates as the main crop in different parts of Caprivi. To these estimates of communal farmer output should be added 3-4,000 tonnes of maize from the FNDC's irrigated farms on the Okavango River. Total annual coarse grain production the Northern Regions thus approximates to 60-65,000 tonnes. Distinguishing the regions, the EWFU figures suggest that Ovambo accounts for nearly 90 per cent of millet/sorghum production and Caprivi for nearly all the maize.

Total output varies greatly from year to year in an agro-ecological environment that is marginal to rainfed cropping over much of the farmed area. The FSG report put 'average year' millet production at 42,000 tonnes per annum. Tentative figures from the Early Warning and Food Information Unit (EWFU) give a spread for the millet/sorghum harvest ranging from 16,400 tonnes in 1992, one of the worst single drought years this century to 57,700 tonnes for the good harvest in 1991 and 43,400 tonnes for the 'below normal' 1993 season. The Caprivan maize harvest showed even more extreme fluctuations, ranging from 11,900 tonnes in 1991 to a mere 1,000 tonnes in 1992.

The national grain consumption level has been estimated by the Food and Agricultural Organisation (FAO) at around 101 kg/person/year, which is relatively low for the Southern Africa region but supported by the EWFU national average for coarse grains of 106 and 95 kg/person/year for 1992/93 and 1993/94 respectively. The FSG report gives a similar ratio for
the Northern Regions. Assuming a long-term millet yield of 205 kg/ha and a 'typical' small farm planted area of 1.5 ha, it estimated, very roughly, an annual harvest of 300 kg, or 60 kg per member of a five-person farm household. On the basis of a rather higher per capita grain consumption of 150 kg per year, the average output amounted to about 40 per cent of requirements.

Although this estimate is perhaps on the low side, it remains the case that in years of average and poor rainfall most households are unable to meet their immediate consumption needs. The FSG report quoted millers as estimating that they sold 40 per cent of their maize meal output in the northern region, equivalent to roughly 8-10 000 t, part of which would be destined for Northern Regions urban consumers. Taking the consumption estimate of 100 kg/person/year, an Northern Regions rural population of 850,000 would require 85,000 tonnes/year of coarse grain. These admittedly very rough figures suggest an 'average year' deficit in the region of 20-25,000 tonnes/year, rising to 50-60,000 tonnes/year with widespread harvest failure and near to parity with a bumper harvest. Urban consumption in Northern Regions towns would continue to pull in maize meal supplies even during the best years in view of the small cash sales of millet.

Crop yields are undoubtedly low. Until very recently local farmers have relied on unselected local varieties of grain and improved varieties, whether selected local strains or imported, have not been widely available. The FSG report (FSG 1990: 12) estimates the average mahangu yield in Owambo at 250-400 kg/ha in 'normal' years but much lower in drought years. Illustrating the impact of variable rainfall, the EFWITU's estimates for the past three years show a range for Owambo millet between 100 and 350 kg/ha. On the basis of the first experimental trials, selected local seed might yield 500 kg/ha or more. During the 1991/92 and especially the 1992/93 seasons, exotic varieties such as Okashana-I were more widely distributed through the region.

**Table 10  Crop Yield by Year (kg/ha)**

<table>
<thead>
<tr>
<th>Yield (kg/ha)</th>
<th>1990/91</th>
<th>1991/92</th>
<th>1992/93</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millet/sorghum:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owambo</td>
<td>350</td>
<td>100</td>
<td>240</td>
</tr>
<tr>
<td>Kavango</td>
<td>300</td>
<td>100</td>
<td>260</td>
</tr>
<tr>
<td>Caprivi</td>
<td>300</td>
<td>200</td>
<td>445</td>
</tr>
<tr>
<td>Maize (rain-fed):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kavango (FNDC)</td>
<td>1150</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Caprivi</td>
<td>700</td>
<td>50</td>
<td>590</td>
</tr>
<tr>
<td>Commercial</td>
<td>1550</td>
<td>230</td>
<td>1450</td>
</tr>
<tr>
<td>Maize (irrigated):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kavango (FNDC)</td>
<td>5500</td>
<td>6610</td>
<td>7000</td>
</tr>
<tr>
<td>Commercial</td>
<td>4700</td>
<td>4800</td>
<td>4850</td>
</tr>
</tbody>
</table>

Namibia's cereal imports, whilst fluctuating considerably in relation to local climatic conditions, are in the range of 100-120 000 tonnes per annum (excluding yellow maize for animal feed). This implies that Namibia is about 40-50% self-sufficient in basic cereals in terms of actual consumption. This ratio dropped below 25 per cent in the 1992 drought year but
with the expansion of maize farming in recent years could approach parity in coarse grains with a bumper maize harvest and above 75 per cent overall, the principal deficit being in wheat (EWFTU Bulletin 4.93, table 2). Many farmers in the Northern Regions may produce surpluses in the best years, as in 1991. These are stored rather than sold, but regionally are insufficient, as the following year’s drought illustrated, to provide more than a few months’ grain reserves.

### Table 11 Total Crop Production by Year (’000 tonnes)

<table>
<thead>
<tr>
<th>Production</th>
<th>1990/91</th>
<th>1991/92</th>
<th>1992/93</th>
<th>Average year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ovambo:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>millet/sorghum</td>
<td>55.0</td>
<td>15.0</td>
<td>34.0</td>
<td>40.0</td>
</tr>
<tr>
<td>Kavango:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>millet/sorghum</td>
<td>2.4</td>
<td>1.2</td>
<td>4.4</td>
<td>3.5</td>
</tr>
<tr>
<td>FNDC maize *</td>
<td>5.3</td>
<td>3.2</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>sub-total</td>
<td>7.7</td>
<td>4.4</td>
<td>7.9</td>
<td>7.0</td>
</tr>
<tr>
<td>Caprivi:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>millet/sorghum</td>
<td>0.3</td>
<td>0.2</td>
<td>5.0</td>
<td>4.0</td>
</tr>
<tr>
<td>maize</td>
<td>11.9</td>
<td>1.0</td>
<td>8.7</td>
<td>10.0</td>
</tr>
<tr>
<td>sub-total</td>
<td>12.2</td>
<td>1.2</td>
<td>13.7</td>
<td>14.0</td>
</tr>
<tr>
<td>Northern Regions:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>millet/sorghum</td>
<td>57.7</td>
<td>16.4</td>
<td>43.4</td>
<td>47.5</td>
</tr>
<tr>
<td>maize</td>
<td>17.2</td>
<td>4.2</td>
<td>12.2</td>
<td>13.5</td>
</tr>
<tr>
<td>total</td>
<td>74.9</td>
<td>20.6</td>
<td>55.6</td>
<td>61.0</td>
</tr>
</tbody>
</table>


Vegetables are widely grown inter-cropped with millet and sorghum or in gardens, notably water melons, cowpeas, groundnuts and beans. Wild fruit trees are conserved and harvested, especially in Ovambo. However, there are no reliable estimates of the volume of output in any of these crops. It is apparent that little horticultural produce is sold into the Northern Regions urban markets where fresh produce in the larger shops and supermarkets is imported mostly from distant South African suppliers.

Animal products derive from cattle, goats, pigs and chickens. Again while the numbers in each category are known approximately, there are few if any reliable indicators as to the volume of food production. Although cattle are still valued primarily as a store of wealth and hedge against risk, in Ovambo there are active bush markets and the supply of meat is perhaps greater than might be anticipated. Sales to the Meatco abattoir in Oshakati have also increased sharply. But the marketed off-take derives mainly from the larger stock-owners and the marked inequalities in farm herd size have a major influence on the household supply of animal foodstuffs. Freshwater fish in the seasonal floodwaters (Ovambo) and rivers (Okavango, Zambezi, Chobe) are an important and widely exploited source of animal protein.
In Caprivi, where maize is more prominent, cash trading in agricultural produce is more extensive. Farmers sell maize to the local mill which in turn supplies most of the local demand. But low-priced imports from Zambia, whether legal or not, have been significant, especially in years of poor harvest. Although Caprivi is probably not self-sufficient in cereals in most years, it has seen the strongest recent initiatives towards cash-crop arable farming in maize, rice and non-food products.

A striking feature of distribution pattern for bulk foodstuffs is the near absence of trade between the three Northern Regions. After independence, a pilot scheme was started to market millet grown on the FNDC farms into Owambo, but the quantities involved were very small. Preparatory analysis and planning have begun for a more comprehensive millet marketing scheme which would also target the main urban centres outside the Northern Regions. At present, however, the Northern Regions grain deficit is covered mostly by externally supplied maize meal in retail packs.

Mention should nevertheless be made of freshwater fish, which is a more significant contributor to the Northern Regions food supply than is commonly appreciated. The Owambo seasonal flood-plain and Okavango River fish stocks have long been under harvesting pressure and any surpluses are usually small, local and exchanged on a household basis. But the Zambezi/Chobe river fishery is more artisanal and commercial. Fish is both marketed in Katima Mulilo and distributed through well established channels to other districts. Small quantities are dispatched westwards to Kavango and Owambo, where tinned pilchard and dried horse mackerel from Walvis Bay also find a growing market.

Turning finally to horticultural produce, one of the more remarkable features of food supply in Owambo is that the great bulk of marketed vegetables and fruit originate from South African centres 2000 km or more away. Very little local produce is sold through either the roadside markets, the rural mukua shops or the supermarkets which dominate urban Northern Regions supply. In general, most food commodities and the great bulk of Northern Regions urban supply derives from external origins, principally through South African distributors and wholesalers.

4. NATIONAL AND HOUSEHOLD FOOD SECURITY

In evolving its rural development policies, the new Government has recognised the real risks to food security in Namibia, and has committed itself to addressing a range of underlying and immediate factors causing or associated with household food insecurity. Policies and programmes addressing the underlying factors are necessarily diverse in character. They include, in rural communities in the communal areas, direct support to small farmers such as:

* extension services;
* improved seed varieties of especially millet;
* agronomic research geared to small farming systems;
* a revamping of agricultural training;
* credit schemes for small and emerging commercial farmers;
* an extension of commercial cattle marketing prices and infrastructure to the Northern Regions;
and indirect support such as:

* rural water supply infrastructure (boreholes, dams, canals);
* old age pensions;
* primary health care;
* curriculum revisions in the school syllabus;
* strengthened policing against stock theft;
* creation of regional councils with services to rural communities written into their mandates.

To date one of the biggest missing elements has been a policy on communal area land reform, together with regional strategies on land use. To take the instance of fundamental significance for long-term agricultural planning in the Northern Regions, the rapidly advancing enclosure of the seasonal rangelands in Owambo and Kavango may be entrenching food insecurity at both the national level and the household level. By advantaging large stock-owners geared to producing cattle for export, potential increases in grain output, from commercial and especially small farms, are foregone. Small mixed farmers in the populated zones lose access to seasonal pasturage, increasing their exposure to risk and to diminishing returns. New employment and wage income on the enclosed ranches is unlikely to compensate for more than a small part of the employment output foregone from an alternative development strategy strengthening the security of small farmers and expanding their zones of farming settlement.

Short-term measures are also significant in a marginal, high-risk farming environment. The recent drought saw for the first time a major relief effort geared to the needs of poor rural communities and small farmers. Its principal form during the past two years has been supplementary food supplies to rural communities, including the whole of the Northern Regions, in the form of short-term drought relief. Emergency feeding was concentrated on so-called 'vulnerable groups' and organised by the National Drought Task Force, in which NGOs played a prominent part. In addition, food-for-work projects were organised in many CAs.

Given that the 1992 crop failure was almost total, that this was the first ever relief exercise mounted on a national scale and that it occurred less than three years after independence, the results were commendable: food reached most communities in need and famine was averted in the critical months. However, major problems arose in entitlement, where excessive registration allowed the non-needy and business interests undue access, and in distribution from the regional depots, which in Owambo rarely reached beyond a radius of about 30 km, leaving under-provided the remote communities in greatest need.

Food aid made a major contribution to Namibia's ability to ride out the severe 1992 drought. During the 1992/93 marketing year (May to April), 31,300 t of wheat and coarse grain were imported as food aid or on concessionary terms. This total amounted to 16 per cent of the 195,200 t used domestically for food (EWFIU 4.93: table 2).

The Government has indicated that it will simultaneously pursue self-sufficiency in basic foods at the national level, in order to increase economic independence, and food security at the household level. Where necessary, support to household food security at the household
level will be given by short term relief assistance, while self-reliance among families will be promoted on a longer-term basis.

Namibia nationally is well able to cover cereal import requirements at both present and nutritionally-desirable levels of consumption. At 1988/89 selling prices, imports of white maize and wheat are estimated for that year at R16.1 million and R14.7 million respectively, in total R31 million. This amounted to only 1.2 per cent of Namibia's merchandise export earnings. Even in drought years when the demand is high, the grain import bill is unlikely to exceed 5 per cent of export earnings. Furthermore, the fully developed and efficient transport, wholesale and retail infrastructure ensures that grain and other basic food commodities will reach most centres of demand and beyond. In Ovambo, even remote rural communities are connected through the numerous cua shops selling maize meal, cooking oil and tinned food.

Namibia's strong position in terms of national food security is well illustrated by experience during the 1992/93 drought emergency. Although Namibia was successful in raising substantial commitments of food aid (31,300 t), commercial imports exceeded expectations, exceeding estimated requirements by some 33,000 t in the year to April 1993. As a result, total grain stocks at the end of the period, by which time the new harvest was coming in, had risen to more than 32,000 t and were some 14,000 higher than at the start of the period. They included 8,000 t of food aid in addition to 23,300 t of commercial stocks.

The issue of national food security has commonly been confused with national food self-sufficiency. The latter, as indicated above, is far from being a necessary condition for achieving the former. Ready access to regional and world suppliers, adequate export cover, a national distribution infrastructure and a functioning retail market system are all in place and reduce the dependence of domestic consumption on domestic production to insignificant proportions. Greater food self-sufficiency would reduce the balance-of-payments burden in normal and good harvest years, but ironically would make little difference in drought years unless the bulk of the increased output came from irrigated crops, which would be a very expensive path to self-reliance.

If greater incidences of self-sufficiency in both cereal and horticultural commodities are to be achieved, river irrigation (Orange, Okavango, Zambezi, Chobe), dam irrigation (Hardap, Naute etc) and an expansion of arable farming in the better watered Otavi highlands are all likely to contribute part of the increased output. However, the potential in the commercial farming zone is strictly limited by the semi-arid climate, the lack of surface water resources and the high cost of irrigation infrastructure. Greater potential lies in the river sources and higher rainfall zones of the Northern Regions.

One option is intensive cultivation on irrigation schemes. Small-scale projects - the FNDC's Okavango farms plus a rice project in Caprivi - have been going for some time, with mixed results. Technically, there can be little doubt that the river soils and floodplains of the Caprivi and a few stretches along the Okavango River offer opportunities for commercial farming schemes delivering surpluses of cereals and vegetables to markets in the Northern Regions and nationally. The cost of such schemes is, however, high and on past experience careful regard will have to be paid to their economic viability.
A second option is more productive rainfed field agriculture yielding surpluses from both large and small farmers. For Owanbo, the contemplated millet marketing scheme might open opportunities for cash earnings to a broad range of small farmers selling into urban markets to the south as well as the rather limited local urban markets. Their principal contribution would thus be to an overall reduction in the long-term grain deficit in the Northern Regions and to a balancing of millet exports against maize meal imports.

While production at the national level is improving, production and access to food at the level of individual households is far less secure and food insecurity remains a serious problem among many rural and low-income urban families in the Northern Regions. This is a consequence both of the insecurities of variable seasonal rainfall and of the lack of access to alternative sources of income and, among urban dwellers, of unemployment. In that respect, the widespread malnutrition among children is likely to be caused to some degree by food insecurity at the household level.

Food crop farming in northern Namibia is highly dependent on variable seasonal rainfall, increasingly so towards the west. A poor rainfall season means a decline in food availability from crops and commonly a decline in livestock holdings. Existing evidence suggests that in years of average to poor rainfall most households grow sufficient grain to last for 3 months of the year or less. For the remainder of the year they must rely on maize and other foodstuffs purchased from local shops. Only the occasional bumper harvest yields sufficient returns for the majority of small farmers to build up household reserves lasting more than a few months. One such example was the 1991 harvest in Owanbo. Reserves from which sustained many households through most of the following year’s harvest failure. It was the very late 1992/93 rains that escalated hardship towards the threshold of imminent famine.

These seasonal threats to household food security (HFS) are compounded by the longer-term deterioration of the ecological base arising from pressure on natural resources. Owanbo, where considerable population movements have taken place both internally and from southern Angola, is particularly affected by apparent deterioration.

5. **EXISTING MARKETING MECHANISMS**

A poor marketing infrastructure for local farm products is a feature of the Northern Regions. This may be attributed to administrative neglect during the colonial era and to the close integration of Namibia’s agricultural markets with those of South Africa.

The communal areas also suffer from distortions in the form of implicit and explicit subsidies for commercial producers and from segmentation between commercial and communal areas. With the exception of recent pilot projects, there are no formal marketing facilities for millet, the principle crop grown by the vast majority of farmers in the Northern Regions. Commercial retail marketing of maize products, and to a lesser extent of wheat products, extends into all regions of Namibia.

Schemes for the marketing of millet have been investigated by the British Overseas Development Administration, and consideration is being given to the introduction of small scale mills.
As indicated elsewhere, most households in the Northern Regions market livestock through informal butcheries. For the few larger farmers, however, access to primary domestic or foreign markets has been constricted by the existence of the veterinary cordon.
CHAPTER H: TRADITIONAL LAND TENURE SYSTEMS

1. INTRODUCTION

In common with tenure systems elsewhere in Africa, Namibian customary land tenures underwent significant reconstruction under colonial rule, in part through the collusion of subordinated chiefs and headmen themselves. As a consequence, customary land tenure is in general, neither 'customary' nor 'traditional' in the implied sense of the words. A salient feature of this process was the progressive loss of accountability on the part of chiefs as land managers, as their frame of reference shifted from community to the colonial administration.

2. THE LEGAL FRAMEWORK

"Customary law" in Namibia does not exist in its own right, and is subsumed under statutory (Roman Dutch) law. The judicial acknowledgement of custom was formally sealed with the Native Administrative Proclamation of 1928 which gave official recognition to customary law in so far as it did not contradict statutory law. To a significant extent the Constitution of the Republic of Namibia (Article 66) retained the status quo and reinforced the subordinate position of customary law.

Article 25 [1(b)] of the Constitution retains all laws in force immediately before the date of Independence, until amended, repealed or declared unconstitutional; few laws relevant to customary law have been so repealed and thus the colonial legal framework within which communal land tenure operates, is still in place. This is significant, as it enables a wide range of even conflicting actions in regard to land matters to be upheld by one or other 'law'.

Despite the fact that traditional leaders lost some power and influence under colonial rule, they still maintained effective control over the allocation of land. This right has been formally arrogated by the State under Article 102 (5) of the Constitution, which defines the role of traditional leaders on land matters as advisory. Their right to allocate land has thus not been statutorily regained. Nevertheless, due to the continued existence of some twenty pieces of colonial legislation of direct relevance to the current status and management of communal lands, and in the absence of new policy on such matters, traditional leaders do still maintain effective control over the allocation of communal land.

Unlike some other African states (Zambia, Tanzania, for example), the Namibian Government did not opt for nominal ownership of communal Areas: i.e. that the state merely holds these lands in trust for the people. Whether intentional or not, it is significant that Namibia did not choose this route, since the principle is symbolically important in that it entrenches both the founding principle of communal tenure, that of 'the right of every citizen to land' and the principle of the State as 'the people'.

3. CUSTOMARY LAND TENURE IN THE NORTHERN REGIONS TODAY

The prevailing system of land tenure in the Northern Regions is one of communal tenure with usufructuary rights. Although there are considerable regional variances in access rights, there are also many features which are common to all regions. Perhaps the most pervasive feature of tenure in much of the Northern Regions today, is the fact that it is undergoing extensive change.

Although the impact of the war precipitated considerable change in the social order of the north, the advent of independence has released forces which are further reshaping the social-economy, land-based production and tenure. Of considerable importance is the new-found 'freedom' mainly wealthier people feel to 'expand' into the remoter parts of their regions, and the increasing enclosure of communal pasture in lightly-settled and previously unsettled communal land. This trend reflects fundamental shifts in the social-economy and will over time, if allowed to develop without interference, lead to major change in the content of local land tenure systems.

A characteristic of the current situation in the Northern Regions is the effective absence of formal administrative or regulatory authority, the recent establishment of Regional Councils notwithstanding. A lack of administrative leadership and authority at the local level is likely to continue for some time, given the difficulties currently experienced in devolving authority and resources to the local and regional levels. In this situation and in the absence of strongly presented national policy on such matters, scope for ad hoc transformations in local land tenure abundantly exists and will definitely take place.

Little is known of the form and pace of change in traditional tenurial systems in the Northern Regions. It is, for example, not known just how far people's perceptions of their 'ownership' over arable plots has changed, to what extent renting of land or inter-household or intra-household land transfers are taking place, precisely in what conceptual and tenurial frame chiefs and headmen are allocating pasture for enclosure, what shifts in inheritance practices are evolving, or whether headmen and elders at the local level are 'changing the rules' in response to perceived local land shortages, if at all.

4. FEATURES OF TRADITIONAL TENURE

In view of the above, the ascribed features of tenure in the Northern Regions must thus be viewed cautiously. Summarily these include the following points:

* Tenure 'systems' in Caprivi are a lot more stable than elsewhere in the north
* Practices are different among regions and within regions
* Traditional leaders continue to allocate lands, ambivalence over their legal right to do so notwithstanding
* The most senior traditional leaders (kings, chiefs, senior headmen) effectively 'own' the land, and delegate the right to allocate it to (subordinate) headmen
* In five of seven sub-ethnic areas of Ovambo, headmen collect fees for allocating arable land, part of which they pass to the senior headmen. In the other two areas, the king and senior headmen 'sell' the right to allocate land to
headmen, who then retain the fees. Fees are variable. In Okavango and Caprivi payments for land are not common and where payments are made, they more explicitly represent tribal or 'allocation fees'.

- Clan membership is not a pre-requisite to the acquisition of land
- Women have always had the right to hold (arable) land but remain the minority landholders
- Rights are strictly usufructuary in the sense of being available only for life
- Inheritance is the principal means through which ownership of land is transferred. Differences pertain in the 'rules' as to who is eligible for inheritance; whereas in Okavango and especially East Caprivi, widows routinely inherit land, in some areas of Owamboland widow's may only inherit with the permission of the spouse's family and through payment and to the headman.
- Rights over residential and arable holdings are individually held but revocable if the plot remains unused, usually for transfer to a smaller plot
- Rights over arable land are not transferable from one household to another, as such transfers may only take place through reallocation by the headman
- Disputes are dealt with by the headman in consultation with elders, with unresolved disputes referred to senior headmen, chiefs and kings; dispute resolution (usually with some form of payment) is the main function of the senior traditional leaders
- Rights over grazing land are held equally and communally
- Enclosure symbolises private, individualised rights but the enclosure of pasture is not customary on these grounds
- Water rights are communal, 'regulated' or regulatable by the headmen, except in circumstances where an individual or group of individuals have dug their own well or paid for a borehole
- Rights to all resources such as trees, fuelwood, fruit, within residential/farm plots are held by the plot-holder who also maintains priority use rights over such resources nearer to his own farm than to the property of others. Rights over tree resources beyond the local area are communally held, regulatable by the headman. In practice the felling of important and widely-used species (marula, palm etc) is not allowed, and offences are punishable by fine

To the above could be added the following trends:

- While household heads remain the principal right-holder, significant rights to use the land exist within the household. This is particularly the case with regard to women and their ownership over crops and by implication, to their ownership over crop-land
- While household heads/right-holders are still predominantly male there has almost certainly been a major shift in recent decades, with more women acquiring land in their own right
- The concept of usufruct as a system of lifetime use, has almost certainly already shifted towards more stable private 'ownership'. Improvements to the allocated land, in the form of fencing and housing, limit the 'right' of headmen to evict 'owners' or to change their allocations in the face of vacancy or non-use. The prevalence of out-migrating labour has meant that the re-allocate unoccupied
plots is no longer customary, if it ever was. In sum, 'security of tenure' over arable land is increasing in subtle but significant ways.

Usufruct is also in practice losing its 'lifetime' connotation through steadily increasing emphasis upon the rights of inheritance (in the face of declining mobility, improvements to land and land pressure in settled areas). In a relatively short period this trend may come to resemble usufruct in most local tenures elsewhere in Africa where land is explicitly heritable.

The payment of 'allocation fees' is increasingly regarded as having 'bought the land'. Rates do not differ widely in a particular area and it is possible that they reflect a form of 'market value'.

Seemingly in contradiction, the right of every person to land overrides other considerations. Therefore headmen feel bound, for example, to allocate a plot to a needy person (especially if he is male) even if he can't meet the fee payment immediately.

Forces of socio-economic and political change (and a concommitant decline in 'tribalism') is probably already removing some of the distinctions between the way headmen in different areas allocate land; in this context, their own framework of reference will fairly quickly become more 'regional' and 'national'.

5. ATTITUDES TO LAND REFORM

Four concepts appear to have underwritten much of popular thinking about 'land tenure' in post-Independence Namibia. These are as follows:

a) that there is a need for equity in land-holding at least to the extent of 'correcting the wrongs perpetrated by colonial dispossession' - in effect, redistribution of the white-owned freehold farms which embrace 45 percent of the country's land area. This aspiration not only gave rise to the 'land issue' but proscribed its content; 'the land issue' or 'the land question' has, to all intents and purposes, be used as a shorthand for 'land redistribution'. Implicitly, the 'equity' refers to equity with white-owners not necessarily equity among the black population.

b) There is a conviction that 'traditional' systems of land tenure are a prime cause of under-development, and must be done away with, in favour of statutorily-managed freehold individual title. Proponents of this view visualise a category of middle class farmers, owning farms large enough to allow 'commercial, ranch-type production' such as practised on the white-owned freehold estates. Poor and non-livestock owners would 'disappear', either acting as labour to the farm-owners or seeking wage employment elsewhere. This transformationist approach has been shaped by the freehold ranch model. This 'economic unit' thesis has been 'policy' since the sixties and still holds sway in some quarters.

c) The fourth broad concept is premised on the idea that 'all Namibians have a right to land' and that it is the responsibility of the State to ensure that this 'basic human right' is met. This concept has its origins in 'traditional' communalism, and is strongly held in the communal areas and even by those
who argue for the individualisation and privatisation of communal land. A 'conflict' between both ideas is recognised (routinely referred to as 'equity' versus 'development', with Namibia caught 'on the horns of a dilemma'.

These ideas generally have had different constituencies which have presented policy makers with seemingly irresolvable contradictions. As the complexities of redistribution of the freehold farms came to light and as the Government recognised that any land reform policy would affect access to land in ways it had not previously calculated, throwing the 'question' open to public debate appeared the best strategy.

6. APPROACHES TO LAND REFORM

A process of consultation on the land issues began in mid 1990 with a commitment made by the Prime Minister to the National Assembly to hold a conference to 'act as a forum for discussing land issues and grievances', to 'review strategy options on land reform' and to 'develop a national policy and programme of action'.

The landmark Conference on Land Reform and the Land Question took place a year later in June 1991. Five hundred participants from all over the country and representing diverse interests, met for one week under the chairmanship of the Prime Minister. By the time the Conference was held, its role in 'developing policy' had firmly changed to that of providing advice to Government.

Twenty-four recommendations in the form of consensus resolutions emerged out of the Conference. These recommendations were significant in two key respects: firstly, they established the principle that redistribution of white-held commercial land would target only certain categories of land holding (and implicitly the least contentious and least likely to provoke an exodus of white investment).

Secondly, they upheld the integrity of the communal areas as communally owned land, with the sub-division and commercialisation of communal land into 'economic units' set aside - at least for the short term. The administration of land allocation in the communal areas was to be improved through the establishment of local government land boards (and clarification of the role of traditional elders) and with the recommendation that the delivery of inputs and services should be extended. Such commercialism as was evolving in the communal lands should be deflected by the immediate cessation of 'illegal fencing' and by encouraging and supporting larger stock owners to leave the communal areas for the commercial areas.

By implication, the conference recommended the abandonment of the 'economic units' 'policy'. However it did not directly resolve the issue on whether the 'transformation' approach should be replaced with the reform of 'customary' land tenures. As a consequence, despite the lessons of the failures in neighbouring countries, the 'economic unit' policy and support for enclosing at least parts of the communal lands (the so-called unutilised zones) remains. Nonetheless, the options were widened and doubts as to the appropriateness or viability of grazing land enclosure in communal areas were firmly sown.
Implementation of the Conference’s resolutions has been slow. Immediately prior to the Conference, Cabinet issued an in principle decision that, "illegal fencing should be declared null and void and that all communal farmers, whether big or small, should have equal access to pastures in the communal areas." However, no enforcement of the policy has taken place.

A concrete output of the Conference was the formation of the recommended Technical Committee on Commercial Farming (TCCF), which was mandated (in the main) to identify which estates could be redistributed and how that should be implemented. The Committee was constituted in late 1991 and submitted its report to Cabinet a year later. A Cabinet Committee is currently considering the recommendations and expects to make its views known to Cabinet for subsequent land reform policy formulation 'before the end of 1993'.

A noteworthy, if somewhat contentious, surprising conclusion of the TCCF was their prioritisation of the resettlement of poor and landless people on expropriated commercial farms. Aside from the viability of resettling people in new and unknown areas, it is doubtful whether such resource poor people could sustain commercial agriculture, which elsewhere in the report the TCCF argues should be 'maintained' in the commercial areas. It also contradicts a recommendation elsewhere to provide minimum financial support to settlers in the commercial areas. As importantly, the prioritization of such settlers would inhibit rather than promote the departure of the large-scale farmers from communal lands as it is anticipated that these people will secure farms on the private market, not through Government assistance. MAWRD has argued against the involvement of poor and landless in commercial resettlement, insisting such people be settled on unused communal land.

The Technical Committee did make some recommendations relating to the communal areas and strongly endorsed 'the protection of access to traditional communal land by preventing the privatisation of land through fencing. It further endorsed the idea of "bringing farmers from communal areas into commercial areas' both to reduce pressure in the communal lands and in service of the policy of 'national reconciliation, affirmative action and integration'. The manner in which the communal areas would be managed (or whether 'communal land tenure' would be reformed) was not addressed. Thus, in formal policy at least, the original 'narrow' focus upon redistribution has, for all intents and purposes remained. A systematic assessment of the agrarian and tenurial issues facing communal areas has yet to take place.

In the absence of policy guidance and formal policy and programme formulation, a land reform of sorts is taking place at the local level. Without the restraining hand of Government - or the Regional Councils - fencing of communal rangeland continues under the authority of local leaders, who continue to have legal standing due to the fact that key statutes have not been repealed and the constitutionality of their status has not been clearly defined. There is also a tendency for government projects to be planned with the commercialisation of under and unutilised communal areas still high on the agenda.

A further impediment to the formulation of policy on land, has been a lack of clarity on which government agency (or agencies) should assume responsibilities for land tenure matters at national and local level and for 'land reform' in the widest sense. The Ministry of Lands, Resettlement and Rehabilitation (MLRR) was indeed established to plan and implement resettlement and land reform, but the context in which the latter is defined makes it uncertain whether this refers to 'redistribution' matters in the Commercial Areas or a broader mandate
which could embrace tenurial reform in the Communal Areas. The Ministry of Local Government and Housing (MLGH) assumes some responsibility for land matters in the rural areas through its supervision of the Regional Councils.

The MLRR has taken the initiative to develop regional land use planning capacity, which it rightly perceives will be essential to the sound administration of land management and tenure in communal areas. Although Cabinet has endorsed the establishment of a Land Use Planning Sub-Division, other ministries (most notably MAWRD and MLGH) might also, logically, lay claim to these functions, either in the context of supporting Land Boards (which MLGH might claim, given their likely constitution under Regional Councils), or in the context of agricultural planning (MAWRD).

In summary, the formulation of a coherent land tenure policy for the communal areas has yet to take place. The ensuing delays are giving rise to some popular dissatisfaction and, as significantly, a lack of proper land management is contributing to the over-exploitation of the natural resource base.
CHAPTER I: EXISTING INFRASTRUCTURE

I. POWER

1.1 Introduction

Rural electrification in Namibia commenced in 1990, with technical & financial assistance from NORAD and the Government of Namibia. In conjunction with the South West Africa Water & Electricity Corporation (SWAWEK), the first large scale electrification program in Owamboland was launched. Prior to 1990, rural communities were largely without a regular reliable power supply. Electricity in Namibia is provided by an extensive National Grid operated and maintained by SWAWEK. In all areas covered by the National Grid (see Map 18) SWAWEK operates as the bulk supplier to all major towns, industries and individual subscribers. The operation of local distribution networks in towns, (11 kV and 380V/220V) is the responsibility of municipal authorities. Operation of isolated diesel generators in rural areas is undertaken by local authorities or the Ministry of Local Government and Housing.

The following electricity generating plants are connected to the National Grid and are operated by SWAWEK:

a) The Ruacana Hydropower Plant with an installed capacity of 240 MW (megawatts).

b) The Van Eck Thermal Power Plant (coal fired) having 130 MW capacity

c) The Walvis Bay Thermal Power Plant (diesel/gas) having 46 MW capacity

SWAWEK also imports electricity from the Republic of South Africa by an interconnecting transmission line between Namibia and the RSA. The peak capacity is 200 MW.

SWAWEK undertakes power transmission at the following levels: 330 kV, 220 kV, 132 kV, 66 kV, 33 kV, 22 kV and 11 kV. (See Map 18)

Presently installed transmission line lengths at various voltage levels are as follows:

<table>
<thead>
<tr>
<th>VOLTAGE LEVEL (kV)</th>
<th>LENGTH (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>330</td>
<td>321</td>
</tr>
<tr>
<td>220</td>
<td>1495</td>
</tr>
<tr>
<td>132</td>
<td>790</td>
</tr>
<tr>
<td>66</td>
<td>4387</td>
</tr>
</tbody>
</table>

SWAWEK has its own technical staff which maintain and control all their installations.

1.2 Power Supply in Owamboland

Electricity facilities in Owamboland can be grouped as follows:

- Facilities connected to the National Grid.
- Isolated installations fed by diesel generators.

The following substations are connected to the National Grid:

- A 66 kV/22 kV substation with 2.5 MVA transformer capacity located at Oshivelolo.
- A 66 kV/22 kV substation with 2.5 MVA transformer capacity located at Okatope.
- A 66/11 kV substation with 5 MVA transformer capacity located at Ondangwa.
- A 66/11 kV substation with 5 MVA transformer capacity located at Oshakati.

All of the above substations are fed from the 40 MVA, 132 kV/66 kV Otjikoto substation near Tsumeb.

A 66 kV/33 kV substation at Baobab connects the following towns via overhead lines: TSANDI, ONESI, ONGONGO AND OKALONGO. SWAWEK is responsible for the power supply. Operation of all the substations, all 11 kV and low voltage distribution networks are the responsibility of the Ministry of Works in Owamboland. The distribution network in the Oshakati and Ondangwa areas has approximately 80 km of 11 kV lines of which more than 85% are overhead. There are 105 11 kV/400V substations in Owamboland of which sixty are in the Oshakati - Ondangwa area. The following centres were only recently connected to the National Grid:

- Ongua, Onekxvoo, Okatope, Ongwewena, Engela Otokango, Odiba and Enounja, via a 66 km Ondangwa - Oshikango 33 kV overhead line.
- Elim, Oshikuku and Ongongo, via a 51 km Oshakati - Elim - Oshikuku - Ongongo 33 kV overhead line.
- Oshikango, Ondobe and Uehana, via a 79 km Ondangwa - Ushikango - Ondobe - Uehana 33 kV overhead line.
- Omubalanu, Tsandi, Ongandjera and Onesi, via a 45 km Ruacana - Caluquix 66 kV overhead line.
- Owipa, Okonkonda, Onatanga and Ongwediva, via a 33 kV line which branches from an existing 66 kV Okatope - Ondangwa - Oshakati line.
- Okatope, Onyaanya, Owayewe and Okankola, via a 37 km Okatope - Onyaanya - Onaya 33 kV line with a branch off to Okankola.
- Okalongo and Awamulenge, via a 42 km Omubalanu - Ongongo 33 kV overhead line.
1.3 Power Supply in Okavango

Existing facilities in Okavango can be grouped into:

- Those connected to the National Grid.
- Small, related diesel driven generator installations.

The following substations are connected to the National Grid:

- A 132 kV/66 kV/22 kV substation located in Rundu with 5 MVA transformer capacity.
- A 66 kV/22 kV substation with 500 kVA transformer capacity located at Kapako.
- A 66 kV/22 kV substation with 500 kVA transformer capacity located at Bunya.
- A 66 kV/33 kV substation, 2.5 MVA transformer capacity located at Mpasie.

There are 2 outgoing 66 kV overhead lines from the substation at Rundu, one feeding a substation at Bagani and the other a 300 kVA substation at Kapako. Also present are two 11 kV lines that supply twenty 11 kV/400V substations operated by the Ministry of Works, Transport and Communications. One 22 kV overhead line originating from Kapako substation supplies Ruipa and Mushiri. Two 33 kV overhead lines originating at the 2.5 MVA Mpasi substation supply Ruipa and Numafrica.

The number of consumers in the Rundu area is approximately 1500 of which the bulk are domestic, located within a radius of 10 km around the Rundu town centre.

1.4 Power Supply in Caprivi

The existing electricity facilities in the Caprivi are:

- The Katima Mulilo network.
- Small diesel driven installations.

The Katima Mulilo network comprises a thermal power station consisting of 6 diesel generators rated at 500 kVA each. Four of these generators were, until 1990 connected to 400 kV/11 kV step-up transformers feeding an 11 kV busbar system. The power station and 11 kV switchgear were operated by SWAWEK with two 11 kV outgoing feeders. The related 11 kV/400V distribution system has been the responsibility of the Ministry of Works. Since August 1990 the 11 kV busbar system is fed by a 10 km, 11 kV line, from the Katima substation in Zambia. The present peak load in the Caprivi is approximately 1 MW. The distribution network in the Caprivi consists of about 25 km of 11 kV lines and seventeen (17) 11 kV/400V distribution transformers. All the facilities are located within an area of approximately 7 km from Katima Mulilo. There are about 1470 domestic bulk consumers.

1.5 Power Supply in Okakarara District

The facilities in the Okakarara district are very limited and consist of only one 22 kV substation located at Okakarara. This substation is fed by a 22 kV feeder from the 66 kV/22 kV Osire substation. SWAWEK are presently planning a 66 kV line from Grootfontein to Okamipasi via Coblenz.

2. ROADS, RAILWAYS AND AIR STRIPS

2.1 Introduction

2.1.1 Basic Background

A good road system is one of the basic necessities for the development of rural areas. Roads are needed to enable producers to market their produce effectively and to bring the rural population into contact with the better developed areas where they can be exposed to new ideas and technology.

2.1.2 Role of the Department of Transport

The Department of Transport (DoT) is responsible for the planning, construction and maintenance of proclaimed roads in Namibia. With the exception of Trunk Roads, which have always been the responsibility of the DoT, responsibility for roads in the study area was taken over by the DoT in the early eighties from another department previously responsible for the administration of the communal areas at the time. The construction and maintenance of roads was of secondary importance and due to financial constraints, remained undeveloped.

Subsequent to assuming responsibility and due to lack of funds, other priorities and the war situation in the north, the DoT could only construct and improve the most important and strategic roads in the area.

Since independence, the DoT has embarked upon a more concentrated effort to upgrade roads in the study areas.

Decisions to proclaim new roads, upgrade existing tracks or roads or to provide roads with blacktop surface are based on traffic counts and economic factors for which purpose feasibility studies including cost-benefit analyses are carried out.

2.1.3 Definitions

Roads in Namibia are classified as follows:

a) Trunk Roads link Namibia with neighbouring countries and to link the major population centres.
b) *Main Roads* link smaller centres and districts to the Trunk Road system.

c) *District Roads* link rural areas with Main Roads and Trunk Roads.

d) *Proclaimed Farm Roads* link farming areas to District, Main and Trunk Roads. Proclaimed Farm Roads are only found in the commercial farming areas of Namibia and not in the study areas.

Where a proclaimed farm road passes over a farm, that farmer is responsible for maintaining such a road on a 50:50 basis together with the DoT.

2.2 Railways

No railway lines exist in the communal areas nor in the study areas. The railheads nearest to the study areas are the following:

- Ovamboland: Tsumeb
- Kavango: Grootfontein
- Caprivland: Grootfontein, Victoria Falls (Zimbabwe), Livingstone (Zambia)
- Okakarara Region: Grootfontein, Ojiwarongo, Gobabis

The centres located in Namibia are shown on Map 1.

2.3 airstrips

Because of large distances and lack of all weather roads, numerous airstrips have been cleared and gravelled. The most important ones near main centres have been bitumen surfaced and are suitable for larger types of aircraft.

Airports and landing strips are shown on Maps 19, 22, 23 and 26.

All airstrips are not necessarily licensed or regularly maintained and are not always fenced in to prevent livestock from entering the landing area.

2.4 Situation in Ovamboland (MAP 19)

2.4.1 Pre-Independence Developments

The only roads constructed to bitumen surfaced standards are Trunk Road 1/11 from Oshikango via Ondangwa to Oshikango on the Angola border and Main Road 92 from Ondangwa to the hydro-electric power station at Ruacana. Main Road 67 from Ruacana to Kamanjab in the south is built to gravel road standards.

District Roads built to gravel standards included DR3601 from Ohangwena near Oshikango eastwards to the Kavango area and District Roads 3602, 3603 and 3622 located east from Trunk Road 1/11. These District Roads were mainly built for military purposes.

A large number of minor roads and tracks in the Ovamboland region have been proclaimed but have not been built up or improved. Most of these minor roads follow the courses of oshanas and may become impassable in the rainy season.

2.4.2 Post-Independence Developments

The most important development was the preparation and finalisation of the Ovamboland Roads Master Plan. The Department has recently started to implement this Master Plan.

The plan is basically an economic analysis of the roads system in Ovamboland. All the proclaimed roads have been prioritised for upgrading and improvement to various degrees over the next 10 years, obviously depending upon the availability of funds.

2.4.3 Current Construction

Roads currently under construction or to be constructed in the foreseeable future are the following:

- *Main Road 111*: Oshakati - Okahau, under construction to bitumen surfaced standard.
- *District Road 3608*: Engel to Okalongo under construction to gravel road standards.

2.4.4 Planned Schemes

The following schemes are currently planned:

- *District Road 3616*: Epalela to Ones, construction to gravel road standards to commence before the end of 1993.
- *District Road 3612*: Oshikango to Okalongo, construction to commence in 1994.
District Road 361V: From MR111 to Omaanda: under construction by labour based methods.

The Department plan to have certain other roads also constructed by labour based methods e.g. District road 3608 from Okalongo to Ombalanu.

Personnel form a number of consulting firms are currently on an intensive training course in Kenya funded by SIDA, on labour based construction methods and management.

2.4.5 Major Problems

The main physical constraint in Owanbo is the lack of good road building materials. Mechanical modification whereby materials from different sources are blended to obtain a material conforming to the required standards for the wearing course are often required.

Another major problem is the large number of water courses to be crossed by roads running east-west, especially in the area west from Trunk Road 1/11. Major roads cross these oshanas by means of concrete culverts or pipes and lower category roads by means of concrete course ways.

Most of the minor roads and tracks follow the courses of oshanas and may become impassable in the rainy season. Outside the oshanas the in-situ material is quite often very sandy and only four wheel drive vehicles can be used. Where minor roads are upgraded to gravel standards, they are re-aligned to avoid oshanas as much as possible to keep drainage costs low.

2.5 Situation in Okavango (MAP 22)

2.5.1 Pre-Independence Developments

Trunk Road 8/3 from the southern border of the area to Rundu and Trunk Road 8/4 from Rundu to Marshari were bitumen surfaced. A bridge over the Okavango River at Bagani was also constructed.

All the other gravel roads and tracks in the area were subject to normal maintenance work only which includes reshovelling and regular grading of the roads.

2.5.2 Post-Independence Developments

These developments consist mainly of the planning of the Trans Caprivi Highway from Marshari to Bagani.

2.5.3 Current Construction

Trunk Road 8/4 from Marshari to Bagani, which forms part of the Trans Caprivi Highway, is currently under construction and is due for completion early in 1994. Approximately 48 km from Marshari to Nyangana has already been opened to traffic.

2.5.4 Planned Schemes

The only road planned for further construction, is District Road 3403 from Bagani to the Botswana border.

2.5.5 Major Problems

The major problems are the lack of suitable road building material. Material are generally found near the Okavango River where the sand overburden which has to be removed, is thinner. Materials are often found under millet fields which have to be stripped to reach the gravel underneath.

The alignment of the road was decided upon with the assistance of agricultural experts, to avoid areas with agricultural potential. The fact that most of the population is settled fairly close to the river also had to be taken into account.

Apart from the Okavango River, no major water courses are crossed and due to the thick sand overburden run-off is negligible.

2.6 Situation in Caprivi (MAP 23)

2.6.1 Pre-Independence Developments

The only major road built was the bitumen surfaced Trunk Road 8/6 from Kongola to Katima Mullilo and a culvert type bridge over the Okavango River at Kongola.

Trunk Road 8/5 from Bagani to Kongola was re-aligned and gravelled by the military. Other roads were normally maintained.

2.6.2 Post-Independence Developments

Trunk Road 8/5 from Bagani to Kongola is currently being planned for upgrading to bitumen surfaced standard. Construction work is due to commence in early 1994.

A feasibility study on the widening of the existing bitumen surfaced Trunk Road 8/6 from Kongola to Katima Mullilo and the bitumen surfacing of Trunk Road 8/7 from Katima Mullilo to Ngoma was completed in 1993. The first 12 km of the road from Katima Mullilo to Ngoma has recently been completed to bitumen surfacing standards by a Departmental construction unit.

2.6.3 Major Problems

Material is again the major problem in the Caprivi as regards road construction.

133
A secondary problem is the fact that a very large area to the east of the Katima Mulilo Ngoma Trunk Road is subject to flooding during the rainy season. This often leads to small communities being isolated for considerable periods of time. These conditions make the planning and construction of roads difficult and expensive because of the high fills and large number of culverts required for a sparsely populated area with low traffic volumes.

2.7 Situation in Okakara District (MAP 26)

2.7.1 Pre-Independence Developments

This area is sparsely populated with communities mostly centred around the few major settlements. Lack of water also constrained the development of the area.

Most of the roads in the area were cleared and built in the pre-independence period and were not upgraded or improved to a marked degree. The fact that this area was not in the war zone and the low population density contributed to the fact that very little was done to improve the road system.

Only Main Road 101 from the commercial farming area to Okakara was provided with a bitumen surface.

2.7.2 Post-Independence Developments

Apart from relatively heavily traffic roads from the commercial farming areas which are regravelled from time to time, very little has been done to improve the road system.

With the improvement of the water supply system to the region, the improvement of roads has become necessary and with this in mind, a Master Plan for this area is currently being prepared.

2.7.3 Major Problems

The lack of water for construction purposes in this area, will be one of the major problems encountered.

3. WATER SUPPLY

3.1 Introduction

The Department of Water Affairs (which falls under the Ministry of Agriculture, Water and Rural Development) exercises control over natural water resources in Namibia including water resources investigations and management, pollution control and planning operations for meeting water demand by various consumer groups.

The Department has been particularly responsible for bulk water supplies until a Directorate of Rural Water Supply has been introduced recently.

Various NGOs are active in the water field in the study areas. NGO’s are mostly active in the low technology areas (shallow wells, hand pumps, storage reservoirs, appropriate means of water transport, etc.) but have been involved in deep borehole development schemes and some minor pipelines.

3.2 Owanbo

Surface water from oshanas (very slow flowing rivers) and shallow hand-dug wells supplied and still supplying a large portion of the water requirement of Owanbo. This surface water was also collected in earth canals and earth storage dams.

To cope with an ever increasing demand for water, water from the Cunene River at the border with Angola has been brought into western and central Owanbo since the early 1970’s.

Water is either pumped from Ruacana (down-stream of the hydro-electrical scheme) or gravitated from the Calueque Dam situated in Angola. Both sources discharge into a canal at Malenens where water gravitates to Oongo.

Water is stored in a 1 million m³ earth storage reservoir before it is purified at the 36 Ml/day purification works at Oongo. Purified water from Oongo is distributed north, south and east of Oongo by means of various pipe routes as shown on Map 20.

An open canal is being planned to supply raw water to a new 40 million l/day water treatment plant at Oshakati.

Purified water is pumped from Oshakati to Ongwediva and Ondangwa including consumers along the water line. At Ondangwa water is pumped in a south-easterly direction and the so-called Herringbone network serves the northern points of central Owanbo.

Approximately 8.6 million m³ water is produced and distributed per year in Owanbo.
3.3 Okavango

The Okavango river is the major source of water in the area and relatively few bulk water schemes are in operation in this area.

Twenty (20) bulk water schemes are operated by the Department of Water Affairs in Okavango. The river based schemes are the largest. Relatively large (in the order of 200-500 m³/day) river based schemes are situated at:

- Kandimi - Muvangl
- Kapako
- Linus Shashipapo
- Mukwe
- Rundu

Smaller borehole schemes are operated at Andeva, Bagani, Buenja, Kahenge, Kayangona, Npungu Vlai, Mopini, Mashuri, Nyangana, Nkunkuru, Omega, Murani, Rupara, Sambia and Tendoro.

Approximately 315 boreholes are known to exist in the Okavango.

No pipelines are in operation in this area.

The annual water production by the Department of Water Affairs in the Okavango Region is in the order of 3,0 million m³ per year.

3.4 Caprivi

Bulk water supply schemes operated by the Department of Water Affairs, are at Katima Mulilo, Malutwa, Buhalo, Chinchimane and Linyanti.

Supply to smaller settlements are at present the responsibility of local authorities or under control of the local residents themselves.

Approximately 300 boreholes are known to exist in the Eastern Caprivi with the following approximate characteristics:

- Depth = 42m
- Rest water level = 16,6m
- Yield = 4,9m³/h

The capacities of the existing bulk water schemes are as follows:

- Katima Mulilo = 8 2-10 m³/day
- Malutwa = 135 m³/day
- Chinchimane = 240 m³/day
- Linyanti = 300 m³/day
- Buhalo = 260 m³/day

A pipeline was constructed along the Katima Mulilo-Kongola road to supply water for construction purposes. On completion of the tar road in 1980, the pipe was taken out of commission, but was recommissioned in 1987 as a drought relief measure.

Water in the pipeline is pumped from Katima Mulilo (utilising water from the Zambezi river) as well as from Kongola (utilising water from the Kwando river). The water is untreated and cannot be regarded as suitable for human consumption.

An investigation is currently being undertaken to investigate possibilities of supplying water to settlements along the Katima Mulilo-Kongola Road.

3.5 Okakarara District

Three bulk water schemes are operated by the Department of Water Affairs in the Okakarara District.

Borehole schemes consists of three diesel driven borehole pumps and two wind pumps which supply water to the settlement at Okakarara.

A pipeline system feeds water from a reservoir at Berg Aukas to Elandspan via Otjiuonka. The size of the main pipeline is 150 cm and the scheme has a capacity of approximately 30,000 m³/day.

The Okakarara-Central reservoir scheme draws water from the East National Water Carrier Canal Component, which originates at the town of Komat, to the town of Okakarara where it is purified by means of a pressure filter and chlorination system. Water is pumped via a 150 pipeline to the Central Reservoir located at Elandspan. This scheme has a capacity of approximately 30,000 m³/day.

4. POST AND TELECOMMUNICATION SERVICES

4.1 Introduction

Prior to 1990 telecommunication services in Namibia were almost exclusively run by the state. However after independence a decision was made to privatise all post and telecommunication services. Telecom Namibia is now responsible for the operation and maintenance of telecommunication services. They operate a national telephone network consisting of primary, secondary, tertiary, minor and end exchanges closely linked via either optical fibre cables or telephone lines.

4.2 Telecommunication Services in Ovamboland

There is one tertiary exchange in Oshakati which is linked via a telephone line to a secondary exchange in Tsumeb which in turn is connected to a primary exchange in Windhoek, capital of Namibia. The Oshakati exchange has a capacity of 1728 of which 1376 are utilised. There
are 27 pay phones in the Oshakati area. A number of manual exchanges are located at the following centres in Ovamboland:

- Ruacana with a capacity of 100 of which 35 are utilised.
- Ombalantu - capacity 30 of which 12 are utilised.
- Uukwauudui - capacity 30 of which 6 are utilised.
- Ongandjera - capacity 30 of which 16 are utilised.
- Oshikango - capacity 30 of which 7 are utilised.

Two minor exchanges are located at Ondangwa and Oshibelo with capacities of 808 and 20 respectively.

Telecom Namibia is currently planning to extend services to include the following centres:

- Anamulenge
- Elim
- Nakayale
- Ogongo
- Okahau
- Okalongo
- Okakalongo
- Onesi
- Oshikukua
- Tsandi

Introduction of these exchanges will start in December 1993.

4.3 Telecommunications Services in Okavango

There is one manual exchange in Rundu with a capacity of 500 of which 685 are utilised. This exchange is linked to a tertiary exchange in Grootfontein. Minor exchanges are located at the following small centres:

- Nkurenkuru
- Rupara
- Mashare
- Nyangana

They are linked to the Rundu main exchange via ring down circuits.

4.4 Telecommunications Services in Caprivi

There is a manual exchange in Katima Mulilo with an installed capacity of 800 of which 559 are utilised. Communication from centres outside Katima Mulilo such as Bukalo and Mapaupa, are only possible via radio telephones.

4.5 Telecommunications Services in Okakarara District

There is one post office in Okakarara. Okakarara is the only centre currently linked to the national telephone network. There is a manual exchange in Okakarara with an installed capacity of 200 of which 171 are utilised. Communication from Okondjato is only possible via radio telephones.

5. INPUT AND MARKETING FACILITIES

5.1 Crops

Input supplies of seeds, fertilizers, chemicals and other farmer requirements are handled almost entirely by the informal sector and through local businesses. Some of the wealthier farmers go to Tsumeb and Grootfontein to the south of the Northern Region where they obtain supplies from AGRA and other suppliers. They would also make purchases for their neighbours whilst they are there. As mentioned in Chapter 3 the A & RDCs that will be funded by other pipeline projects are planning to store and supply some of these inputs.

Similarly, the marketing of produce is largely an informal activity where small quantities are sold in the urban markets of the Northern Regions. Surpluses are not generally achieved and therefore there is little need for marketing of crops.

5.2 Livestock

Inputs for livestock are not considerable in the Northern Regions. In some instances veterinary drugs are supplied either by the AHUs and the AAHUs where the State Veterinarian orders in bulk, distributes to his officers and supplies the community at subsidised costs, or by the pharmacies which are established in the bigger towns. Some vet supplies, such as burndizzos, are hard to obtain partly because there are few shops that deal in hardware and partly because they are expensive.

Feed supplies and supplements are normally obtained from Tsumeb and Grootfontein. In general not much is used. AGRA has opened a shop and distribution point in Okakarara town (in Okakarara District) where they supply and sell a wide range of licks and supplements but not as yet in very great quantities. They do not yet operate in the other Northern Regions.

Breeding stock can be supplied by commercial farmers but also a breeding farm on the edge of the Waterberg mountain, owned by MAWRD, breeds bulls specially for communal farmers. Many of the Okakarara District farmers buy from this farm's annual fair.
The informal or bush markets are extensive. The infrastructure is minimal except for market stalls hired out by NDC in Oshakati. A detailed description of the formal livestock marketing can be found in the report commissioned by the EC.

In the Northern Regions there are two main abattoirs: Oshakati and Katima Mulilo. There is a smaller one at Rundu. Holding grounds and quarantine stations are established, but not all are functioning, at Omarando Mawe and Oshiwemo in Ovamboland, in the Mangezi farms area and Mile 46 of Okavango, and as yet there are none in Caprivi. There is only one auction yard at Ilindi near Ondangwa. The only marketing facilities in Okakarara District are five sets of auction pens: Okakarara, Ongongoro, Okamatapati, Ojituu and Okarjatu.

Aside from these one of the major marketing benefits is the extensive and excellent road system.

---

1. KPMG Pest Marweck Namibia Consulting Team, June 1993. "Livestock and meat marketing in the Northern Communal Areas of Namibia", Commissioned by the Commission of the European Communities.
CHAPTER I. INTRODUCTION

1. OBJECTIVES

The objectives of part II of the report are to elucidate some of the major constraints to development and highlight those development options which are considered to justify GRN/ADB's support under the proposed Northern Regions Development Programme (NRDP).

The following subjects have been examined in sufficient detail to allow identification of development priorities which will be addressed under Phase III of this study for financing and implementation under NRDP:

- Other Major Projects for the Northern Regions presently under consideration by GRN
- Alternative Land Use Options: Covering farming systems - crops, livestock and moisture conservation, agro forestry
- Support Services including Adaptive Research, Extension and Training
- Small scale irrigation
- Agro Industries
- Land Tenure Policy Options
- Manpower and Training Needs
- Database needs for Planning
- Role of Parastatals, Boards & NGOs with respect to finance, credit and marketing, input distribution, technology transfer and training

2. METHODOLOGY

The multi-disciplinary consulting team has interviewed farmers, organisations and institutions throughout the project area, and has initiated Rapid Rural Appraisal Surveys of one village in each region. These surveys will be based on specially contracted vertical aerial photography. The surveys will be completed in September and are intended to serve as models of the recommended approach to be adopted by Extension Staff when they commence the process of community mobilisation under NRDP.

Where community mobilisation has already commenced it can be enhanced through the use of aerial photography to assist with development planning. Aerial photography can also be used to monitor the progress of project interventions over the seven year project life.

The team has drawn on its varied experience of subsistence farming in many African countries to identify a limited number of practical interventions which should be successful in the Northern Region. There is a grave risk of making the scope of a project such as NRDP too broad and we shall take considerable trouble to avoid this pitfall in Phase III of the study.

CHAPTER L. REVIEW OF MAJOR ONGOING AGRICULTURAL DEVELOPMENT PROJECTS AND PROJECTS UNDER CONSIDERATION BY MAWRD

1. ONGOING PROJECTS

According to the NPC estimates of expenditure on Development Projects for 1993-94, MAWRD has 34 ongoing projects.

Budgetary provision for major project categories for 1993/94 and estimates for the following two years total R85m. Provision for the current financial year amounts to R38m which is targeted mainly on the Northern Regions and covers the following major project categories:

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>IMPLEMENTATION PERIOD YEARS</th>
<th>TOTAL ESTIMATED COST Rm</th>
<th>3 YR BUDGET Rm 1993-94 &amp; 95</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture Staff Housing</td>
<td>4</td>
<td>13.7</td>
<td>9.4</td>
</tr>
<tr>
<td>Research</td>
<td>5</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>ADCs &amp; Offices</td>
<td>5</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Development Programme</td>
<td>4</td>
<td>17.7</td>
<td>11.8</td>
</tr>
<tr>
<td>Drinking water, sanitation, stock water</td>
<td>4</td>
<td>33.7</td>
<td>19</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>4</td>
<td>21.6</td>
<td>4.1</td>
</tr>
<tr>
<td>Agriculture Colleges</td>
<td>4</td>
<td>12.4</td>
<td>13.4</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>103.1</td>
<td>54.2</td>
</tr>
</tbody>
</table>

Source: NPC Development Project Estimates 1993-94

From the above it can be seen that most investment is currently planned for infrastructural development from which it should be feasible to launch production oriented projects in future.

The only questionable project listed above is the Ovamboland irrigation project which is designed as a highly technical solid-set sprinkler scheme of 159 ha catering for the settlement of 50 farmers on 3 ha units. It is most unlikely that the scheme will be economic at a development cost of R118,000/ha or R34,000/farmer.

So far, foreign contributions are limited to only 4 of the 34 projects listed by NPC, but it is probable that many others are also receiving foreign aid. Foreign assistance is utilised chiefly on Capital Development Projects but can also support recurrent expenditure.

Evidently the Ministry of Finance proposes to clearly identify foreign contributions to Capital and Recurrent expenditure from April 1994.
CHAPTER M: ALTERNATIVE LAND USE OPTIONS; NORTHERN REGIONS

1. HUSBANDRY SYSTEMS - CROPS

1.1 Introduction

This section applies a farming systems perspective to identify some of the main opportunities for intensifying existing crop husbandry systems on the assumption that food security is the overriding concern of the majority of households.

A systems bias is justified on the following grounds:

* It challenges researchers and extension specialists to take account of farmers' priorities, objectives and circumstances within the socio-economic context described in Part I Chapter F
* It identifies farming constraints posed by traditional practises, the environment and existing institutional arrangements
* It exposes gaps in research to be addressed and helps researchers to both prioritise investigations and identify areas where collaboration between disciplines is required to solve inter-related farming problems
* It contributes towards the definition of extension management systems that will best address farmers needs and highlights those areas where collaboration between discrete rural development services will be required
* It obliges extension specialists and researchers to heed the interrelationship between crop and livestock husbandry
* It complies with a key recommendation of the MAWRD/ISNAR 'Joint Review of National Agricultural Research' that investigations into communal farming should be multi-disciplinary (systems-based)

1.2 Traditional Strategies

As described in Part I Chapter F, traditional farming systems in the Northern Regions are extensive; many farmers view bringing additional land under cultivation as the most appropriate option to increase production and thereby satisfy household security. Because farmers link production and food security to the total area cultivated, they do not see intensification as a realistic alternative. In addition, for many farmers, the resources needed to intensify are unaffordable or unavailable under present circumstances. The availability of draught power and labour at critical periods in the farming calendar also shape traditional farming strategies, including the ability to increase production.

The general decline in the availability of farm labour, (see Part I Chapter F), and the widespread shortage of animal and mechanical draught power at the onset of the rains also inhibit production further as farmers planting pearl millet often forego essential practises, such as timely weeding and the application of kraal manure.
In Owambo, farmers recognise the benefit of kraal manure as a soil treatment, with a recent study showing that 50% of farmers spread kraal manure sometimes. However, its application is haphazard and limited to the areas closest to the homestead. Moreover, farmers do not undertake measures to preserve manure against deterioration. In Okavango, few farmers apply FYM, citing haulage and weed infestations as insurmountable problems, and in Caprivi it is never used.

The shortage of draught power and labour were key factors in the rapid uptake of Okashana 1. In fact, the variety has only a slight yield advantage over local-varieties, according to on-farm trials conducted by MAWRD/ICRISAT in the 1992/3 season. Furthermore, it does not store as well as many local selections. Nevertheless, because it has a shorter growing season, Okashana 1 permits later land preparation and planting without increasing the risk of crop failure.

However, intensification might also enhance food security. As ICRISAT studies show, the application of 20 units of phosphate and 6/tonnes/ha of FYM can raise yields of pearl millet from present levels of 300 kg/ha to more than 1000 kg/ha. This is of particular relevance for Owambo, where only 28% of households produce sufficient pearl millet for their subsistence requirements (Bembridge 1992).

Populations of traditionally planted pearl millet vary between 8000-50000 hills/ha with 3-5 plants/hill. This density appears to be relatively constant across the Northern Regions, as it seems to provide a 'trade off' between head size and head weight under the prevailing environmental conditions. However, sowing is haphazard. In general, farmers appear to be unaware of the potential advantages of planting in rows. Indeed, other than the mouldboard plough, ox-drawn tillage equipment is unavailable in the communal areas. Thus, farmers have not been exposed to the benefits of configurations that enable inter-row cultivation. It is remarkable that within this predominantly 'cattle culture', draught animals are not harnessed for secondary tillage, even though farmers cite weed control as the most significant constraint in the farming calendar. The failure to adopt this practice is due, in part, to the dichotomy of tasks between men and women (land preparation being done by men while women do the other tasks and practises), absenteeism of male members from the household, and the pre-eminence of stock over crop husbandry.

1.3 Opportunities for Intensification and Diversification

The opportunities for increasing production in the Northern Communal Lands are severely limited by environmental, social and resource constraints. Nevertheless, beyond the immediate goal of food security some scope does exist for crop diversification and the production of modest surpluses in clement years.

1.3.1 Farm-yard Manure (FYM)

It is estimated that one livestock unit (LSU), kraaled at night, will produce 2 tonnes of FYM/yr. If the animal also receives fodder at night, the figure rises to over 3 tonnes. In Okavango and Caprivi most animals are kraaled at night throughout the year, but very little of the accumulated FYM is used. It is probable that sufficient FYM is produced to permit applications of 6 tonne/ha to half the cultivated land each year in both Okavango and Caprivi. In Owambo the situation is different in that many cattle spend a large part of the year away
**Recommendations**

Efforts must seek to increase the availability of animal and mechanical draught power over time and to sustain the condition of draught oxen during the latter part of the dry season. Interventions must therefore include credit for purchase of oxen, privatisation of tractor services, introduction of legume and sorghum varieties with high fodder values, and supplementary feeding of oxen with urea to improve use of low quality roughage such as cereal stover. In addition, farmers must re-examine the tradition of ploughing immediately after the onset of rain, as it imposes demands on labour and draught power that cannot be satisfied in the time available. Instead, the extension services should promote autumn ploughing.

### 1.3.3 Planting Configurations

Row planting of cereals to enable inter-row cultivation as opposed to haphazard sowing should be an integral part of farm demonstrations. Spatial arrangements that enable farmers to inter-crop legumes and cereals in organised and complementary configurations also require investigation and demonstration.

### 1.3.4 Draught Equipment

The range and types of tractor and ox-drawn equipment presently available to communal farmers is not adequate and should be expanded. The objective of primary tillage may not match the prevailing soil and climatic conditions. If the goal is to prepare a seedbed and ensure the infiltration and conservation of moisture, mouldboard ploughs, disc ploughs, and disc harrows are probably inappropriate.

Mouldboard ploughing accelerates the loss of accumulated moisture, and demands excessive power and time to accomplish. The inversion of 1 hectare of soil, for example, requires a pair of oxen to tow a plough for 25 kilometres. Therefore, agricultural services should demonstrate and introduce alternative soil management techniques and equipment successfully adopted by traditional farmers cultivating light soils in similar climatic conditions. The fundamental objective of this effort must be to:

- conserve moisture
- minimise draught energy requirements
- maximise the period available for tillage
- harness draught power for weeding and the cartage of FYM

**Recommendations**

MAWRD should conduct practical field based research on tillage systems and equipment in collaboration with research in Zimbabwe and Botswana. Agencies should be appointed to import equipment and provide a back up service. A rural credit service must be established.

### 1.3.5 Seed Security

Analysis of the climatological data presented in Chapters C, D and E emphasises the importance of 'seed security'. Localised and regional drought incidents, the general decline in rainfall and the inability of farmers to guarantee timely planting (as discussed in Sections b and
d above), all point to the need for a comprehensive seed service covering production, collection, processing, storage and distribution.

**Recommendations**
The seed security question should be addressed as an integral component of grain security stratagems.

### 1.3.6 Inter-cropping

Communal farmers do not fully exploit the additive effects of inter-cropping. Yet, it is well-known that the system is superior to mono-cropping in terms of biomass (grain and fodder output), labour utilisation, and food security. Equally important is the reality that rainfed agriculture in the Northern Regions cannot, within the constraints prescribed by soil and climate, support high inputs of inorganic fertilisers and pesticides. Alternatively, inter-cropping legumes and cereals enables 'in-situ' rotation, improves soil fertility and reduces the incidence of pests.

**Recommendations**
Improved varieties of millet, sorghum and cowpeas should be demonstrated and tested on farmers fields in inter-crop configurations with dressings of FYM and modest applications of inorganic fertiliser (15-20 units of N & P/ha). The nitrogen fixing capacity of cowpeas should be established in relation to soil rhizobium, and the need for inoculum.

### 1.3.7 Cowpeas

In Ovamboland, Okavango and Caprivi cowpeas are occasionally inter-cropped with pearl millet. Field visits confirm that, despite their popularity, these legumes are grown on a very small scale, seldom covering more than 5 -10% of the gross cropped area. The explanation for this may relate to fact that, because they are susceptible to insect damage in field and store, cowpeas are exploited primarily as a vegetable supplement rather than as a field crop.

However, cowpeas have been the focus of a 10 year international research effort. The screening of pest resistant grain and fodder cultivars adapted to the local environment should be intensified. Highly effective (benign) insecticides for the control of store pests are available and should be introduced.

**Recommendations**
Fodder and dual purpose cowpea varieties should be introduced by carrying out field demonstrations at an early stage in the research process. The aim should be to raise cowpea production to 500 kg per household for 30,000 households and to significantly increase the availability of haulms for feeding to draught animals.

### 1.3.8 Sorghum

In the ecologically similar regions of the Sahel, white grained 'dune' sorghums share an equal status in the farming system with pearl millet. The merits of dune sorghums include more vigorous germination, a better ability to withstand dry periods, and a growth habit that enables them to be inter-cropped with additive results.
Recommendations
Local white grained sorghums produced and utilised for consumption on a very minor scale provide a precedent for the testing and introduction of superior grain and fodder varieties. The testing should aim to increase inter-cropped sorghums from the present level of less than 10% to at least 25%.

1.3.9 Rice

Namibia imports 8-10,000 tons of rice per annum, South Africa over 200,000 tons. All countries in the SADC region, Malawi excepted, import rice. In Namibia, the only area with suitable agro-ecological and topographical conditions for rice-growing on a significant scale is the Zambezi-Chobe flood plain in Eastern Caprivi.

This flood-plain features annually recharged shallow aquifers at depths of 4-6 metres and impermeable clay cells underlying the sandy soils. These features suggest that relatively cheap 'in situ' abstraction for irrigation purposes is possible.

From 1984-1991, FNDC carried out a pilot rice development programme centred at Isize 30 km east of Katima Mulilo. The programme evaluated rice cultivars, agronomic techniques and processing methods, under a smallholder (1 ha) paddy irrigation regime. The development farm included 36 hectares of surface irrigated land fed by water pumped from the Zambezi river into a lined canal. Several 90 day cultivars yielded over 10 tonnes/ha in experimental conditions. However, difficulties with weed control and quelea birds, and a lack of technical experience prevented this level of yield from being repeated on a field scale. The inexperience of local people with irrigation also inhibited development. The development farm is currently leased to LONRHO, which is evaluating the area's potential for large-scale sugar production.

Namibia's projected population growth, coupled with a low overall potential for food production, point to the advisability of promoting the cultivation of irrigated rice in the Zambezi-Chobe flood plain. FNDC has already surveyed a 10,000 ha block of land and found that 40% (4,000 ha) of the soils were suitable for surface irrigation. This result suggests that the potential in the remainder of the flood plain may be considerable and that a rice development programme would be justified.

The components of such a programme should include:

* assessment of shallow aquifer potential in terms of magnitude and areas of salinity
* Introduction and development of tube well technology for the abstraction of shallow ground water for the irrigation of smallholder rice farms of 1-4 hectares
* On-site adaptive research covering all aspects of rice culture under the above regime

Recommendations
GRN should approach traditional rice growing countries with existing Development Cooperation Agreements and encourage joint ventures with private companies to develop medium scale nucleus production and processing units of 100-200 ha, around which small-scale production can be gradually developed.
1.3.10 Groundnuts

The potential for increasing Groundnut production within traditional systems is modest. Groundnuts' insignificant status as a secondary crop is due to the likelihood of crop failure in poor years. A further constraint is the high seed demand of 50-80 kg/ha and a low multiplication ratio. Moreover, households that run out of food cereals well before the next harvest are unlikely to store large quantities of groundnut seed for sowing, when they could eat it.

Recommendations
The research service should continue to screen promising short season groundnut cultivars which would have a limited uptake.

1.3.11 Sugar Cane

Sugar cane grown for chewing sticks can be a highly profitable crop for small scale irrigators. The advantages of chewing cane are as follows:

- It is easy to grow, and will tolerate some water stress, if irrigation is neglected
- Cut chewing sticks have a life of two weeks and can therefore stand considerable delay in transport to market
- It can be inter-cropped with vegetables for 2-3 months while it regrows after cutting
- Replanting is only required every 4-5 years
- Gross income of R8-12000 per hectare can be achieved. (LONRHO Isize).

This implies that smallholder irrigation using centrifugal pumps would be viable

Recommendation
Easy-peeler varieties should be introduced for distribution amongst interested irrigation farmers particularly along the Okavango river and in the Chobe-Zambezi confluence.

1.3.12 Mango

Mango grows well throughout the Northern Regions, and there is ample opportunity to promote mangoes along the entire length of the Okavango river bank. Use of the fruit for home consumption would be the initial aim, but there also exists a large and unsatisfied market for pickled mango or 'achar' in South Africa. A private enterprise is investigating the feasibility of mango achar production east of Rundu. The enterprise would consist of a nucleus orchard and a processing unit. Support to out-growers would include the supply of grafted trees, training in husbandry, and subsequent collection of produce at the farm gate.

Recommendation
GRN should support this project with land, materials and even finance.
1.3.13 New Cash Crops

*Amaranthus spp.*
World-wide there are more than 60 Amaranth species, of which about eight occur in Namibia. *Amaranthus hybridus* is widely distributed in the Northern Regions as a weed which is found in arable land and around cattle kraals. Twelve species including improved strains of *A. hybridus* are used as cash crops for grain, vegetables for humans and forage for livestock. An important crop of the Aztec civilisation in Mexico, Amaranth was virtually wiped out by the European invasion. Recently the US-based Rodale Institute has researched Amaranth and developed several high-yielding grain types suited to commercial production. Rodale has also stimulated a breeding programme in China and Peru where thousands of hectares are now grown. The main characteristics of Amaranth include:

* a vigorous and efficient root system capable of loosening compacted soil
* Moisture requirements are 60% below those of maize
* Grain yields range from 1-4 tonnes/ha
* Forage yields 4-40 tonnes/ha of material which is equivalent to lucerne in quality
* The grain has a 16% protein content and a nutrient value superior to all other cereals and pulses
* The seed rate is approximately 1 kg/ha. This is an important feature for semi-arid regions where re-seeding is often required to re-establish a crop after post-sowing drought

World-wide, the development momentum for Amaranth is growing. Amaranth is one of the most important crops under investigation for widespread use in the semi-arid tropics. The grain is used in a 4:1 ratio with wheat to make bread with a superior shelf life. It can also be fed to pigs and poultry. In addition, forage types provide high quality fodder suited to intensive feeding of lactating animals and young stock. Namibia should participate in cooperative research work, in order to select grain and fodder strains suited to local conditions.

*Sesame (Sesamum indicum)*
One of the most common weeds of disturbed soils in the Northern Regions is *Sesamum alatum*, a close relative of *Sesamum indicum*. Sesame is an annual crop growing from 70-120 cm tall. Self fertilisation is normal. It is one of the most important oil crops of traditional agriculture in dry climates. Indeed, the introduction and promotion of Sesame as an oil seed crop generally offers better prospects than do either groundnuts or sunflowers. The main characteristics include:

* It grows best on light soils in rainfall of 400-600 mm and takes 90 days to mature
* Favoured temperatures are 27-30°C, and response to fertiliser is limited
* It is 'compensatory', and population ranges of 25000-500000 give similar results
* Thousand seed weight is 4-5 grams and seeding rates are therefore low (0.5 kg/ha)
* It has a vigorous tap root that improves soil drainage and aeration
The seed contains 55% highly stable edible oil which can be extracted by simple mechanical presses.

- Weeds can be a problem during initial growth so the crop should be grown in rows.
- The oil is low in polyunsaturates and is a highly valued commodity internationally.
- Sesame cake is a nutritious human and animal feed.

As there are thousands of strains of sesame, research must initially concentrate on the introduction and screening of cultivars suited to the local environment. The self-pollinating characteristics and small seed size of sesame would greatly facilitate subsequent dissemination. The crop is suited to village based processing for edible oil production, and funds under the Japan/Namibia Development Cooperation Agreement could be used to purchase appropriate equipment.

**Oriental (Turkish) Tobacco**

*Introduction*

Oriental or Turkish tobacco is an important blending constituent of 'American style' toasted cigarettes. It is grown mainly in the Mediterranean region but is also found in Zimbabwe, Malawi and South Africa.

*Main Characteristics*

Oriental tobacco has several important features:

- It is highly drought-tolerant and flourishes on poor sandy soils in a 250–400 mm rainfall regime.
- Production is labour-intensive, but not capital-intensive. Therefore, production remains the preserve of small family farms.
- The leaf has a high value-to-weight ratio.
- Oriental tobacco has no negative impact on the environment. The leaf would be intended for export, rather than for internal consumption.

*Agronomic Trials*

In 1991/92, MAWRD helped to carry out comprehensive 'oriental' trials. Results were positive in terms of yield and quantity.

*Markets*

World tobacco consumption is still increasing. Tobacco is one of the most profitable crops grown by small farmers. Bumper crops in the major producing countries of Brazil, Malawi and Zimbabwe have depressed world prices, but prices are expected to return to normal levels within three years. However, good quality oriental will always find a market. Scope exists for adding value to the tobacco by further processing in Namibia.

*Recommendations*

GRN should invite a multi-national tobacco company to invest in a pilot production project involving small farmers in the Northern Regions. GRN should offer an existing farm as its contribution to a joint venture.
2. LIVESTOCK

2.1 Constraints

2.1.1 Population

The burgeoning human population presents the greatest threat to the development of livestock within the Omwando Region and Okakarara District. In Omwando the effects of the drought may be masking the cattle population trends. A regression on graphical data suggests that there has been an overall reduction of 0.5% per annum over the last 30 years. This is bound to accelerate because of the ever increasing demands for land from new farmers. These farmers leap from the oshana areas to open up crop farms within communal grazing-lands, thus further reducing the range available for cattle.

On the other hand Caprivi and Okavango are not yet subject to these population pressures. However, unless plans are drawn up and put into effect now, these regions will face a similar situation as in Omwando.

2.1.2 Water

Low rainfall and water shortage are generally regarded as the major constraints to livestock production in Namibia. Additional water pipelines are being laid in Omwando, and Okavango and Caprivi have considerable potential for borehole development. Water development seemingly has reached its limits within Okakarara District; the pipeline cannot be extended because the Eastern National Water Carrier has reached its maximum output from its sources near Grootfontein. Borehole water on the eastern side of the District is too deep, uneconomic and sometimes saline. Only a water link from the Okavango River can alleviate this problem.

2.1.3 Rangeland

The quick installation of water in poorly planned drought relief programmes is a primary constraint to rangeland improvement. In addition, continuous loss of range to cropping, to illegal enclosures, or through overstocking and degradation will continue unless management improves. Water management and range management go hand in hand. Lack of water gives rise to under-utilised grazing; too much water gives rise to overgrazing and degradation.

Traditional communal grazing management and husbandry systems have to adjust to increasing human population and sedentarisation - when the land gets congested, then individuals move to a new area. Such a strategy is no longer an option in the Northern Regions. Now, the decrease of available range calls for the intensification of management and the use of modern techniques.

Large Cattle Herd Owners
The owners of large cattle herds are also a major constraint to the development of communal management systems. Their large herds squeeze out those of the smaller farmers. The effort to move them to farms in the commercial areas has been inhibited by inappropriate rules, (see under The Law below), which act as disincentives to relocate. Because water and veterinary services are free in the communal areas and taxes are minimal, there is no financial incentive
appropriate). Excellent grass stands were seen within enclosures that farmers had developed on communal lands.

**Trees**

Trees have been cut down for fencing and firewood. Solid log fencing and open cooking fires are extremely wasteful of this resource and worsen the degradation of the farming areas into the rangelands.

**Cattle Breeds**

Choice of breed is often an emotive issue, but it is also a matter of sustainability under difficult production conditions. The larger breeds that are being encouraged by the grading system may not be the best breeds to farm under communal management systems in harsh, low rainfall areas. Farmers would do better to use pure Sanga as breeding stock, providing cross breeds for fattening.

### 2.1.6 Finance and Credit

The lack of sufficient cash in the communal area economy is a serious constraint to the improvement of management systems. In the past, farmers in the commercial areas were given subsidised assistance to develop their farms. Assistance should now be extended to communal farmers in the form of soft credit and subsidised inputs, but only under supportive economic and legal conditions as incentives for improvement.

No organisation presently has the capacity to provide umbrella administration and control for communal area credit systems. GRN is planning to establish a new institution specifically for smallholder credit.

### 2.1.7 Marketing

Marketing is reasonably well developed. However, farmers lack access to the up-to-date market information needed to compare local prices with those of alternative auction yards, national and international markets. Auction infrastructure needs to be reviewed. Holding ground facilities would be beneficial but not essential.
2.1.8 Adaptive Research and Demonstrations

Demonstration is one of the best ways to introduce innovation. At present few demonstration schemes exist in most of the Northern Region.

2.1.9 Crop Production

While there is little scope for annual crop production in Okakarara, vegetable production in kitchen gardens would improve HH nutrition.

2.1.10 The Law

Under customary law, a Chief/Headman can allocate land to an individual for enclosure. Many wealthier farmers have been allotted big areas on this basis. However, the GTZ-supported SARDEP was not permitted to provide wire for a village enclosure scheme, despite a detailed consultation and agreement process. Statuary law forbids enclosure of communal grazing land. The villagers including the Headman are very angry, and GRN is caught on the horns of a dilemma.

In addition, the rules currently imposed on the subsidised purchase of land in commercial areas are impossible to follow or enforce. Farmers must move all of their cattle out of the communal area upon purchasing a farm; however, identifying who owns cattle is complicated by the extended family ownership system. Furthermore, a purchaser from the communal lands cannot buy more than one farm. This prevents prospective purchasers from moving their whole herd out because the farm is too small.

2.2 Issues

The government has to develop policy and policy guidelines so that long term plans can be laid. Without a long-term view, with decisions guided by political expediency and crisis management (e.g. drought relief), and without coherent regional and national development plans, management of the environment becomes almost impossible. The types of national issues that need to be addressed are:

a. Legislation to regulate the enclosure of communal lands;

b. Policies must take account of human population increase. Although Namibia is blessed with a large land surface, the human and livestock carrying capacity is very low. GRN must adopt a consistent policy and implement a long term plan to reduce population increase.

c. The population in communal areas must eventually pay for services (electricity, water, etc.) on an equal footing to all other citizens. Non-payment is contributing to land degradation and population increases.

d. As part of national planning, strict coordination of projects (international and NGOs) must be undertaken. Government should compel all loan and donor agencies to adhere to this coordination.
e. Subsidised credit should be made available immediately. Commercial rates of interest can be imposed later.

f. The rules for subsidising the movement of bigger, wealthier farmers to farms in the commercial areas need to be changed to encourage movement not to discourage it. The options are:

- Limit purchases to one farm but allow some cattle to remain in the communal area, or
- Allow purchase of more than one farm, which would require substantial funds to be spent on policing the system.

g. Incentives and/or sanctions must be used to enforce community agreements for improved management systems, otherwise rangeland degradation will continue to take place even within enclosures.

h. Enclosure will make it possible to regularise brand numbers on a farm basis, which will permit easier control of livestock numbers and the environment.

2.3 Opportunities

2.3.1 General

Interventions in livestock husbandry must aim to address the constraints in a systematic and sustainable fashion, through both a long term and committed consultation process and practical training in management and range improvement. This approach could substantially reduce livestock losses, which, in turn, would improve the availability of oxen. This approach would also benefit crop production, HH nutrition, health etc., thereby reducing dependency on GRN support systems.

Ad hoc provision of water is sure to meet short term needs for drought relief or political expediency, but it must fit into longer term plans designed to improve and sustain production practices. Such planning must rely on Training and Extension to lay the foundations for improvement among the farming community.

2.3.2 Extension and Training

Extension and training must first aim to institute a village level consultation process. The objective of this long-term process would be to set up Village Extension Groups (VEG) to steer the village and management decisions emanating from the village.

Recruiting
Private companies would be invited to tender for contracts to build a Training Extension Group (TEG) and to co-ordinate extension activities. The TEG would:

i. Take on the supervision of MAWRD Extension staff (and recruit and train them if required);
Recruit NGOs where feasible to start the village consultation process and to help in the training of the newly recruited Extension Offices;

Recruit experienced and respected private farmers or farming-oriented professionals from the commercial areas. These professionals would undertake village or on-farm training of local farmers and Extension Officers and carry out supervision. In the beginning, numbers would be small, but there would be incremental growth and dissemination of techniques beyond the immediate trainees.

Consultation/Training in Village Communities

The above groups would undertake a form of in-service training in the villages and on the farms. Farmers' Associations (FA) would be encouraged, and they would start the decision process in the villages. FA would also help to create VEGs and promote effective community agricultural and livestock management. Conditional credit would be available on easy terms to motivate the associations to cooperate (see Credit below).

Enclosure of some of the communal areas would be an option. The rules would be agreed between the VEG or farmer (see below) and the Extension group at the start. Reasonable stocking rates, good management and strict rotational grazing practices would be prerequisites. The agreement would make farms eligible for credit to accomplish enclosure, farm and management improvements. These loans would be progressive: subsequent loans would be subject to proof of improved farm/environmental management.

Ox Paddocks

Villages would establish paddocks exclusively for oxen. A grazing fee per head paid to the VEG would finance the paddocks. The paddock would be comparatively small. sufficient for three months grazing for the village oxen. It would remain shut for nine months of the year in order to preserve feed for the oxen. The ploughing oxen would be put into the paddock in about October, and they would be given urea/mineral/energy supplements to ensure that they are sturdy and strong at the beginning of the ploughing season. These paddocks would be established in the cattle post areas nearest to the villages.

Farmer Training

The Extension Group would also interview and select farmers who have already enclosed farms for the extension/management operations. New farmers would be matched with commercial farmers and Extension Officers. Regular joint visits (on a weekly or monthly basis as necessary) and discussions would be undertaken on the farms. Farmers who show willingness to follow the strict management would become eligible under the credit scheme (see below) for loans to improve farms, water systems or livestock.

Potential Commercial Area Farmers

The Extension Group would identify larger farmers eligible for credit to purchase farms in the commercial farming areas. The loans would be subsidised, but subject to strict rules. These rules would be based on good management, strict rotational grazing practices and regular supervision by the Extension Services and by neighbouring commercial farmers, such as the farmers involved in the TEG. Farmers who have already moved to the commercial areas prior to the scheme could also join; such farmers would be subject to the same extension requirements.
In cases where credit is approved, incentives or sanctions would be attached to encourage the farmers to follow good farming guidelines. For example, incentives might enable a small farmer to move to a bigger farm in due course or to gain access to additional credit lines at subsidised rates for further improvements. On the other hand, farmers who do not comply would face sanctions, including no authorisation of additional credit lines, removal of the subsidy from credit repayments, or exclusion from purchase of larger farms. As a last resort, farmers would be removed from the enclosed farms.

**Communications support**
Equipment and finance would be provided where necessary for education, information dissemination and advertising. For example, the provision of equipment such as mobile TV units would bolster agricultural TV shows (they are said to be very good already but the people do not have TVs).

### 2.3.3 Credit

Credit schemes would be handled through a credit organisation approved by MAWRD and If necessary, the project would help to set up credit schemes. Each FA would have a Credit Officer and/or Credit Committee. The VEG, the TEG and the appropriate FA official would have to sponsor all credit applications. The FA would be responsible for supervising the loan as well as for collecting the regular payments. They would receive a percentage of the moneys collected as a fee. Any farmer requiring credit would initiate his application through his VEG and his FA (see above). Several basic types of credit would be available:

**Farmer/Village Credit**

This type of credit would support perimeter fencing, internal fencing, water supplies, water reticulation, bush clearing, feeds/licks, purchase of bulls, etc. No more than one credit line would be awarded at any one time. If a second line is needed, a farmer would have to earn the right to it by proving that his farming methods and his rangeland quality are improving.

**Water**

Credit for the provision of water would be available, but only if planned between the VEG and the TEG within the requirements of good management. Further water development, such as reticulation, would be granted only for farms with proven to have good husbandry systems.

**Commercial Lands Credit**

This type would extend the present credit scheme. Credit at subsidised rates would be provided for large farmers from communal areas to purchase farms in commercial areas. This type of credit would be tied to a strict extension package.

**Association credit**

An FA would be eligible for lines of credit for such items as auction yard renovations, provision of extension, or necessary buildings to benefit the farmers, to enhance marketing, and to support infrastructure needed to acquire the necessary market information.

GRN is currently designing the mechanism for the credit scheme. However, the project would emphasise the delivery of soft loans for small farmer development.
Oxen and Ox Carts
Credit would be available for farmers to purchase oxen and ox carts. Credit would also be provided to an entrepreneur to build ox carts, for example from smashed vehicle chassis, broken axles and wheels.

Breeding Stock
Credit would support the purchase of Sanga cattle as basic breeding stock. Exotic bulls should only be provided for cross-breeding purposes.

2.3.4 Marketing
The FAs or their management committees would be responsible for improved marketing operations. These organisations would appoint a Marketing Officer to undertake the following:

Market information
The Marketing Officer would collect market information in each area - such as meat prices in RSA, meat prices at Namibian abattoirs, latest auction prices around the country - and he for display at the FA's auction yards and in other public venues. Through this system, farmers would be better able to choose in which market they would like to sell. For example, they would be able to judge whether permit sales were giving the best return, or whether one sale yard was better than another.

Market research
This unit would look into markets that are not yet tapped. For instance, although many claim that goat meat does not sell, such markets do exist in other parts of the country. This unit would seek out these markets for the benefit of FAs. Where no markets can be found, they would be created by research and advertising etc.

Holding grounds
The FAs in partnership with farmers would establish small area for holding grounds not more than ten kilometres distance from the auction yards. These would have three functions:

a. They would aggregate cattle ready for slaughter over a short period of time. This will ensure that a full truck load be sent at one time, permitting the most advantageous transport price. A small daily grazing fee would be charged to cover management and running costs;

b. They would take in cattle that have walked a long distance to the auction or are delayed at auction for several days. These cattle would regain some condition, or at least maintain it, before being sold in the auction pens. Again, a small grazing fee would be charged;

c. They would undertake some adaptive demonstrations (see below).
2.3.5 Adaptive Demonstrations

Along with some experimentation, the main purpose of adaptive demonstration would be to search out effective and economic farming techniques to demonstrate to farmers. Some of the areas to be investigated include:

Bush control
Demonstrations would present the use of grazing/browsing methods, chemicals, fire and rotational grazing practices.

Camels
Camels are not presently used, but they may be one way of overcoming many problems. Having fed on twigs and browse, they would be strong and fit at the end of the dry season. One camel could replace two oxen at the plough. They would not require extra water points and would not denude the waterhole areas, nor would they compete with cattle for grazing. Finally, they would provide excellent milk even at the height of the dry season.

Poisonous plant control
Demonstrations would illustrate the use of chemicals and the consideration of any other possible techniques;

Fodder crops
Demonstrations would address the use of water harvesting for fodder crops or simple irrigation techniques to improve the production of crops from vegetable gardens;

Improved nutrition
The use of urea treatment techniques and storage of residues to alleviate feed shortages in drought periods or for improved nutrition would also be demonstrated. This would include the use of licks and supplements.

Re-establishing grass on rangelands
Adaptive demonstrations might also look at the use of cultural methods to encourage grass growth on the compacted soils. Types of grass seed that may be effective in these low rainfall areas, as well as the economics of reseeding under Northern Region conditions, would be studied.

2.3.6 Technical Assistance

Two Technical Assistants would be required:

a. TA, for approximately 3 years, to initiate the village consultation system. Significantly, the TA would serve as a bridge between Government and the private sector extension services.

b. TA (either locally recruited or from overseas) to set up and to help run the marketing aspects of the project. Holding ground sites would be identified near Otjituuo, Okandjatu and Okamatapati.
2.4 Regional Specifics

Owambo
Village development would include:

a. VEG and Farmers' Association development through the consultation process;
b. Ox paddock development;
c. Adaptive demonstrations, including camels, fodder development, forage treatment, etc.;

Okavango and Caprivi
Village development would include the intervention proposed for Owambo In addition:

d. Development of group village settlements along the new road;
e. Mixed-farming development in the hinterland;

Okakarara District
The project would encompass village, farm, commercial farm and holding ground development in the district. All aspects of the project components would be undertaken there.

3. AGROFORESTRY

Traditional systems of agroforestry are well established in the northern communal areas (with the exception of Okakarara district). Wild plant resources are widely used and their value lies in their being well adapted to local conditions and so being able to meet many basic human needs under a range of conditions. They provide low-cost construction materials, food supplements, fuelwood, household utensils and traditional medicines. They also provide a source of income and employment through the use of materials to make carvings, baskets, beer and other products for resale. As such wild plants provide an essential buffer against absolute poverty (Cunningham et al. 1992). Children eat the greatest variety of wild plant foods and these provide important vitamins and nutrients which may be lacking in the staple starch diet of pearl millet.

Even though the extensive use of wild plants is well established, there has been a decline in the acceptance of the use of wild plants as the population becomes urbanised and "western" cultural practices become established. With a change in emphasis from subsistence farming to a cash economies there has been a loss of interest in traditional recipes and foods. These vegetation resources are however extremely important in that they provide a base to the mix of agriculture, crafts and food products which constitute the subsistence economies of the communal areas. They provide an essential element to the drought avoidance strategies of the communal farmers in northern Namibia.

New initiatives in reinforcing the value of traditional agroforestry practices are needed and there is an additional need to promote the utilisation and conservation of wild plant resources
(food, construction materials, financial resources, etc.). Agroforestry interventions would need to focus on:

- **adaptive research** - focused on both indigenous plant species and introduced multipurpose exotics. The process would largely be one of expanding the collection and accession of seed collections of important species and the evaluation and characterisation of plants grown from collected seed (growth rates, crop yields, disease resistance). Once high potential varieties have been identified, seed is passed onto commercial plant breeders. This is a long term process and requires considerable financial and infrastructural inputs. However, there is considerable potential for commercial benefits to be derived from these resources. There is considerable local, regional and international interest in these types of initiatives. The Namibian Plant Genetic Resources Programme is already well established at the Botanical Research Institute (formerly the Herbarium) and is currently supported by the SADCC Regional Gene Bank in Lusaka. Several international organisations would also be able to give some support and training, including, ICRISAT, ICRAF, IBPGR, and other programmes such as the UNEP/WWF/Kew Hidden Harvest and People & Plants projects.

- **village nurseries** - should focus largely on providing local people with important agroforestry trees (e.g. *Ricinodendron raunenii*, *Sclerocarya birrea*, *Berchemia discolor*, *Strychnos spp.*) at low cost. This would necessitate the establishment of a village nursery owned or managed by an individual who would provide extension and training courses to locals. This individual would need to be supported technically and financially by the NCA Project.

- **extension and training programmes** - a series of agroforestry extension and training programmes could be developed within the Project framework. These could include: promotion of indigenous plant resources within rural communities (attempting to reverse the move away from these resources); promotion of soil conservation techniques using agroforestry species; promoting new plant species (e.g. exotic grain amaranths) to supplement the current agricultural crops; promotion of wise use of fire as a management tool; extension programmes on borehole settlement and the implications for agroforestry; promotion of craft skills (basketry, woodworking) so as to minimise wastage; extension programmes promoting the combined use of traditional crops and forest products together with an increased production of commercial crops (the one need not exclude the other). The underlying objective of the extension programmes should be to develop a greater awareness of the environment, particularly the limits on utilisation and the interrelated nature of the processes determining food production in subsistence agriculture.

- **school level interventions** - the Project would play a major role in developing an awareness of agroforestry issues at the school level. Through the promotion and support of young farmers clubs, school nurseries, conservation societies and earth-care clubs. Through these institutions (already operational
in a number of areas), the values of traditional and modern agricultural methods could be advanced. Certain practices such as the nurseries could be used in generating small amounts of cash for school projects.

4. WILDLIFE

The northern communal areas of Caprivi and Okavango offer considerable opportunity for wildlife as an alternative land use option. The proper use of wildlife offers one of the best opportunities for redressing the socio-economic and environmental plight of the drier parts of Africa. This has been well demonstrated in Zimbabwe where there are currently a number of conservation initiatives running or developing at the village and ward level. Communities are able to share in the financial benefits wildlife generates in communal lands and there is considerable support for conservation efforts.

This situation, however, only developed once the state controls on wildlife utilisation were abolished (with the exception of specially protected species) and legislation enacted that gave landholders usage rights. Mechanisms have been provided whereby abuses of these rights and resources can be controlled by the local landholder community (or state where necessary). Participant communities gain benefits from ecotourism, recreational hunting, culling (meat sales and by products), curio sales and increased job opportunities in service industries. The mechanism of entry into such a programme varies considerably as does the disbursement of funds derived from wildlife.

The current situation in Namibia is such that the Nature Conservation Ordinance of 1974 does not allow landholders in communal lands any legal access to wildlife except through special dispensation. The Ministry of Wildlife, Conservation and Tourism is however working towards new legislation and draft policies are currently under review. Initiatives in this direction include: a Draft Policy on Wildlife Management and Utilisation in Communal Areas currently being reviewed by Government; the commissioning of a study at the Legal Assistance Centre on ways in which initiatives regarding communal resource management issues can be furthered without contravening the current legislation (Nature Conservation Ordinance); the review and revision of all environmental legislation in Namibia together with the Attorney-Generals office. A large component of this review will be formulation of new legislation on the rights to resources in communal areas.

The areas around the Mudumu and Mamili National Parks and the eastern flood plain (opposite Chobe) offer the best opportunities for this type of alternative land use in the Caprivi. Initiatives along these lines are already under way in west Caprivi. In the Okavango the large tract of land between the Omuramba Omako and the western boundary of the Kaudom Game Reserve offer considerable wildlife based land use opportunities. Owambo offers fewer opportunities as the population densities are high and wildlife has been decimated in the past. There are, however, opportunities for tourism developments at Lake Oponono, on the southern Ekuma River and in the area surrounding the Olusati dam in the North-west. Interventions should be on a pilot basis in Owambo, where small initiatives can serve an illustrative purpose giving incentives to other potential participatory communities.
5. CONSERVATION MEASURES

5.1 Crop Water Requirements

For high production millet requires 450-500 mm, sorghum 450-650 mm and maize 650-700 mm although crops of grain can be obtained with less rainfall if the distribution is favourable.

Sorghum has the advantage over millet and maize in that it can resume normal growth after a severe drought lasting 14 days. Millet, although requiring less water than sorghum for grain production, needs moisture in the root zone throughout the growing season, otherwise it fails.

The sections on climate reveal that the seasonal rainfall in the Northern Regions is rarely sufficient to meet these crop water requirements. Only a proportion of the rainfall is available to crops.

5.2 Causes of Low Availability of Soil Moisture in the Northern Regions

The low availability of soil moisture in the Northern Regions arises through:

* low and unreliable rainfall;
* high evapotranspiration rates; and
* the physical properties of the soils.

5.2.1 Low and Unreliable Rainfall

Seasonal rainfall graphs in Part I show how the rainfall at a given location can fluctuate widely from year to year. The minimum amount of rainfall needed to ensure some water storage under favourable soil conditions has been estimated as 15-20 mm for a single rainfall.

<table>
<thead>
<tr>
<th>Table 13</th>
<th>Number of storms per storm size and proportion of total precipitation at stations in the four Northern Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>OMBALANTU</td>
</tr>
<tr>
<td>Storm size (mm)</td>
<td>No. (%)</td>
</tr>
<tr>
<td>&lt;15</td>
<td>228 36.5</td>
</tr>
<tr>
<td>15-29.9</td>
<td>41 32.3</td>
</tr>
<tr>
<td>30+</td>
<td>14 31.2</td>
</tr>
<tr>
<td>Average</td>
<td>237.8</td>
</tr>
</tbody>
</table>

184
As Table 13 above indicates, between 24-36% of the rain fell in the 15-29.9 mm range, closely matching the observation that the annual effective rainfall commonly amounts to about one-third of the total rainfall (Bagnold 1954). The rainfall is therefore extremely marginal for crop production.

Rainfalls heavier than 30 mm often result in run-off if the intensity exceeds the intake rate of the soil. Heavy rainstorms of 30 mm or more provided about 30% of the rainfall but these storms only accounted for 4.9%, 4.3%, 7.0% and 6.5% of all the recorded showers in Ombalantu, Rundu, Katima Mulilo and Omatjennyne, respectively.

Long gaps between rain storms during the growing season are frequent occurrences. For example: Ombalantu - 15 or more days; Rundu - 15 to 38 days; Katima Mulilo - 30 or more days; and Omatjennyne - 13 to 23 days. Combined with high evapotranspiration rates of 7-10 mm per day these gaps lead to rapid depletion of stored soil moisture. Even if the crop survives, the induced moisture stress seriously reduces crop yields.

5.2.2 The Physical Properties of the Soils

The large pore size of the aeolian sands results in a rapid distribution of moisture through the profile and low amounts of available water at all depths. The surface horizons dry out very quickly but then act as a mulch, preventing further losses by evaporation. As a result, the soil can be quite moist below 30 cm in the absence of ground cover.

By contrast, the loamy sands have a higher water-holding capacity in the surface horizons, but losses by evaporation can also be higher because moisture moves upwards by capillary action as the surface dries out.

Surface capping of soils can reduce infiltration rates to the extent that run-off can be generated by light rains. Penetration of rainwater deep into the soil profile, in some soils, is prevented by dense B-horizons, which also impede root growth.

The presence of water-filled depressions and pans in the aeolian sand areas shows that significant amounts of run-off occur even on very gently sloping sandy soils (cf. Mali: 40-50% run-off from sand with an average slope of 3%; and 20-30% run-off from a coarser sand with gentler slope (Ridder et al 1982). Burkina Faso: 20-40% run-off from 1% slopes (Roose & Piot 1984)).

5.3 Strategies to Improve Moisture Availability

5.3.1 The Need for Water-conserving Cultivation Techniques

Lack of sufficient moisture in the soil is the major constraint to effective crop production in the Northern Regions. The basic principle of crop management in the Northern Regions must be to balance all factors of crop production with the availability of water.

A number of studies in sub-Saharan Africa (e.g. Tourte 1974, Gibbon et al 1974, Kampen et al 1975) have demonstrated that the drier the area, the more important are the interactions between mechanisation and improved varieties. All stress the necessity of water-conserving
cultivation techniques to achieve an improved soil moisture regime, if the benefits from the interaction between new varieties and fertilisers are to be obtained.

There are two ways to improve the soil moisture situation:

* manage the supply of water to minimise losses through run-off and evaporation
* manage the crops to reduce their demand for moisture

5.3.2 Demand Management

The crop's demand for soil moisture can be reduced by improving the availability of water to the roots and lowering transpiration rates. This can be accomplished by decreasing the crop's demand for water by lowering evapotranspiration rates through strip-cropping and improving soil physical conditions to achieve a better distribution of water in the soil profile, and adopting drought-avoidance strategies (see sections 5.4 and 5.7 below).

5.3.3 Supply Management

The best way to get water into the soil is to concentrate a large volume of water onto a small area. This can be easily achieved by turning the two adverse factors of semi-arid agriculture - heavy intensive rainfall and the capping of soils, both of which generate run-off - to advantage through adopting water-harvesting systems (see section 5.6 below).

5.4 Decreasing the Crop's Demand for Soil Moisture

Reducing transpiration decreases a plant's demand for water. As only 1% of water absorbed by a plant is incorporated into the plant cells even a small reduction in transpiration can result in a major saving of water. On-farm trials should test the effectiveness of the following options.

5.4.1 Strip-cropping

Hot dry winds deplete stored soil moisture by increasing surface evaporation and crop evapotranspiration rates. Minor changes to the crop lay out enable strips of sorghum or millet to protect moisture sensitive crops such as sesame and cowpeas from the desiccating effect of wind. This is a useful technique on soils where water-harvesting may not be possible, e.g. dunes.

All the rows of crops are aligned at right angles to the prevailing wind as shown in Figure 7. 10m wide strips of sorghum or millet are alternated with 5m wide blocks of other crops. Long strips provide better protection than short ones.

5.4.2 Preventing Unnecessary Vegetative Growth

Studies of sorghum grown on stored soil moisture in summer rainfall areas have shown that lowering plant population densities to adjust to low moisture levels is the wrong strategy. (Arnon 1972).
At low densities, the young plants have little or no competition, and so show excessive vegetative growth. This increases the evapotranspiration rate; in turn the efficient sorghum root system rapidly depletes the soil moisture leaving insufficient to form satisfactory heads or to mature the grain.

Higher yields can be obtained by spacing the plants more closely within the row and increasing the distance between rows to compensate for low moisture levels. With widely spaced rows the soil moisture supply is not exhausted as rapidly as in narrow ones. Competition between plants within the row prevents excessive vegetative growth. As the laterally developing roots have to grow farther to reach moisture they therefore continue to find available moisture between the rows later in the season when it can be used for grain production. The heads are smaller but relatively numerous and maturity is much more uniform. Densities lower than 100,000 plants/ha or greater than 400,000/ha result in reduced yields.

Sorghum seeds are planted at 6-8 cm intervals within the row (aligned at right angles to the prevailing wind). At higher rainfalls inter-row spacing is closer (1m) than at lower rainfalls (2.5 m). For example, in west Ovambo a 10m wide block of sorghum would consist of 5 high density rows set 2.5 metres apart, whereas in Caprivi the same width of block might have 8-11 rows at 1-1.5m apart.

**Figure 7** Strip-cropping to protect young moisture sensitive crops from the desiccating effect of wind

<table>
<thead>
<tr>
<th>Wind direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>10m Sorghum windbreak</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>5m Cowpeas Sesame</td>
</tr>
<tr>
<td>10m Sorghum windbreak</td>
</tr>
<tr>
<td>5m Cowpeas Sesame</td>
</tr>
<tr>
<td>10m Sorghum windbreak</td>
</tr>
</tbody>
</table>

5.4.3 Adopting Drought Strategies

Drought strategies help reduce evapotranspiration rates and increase the reliability of obtaining a crop (Krishnamoorthy 1974):
• If the onset of the rains is delayed then other varieties, crops, crop mixtures, seed rates and fertiliser applications must be chosen.
• If gaps in the rainfall occur during the growing season then traction power for replanting should be available, weeding has to be more careful, ratooing of millets and sorghum can be practised - the first growth is cut as fodder with the ratoo crop producing the grain - and fertiliser application has to be split.
• If the rains stop too early, then moisture-demanding plants of the crop mixture ought to be removed; the crop of maize or sorghum may be saved by physically removing all but the upper four leaves. If properly timed, this can reduce water lost by transpiration with little or no loss in grain yield.

5.5 Disadvantages of Demand Management

There are several disadvantages associated with managing the crop to match the supply of water. Further expenditure of funds is required to change or reduce the size of the crop. The effective rainfall has still to be equal to or greater than the minimum crop water requirements, otherwise crop failures will still occur. Immediate access to traction also becomes very important if the farmer is to change strategy at short notice - an option not available to many subsistence farmers. Increasing the investment in energy to try to save the crop at a time of water shortage when the risk of failure is greatest, is clearly a hazardous strategy.

A much better alternative is to increase the supply of moisture by encouraging and harvesting run-off. This can be achieved by giving up part of the land to be cultivated and modifying it to form a catchment. The run-off from sufficiently intense storms is concentrated in the cultivated area. By using tillage to enhance the infiltration of water into the soil, this run-off can be stored at depth until the crop needs it.

5.6 Water-harvesting

5.6.1 Definition

Water-harvesting (also called rainfall multiplying) is the interception and concentration of rainfall run-off and its storage in the soil profile for use by crops, grasses and trees. By supplying the plants with run-off water in addition to rainfall water-harvesting is essentially a form of low-cost irrigation.

5.6.2 Design

A water-harvesting system consists of a catchment area which generates the run-off; an area where the run-off is held until it infiltrates into the soil and where the crop or tree is planted; and some form of earth working to intercept or divert the run-off and retain it on the cultivated area.

The amount of water received by the crop as run-off is a function of the size of the catchment area in relation to the cultivated plot, and the percentage of the rainfall during the cropping season that runs off.
5.6.3 A Simple Water-harvesting System for the Northern Regions

Broad-based ridges are probably the most appropriate and easily adoptable method of water-harvesting for the Northern Regions. The aim is to take advantage of the hard crustling that occurs naturally after rainfall on some of the sandy soils to increase run-off (see Photo ...).

Permanent ridges about 30 cm high are formed 1-1.5 metre apart (depending on the severity of capping and the rainfall) with either animal- or tractor-drawn ridgers. The first showers of the season will tend to seal the soil surface, the ridges becoming hard and crusted as the season progresses. Sufficiently intense showers will result in run-off which softens the soil in the furrow making animal-cultivation easy.

Subsequent ploughing, cultivation and planting operations are restricted to a 30 cm wide strip in the furrow where the run-off from the ridges in concentrated and the moisture profile is deeper. Figure 8 illustrates the difference in moisture penetration under flat cultivation (a) and when capping on the ridges is deliberately left intact and rainfall run-off is harvested (b).

If there is a hard B-horizon deep ripping of the furrow with a chisel plough is recommended to increase infiltration (see section 5.7). The crops should be planted at higher densities than usual.

The system has several advantages:

- no annual maintenance of the ridges is required although they will gradually subside with time;
- there is a 70-80% reduction in the amount of ploughing and weeding because the crop is only planted in the furrow;
- with 30% run-off from the 4:1 catchment to cultivated area ratio (120:30 cm) the crop will receive 570 mm in a season of 300 mm;
- scarce supplies of fertiliser and farm yard manure, concentrated in the furrow, become more effective for crop use due to the improved moisture situation;
- the crust tends to suppress germination of weeds, and the amount of water in the upper parts of the ridge is usually insufficient for those that manage to break through to survive;
- the small size of the ridge catchments mean that run-off can be generated from showers much lighter than 30 mm;
- early planting is more reliable as the run-off from intense rain storms should almost double the amount of water wetting the furrow (e.g. the system will magnify a 10 mm storm providing the equivalent of 19 mm of water to the furrow);
- if water-logging occurs in heavier soils, the opportunity for cropping is not lost. The farmer simply waits until the cool season when evapotranspiration rates are lower, and grows vegetables on the stored moisture.

Significant amounts of run-off can also be generated from ridging fields on vegetated dunes. More permanent water-harvesting structures can be developed on gently sloping land around pans using graders to produce a hard, smooth run-off surface (see Photo volume) to generate run-off which is impounded by a contour bund on a levelled cultivation area (conservation bench terrace - see Figure 9).
5.7 Improving Soil Physical Conditions

Any hard, compact or slowly permeable non-saline B-horizons must be fractured to ensure adequate storage of the intercepted run-off deeper in the profile and to allow roots access to a larger volume of moist soil. (This is not recommended on solonetz soils because of saline subsoil may be brought to the surface).

Chisel ploughing or deep ripping along the furrows is recommended. Disc ploughs do not always crack the soil, and have the disadvantage of pulverising the top soil which lowers the infiltration rate of the soil in the furrow.

5.8 The Need for Mechanisation

In his review of cultivation in semi-arid areas, Ruthenberg (1983) concludes that mechanisation is probably essential for the success of any cultivation system in semi-arid areas. Yield-increasing techniques such as tillage immediately after harvest, early sowing, capability for speedy resowing in cases where gaps in rainfall kill the young crop, and proper and timely weeding depend above all on the availability of sufficient traction power. The drier the area the more pronounced are the advantages of animal-traction over hoe-cultivation and of tractors compared with ox ploughs.

Bearing these points in mind, it was interesting that most of the farmers spoken to during field trips requested more tractors be made available. In Caprivi, where the longest gaps in the rains are recorded, the farmers particularly asked for tractors with planters to enable them to resow. Private contractors should therefore be encouraged to obtain ridgers, chisel ploughs and planters for this purpose. A tillage expert should be brought in for a short-term consultancy to advise on the best form of tillage for the different soils in the Northern Regions.

It should be noted, however, that the water-harvesting system based on broad-based ridges, described above, only requires a "one-off" mechanised input, i.e. to form the ridges (although this can be done with ox-drawn implements) and to fracture any compacted B-horizons. Thereafter, the subsistence farmer can use oxen to cultivate and weed the crop. Even hand-hoeing of large fields becomes feasible due to both a 70-80% reduction in area to be treated and a greater depth of softening of the soil in the furrow.
Differences in moisture penetration between flat cultivation and harvesting run - off from capped ridges

(a) Flat cultivation

(b) Crusted microwatershed on ridge

Moisture profile from rainfall

Moisture profile after harvesting run - off

1.5m

30cm
Fig. 9 CONSERVATION BENCH TERRACE SHOWING AVAILABLE SOIL MOISTURE STORED

HOW IT WORKS

Every rainstorm with sufficient intensity to cause run-off is multiplied by catchment area AB. The bund intercepts the overland flow. Concentrating it on levelled cultivated area BC transforms measurable amounts of rainfall into sufficient moisture for crop production. Soil wetted to a depth of 1.5m enables some crops to survive dry spells of up to one month. The ratio of catchment area AB to cultivated area BC may be varied to suit slope, soil and cover conditions.
the river, which has a mobile channel and inhospitable micro-relief close to its banks.

The Zambezi-Chobe flood plain south east of Katima Mulilo is an area of over 200,000 ha. A shallow seasonally recharged aquifer underlies the flood plain at 2-8 metre depth. Although part of the flood plain is subject to occasional inundation (up to 2 metres) from February to April, it already supports ten or more settlements found on higher ground. The aquifer undoubtedly has potential for exploitation with low technology tubewells. In common with most river flood plain soils, the Zambezi/Chobe soils are not homogenous; rather, they vary from fine sands to silty clays, depending on the water conditions prevailing during their deposition. Ultimately, detailed investigation of the aquifer and soils would be necessary before major investment could be considered.

6.3.2 Rivers

Over the last ten years, flow in the Okavango River appears to have decreased by 30% to a level which is becoming critical from October to January. The winter flow from May to September is still considerable and could be exploited for small scale irrigation. However, the importance of the river flow to the ecosystem in the Okavango Delta in Botswana precludes the development of large-scale surface irrigation projects. Furthermore, the first priority for abstraction must be to supply drinking and household water needs which will become critical as the population rises.

The Zambezi and Chobe rivers also have greatly reduced flows but could still sustain many thousands of hectares of irrigation. However, cost implications place this option beyond the scope of the Study. The location and extent of aquifers in the Northern Regions are presented in the Map Annexes.

6.3.3 Soils

Although over 400,000 ha of arable land lie within 1 kilometre of the Okavango river frontage, the area of good irrigable land, with a reasonable clay content, is below 4,000 ha in total. The soils generally have a very low clay content, low water holding capacity and very low fertility. This soil quality imposes the use of high technology, and capital and management intensive irrigation systems.

The Zambezi-Chobe flood plain soils vary greatly, but irrigable soils are more plentiful than along the Okavango. This is confirmed by a FNDC study conducted in the 1980's which found 4,000 ha of soils suitable for rice, out of 10,000 ha surveyed.

6.4 Constraints to Irrigation

6.4.1 Unfavourable Physical Conditions

Poor soils, then, clearly pose a constraint. High evaporation rates of over 3,000 mm/year, and daily rates of over 15 mm at the hottest times have serious implications for irrigation design and costs. Almost all soil nutrients have to be applied at considerable cost, and the application
of irrigation water has to be carefully controlled to avoid leaching of nutrients beyond crop rooting depth.

6.4.2 High Input and Marketing Costs

All crop nutrients have to be imported from South Africa or Europe. Transit costs from South Africa to Okavango can be as high as R415/ton. Local markets are small. Products have to be exported, and only crops with a high value-to-weight ratio would be economically viable, unless processing to add value can be undertaken locally.

6.4.3 Power Sources

Diesel powered pumps are still the most common prime movers of water, despite extremely high fuel/maintenance costs. By the end of 1993, electricity will be available for irrigation at a few sites along 150 km of the Okavango river east of Rundu. Namibia does purchase electricity from Zambia, but the transmission line from Livingstone to Katima is already overloaded and unable to meet current demand, let alone deliver additional power for irrigation. Ultimately, upgrading of the line will be essential if river front irrigation is to be promoted. The alternative of solar powered pumping is presently too expensive to be viable.

6.4.4 Expertise

Namibia is lacking in irrigation expertise, and experience within the extension services is extremely limited. Small-scale farmers will not easily make the transition from rainfed to irrigation farming, as irrigation is substantially more labour- and management-intensive than rainfed farming.

6.4.5 Suitable Crops

The main potential irrigation area of Caprivi is sparsely populated. Thus, markets for bulky perishable crops such as fresh fruit and vegetables are limited. Attention should instead focus on crops with potential for processing and export. Testing under local conditions will ensure that recommendations are appropriate to local husbandry systems. Export markets must also be identified and developed.

6.4.6 Water Abstraction Methods

In Okavango and Caprivi, tubewells could be cheaply developed with wash boring and jetting methods. Once an appropriate engineering package for well development is designed and tested, it can be passed on to private entrepreneurs capable of providing an irrigation service to would-be irrigation farmers.

6.4.7 Water Application Methods

Apart from Caprivi, soils with a clay content suitable to irrigation are quite limited. Therefore, farmers wishing to undertake vegetable irrigation will have to resort to more expensive methods such as drip systems. A small-scale drip system capable of watering a few square
6.4.8 Access

Although access to major roads in Okavango and Caprivi is good, no surfaced feeder roads enter the Zambezi-Chobe flood plain. Roads would have to be built to allow efficient delivery of inputs and transport of crops.

6.5 Recommendations

- GRN must establish an Irrigation Research Unit/Training Centre at Kalimbeza in Caprivi. Irrigation should be offered as a third year practical specialisation for Diploma students wishing to take up irrigation farming.
- Studies of the Zambezi/Chobe flood plain should assess the suitability for major expansion within the next 10-15 years, focusing on small scale irrigation based on tubewells and single household farms. Wells yielding more than 7m³/hour would be needed.
- GRN should develop a suitable engineering package for tubewell installation.
- GRN should improve road access into the flood-plain.
- Priority must be given to individual rather than to group farm development.
- A programme of medium term credit for irrigation equipment must be developed.
- In order to hasten the development of irrigation farming in Okavango and Caprivi, GRN should support the establishment of a limited number of Commercial irrigation farms to spearhead technical innovation, crop processing and market development. The team will recommend that ADB funds be used for this purpose.

7. AGRO-INDUSTRY

7.1 Introduction

Rapid population growth has already led to severe unemployment and underemployment in the Northern Regions. Employment prospects in Namibia are deteriorating as the mining industry declines and agriculture faces harsh economic conditions in its traditional South African meat market. There is a pressing need to create more jobs in the project area.

Investment in mechanised small-scale agro-industries could create more jobs in the Northern Regions but conversely mechanisation often reduces labour requirements. The low level of economic activity in the Northern Regions coupled with the narrow range of cultivated crops also limits the range of potential agro-industries. However, increased investment by private enterprise and GRN in agriculture should improve prospects for small agro-industrial enterprises as crop surpluses begin to accrue.

Most of the rural population in the Northern Regions relies on pounded millet grain as a staple food. Millions of woman hours are devoted to traditional processing of millet. In an effort to improve life for women through partial mechanisation of millet processing development organisations have heightened national awareness not only of the burden which rural woman bear, but also of the, as yet, unquantified potential for employment creation at the village level.
This section describes three rural industries which could improve the quality of life, create employment, add value, and enhance farming efficiency. There are doubtless many others which will be apparent once the project gets underway.

7.2 Millet Processing

7.2.1 Labour Requirements

Although there are no accurate statistics available on gross annual millet production in the Northern Regions, the total probably ranges between 16-60,000 tonnes depending on season. Only a small proportion of this production is processed under partially mechanised conditions. Very little millet is sold, since the majority of households (HH) grow only about 40% of their requirements. Research shows that 2 person hours are required to process 1 kg of millet flour by manual methods. The labour required to process 500 kg is therefore 1000 hours. If labour availability per HH is estimated at 100 hr/week, annual labour availability is 5200 hr. It is sobering to consider that nearly 20% of available labour may be spent on pounding millet.

7.2.2 Manual Processing Method

There are five stages recognised in the manual process:-

- Threshing: carried out on a cow dung plastered floor
- Winnowing: by basket-work tray
- Soaking in water: to loosen hull
- De-hulling: by pounding in a mortar
- Milling: by pounding in a mortar

7.2.3 Options for Mechanisation at Village Level

Threshing
Several different commercial thresher are available. Capacities vary from <100 kg grain/hr to >4 tonnes. Stationary engines or tractors are used as power sources.

Sieving/Winnowing
The size of the individual grains on a millet ear varies considerably. In order to facilitate de-hulling there is a need to sort the grains into at least 3 or 4 uniform sizes. Size grading can be achieved through manually or mechanically powered sieving.

De-hulling
De-hulling is the second most labour intensive input to millet processing. Dehullers with a capacity of 50-100 kg/hr were first developed in France/Senegal and these early machines have now been copied and are available from Zimbabwe and Botswana. Several are already in operation in Namibia. Higher capacity dehullers suitable for industrial scale operation have yet to be commercialised for millet.

Milling
Hammer mills with capacity of 100-500 kg/hr are suitable and several regionally manufactured makes are available.
From the foregoing it can be deduced that there are many permutations of manual and mechanical processing which can be adopted. Custom services provided by entrepreneurs would be feasible for one or all of the operations described above. Within the next two years it is probably that packages of properly matched millet processing machinery of capacity 100-200 kg/hr will have been tested/recommended for the region. Indications are that millet processing will become a profitable agro-industrial enterprise capable of improving living standards and releasing labour for other economic/social activity at village level.

7.2.4 Industrial Scale Millet Processing

If MAWRD support for millet production succeeds, surpluses will soon accumulate. Initially, local transfers from Okavango to Ovamboland will probably absorb surpluses. Thereafter there appear to be two main options for consumption of further surpluses.

* Agronomic Board purchases surplus production and stocks it as a strategic reserve scattered in small stores throughout the Northern Region.
* Commercial millers purchase surplus, and having developed an industrial scale process, possibly involving extrusion, market millet meal in urban areas as a competitive alternative to maize meal. It is possible that commercial farmers may switch from maize to millet production if the Agronomic Board guarantees prices.

7.2.5 Recommendations

MAWRD should facilitate mechanisation of millet processing by:

i. continuing to support development of a package of small machines;
ii. training rural development staff/entrepreneurs in the use of processing machines;
iii. organising credit for the purchase by village entrepreneurs of up to 300 sets of millet processing machinery (300 is the provisional number of villages to be targeted under NRDP).

Given the operating difficulties in remote areas the annual output of 300 sets might be 20 000 tons. (200 sets operating x 500 kg/day x set x 200 days per year) or one third of current estimated production. Once machinery sets have been proven it will be essential to build up numbers quickly in order to stimulate the development of privately owned spares and mechanical repair back-up businesses, without which development will not be sustained.

7.3 Oil-seed Processing

7.3.1 Introduction

Annual per capita consumption of vegetable oil from formal sector sources is probably about 5-10 kg in Namibia. In the Northern Regions, traditional sources of oil which include tree nuts such as marula (Sclerocarya spp.) and mangetti (Ricinodendron spp.) make a significant but, so far unquantified, contribution to supply. Since most oil is imported, the Agronomic Board is encouraging local production of sunflower, mainly in the commercial farming sector. In the Northern Region scope exists for the promotion of sesame growing for oil production.
Soft binding wire is hand woven into netting on a specially constructed, but easily made, table costing R250-00. Output per person is 20 m/day. Table life is estimated to be 50 km of netting. It is understood that Belgium has offered Namibia a grant of raw wire under its Technical Cooperation Agreement. This material could be specially tailored to suit the village wire manufacturing system described above.

The locally woven netting could be supported on poles cut from indigenous trees but it might be preferable to use imported treated poles from Zimbabwe for the purpose, to support Namibia's efforts to reduce tree felling.

7.4.3 Estimate of Requirement for Netting and of the Number of Jobs which could be Created

If it is assumed that there are about 120,000 rural HH in the project area and that a quarter of these would be targeted for enclosure of their arable land over a seven year period the following amount of netting would be needed:

- 30,000 HH x 1 km of netting (to enclose about 5 ha) = 30,000 km
- Assuming annual manufacture of 4,500 km of netting and production of 5 km/worker/year, a minimum of 900 jobs would be created.

7.4.4 Financial Implications

Considering that the raw wire would be provided free by Belgium and some other cost components would be met by the AfDB funded programme it should be feasible to make and sell the netting at a price which small farmers can afford, even if they pay in kind, rather than in cash.

7.4.5 Conclusion

The newly independent government in Namibia needs to deliver a tangible benefit to small farmers to demonstrate its ongoing commitment to their betterment. It is argued that practical assistance with enclosure of arable land could be of immense benefit to both farmers and GRN. Benefits would include job creation, improved crop and livestock husbandry, facilitation of tree planting, reduction of tree felling, and endorsement of tenurial rights over arable land. Throughout Africa the high cost of improved fencing is a major constraint to intensification of farming, and yet development finance is almost always steered away from fencing, the argument being that costs will always exceed benefits. The offer of a Belgian grant for wire, coupled with the farmers desire to enclose, and GRN's commitment to agriculture in the Northern Region combine to form a compelling argument for fencing.

7.4.6 Recommendations

i. MAWRD to assign one Senior Officer, on a full time basis for 3 months, to investigate and design a comprehensive village wire net manufacturing programme for implementation from 1995.

ii. MAWRD to liaise closely with Belgium on the quality of wire to be supplied.
<table>
<thead>
<tr>
<th>Level</th>
<th>Officer Cadre</th>
<th>Responsibility</th>
</tr>
</thead>
</table>
| National   | Division of Extension & Development  
Deputy Director                                                                 | Responsible to the Director of Agriculture for supervising and coordinating National agricultural extension services in accordance with policy guidelines. |
| Regional   | Regional Management & Support Services  
Chief Agricultural Officer  
Chief Agric Extension Technician  
Chief Agric Extension Officer  
Chief Agric Extension Technician  | Responsible to Deputy Director for supervision coordination and implementation of Regional extension services.  
Responsible for consolidation of Annual Programme of Work & Budget and for Annual Reports. Liaison with Regional Coops  
Responsible to CAO for technical support to extension services particularly integration of crop livestock human, veterinary, and adaptive research.  
Design of technical content of seasonal extension programmes to ensure systems approach adopted at field level.  
Main link with adaptive research, rural development and veterinary staff.  
Identification of skill gaps in intermediate and junior cadres and liaison with Training Services for In-service programmes.  
Responsible to Chief Agricultural Officer for the supervision guidance and support of Agricultural Extension Officers.  
For compilation of Annual Programmes of Work & Budget for Sub Regions and for implementation of the Programme.  
Responsible primarily for administrative and organizational aspects of seasonal programmes. |
| Sub-Regional | A&RD M & S Services  
Agricultural Extension Officer  
Agricultural Extension Technician  
Agricultural Extension Technician  | Responsible to the CAEO for the supervision and guidance of Agricultural Extension Technicians.  
Responsible for implementation of overall village based extension programme within the catchment of the A&RD and examination of A&RD level APWB.  
Assistance in establishment of Village Development Groups.  
Review of development constraints, and liaison with A&RD based credit and input supply services for village requirements. |
| Village    | Village Extension Programme  
Agricultural Extension Technician  
Agricultural Extension Technician  | Responsible to the AEO for implementation of agricultural extension programme at the target village.  
Establishment of VDG, review of development constraints at village level. Identification of target farmers for demonstrations, and adaptive trials. Initial guidance to VDG on formation of associations for credit and loan applications. |
CHAPTER N. LAND TENURE POLICY OPTIONS

1. INTRODUCTION

As one of the principal means of production, land remains a key component of the development equation in the Northern Regions. Discussion on land issues in the communal areas, however, has thus far tended to be linked to the broader “land question” in Namibia. This broader scenario relates to such issues as the colonial dispossession of the indigenous population, existing ownership rights and possible redistributive strategies.

While the issue of land in the Northern Regions clearly cannot be isolated from the broader national land question, it is important to draw a distinction between the political imperatives of a national land reform policy (complex as these are) and the demands of agrarian restructuring in the northern communal areas. In that respect, it is important that changes to existing land tenure systems in the Northern Regions are not seen to be contingent on changes at the national level. This assertion is based on the premise that land reform at the national level is likely to be a highly contested and politically protracted exercise, which could extend beyond the life cycle of the Northern Regions project. In addition, changes in tenurial arrangements within the Northern Regions itself would appear more realisable in the short term and could be effected with less disruption of the social order.

While the land issue in the Northern Regions relates to both arable land holdings and communal rangeland, the latter, presents the more complex set of problems. Evidence from recent surveys suggests that a shortage of arable land, of itself, is not the primary impediment to improved agriculture production in the Northern Regions. Furthermore, while the absence of freehold title might present some practical problems with regard to the procurement of credit from commercial banks, insecurity of tenure itself does not appear to be a significant factor limiting investment in domestic production (the case of some women farmers in Ovambo excepting). Shortages of labour, credit, extension and other inputs, as indicated, appear to be more direct constraints under the present farming regime.

Access to and management of communal rangelands, in contrast, does directly influence livestock farming throughout the Northern Regions. This is especially apparent in Ovambo and in the Okakarara District where enclosure of communal rangelands is disrupting seasonal grazing patterns and is leading to over-exploitation of the commons.

2. PRIORITY REQUIREMENTS

Given the pilot nature of the project and the socio-legal complexities surrounding the land question in Namibia, it would not be feasible for the Northern Regions/ADB project to initiate a process of land reform of itself. However, this is not to imply that a broader process of land and agrarian reform should not be pursued by GRN within the Northern Regions at the same time. Among the priorities of such a process would be the following:

a) policy should be focused directly upon the land issues of the Communal Areas:
b) in order to allay insecurity, the parameters within which land tenure reform in the Northern Regions will be planned and implemented should be established and announced as early as possible;

c) the respective responsibilities of local, regional and central government with respect to the management of communal land need to be clarified, and administrative support for each sector will need to be developed;

d) the recognition that tenure in Northern Regions cannot be satisfactorily considered in isolation from prevailing socio-spatial land use, and that land tenure reform will be as much about finding workable systems of management as about "rights" to land;

e) the recognition that the principal requirement for sound communal area management will be the development of accountability on the part of local users; this implies the development of a "rights for responsibility" framework;

f) the recognition that security is a necessary concomitant of accountability and that "this will mean the division of communal land resources into management units which are controled by identified "owners";

g) the recognition, however, that prevailing conditions of high density land use and climate, make it extremely unlikely that workable management units may be achieved through either enclosure of communal pasture or the establishment of rights and responsibilities over pasture on an individual basis;

h) the assistance of those who are financially able and willing to settle within the commercial zone of the country to do so, albeit conditional upon the removal of all their stock from communal areas;

i) the recognition that meaningful progress in sustainable local land management and tenure reform cannot be achieved at a central government level and/or by technical means alone; that progress is unlikely to take place without the direct involvement of local communities and that therefore exploratory initiatives at the local level should be immediately planned and begun;

j) the recognition that local land tenure reform is most effective as a process rather than as a single act, and that adjustments to the process are made with experience;

k) the initiation of resource assessment and land use planning at the regional and local level;
A PLAN OF ACTION

The following actions are recommended to launch land management and tenure reform in the Northern Regions:

3.1 A Direct Commitment Land Reform in the Northern Regions

It is proposed that a Communal Land Tenure Commission or Task Force be established with responsibility for developing a programme of tenure reform directly appropriate to the communal areas over a 12-18 month period. This Commission should include representatives from the Ministries of Lands, Resettlement and Rehabilitation (MLRR), Ministry of Agriculture, Water and Rural Development (MAWRD) and Ministry of Local Government and Housing (MLGH), all of whom have a role to play in supporting land reform.

The Commission should prepare a draft document setting out the following:

i) the broad parameters of intended land tenure policy in the Communal Areas in order to make clear the direction of future policy and the types of activity which will be acceptable at the local level;

ii) specific directives on certain aspects of reform.

3.2 Responsibilities of Central Government

The Commission will also need to identify precisely which Ministries should be mandated with responsibility for implementing land reform, in its whole or in its parts: this would include, for example:

* responsibility for land use planning at the regional and community level
* establishing, supporting and supervising such local land authorities as are necessary
* directing and overseeing progress in land management and tenure reform, restructuring policy in the light of experience, etc.
* legal reform in support of land reform

3.3 Strengthening Local Level Capacity to Support Land Management and Tenure Reform

Any initiatives towards improved management of lands and effective land reform at the local level (especially community-based reform) requires strong and effective local government.

For a range of historical reasons, there is not a strong tradition of community mobilisation in the Northern Regions. The development of local level skills is imperative if sustainable development is to be achieved within rural communities.
3.4 Traditional Leaders

While the responsibilities of traditional structures are likely to be redefined over time, traditional leaders continue to play a pivotal role in the affairs of most rural communities, particularly with respect to the allocation and management of land. It is likely that they will continue to assume positions of prominence both during the evolution of alternative village level organisation and after.

4. REGIONAL LAND USE PLANNING

Assessment of the availability and ownership of land and resources is critical to the planning of land management systems.

There are two levels at which land use planning must take place in the northern communal areas: firstly, at the regional level, resulting in a zoning exercise which identifies where residential, arable, grazing and other use may take place. This regional-level process will also need to identify the "traditional" grazing areas of each community or group of communities in the region.

Secondly, more area-specific land use planning will need to take place at the community level: this would be undertaken on a systematic community-by-community basis over a ten year period. "Communities" will refer to appropriate socio-spatial entities, which (ideally) share certain grazing resources outside settled areas. Several "villages", or a headman's "ward" will probably emerge as the most practical administrative unit. It will be critical that the working unit is of a size where land management and group responsibility may be reasonably organised.

Capacity for resource assessment and community-based land use planning is limited within the Government at present. The MLRR has recently been mandated to develop capacity in this sphere. This process should be strengthened through the preparation of a comprehensive institutional support programme (for donor funding as necessary) to enable the identification, training and posting of staff at the regional level.

Government ministries, donors and NGOs should be encouraged to work in areas designated by the regional land use plan as being of priority. In addition, they should be encouraged and assisted to adopt a community-based land use planning approach to resource management. A Regional Land Use Planning Committee, involving representatives from the central, regional and local levels of government will be necessary in order to ensure coordinated activity.

Given existing staff shortages in government, it will not be possible to implement the land use planning programme identified above in more than two or three regions at a time. Whilst Regional Land Use Plans should be targeted for completion throughout the Northern Regions within a five year time frame.
the local level micro-planning should realistically be scheduled over a ten year time frame.

* The MLRR plans to post Land Control Officers to most regions over the coming 18 months. If it is decided that these officers will be trained as land use planners, then provision will need to be made for technical support and advice.

5. A COMMUNITY-BASED APPROACH TO LAND MANAGEMENT AND TENURE REFORM

* Improved land management and appropriate reform of land tenure will not be achieved in the Northern Regions without a community-based approach. The experiences of other countries confirm that failure is almost certain to arise where "reform" is instituted without the involvement of those affected and in contexts which are alien to the community.

* A community-based approach implies the following:

1) identifying the socio-spatial boundaries of land use (village, ward etc.);
2) working with members of that community to review their system of land management and right-holding;
3) helping the community to revise existing practices, either in terms of areas, assets, activities, or rights;
4) assisting the community (however it has ultimately been defined) to reach formal agreement on a Management Plan;
5) to link this Management Plan to assistance from Government and to the evolution of registered corporate rights.

* Various forms of corporate rights will need to be tested and refined over time; a Community Land Authority (CLA) model is likely to be the most appropriate. In this model, the community is delegated the right to hold and manage the communal resources of the community corporately. The CLA would have clearly defined membership, which would include all residential adults and their children older than 18 years. The rights and duties of each member are spelt out with respect to land utilisation and management. These represent the agreed 'regulations' of the particular CLA. Actions (usually fines) to be taken in the event of abuse of these regulations are also spelt out. Changes in regulations and plans are mooted annually and leadership is elected through a democratic General Meeting.

* Initially a CLA would represent a more or less informal institution but, over time, it could evolve into a company, cooperative or other corporate entity, able to raise and expend funds in terms of its Constitution. The more active or successful communities will utilise their CLA for an increasing range of development projects.
This approach provides a mechanism through which communal resources may be managed by the community which has established de facto usufruct over those resources. That is, the CLA model assigns accountability within the context of users and rights.

The deployment of Land Use Planning Officers to the regional level and the establishment of Land Boards in each region will not be sufficient to establish the basis for land tenure and management reform at the local level. The development of community land planning skills by a wider range of people will be necessary. It is strongly recommended that Government encourage donor programmes to direct aid and technical assistance towards the support of community-based land planning processes.

6. REDUCTION OF DEPENDENCY ON COMMUNAL RANGELANDS

No land management or tenure reform programme can, on its own, eliminate pressure upon land resources, or be entirely responsible for raising local incomes. The lessening rates of dependency upon finite resources is equally as important - especially as populations increase.

It is strongly recommended that Government continues to seek ways of assisting those with the means who wish to acquire ranch land in the commercial zone. Similarly, it is recommended that Government considers the purchase of commercial farms which lie adjacent to the Northern Regions as a means for expansion of the communal areas. This would only be productive where management of use and rights is definitively planned.

In a bid to keep numbers at sustainable levels, it is also strongly recommended that national policy promote off-farm enterprise vigorously in the Northern Regions as a means of moving investment out of the livestock sector. In support of this, the availability of savings account facilities, with high interest rates, in remote rural areas can be instrumental in reducing on-the-hoof investment.

7. ADOPTION OF AN EXPERIMENTAL APPROACH TO LAND MANAGEMENT AND TENURE REFORM

There is no single means towards sound communal land management and tenure reform. Mechanisms may be suitable in one area and not in another. Land reform should be treated not as a single decision but rather as a process. Process demands time and flexibility. Each Regional Land Use Plan will be different if the local conditions have been properly considered.
This approach provides a mechanism through which communal resources may be managed by the community which has established de facto usufruct over those resources. That is, the CLA model assigns accountability within the context of users and rights.

The deployment of Land Use Planning Officers to the regional level and the establishment of Land Boards in each region will not be sufficient to establish the basis for land tenure and management reform at the local level. The development of community land planning skills by a wider range of people will be necessary. It is strongly recommended that Government encourage donor programmes to direct aid and technical assistance towards the support of community-based land planning processes.

6. REDUCTION OF DEPENDENCY ON COMMUNAL RANGETRANS

No land management or tenure reform programme can, on its own, eliminate pressure upon land resources, or be entirely responsible for raising local incomes. The lessening rates of dependency upon finite resources is equally as important - especially as populations increase.

It is strongly recommended that Government continues to seek ways of assisting those with the means who wish to acquire ranch land in the commercial zone. Similarly, it is recommended that Government considers the purchase of commercial farms which lie adjacent to the Northern Regions as a means for expansion of the communal areas. This would only be productive where management of use and rights is definitively planned.

In a bid to keep numbers at sustainable levels, it is also strongly recommended that national policy promote off-farm enterprise vigorously in the Northern Regions as a means of moving investment out of the livestock sector. In support of this, the availability of savings account facilities, with high interest rates, in remote rural areas can be instrumental in reducing on-the-hoof investment.

7. ADOPTION OF AN EXPERIMENTAL APPROACH TO LAND MANAGEMENT AND TENURE REFORM

There is no single means towards sound communal land management and tenure reform. Mechanisms may be suitable in one area and not in another. Land reform should be treated not as a single decision but rather as a process. Process demands time and flexibility. Each Regional Land Use Plan will be different if the local conditions have been properly considered.
8. LAND MANAGEMENT AND TENURE REFORM IN THE NORTHERN REGIONS

It is proposed that the NRDP plan should include direct support for community-based land management and tenure reform in the four designated areas - and that it should use that framework for the promotion of technical agricultural improvements, testing of new research and other interventions determined as priority.

8.1 Institutional Support at the Regional Level

Institutional support would include the funding of three advisory Regional Land Use Planners (RLUP), one for Caprivi/Okavango, one for Ovambo and the third for the Okakarara district. These advisors would work closely with the MLRR Land Control Officers (or other staff developed by the Ministry), effectively training them on the job in resource assessment and regional plan formulation. The advisors would further assist these government officers to establish Regional Land Use Planning Committees in each of the designated project regions.

The three advisors would be responsible for developing regional level land use planning capacity and for the production of Regional Land Use Plans (and as appropriate, Sub-Regional Plans). The RLUP would also play an important role in establishing the regional land authorities.

8.2 Development of a Community-Based Land Management Model

The Northern Regions project should also recruit (locally or internationally if necessary) four experienced rural development specialists (RDS), ideally with agricultural and community mobilisation skills, to spearhead action in targeted pilot rural areas.

Government (MAWRD) would provide one officer in each of the defined project regions to work under the supervision of the RDS and to be trained on the job in community-based land management planning and development. If necessary, these staff could be funded by the project, and then gradually absorbed into MAWRD over the project period.

The community-based land management and tenure model would be piloted in three selected groups of villages in each region (a total of 18 clusters of villages, with up to 150 villages addressed over the project period). Intervention would be staggered over the duration of the project: the first group being the focus of attention over Project Years 1-3, the second group the main target of attention over Project Years 4-5 and the third, Project Years 6-7.

The selection of villages would be determined by their socio-spatial boundaries: a Ward (under a headman or sub-headman) might represent the most appropriate socio-spatial unit. An individual village would be the sole target of attention only where it was very large.

The MAWRD staff, with guidance and support from the Rural Development Specialists would work with villagers to establish Community Land Use Plans on a village basis and, as
appropriate, on a Ward basis where resources (water, seasonal grazing) are shared by other villages in the group).

The Plan would form the basis for the establishment of a Community Land Authority (CLA) which would be formally responsible for the management of land and the allocation of land rights. Formal mapping would be undertaken of the CLA area, and of individually held plots within it.

Depending upon performance, the CLA could be allocated exclusive corporate rights on terms agreed to by the majority of community association members. The incentive for the community will be the exclusivity of their rights and the fact that formation of the CLA will serve as a conduit for raising funds and for gaining further technical and development assistance.

8.3 Partnership with Government

It is clear that the proposed approach to the management of land in the Northern Regions is intended neither to dictate to people in the communal areas precisely how they should manage their lands, nor to leave that decision entirely to them. The essence of the proposed model of management is one of partnership, between the state as technician on the one hand and the community as responsible owners and implementers on the other. This relationship allows for the development of contractual agreements between Government and the CLA.
CHAPTER R: THE ROLE OF PARASTATALS, BOARDS AND NGOs

1. INTRODUCTION

Parastatals and international and Namibian non-governmental organisations will have an important role to play in the development of agriculture in the Northern Regions. In developing integrated plans for the region, it is important to take into account the experiences and initiatives of these institutions. Their resources include knowledge of structures, socio-economic conditions and development capacity of rural communities, drawn from problems and successes encountered in rural projects; committed personnel with training and community management skills as well as technical expertise; and to varying degrees, financial and material resources. Ultimately, formal structures for coordination between government, parastatals, NGOs, international agencies and tertiary institutions will enhance the Ministry's capacity to formulate, implement and evaluate agricultural policies and programs.

2. THE INSTITUTIONS

2.1 Parastatals

A handful of parastatals currently exist in Namibia; these include SWAWEK for the supply of electricity; TRANSNAMIB for the management of transport; National Housing Enterprise for the supply of low-income housing; Namibia Post for post and telecommunication activities; Namibia Development Corporation for support to governmental development schemes.

Clearly, all of the parastatals will contribute to the provision and upgrading of infrastructure in the rural areas to a lesser or greater extent. However, it is the Namibian Development Corporation (NDC) which will have the primary responsibility for business, industrial and agricultural development in the communal areas. The newly established NDC replaces the First National Development Corporation, a parastatal set up in 1978 to promote development in the former bantustans. The restructuring of the corporation places central authority in the Minister of Trade and Industry while a Board of Directors appointed by the Minister will assume responsibility for overall management. The roles of the NDC will be, inter alia, to promote, develop and support both formal and informal economic sectors, with priority given to agriculture and manufacturing; to promote foreign and local trade and investment; to promote increased productivity through training and support; and to implement and coordinate development initiatives on Government's request.

In the past, the focus of the Corporations activities was the establishment of agricultural projects as centres of experimentation, training, and input and marketing support. The Katima Farm in Caprivi, and four farms in Okavango, along with nearby crop and livestock schemes serve as the foundations of the Corporation's work in the Northern Regions. In addition, the Corporation conducted agricultural research and administered a finance scheme for entrepreneurial communal farmers.
2.2 Boards

2.2.1 Namibian Agronomic Board (NAB)

As a statutory body incorporated under Government Act 11 of 1985 and the Agronomic Industry Act of 1992, the NAB is the official marketing arm of GRN for all agronomic products with the aim as described in Article 9 of the 1992 Act:

"strive towards promoting the agronomic industry and to facilitate the production, processing, storage and marketing of controlled agronomic products (maize (white and yellow), wheat and sunflower) in Namibia"

These objectives have been followed solely through funding from registered producers and processors by way of statutory levies without any GRN support; however, NAB was given its framework by MAWRD and does act in an advisory capacity to MAWRD. NAB aims to ensure both food self-sufficiency and national food security.

Further to its declared objective, NAB aims "to develop an economically and environmentally sustainable agronomic industry through advice facilitation and regulation to the benefit of the Namibian nation". This "mission" statement targets the needs of specific groups/customers who will be offered products, services and benefits. Products should be of high quality, competitively priced and subject to guaranteed production loans. Products should have a staple food component, volume and rotational potential and a demand on the world commodity market. Possible new crops that the NAB is considering include groundnuts, pearl millet and dried beans.

Services offered by NAB include marketing information, supplies of staple food, arbitration, logistical support and accessibility to the international market as well as quality control, extension services, financing arrangements, statistics, market development and research. Benefits accruing to members include increased security and availability of staple food, market and price stability and product promotion.

An NAB Strategy Planning Workshop in June 1993 identified a number of objectives and the time frame for achieving them. Some 20 were derived; the relevant ones include:

* the exploitation of present legislation to ensure national food security
* determination guaranteed markets and prices for maize, sunflower and wheat
* establishment of R100m revolving fund
* establishment of applied meteorological services by 1994
* ensuring food security for consumers
* 100% pearl millet self-sufficiency by 1998, 80% maize self-sufficiency by 2000 and 50% wheat/sunflower self-sufficiency by 2000
* scientific analysis of agronomic potential of Namibia by 1994
* supply government with all relevant information on agronomic industry

The planned liberalisation, which sees a shift towards "marketisation" rather than mere privatisation and in which marketing boards are expected to take a promotional and developmental role as institutional mechanisms for the coordination of macro- and micro-
aspects of marketing, is likely to require additional funding to that traditionally available to producers with limited access. Such a requirement will mainly be for smaller transport, storage and bargaining capacities but of necessity will be marketing intelligence gathering, manpower development, research and development. Under the current rigid fixed price marketing scheme, NAB finances marketing loans from the Agricultural Bank of Namibia (which also finances production loans). After liberalisation NAB wishes to administer all such activities through a market-oriented organisation in Namibia; beyond food self-sufficiency the creation of market opportunities for cash crops and to stabilise the rural population through the expansion of agronomic production in pursuit of both national food security and economic prosperity.

Of particular importance to NAB is the provision of awareness and training opportunities to farmers unions and other cooperatives. NAB wishes to establish an in-house capacity to carry out such programmes to contribute towards market integration of communal communities into the national economy. Currently NAB is hampered in the pursuit of these progressive objectives through the inability to self-finance; as a result NAB has requested assistance from potential donors and sponsors on a project basis, the projects being divided into human resource development, research, physical infrastructure and production and marketing. It is worth noting that NAB implemented a white maize scheme in Caprivi in 1991 without external financial support and that it has been able to establish both a pilot pearl millet marketing project with assistance from the EC (again in 1991) and its own marketing schemes.

One of the most significant of these projects relevant to the current study is the "Commercialisation of pearl millet in the Northern Regions of Namibia". NAB will act as national coordinator bringing together the relevant organisations, monitoring the development of the project, determining prices in collaboration with the markets and providing the appropriate training to the target groups. In establishing pearl millet as a controlled product with minimum prices, NAB will be providing a vital step along the path to agricultural development, economic reconciliation and national prosperity. As such NAB provides a model for the type of interventions that would be beneficial to the country as a whole.

2.2.2 Meat Board

The meat industry of Namibia is controlled by three bodies: The Meat Board, the Meat Corporation (Meatco) and the Directorate of Veterinary Services.

The Marketing Act of 1934 made provision for a Meat Marketing Board to promote the interests of the livestock industry in Namibia and elsewhere. The current Meat Board upholds this goal.
The Meat Industry Act of 1981 enacted the creation of the Meat Board. The act set out the objectives, powers, responsibilities and activities of the Board. Specifically, it outlined provisions for the control of grading scales, export, import, and the imposition of levies on livestock meats and meat products.

The Board's responsibilities encompass the following: fair and orderly marketing; promotion of local slaughter of livestock; promotion of the consumption of red meat; application of a class and grading system for livestock and carcasses; and pricing and price reporting. As outlined in the 1981 Act, the Board is required to generate its own capital, to self-finance a data bank for the industry, and finally to advise the Minister on statutory matters including the removal of surpluses, handling procedures and requirements and drought relief.

It is set up as an autonomous parastatal headed by a board of eleven members: six producers, representatives from MAWRD, the Brokers Association, the Butchers Association, an Abattoir Factories Representative and a co-opted member. To promote the meat industry, the Board must actively identify and develop new markets and negotiate to retain Namibia's current markets. It also must carry out research into consumer preferences on a continuous basis.

Within Namibia, the Board regulates the supply of cattle both to the slaughterhouses and to the export markets. The board negotiates quotas with the importing country and allocates these to the producers. Producers register with the Board annually for both, indicating numbers for slaughter and for export. Export stock require an export permit from the Meat Board. The Board is financed by levies placed on all slaughter stock and all livestock exported.

The pricing of the different grades of meat at the slaughterhouse is calculated by the Meat Board in collaboration with Meatco. Together they have worked out a formula based on the RSA meat industry. This formula reflects reasonable but competitive prices in RSA (Namibia's main market) and within the regional market area. Prices have remained level over the last five years or so because of the slow down in the world economy and the quantities of meat available in the world markets. Costs have risen by over 200% in the same period. Figures from the Meat Board for the last three years show a 10% price increase for beef in that time and a 2% increase in small stock meat prices (see the table below).

<table>
<thead>
<tr>
<th>Year</th>
<th>1989</th>
<th>1990</th>
<th>1991</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>454</td>
<td>461</td>
<td>500</td>
</tr>
<tr>
<td>Small stock</td>
<td>600</td>
<td>544</td>
<td>614</td>
</tr>
</tbody>
</table>

Over ten years meat output has remained relatively level. Total market production in 1982 was 323,317 head of cattle; in 1991 it was 314,487. Production has fluctuated around these
figures over the last decade. Market small stock have risen from 714,035 in 1982 to 1,089,871 in 1991.

Meatco

The Meat Corporation (Meatco) is not a parastatal but a private, autonomous corporation run by a board of nine persons who operate a slaughterhouse business. Its ownership is currently in dispute because GRN, who has loaned it some money, wishes to have a bigger say in its ownership and management. On the other hand, the predominantly producer board of directors wishes Meatco to remain an independent corporation.

The board of directors is made up of six producers, two MAWRD representatives and an appointee from the Corporation, usually the Managing Director. They operate abattoirs in the commercial areas in Windhoek, Okahandja, Otavi and Gobabis. In the past they have operated a feedlot. There are plans to open a tannery.

In the communal areas they have abattoirs at Oshakati, Rundu and Katima Mulilo. The main factory, located at Oshakati, takes surplus meat particularly, from the Katima Slaughterhouse. The Oshakati abattoir also has a canning unit.

Meatco purchases cattle, sheep and goats. Livestock are supplied from the commercial areas on a quota basis to the slaughterhouses. This system controls throughput for both export and local consumption requirements. In the communal areas, livestock, mostly cattle, are supplied direct to the abattoirs or are procured through commission agents and buyers.

In 1991 Meatco slaughtered 122,294 head of cattle; 108,777 head of small stock were also slaughtered. In 1991/2 financial year their net operating surplus was R 21,928,535 million as against R 7,361,101 million for 1990/1. In the last ten years Meatco has increased its share of the market by about 4.5% per annum for cattle at the expense of direct live sales to RSA. Their market share for small stock has remained fairly stable.

2.3 Non-Governmental Organisations (NGOs)

In most developing countries NGOs play a significant role both in mobilising rural communities and in providing a platform for development activity. In Namibia this practice has historically been constrained by the fact that relatively few community-based organisations currently exist and NGO activity prior to independence was limited. The impact of the war and of security oriented policies which prevailed during the colonial period, effectively acted as a disincentive to community mobilisation. There is thus not a strong tradition of community based development activity in the Northern Region and organisational skills are frequently limited both within communities and within newly established NGOs.

Nevertheless, the involvement of NGOs is seen as of central importance in supplementing and complimenting government’s development initiatives in the Northern Region. In addition to the provision of a range of services, NGOs can play a key role in the mobilisation of rural communities, both in empowering local people and in strengthening popular participation in decision making processes at both local and national levels.
Non-governmental organisations, virtually by definition, cover the full spectrum of human activity. In Namibia several categories of NGO exist:

- International NGOs, such as Oxfam, CRIAA, and Ibis (WUS-Denmark);
- National NGOs, such as the Namibia Development Trust, the Council of Churches in Namibia, and the Rossing Foundation;
- National Unions, such as the Namibia Agricultural Union, the Namibia National Farmers Union, and the Namibia Credit Union League;
- Community Organisations, including cooperatives, farmers associations, and self-help projects.

Since independence, NGOs and community groups have blossomed in Namibia, and the nature and scope of activities has widened considerably. In particular, the nascent cooperative movement, supported by the formulation of cooperative policy and legislation, has expanded into the rural areas.

Although national NGOs have an important role to play in mobilising rural communities, it is also important that their organisational capacity is not over-estimated. Many NGOs, as intimated, are still in an early phase of organisation and lack both the staff and the management skills to launch and sustain large community programmes. Thus, in enlisting national NGOs consideration will also need to be given to training and capacity building among NGO staff themselves.

Both the NDC and the growing network of NGOs working in the communal areas can contribute to agricultural development through their past and current involvement in finance and credit; marketing and input distribution; technology transfer; and training.

3. THE ISSUES

3.1 Finance and Credit

Commercial farmers can finance the purchase of land and inputs through loans from the Land and Agriculture Bank. However, the Bank requires surveyed, freehold land as collateral, thereby precluding access by communal farmers. Few options exist for communal farmers who wish to invest in inputs and labour to boost their agricultural and livestock production. Lack of credit remains a formidable obstacle to agricultural and off-farm income generation alike. Because experience and capacity in obtaining loans and credit is limited, financing and credit schemes should consider both individual and community-based models.

The former FNDC briefly administered a credit scheme to support specific projects of entrepreneurial farmers. The credit facilities were housed at the corporations wholesale outlets, where inputs were also supplied on credit. The FNDC in the past successfully identified farmers whose motivation and progress ensured that they had the potential to repay and to capitalise on their investment. This experience could enhance the NDC's capacity to administer a financing scheme for individual, qualified communal farmers. (They have also run a small loan program for informal sector business-people). However, given its focus on Okavango, and to a lesser extent Caprivi, the NDC lacks an understanding of conditions in
In the past, FNDC’s operations enjoyed tax breaks and soft loans. As such, inputs were often subsidised, failing to reflect the operations’ true financial viability and effectively precluding any competition. In Caprivi, Okavango and the Okakarara District (but only minimally in Owambo) farmer’s co-operatives and associations have begun to fill the niche for marketing and supply in the communal areas. Likwama and its member associations have marketed maize and millet and distributed seeds and implements on credit to its members.

Lessons should be drawn from the achievements and problems of drought relief and distribution programs in the communal areas. The reach and effectiveness of these programmes did, to a considerable extent, hinge on the organisational capacities of local community structures. Where there were strong NGOs which worked closely with community representatives, the distribution process was largely effective. Conversely, the absence of such bodies or poor coordination of community activity, greatly minimised the reach and impact of the programme - some remote but needy communities received no support at all.

In the North, despite a subsidy of R120/head, destocking did not take place on a significant scale. However, the drought programs did enhance co-operation between the government and regional organisations, and showed that these groups can successfully administer distribution and marketing schemes. For example, in collaboration with the French NGO CRIAA, Likwama purchased millet from local producers and distributed it as food relief. Similarly the Canadian based CANAMCO (OXFAM Canada) continues to operate a food for work programme in Okavango.

Because community-level associations are newly-emergent, the scope of input distribution and marketing initiatives by the NDC and non-governmental groups has been confined to urban centres. Co-operatives will need to charge marketing commissions, which producers may not find attractive if direct outlets are more convenient or efficient. However, by involving these institutions in the design and implementation of marketing and supply strategies, the government, as well as the proposed ADCs can broaden the reach and impact of interventions. As with interest rates, however, overly-subsidised seeds and fertilisers, while improving conditions in the short-term, may undermine the development of local capacity to administer marketing and supply schemes.

3.3 Technology Transfer

The NDC’s agricultural projects have yielded up a wealth of technological and agricultural expertise. The projects have provided test grounds for various types of irrigation, production systems, and crop diversification into groundnuts, cotton, and vegetables. (The failures of two citrus schemes also provide useful case studies). The Corporation has run small poultry, piggery and dairy projects as well. Since irrigation is yet to be practised on a significant scale in the regions, the technical expertise is primarily project oriented. However, the NDC is managing the Etunda Irrigation Scheme, recently initiated in Owambo, where local farmers will be settled.

The NDC has and will continue to have a role in assisting farmers to grow new crops. A vegetable scheme near Katima Mulilo has enabled households (mainly women) to diversify their diets or to sell for income. The NDC can also support basic research through demonstration trials (on its research station in Okavango) and working with local farmers.
Research has also led to a proposal for a rice project, although it was shelved due to lack of funds.

Currently, the future of the NDC's agricultural project remains uncertain, as the NDC is seeking to sell off the five farms. Privatisation of its projects will ease the corporation's financial burden, freeing it to undertake less-capital intensive ventures. However, it is unclear if the local farmers will continue to have access to project-based mills. The following constraints limit the impact of the NDC and/or NGOs:

* shortage of finance
* the difficulty of identifying and implementing development interventions on a large scale to make a significant impact on primary production
* lack of extension, inputs and credit to enable small farmers to adopt more intensive farming practices/packages

NGOs are also involved in transfer of technology, as with the promotion of the Okashana cultivar, assistance to community garden projects, and other initiatives. One field of NGO (as well as donor) involvement has been community-based rural water provision.

3.4 Training

It is in the field of training that the NDC and, in particular, NGOs can offer resources and experience. Farmers and rural communities can benefit from three types of training currently being run:

* technical training, such as livestock management, fertiliser use, or water pump maintenance appropriate technology. Groups providing training include IMLT and the NAU's Agrifutura. The Rural Development Centre in Ongwediva, a state-supported training centre provides short-courses in appropriate technology and well and water storage construction.
* training for small-scale business operations, such as farm management, bookkeeping, and administration. The Private Sector Foundation, IMLT and other NGOs run training courses in this field. These are often aimed at the individual entrepreneur.
* training in organisational and co-operative management, such as strategic planning, proposal-writing, budgeting, evaluation, etc. The National Job Creation Service has provided courses to farmers associations in the pre-cooperative stage. The Namibia Development Trust also provides training and financial support to Namibian NGOs and community groups. ACORD, a consortium of European NGOs is training staff of the NNFU and other NGOs in participatory approaches to research and development.

In addition, a number of international volunteer groups are supporting expatriate and local staff working with government staff, the agricultural colleges, and community groups in forestry, horticulture, rural water supply, marketing and other agriculture-related fields. Given the demand for more and improved extension services in the NCAs, non-governmental agricultural staff and trainers can provide an invaluable bridge between extension officials and local communities.
Ultimately, the impact of training is inhibited by several factors. Training is often run ad hoc, providing one-off courses to interested individuals. It needs to be placed into a local and regional context, and efforts should aim to ensure that the skills learned are evaluated and institutionalised. In addition, curriculum used by NGOs varies, and would benefit from evaluation and revision. Moreover, as discussed above, the training takes place in an unfavourable credit environment, which prevents potential entrepreneurs from accessing finance for investment and start-up costs. The Rural Development Centre, for example, has recognised that many course participants fail to generate income from the skills training.

4. CONSTRAINTS AND RECOMMENDATIONS

4.1 Overview

The NDC and NGOs must build their management, accounting and governance systems if they are to make sustainable contributions to agricultural finance, marketing and supply, technology transfer and training. In addition, the institutions need to identify priorities appropriate to their capacity, lest involvement in too many disparate activities diminish their effectiveness. The NDC faces funding constraints, while, in contrast, some NGOs are flush with donor funding, which may hamper their autonomy and grassroots involvement. In general, however, agricultural projects often suffer from high overhead costs, due to the costs of related inputs and services, which may be further increased by subsidising prices. Further, rural communities are not homogenous, and development institutions must navigate a complex sea of economic and political interests. The NDC, for example, has previously worked with farmers with commercial potential, while GRN must consider social equity and increased household food security.

The Ministry would benefit from strengthening its relations with NGOs and from forging a clear-cut working relationship with the NDC. The NDC, for example, remains unclear about national policy objectives and priorities. As was done with the drafting of the National Cooperative Policy, the Ministry should, therefore, involve the NDC, the farmers unions, and appropriate NGOs in steering committees around specific areas of policy formulation and debate (financing and credit, etc.).

Greater coordination is needed between different development agencies, at the national and regional levels. One such example is the Northern Regional Development Committee, which provides a forum for information-sharing and co-ordination among regional ministries and NGOs working in the Owambo region. Ultimately, the Ministry should carefully consider how the resources and experience of parastatals and NGOs can be built into regional agricultural and livestock strategies.

4.2 Rural Credit

The Government recognises the need for credit among small scale farmers in the Northern Regions and considers that the demand for seasonal loans may increase from virtually nothing to over twenty thousand by the year 2 000. At present there are four different government schemes in operation in Namibia:
The Agricultural Bank administers two schemes:

a) Loans to Commercial Farmers

b) Affirmative Action Loans - designed to assist progressive farmers from the communal areas to take up loans in the commercial areas.

Advances to Communal Farmers: this scheme is administered by MAWRD and aims to support extension efforts aimed at overall agricultural intensification. Long, medium and short term loans are available. So far very few farmers have accessed these loans owing to difficulty in providing necessary collateral. The administrative procedures are also cumbersome and place an unreasonable burden on MAWRD which lacks the manpower and expertise needed to deliver the service.

Farmer Support Programmes: NDC administers a small credit scheme which is restricted to less than 50 emerging farmers who have embarked upon mechanised agriculture under the guidance of the Corporation.

It is obvious from the foregoing summary that the existing schemes will be inadequate to meet demand. It is also true to say that the existing institutions: Agricultural Bank, MAWRD and NDC, as presently organised, are unsuited to managing a credit scheme for small scale farmers.

5. CURRENT GRN/MAWRD ACTION PLAN

5.1 National Credit Committee

A National Credit Committee (NCC) has been formed to investigate credit needs. The EC is about to provide technical assistance to MAWRD in support of this initiative. The TA will be seconded to NCC and is required to design an agricultural credit scheme specifically for the communal areas. It is probable that the design will recommend the establishment of a completely new institution which will deliver credit through Agricultural Cooperatives and other regional organisations yet to be identified.

It is not possible to predict when this new credit institution will commence operations, but a target date of June 1995 is postulated. It is recommended that some ADB funds, likely to be made available under the Northern regions Development Programme (NRDP), be committed specifically for credit disbursement by the new institution.

5.2 Agricultural Marketing and Supply Cooperatives

The Division of Cooperative Development (DCD) is a Division of the Directorate of Planning, Marketing Cooperatives and Rural development within MAWRD. Within the last two years DCD has, in consultation with a wide range of players in the cooperative field, succeeded in working out a National Cooperative Policy. The most important objective of the policy is to create an economic, legal and institutional environment which is conducive to the development and growth of all types of cooperative.
The second important achievement of DCD, is that it has written a new "Cooperative Act" which should become law by November 1993. The new act will replace the outmoded Cooperative Ordinance of 1946. As a result the number of legally registered cooperatives in Namibia is expected to rise from the present five, to well over 100.

Within the Northern Region the most advanced cooperative organisation is the Caprivian Likwama Farmer Cooperative Union which began in 1984. It now has 26 Local Associations which are organised in 6 districts. Total membership exceeds 800.

In a region where there is so little indigenous institutional organisation, it is not surprising that Likwama has already attracted considerable financial and technical assistance from the EC and others. However, it still faces many serious constraints, notably a lack of managerial and financial expertise, insufficient turnover to cover recurrent expenditure, let alone generate capital for investment, and competition from GRN which is providing a number of highly subsidised services in the region.

To evolve a more equitable way of working with Likwama, GRN has instructed DCD to convene a Technical Committee comprising all interested parties. The Committee is required to submit recommendations to Cabinet, so that decisions can be taken in good time for the 1994 cropping season. Since Likwama does not yet have the capacity to provide all those services rendered by the GRN, it is probable that the Technical Committee will recommend a phased withdrawal of GRN.

One of the most contentious services currently provided by GRN is the Ploughing Service. Demand for the service is far higher than the effective supply. Given the difficult operating conditions, it is not surprising that the service falls short of expectations. GRN will have to resist the temptation to pass the service to the Likwama Management which is not yet sufficiently developed to absorb such a problematic operation.

A better solution would be for GRN to sell off its fleet of tractors to private entrepreneurs who would be selected from amongst the Local Associations of Likwama. For this action to have the desired effect, GRN would also have to support private enterprise to establish tractor repair services. The economic viability of such services would be assured if they also catered for motor vehicles.

The existence of the Likwama Cooperative Union creates a good opportunity for GRN to evolve a tactical withdrawal strategy which leaves the field clear for private enterprise to operate more efficiently in Caprivi.

Likwama is an obvious target for support under the forthcoming ADB programme. Specifically, Technical Assistance in Accounting/Credit Control and Training would be welcomed by the Union. It is possible that Likwama may succeed in attracting some TA before the ADB programme is effected. However, there are several other spheres of operation where TA would also be useful e.g. management of agro-industry such as grain and oilseed processing.
4.55 The diagnostic survey was unable to obtain conclusive data on herd composition; other workers have also experienced difficulty in obtaining accurate information on herd numbers and composition from household interviews. Unfortunately the data available from other reports are not presented in a standard format, so making regional comparisons difficult. The available data (Table JS5) show a healthy proportion of cows and calves, with a higher proportion of the latter in Kaokoland, although that sample was only four herds. The relatively high proportion of mature oxen reflects the importance of draught animals, except in Kaokoland.

Grazing and water management

4.56 The principal livestock management activity is herding, which is practised during the wet season to protect crops. For the rest of the year the animals are allowed to range free during the daytime, as they return voluntarily to the water points. All stock are normally kraaled at night throughout the year but less rigidly during the dry season. Herding is traditionally the responsibility of the younger men and boys, but school attendance causes a scarcity of herding labour, and has led to changes in herding patterns. In areas where the croplands are of low density, or adequately fenced, many cattle are now left unherded. In some of the remoter areas, herd owners complain that their animals range too far from the homesteads and consequently become lost or stolen. In Ovambo most farmers herd all their livestock together but in Kavango, where the cattle are often herded away from the homestead, the goats are more often herded separately. Where no herding is practised the goats tend to remain closer by than the cattle.

4.57 With the exception of a limited area of fenced ranch developments, mostly in the Mangetti area of Ovambo and Kavango, all grazing land is communal and no individual, village or group grazing rights are recognised. There is no active grazing management, and the seasonal distribution of livestock is inextricably linked with water availability. In the wet season livestock find water widely in ephemeral catchments such as pans and oshanas, but in the dry season are reliant on permanent sources which include hand dug wells, boreholes and the two major rivers. Springs are limited to the Kaoko hills. Dams are few, and limited mainly to Ovambo as the soils are unsuitable in Kavango.

4.58 There are, however, seasonal movements related to water and grazing availability. In Kaokoland the Himba tend to live near temporary water points in the wet season, and move to permanent water (springs, the Cunene river) in the dry season, and thus practise a form of rotational grazing. The Herero are known to be more sedentary and to move only when the local grazing is exhausted.
4.59 In Ovambo many cattle owners move their herds out to dry season grazing areas (cattle posts), due to lack of grazing and lack of water in the homestead area. The main movement is eastwards, even into Kavango, and there is also movement into Angola (Map 10) but there is little movement to the western part of the region, owing to lack of water. There are specific grazing areas surrounding the oshana area that have been traditionally used on a regular basis, for example the Oshimpolo veld (in Angola), the Ombuza flats, the Andoni flats (now largely in the Etosha Game Reserve) and the Omasheke. The large movement eastwards suggests that there is already considerable water development, although water for dry season grazing is still cited by herd owners as a major constraint. Most of the water sources are reportedly hand dug wells, and hence of limited extraction capacity, but there has been some borehole development in eastern Ovambo and more in western Kavango.

4.60 Herd owners commonly group their animals together for the dry season grazing to reduce the herding requirements. The movement principally involves cattle but some farmers send all their livestock. The herds usually move out in about May, after grazing the crop residues, and return in time for ploughing at the start of the next wet season in October/November. The majority of herds return to the same areas year after year but some entire herds are kept permanently at the cattle posts, with only the milk and draught animals returning to the homesteads for the wet season.

4.61 In Kavango there is less pronounced seasonal movement, and what there is occurs in the wet season. Cattle from the densely cropped and settled river zone tend to be grazed inland during the rains to keep them away from the crop lands. During this period they make use of ephemeral water sources although these are scarce in the sandveld. In the dry season the animals return to the river and homestead area. Cattle from inland settlements are also in some instances herded away from the homesteads and croplands during the wet season but, generally, where there are boreholes the animals take water from them all year round. Small stock are seldom grazed far away from the homestead.

4.62 In Caprivi the grazing and watering patterns are thought to be similar to those in Kavango, but the study team has no reliable data.

4.63 At present the rivers, dams and, with the same fenced ranch exceptions mentioned earlier, boreholes are essentially all communally accessible. Hand dug wells are owned and maintained by the people who dug them, but access to other stock owners in times of need is rarely denied. All the communal grazing area dams and boreholes have been provided by government and their maintenance is accepted to be the government's responsibility. There is no community responsibility for meeting any operational or maintenance costs; each borehole with a diesel pump has a pump operator paid by the tribal authority, and the diesel is supplied free of charge by government; the only cost sometimes borne by the beneficiaries is that of transporting
the diesel. Boreholes with handpumps do not have operators but the repairs are effected by government. Many respondents complained about delays in repairing borehole pumps. Each borehole has a single outlet and there is no practice of reticulation to additional water points.

Animal husbandry

4.64 There are no planned breeding seasons but the majority of animals are born during the wet season, from December onwards. Calves and kids are allowed to run with their mothers until naturally weaned, at about one year for cattle and six months for goats and sheep. All surplus males are castrated, during the coolest months of May and June, usually between 12 and 18 months of age. Castration is most commonly by knife for all species but some farmers in Ovambo reported using a Burdizzo for calves and/or elastrator rings for goats. Dehorning is not practised at all. The males kept entire are selected mainly on their own conformation characteristics but some farmers also take into account the production record of the dam. A seasonal calendar showing the main livestock related activities is presented in Table JS7.

4.65 The criteria are less specific for culling of females. Some owners say they get rid of a cow if it has not produced a calf for 3 or 4 years, others say they cull when the teeth are too worn or the owner thinks it will not survive the dry season. In practice no animal is sold or slaughtered until there is a specific cash need. Where possible a farmer will exchange his cull animal with a younger one from a household that intends to slaughter.

4.66 Cattle, and sometimes other stock, are given access to crop residues in the fields after harvest. In Ovambo and sometimes in Kavango, if the fields are nearby farmers harvest some of the crop residues and store them at the homestead. They are fed late in the dry season, primarily to the oxen to build up their condition for the next ploughing season.

4.67 Goats are normally expected to be entirely self sufficient on what they graze and scavenge. Chickens are free range but receive household scraps and are sometimes supplemented with grain residues. Pigs in Ovambo are also free ranging but some in Kavango are kept in small enclosures. All pig owners agree that, unlike chicken pigs must be supplemented for their survival. The number of pigs that can be kept by household is a function of its crop production and food surplus, hence pigs are found in small numbers and are sold off in times of food shortage. Housed pigs must be entirely fed, and the constraints are tighter.

4.68 Cattle and goats are normally kraaied separately. In Kavango, where the manure is not removed from the kraals, the kraal sites are moved periodically and so
stock owners alternate kraal sites during the wet season to let one dry out while the other is being used in order to reduce foot problems. No use is made of old kraal sites for planting of fodder or vegetables, although upon questioning some stock owners said they intended to do so.

4.69 There are few inputs into the livestock production systems; water and grazing are free, and herding is normally performed by a member of the household. The only cash inputs might be for additional labour for herding (although labour is also arranged by means of exchange, or paid in kind) and for animal health treatment. Other inputs include non-cash payments for herding labour, time for collecting and feeding crop residues, and any feed or feed residues fed to pigs and poultry. Returns are seldom realised directly in cash because so few animals are sold. Benefits include improved herd/flock health and productivity, and draught animal performance.

4.70 The diagnostic study was unable to obtain reliable animal (or bird) productivity data, and there do not appear to be any available. NISER has estimated that calving rates in Ovambo are as low as 30%, heifers come late into first calf, calving intervals are long, the cattle grow slowly and oxen mature at over 6 years with slaughter weights of 350 kg, while cows weigh 200-300 kg.

4.71 Most respondents in the diagnostic survey claimed that their cows produced calves nearly every year but the herd composition data in Table JS5 suggest calving rates of about 50% for Ovambo, Kavango and Caprivi, and about 70% for Kaokoland, although the last sample was only four herds and may be an over estimate.

4.72 Respondents also claimed that heifers calve at 3-4 years of age, and that oxen are mature for ploughing at the same age. From the NISER data, it is more likely that 4 is the minimum age for both. Mortalities are highly variable, with no losses in some years and very high losses in others.

4.73 All cattle owning respondents in Ovambo and Kavango said they milk their cattle. Milk is only available in the wet season and is drunk fresh or sour, or made into a type of butter. Goat milk is used sporadically in Ovambo and scarcely in Kavango. Cattle are milked by men while smallstock are more likely to be milked by women. In Kaokoland milk is an important part of the diet, particularly of the Himba people; cattle milk is preferred but smallstock milk is consumed in time of drought or in absence of cattle. There are no data for milk yields in the NCAs but they are known to be low.

4.74 The cattle and smallstock are let out of the kraals somewhere between 8am and 10am. The cattle are allowed to graze until about midday, then brought back in for milking. Thereafter they are let out again to graze until evening. Cows with older calves may be milked again in the evening.
Animal Health

4.75 Animal health is a major constraint to productivity, and for sheep, goats and poultry is of much greater significance than water or nutrition. Annual vaccination campaigns for cattle are conducted by the DVS against the major scheduled diseases Anthrax, Foot and Mouth Disease (FMD), Contagious Bovine Pleuropneumonia (CBPP or lungsickness) and Brucellosis (contagious abortion), according to the known areas of occurrence. Kaokoland is only vaccinated for CBPP, Ovambo for all except Brucellosis, Kavango for CBPP and FMD. East Caprivi is excluded from CBPP but Bovine Pasteurellosis vaccination is included due to large scale mortalities from this disease in the past. There are no routine vaccination programmes for other stock.

4.76 In Ovambo and Kavango the main cattle diseases are CBPP, botulism and blackquarter. Blackquarter causes rapid death but affects only young stock, whereas Botulism is prevalent among all animals in the dry season. Trypanosomiasis is enzootic in Caprivi at a low incidence in the vicinity of the Kwando River. FMD outbreaks are rare. Eradication of lung sickness has not been achieved in Ovambo due to a combination of factors including two-way movement of stock across the Angola border, a vaccination rate of less than 80%, and less than 100% efficacy of the CBPP vaccine. Furthermore, there is no effective treatment for the disease. Eradication of CBPP had been achieved in Kavango but it occurred in 1984 due to the war situation. Botulism could be avoided by calcium/phosphate supplementation but this entails supply logistics and a willingness to spend money on livestock. There is little problem with external parasites or tick borne diseases, although Anaplasmosis and Babesiosis occur in the higher rainfall areas. Dipping of cattle is not recommended by the DVS for any of the northern areas except Caprivi.

4.77 Internal parasites are a significant constraint for most stock, and the overriding health problem of goats (and sheep), but pasteurella and enzootic abortion also occur. Pigs seem to be fairly free of health problems but are liable to have measles owing to their scavenging habits.

4.78 Chickens are prone to a range of diseases with similar symptoms but samples are seldom obtained for laboratory diagnosis. Newcastle Disease can wipe out entire flocks; Coccidiosis and Mareks complex also occur. Vaccination and treatment of poultry is more difficult than with other livestock owing to the large total number of birds widely dispersed in small flocks.

4.79 In Ovambo the diagnostic survey found that anthrax, blackquarter, lungsickness, gall sickness and lameness were stated to be problematic at almost every livestock owning village. In Kavango only lungsickness, lameness and FMD were commonly reported, reflecting the higher disease control status of this region. According
to the DVS, there has only been one outbreak of FMD in the NCAs in the last 24 years, but the local people often mistake lameness for FMD.

4.80 The diseases reported for goats and chickens were similar in both regions and included scab, diarrhoea, itch sickness, gallsickness and plant poisoning. According to the DVS, the diarrhoea is mostly attributable to internal parasites, and the itch sickness is probably caused by a Psoroptes mite. Scab is less common in goats than in sheep and the problem might be mange. The poisonous plant Dichapetalum cymosum is known to occur in the sandy soils of the northern areas. The most widely reported chicken disease was trembling sickness (thought by DVS to be Newcastle disease), followed by swollen eye problems (said by DVS to be symptomatic of several poultry diseases) and external parasites. Pigs were generally reported to be disease free.

Livestock Marketing

4.81 Offtakes of cattle and goats are low, particularly in Ovambo. Livestock are the principal capital assets and food security of rural households and, as such, they are only sold to meet particular cash needs. Small herd owners have little leeway to sell and still maintain a positive herd balance, and there is no clear herd size threshold beyond which an owner can be expected to sell regularly rather than on a need basis.

4.82 Contrary to expectations, the diagnostic study did not find among farmers a general preference to sell goats rather than cattle to meet their cash needs. In fact many respondents said they prefer to keep their goats for home consumption and would only sell any if specifically requested to. The principal cash requirements necessitating animal sales were stated to be school fees, clothes, food and medical bills.

4.83 Prior to independence the northern abattoirs were operated by FNDC, and a price differential existed between the north and south of the cordon fence, with lower prices prevailing in the north. In February 1992 Meatco took over from FNDC all meat marketing activities in the NCAs including the operation of the three abattoirs at Katima Mulilo in Caprivi, Rundu in Kavango and Oshakati in Ovambo. Prices paid in the north are now the national ones, aligned to the South African market and adjusted on a weekly basis. In addition, since April 1992, the government has been paying a bonus of R120 per head for mature cattle as an incentive to sell during the current drought. North of the cordon fence all cattle with at least 6 teeth (2 1/2 - 3 years old) qualify for the subsidy but in the southern communal areas it is understood to apply only to mature females.

4.84 All meat in the northern areas is currently canned at Oshakati, but Meatco is building a quarantine camp at Mangetti. When this is operational meat from animals that have been quarantined for 3 weeks immediately prior to slaughter, and which has been kept in cold storage for a further 3 weeks after slaughter, will be eligible for transportation south of the cordon fence.
4.85 The Oshakati abattoir has a slaughter capacity of 120 head per day but seldom slaughters more than 40, including those coming from outside Ovambo. From March to July 1992 Meatco slaughtered 1,106 cattle from Kaokoland and 2,079 from Ovambo and Caprivi, but a significant number of those purchased at Oshakati are believed to come from Angola. The Ovambo offtake, excluding local slaughter, is probably not much more than 2% per annum. The Meatco manager gave the following reasons for the extremely low Ovambo offtake:

- no decentralisation of buying points; apart from the Mangetti buying point, stock are purchased only at the abattoir (Meatco has plans to develop buying points).
- bush market prices are higher than Meatco prices
- farmers do not understand or trust the grading system and price fluctuations
- it is not in Ovambo tradition to sell livestock.

4.86 The Caprivi abattoir is currently closed for upgrading, and all slaughter stock are being trucked to Oshakati (because the Rundu abattoir is too small), a distance of approximately 1,000 km, which costs R5,000 per journey for 32 head of cattle.

4.87 In Kavango the offtake is a little higher than in Ovambo, probably in the region of 3% to 3.5%. Meatco slaughtered 1,107 head from March to July 1992; averaging 187 kg CDW they realised a mean net price of R3.91 per kg and R731.63 per head, but these figures include some pre-subsidy prices. The figures for July were 397 cattle slaughtered at an average carcase weight of 169 kg, realising an average price (with subsidy) of R4.05 per kg and R684 per head. The manager said that Meatco has about 12 buying points in the Kavango region, and buys 2-3 times a week from different points.

4.88 Despite the unprecedented high price there appears to be a poor sale response from the communal areas, particularly in Ovambo. The manager said he believes that the bush market price is still competitive with current Meatco prices including the subsidy, and that ten animals are sold in the bush market for every one that reaches a Meatco abattoir. The vast majority of those slaughtered since Meatco took over have been 8 tooth animals which graded C2 to C4, and would not have been acceptable to the prime beef export market. The average killing out percentage at the Rundu abattoir is only 43%, which is very low compared to the 50% plus averaged in the commercial areas. Slaughter data from earlier (FNDC) years were unavailable for comparison.
4.89 The subsistence farmers rarely sell a live animal except when they have a major cash need or there is insufficient local demand for meat to dispose of a slaughtered one. They prefer to slaughter within the village, sell what they need to meet their cash requirements, exchange some of the meat for millet or other commodities, and keep some for home consumption. In Ovambo the diagnostic study determined that returns of between R800 and R1,000 are realised for an animal of 350kg liveweight that would fetch only R600 at Meatco prices, and the same holds true for Kavango.

4.90 In addition to the bush markets there is an active urban and peri-urban market. For example, the diagnostic study found about 20 livestock traders at the Upindi market (Oshakati), where about 10 animals are slaughtered daily. The traders buy animals from market areas along the Angolan border at prices between R700 and R1200, hire local people to walk them to Oshakati where they are slaughtered, then sell the meat to local retailers or butchers at a profit of about R120 per head. Interestingly, the diagnostic study determined that the price paid by these peri-urban meat retailers is also higher than that paid by Meatco, and so it would be to their advantage to buy carcases from Meatco rather than from the traders. However, in the present system the retailers are given short term credit by the traders, and payment is made only after the retailers have sold to the butchers. Meatco does not provide credit.

4.91 The informal sector of livestock marketing appears to satisfy the majority of smallholder stock owners’ requirements, and the diagnostic study found no indication of a more commercial attitude to livestock ownership among the larger fenced ranch operators in Kavango. For example, one farmer interviewed close to the Mangetti block, who had 160 cattle and 40 goats in addition to growing millet and cotton, said he normally expected to sell 2-3 head per year to meet cash needs, but had sold more in 1991/92 because of the drought; it transpired that he had sold 6 old cows, 10 2-3 year oxen and 2 bulls (all for slaughter) to meet drought needs and wages and the demands of an extended family totalling 26 people. However he had sold no animals at all in 1990/91, and had had no intention of selling any more in 1992/93. Less than 8% of the total cattle population in Kavango is in herds larger than 100 head (Table J34), and the figure is probably lower for Ovambo.

4.92 There is thus little evidence there would be a positive cattle sale response if the NCAs were opened to the South African or EEC markets. The drought situation is undoubtedly stimulating sales at present (to buy food) but there is likely to be a fall off when the rains come, irrespective of the planned removal of the subsidy.

4.93 Meatco abattoirs do not handle smallstock but there is a small factory for slaughtering sheep, goats and pigs in Oshakati. The throughput is about 200-300 sheep and goats per year, many of these from Kaokoland. Goats, pigs and chickens are rarely sold outside the home village, although there is considerable peri-urban demand and people from the urban areas do sometimes go into the villages to purchase goats. In
Oshakati the local butchers are mainly supplied by Kaokoland goats, which are considerably larger and command a higher price (R170 - R190) than the Ovambo ones (about R120). The price of goat meat is higher than that of cattle purposes.

Translocation of the Cordon Fence

4.94 The "red line" cordon fence has been widely cited as the principal cause of low cattle off-takes from the NCAs, by denying access to the high price markets of South Africa and the EEC. There have been a number of different proposals for its removal or relocation, including moving it in stages to the national border and restocking the NCAs with "clean" animals from the south. The idea of restocking has now been abandoned as impractical.

4.95 The current DVS proposals\(^1\) include fencing the Angola border between the Cunene and Kavango rivers and establishing a buffer zone at least 50 km deep along the "high risk" borders of Ovambo and Kavango (Kaokoland is considered low risk for FMD). The present cordon fence line would remain in place, or be moved forward in stages, until the areas between the present line and the new buffer zone are certified free of FMD and CBPP. Animals from CBPP endemic areas would only be allowed to cross the cordon fence after a quarantine period, and only to approved abattoirs. Animals within the buffer zone would thus never be eligible for the export markets.

4.96 The line of the present cordon fence and the proposed buffer zone are shown in Map 3. Caprivi is within the buffer zone and therefore remains excluded from the export market. The DVS in Kavango estimates that only 10% of the Kavango cattle population would lie outside the buffer zone and be eligible for export. In Ovambo the proportion would not be more than 30%. As explained earlier, there is no longer a price differential between the north and the south of Namibia, and there does not appear to be a market constraint in the NCAs. The diagnostic survey found almost no antipathy among farmers to the present cordon fence, and there is no doubt at all that the alternative buffer fence would be far more disruptive to their lifestyles and to their livestock movements. It should be noted that any northward relocation of the present fence would divide the northern regions of Kaokoland, Ovambo and Kavango. Thus the results of the diagnostic survey do not support the proposal to relocate the cordon fence.

Other productive activities and off-farm income

4.97 During the flood period (January to March) of the Ovambo oshanas, fishing becomes a food contributory activity of those living in the Cuvelai area. The floods are

\(^1\) DVS memo V13/1/B of 12th February 1992
erratic and the fishing opportunistic, but fish can constitute the major source of dietary protein to non-stock owning households during this period. In the shallow waters of the oshanas the fishing is mainly by performed by young boys using spears.

4.98 Fishing is also a major source of dietary protein for those households living close to the rivers in Kavango and Caprivi. Various methods are used to catch fish, including lines, nets and traps. The nets seen by the survey mission were of such fine mesh that there must be a danger of depleting the fish stocks. Unlike Ovambo, where fish are caught at the height of the rains, fishing in Kavango does not take place when the river is high, and is thus more of a dry season activity. Both men and women are involved in fishing, although there seems to be variation from village to village in the preferred times of year, the methods used, and the household members involved. The variations are linked to the depth and turbulence of the river, and the proximity of the household to the river.

4.99 The gathering of wild fruits is of particular importance to poorer households when faced with a food deficit from their crop lands. Hunting and gathering plays a more important role in the subsistence of the Bushman population, particularly in Kavango and Caprivi.

4.100 Pensions are probably the single most important source of off-farm income, outweighing remittances from employment. Men and women become eligible at the age of 60 for state pensions of R120 per month (R1,440 per year), paid in alternate months. In Ovambo twelve of the interviewed households (35%) obtained income from at least one pension, and only four households enjoyed incomes of over R1200 from migrant labour. Nevertheless, real income from migrant labour may have been understated as remittances often consist of food, clothing and other commodities rather than cash.

4.101 In Kavango, 6 out of 20 inventoried households (30%) had at least one household member receiving a pension, a level similar to that in Ovambo. Among the households surveyed in Kavango, local off-farm employment in government service was found to be the principal source of income, but this finding was influenced by the fact that one of the villages where household interviews were conducted had a hospital and secondary school, both of which provided job opportunities that were exceptional in comparison with other villages.

4.102 Since the departure of the South African forces and, latterly, the United Nations forces there has been a marked drop in the potential for off-farm employment within the northern regions. However there is substantially more urban development in Ovambo than Kavango, and hence more potential for non-farming income earning activities. Secondary schools and hospitals provide work for some members of the population in the areas they are located. However, off-farm employment is generally difficult to find and the level of remittances determined by the diagnostic survey was less
than expected from other reports; only 4 out of 34 households interviewed in Ovambo had significant remittances.

4.103 The production of beer, other forms of alcohol, and household requirements such as granary baskets provides modest income for some households. In Kavango there is a small woodcarving industry but few, if any, rural households benefit from it. Within village communities, members of poor households find opportunities to assist less poor households with such tasks as herding, weeding, building huts and gathering wood in return for food or loan of draught power or, occasionally, cash.

4.104 A large number of small shops (cuca shops) developed, particularly in Ovambo, in response to the presence of the armed forces, and their business has suffered badly since the forces' withdrawal.

Labour allocation

4.105 The labour priority is generally toward crop production activities, except for those who have off-farm employment. The majority of the manual labour tasks fall to women, however the diagnostic study observed that the women were also more involved than men in both the brewing and consumption of alcoholic beverages, particularly in Kavango.

4.106 Daily tasks of women and girls include fetching water and firewood (both of which can be time consuming), processing and pounding millet, child care, cooking and housekeeping. Seasonal tasks include planting, weeding, harvesting, threshing and cutting thatch grass. After the harvest there is time to relax, brew alcohol, and make baskets and clay pots.

4.107 In livestock owning households men and boys are primarily occupied by the livestock related activities of herding, watering and milking, and are responsible for ploughing, whether by hand or with draught animals. Otherwise they assist with weeding, harvesting and threshing. In the dry season the men and boys are traditionally at the cattlepost. Men’s dry season tasks also include digging and repairing wells, building/repairing houses and fences, and cutting the necessary wood for these jobs. The large grain storage baskets are normally made by men. Boys, and sometimes girls, make clay bricks during the dry season.

4.108 In small households there is less distinction between traditional male/female responsibilities, and most of the production activity tasks are shared. The children are normally assigned the task of collecting the fallen fruits and nuts of *mangetti* and *nsivi*, while the women collect the wild spinach and bush cabbage (*mutete*). As mentioned
earlier, the majority of children between the ages of 6 and 18-20 attend school, so depleting the traditional labour force.

4.109 The seasonal distribution of labour for typical household and production activities is shown in Tables JS5 and JS6.

Crop models and farm budgets

4.110 Indicative crop models and farm budgets for millet, sorghum and cowpea are included in Appendix 3 (tables 1.1 and 1.2). The models are based on the use of minimum inputs, namely seed and hiring of oxen, and on expected yields in an average season. No distinction is made between the greater reliability of yields in Kavango compared to Ovambo. A constant value is placed on crop residues which, although having value in intensively settled Ovambo, have generally less value in Kavango. Returns to labour for millet, sorghum and cowpea are shown as (R/day) 3.96, 3.38 and 4.18 respectively.

4.111 Farm models based on the farm typologies described in Chapter 5 are presented in Appendix 3 (tables 2.1 and 2.2). The area of crops and net value of crop production for each of the Models A, B, C and D are 1.5 ha (R436), 2.5 ha (R728), 3.0 ha (R866) and 5.0 ha (R1456) respectively. Total net values (of crops and livestock) are shown as R436, R826, R1066 and R3556 respectively.

Constraints Analysis

Livestock related constraints and possibilities

4.112 The principal livestock production constraints are water, nutrition and disease. For grazing livestock (cattle and goats) the factors of water and nutrition are usually inter-related, and there are large areas of good rangeland which are under-utilised owing to water constraints; however there are other areas near to permanent water where the range has been degraded by overgrazing. There is also a constraint of labour for herding during the wet season to prevent crop damage.

4.113 The main diseases of cattle are lung sickness (CBPP), botulism and blackquarter. Cattle are routinely vaccinated against CBPP and FMD but not more than 80% of animals are covered (lower in Ovambo), the CBPP vaccine is not 100% effective, and there is no treatment for the disease. Botulism could be avoided by calcium/phosphate supplementation but this entails supply logistics and a willingness to spend money on livestock. Internal parasites are also a significant constraint but there is little problem with external parasites or tick borne diseases, except in Caprivi. The
overriding health problem of goats (and sheep) is internal parasites, but pasteurella and \[\text{enzootic abortion also occur.}\]

4.114 The main production constraint of pigs is nutrition. Free ranging pigs can forage much of their requirements but do need supplementation, and their scavenging leads to a high risk of measles. Housed pigs are free of measles but have to be fed throughout the year, and are in competition for human food resources.

4.115 With chickens the main constraint is disease. Vaccination and treatment is more difficult than with other livestock owing to the large total number in conjunction with wide dispersion in small flocks.

4.116 The informal sector of livestock marketing appears to satisfy the majority of stock owners' requirements. The constraint in the formal sector is less one of inadequate infrastructure than one of supply, however a need for more buying points and better market information has been identified. There is little evidence that owners of fenced ranches in the NCAs manage their livestock more commercially than subsistence farmers. Since introduction of a uniform pricing policy throughout the country, the "red line" cordon fence can no longer be stated to reduce market opportunities for the NCAs.

4.117 The main livestock related constraints and possibilities are summarized in the table below.

<table>
<thead>
<tr>
<th>CONSTRAINTS</th>
<th>POSSIBILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition</td>
<td>open up new grazing (water development)</td>
</tr>
<tr>
<td></td>
<td>grazing management &amp; improvement</td>
</tr>
<tr>
<td></td>
<td>improve quality &amp; utilisation of crop residues</td>
</tr>
<tr>
<td></td>
<td>fodder banks, legume introduction</td>
</tr>
<tr>
<td></td>
<td>increase crop production</td>
</tr>
<tr>
<td></td>
<td>feed supplements, compound feeds</td>
</tr>
<tr>
<td>Water</td>
<td>dams in pans and oshanas</td>
</tr>
<tr>
<td></td>
<td>new wells and boreholes</td>
</tr>
<tr>
<td></td>
<td>reticulation from existing boreholes</td>
</tr>
<tr>
<td>Health</td>
<td>support to DVS</td>
</tr>
<tr>
<td></td>
<td>build vaccination crushes</td>
</tr>
<tr>
<td></td>
<td>training and extension</td>
</tr>
<tr>
<td></td>
<td>improve availability of drugs</td>
</tr>
<tr>
<td></td>
<td>calcium/phosphate supplementation (against botulism)</td>
</tr>
<tr>
<td>Herding</td>
<td>live fencing - fencing croplands</td>
</tr>
<tr>
<td></td>
<td>- drift fences</td>
</tr>
</tbody>
</table>

56
5. HOUSEHOLD TYPOLOGY, CONSTRAINTS AND OPPORTUNITIES

Socio-Economic Differentiation between Households

5.1 The main goal of Ovambo and Kavango rural households is food self-sufficiency. Self-sufficiency has to be obtained through crop production and depends primarily on the area of cultivated land, which in turn depends on capacity to perform land preparation, i.e., access to draught power. Thus, cultivated area, access to draught power and labour availability are criteria to be used for a household typology. The second priority for rural households is income generation for the purchase of bare necessities that cannot be home produced: foodstuffs such as salt and cooking oil, clothes and school uniforms for children. Cash is also essential for school fees, medical costs and transport. The third priority for rural households is building up reserves to be used in times of need, particularly years of crop failure. The ability to build up such a reserve, mostly in the form of cattle and sometimes in the form of cash or off-farm activity (mainly cucashops), is therefore another key element in typefying households.

5.2 Other household characteristics, namely resource endowment, production systems, food self-sufficiency, savings and survival strategies are to a major extent determined by the above mentioned indicators. The choice of crops, cultivating practices and input use, access to crop land (the limiting factor is not the quantity of land available but the ability to work it), and farmer’s objectives and strategies (the objectives are similar, the differentiation is encountered in the ability to achieve them) are governed by these factors.

The following household typology for Ovambo and Kavango can be elaborated:

Model A: Poorest Households

- Estimated proportion of rural households: 25-30%
- Economic mainstay: crop production (millet) and gathering.
- Small cropland/cultivated area (1-1.5 ha), land preparation by hand, usually no or very limited access to oxen for land preparation.
- Livestock: no cattle, goats or pigs, a few chickens.
- Limited household labour does not permit cultivating larger areas.
- Includes a significant proportion of female headed households: divorcees or (young) widows.
Not enough food production to attain food self-sufficiency for longer than six to eight months a year, even with a good harvest.

Income in Ovambo almost exclusively from sale of (processed) gathered products; in Kavango also work on crop land of other (Model C and D) households. Cash income less than R 600 a year.

Diet: millet (in drink or in porridge), maize meal, gathered products, particularly "bush cabbage" (evama in Ovambo, mutete in Kavango), pumpkins, melons. Some beans, occasionally maize, consumed green. Meat less than once a month. On occasion may consume or sell a chicken and consume fish (in central Ovambo from the oshanas in the rainy season, in Kavango from the river). Protein deficiencies and in poor crop years carbohydrate deficiencies are likely.

Expenditure: on food (maize meal, salt, cooking oil), school fees, very little on clothing except for occasional school uniform.

Survival/production strategy: attempt to provide as much as possible in food needs, particularly millet, from own cropland. Deficit is alleviated through gathering and purchase of maize meal with proceeds from sale of processed gathered products. Particularly in Kavango, household members may work for somewhat better-off households (Models C and D) and be paid in cash or kind. Also participation in group work without labour exchange, i.e. only remuneration is food and drink given by organizing household. Some food aid from better-off relatives.

Causes of poverty: loss of livestock through drought, disease, war or, in case of divorced women or widows, claim by husband or family. No or weak relations with better-off households, therefore no access to draught power. Lack of access to draught power and in some cases lack of labour limits possibilities for food production. Limited productive capacity results in incapacity to employ non-household labour: lack of food does not permit organizing group work as participants cannot be given the expected food and drink. No access to sources of significant off-farm income, no capacity for accumulation.

Perceived problems and priorities: lack of food security, lack of food and income to buy barest necessities. Gaining access to ploughing services, either by ownership of oxen or obtaining income to pay for services is perceived as a possible solution, particularly in Kavango.
Opportunities: Improved crop cultivation practices and possibly introduction of new crops could raise production and create surpluses to be used for sale and animal feed, particularly for chickens and pigs. Proximity to boreholes or dams might permit small scale irrigation for high value crops, particularly vegetable and adapted tree crops. Making oxen (or possibly donkeys) available would permit increase in cultivated area. Increased cropping areas may result in labour shortages for weeding, hence labour saving measures for weeding should be analyzed.
Model B: Poor Households

- Estimated proportion of rural households: 30-40%

- Economic mainstay: crop production (millet), gathering, additional income from pensions or small scale economic activity.

- Intermediate size cropland/cultivated area of between 1,5 and 3 ha; land preparation at least partly by oxen

- Livestock: no or a few heads (less than five) of cattle, may or may not have goats, up to ten chickens

- Labour: household labour somewhat more ample than Model A households, however, not sufficient for cultivating larger areas. Better able to organize groupwork, thus at least alleviating labour constraints in peak periods.

- Includes households with elderly person receiving state pension

- Only in very good year is self sufficiency in millet obtained, normally self sufficient for 8 to 10 months.

- Cash income from pensions, minor remittances from temporarily employed young household members, gifts from relatives. Also sale of (processed) gathered products and work on other farms for cash or kind (mainly in Kavango). Cash income between R 600 and R 2000 a year.

- Diet: millet (in drink or in porridge), maize meal, gathered products, particularly "bush cabbage". Some beans, green maize, ground nuts, bambara nuts, pumpkins, melons. Meat once or twice a month. On occasion consumption of a chicken and fish. Protein deficiency and in very poor crop years carbohydrate deficiencies are likely, depending on family size.

- Expenditure: on production: ploughing, group work. Consumptive: food (maize meal, salt, cooking oil, very occasionally meat), school fees, clothing, school uniforms, occasionally bottled drinks, tobacco.

- Survival strategy: cash income is essential to obtain ploughing services and food. In some instances, food is received from better-off...
relatives. In some cases household may have small cash savings for emergencies.

- Causes of relative poverty: loss of livestock through drought, disease, war, need to sell livestock to satisfy household needs after consecutive cropfailures. Limited possibilities for obtaining off-farm income, little or no capacity for accumulation.

- Perceived problems and priorities: lack of food security, lack of food and income, lack of reserve. Fixed employment is perceived as a possible solution.

- Opportunities: Similar to those of Model A: Improved crop cultivation practices to raise production for sale and use as animal feed (chickens and pigs). Where possible, small scale irrigation for high value vegetable and tree crop production. Improving access to oxen or donkeys would permit expansion of cultivated land.

**Model C: Less Poor Households**

- Estimated proportion of rural population: 15-20%

- Economic mainstay: crop production (millet), livestock, in some cases additional income from pensions, wage earning and/or trade.

- Somewhat larger cropland/cultivated area of between 3 and 6 ha; land preparation with own oxen

- Livestock: herds of cattle between 5 and 20 head, including oxen. Frequently also goats and a few pigs, and between 10 and 20 chickens.

- Variable supply of household labour: sometimes large households with cattle, in other cases shortage of labour because of off-farm work of men. However, in latter case the household has the capacity to contract labourers (for cash, kind or in exchange for ploughing services) and/or organize group work. In both cases, access to labour permits cultivating larger areas than first two Models.

- Includes households with head having steady employment.

- Cash income mainly from occasional homeslaughter of cattle and local sale of meat, off farm work, pensions, cuca shops.
In normal years enough food production to attain sufficiency, although millet may be mixed with maize, harvest is used for participants in group work and gifts, between R 2000 and R 5000 a year.

Diet: millet (porridge), maize meal, milk (in rainy season), products such as "bush cabbage", beans, green maize, bambara nuts, pumpkins, melons. Meat a few times occasion chicken or pig meat, and fish (when and when)

Expenditure: on production: paid labour on crops and herding, expenses for group work and on occasion, cattle; on food (maize meal, meat, fish), school fees and clothing, transport, bottled drinks, canned food, tobacco

Survival/production strategy: obtain food security, generate production costs and purchase of consumer goods, emergency fund / savings account in the form of a hoard, Diversification into cuca shops. Accumulation of ownership, investment in cuca shops; in some cases

Reasons for lesser poverty: lesser or no livestock losses, regular income from present or past regular off-farm

Perceived problems and priorities: drought affects crops thus self-sustainability, lack of grazing, lack of water, particularly for those who take cattle out to cattle poles; problems with cattle and goats (in Ovambo).

Opportunities: this group would also benefit from the of crop production. Successful development for Model might limit access to paid labour, hence labour (mechanical weeding) important. Improved crop could create surplusses to be used for sale and animal chickens and pigs. An effective animal health care can reduce losses of cattle to disease. Water development undeveloped grazing areas would increase grazing

1/ Labour-saving devices applied by Model C and D farmers would enable the poor to obtain off-farm income (in cash or kind), essential in reducing their dependency on such labour by aiming agriculture efforts specifically at Model A and B households.
thus allow herd increase (however, successful development could reduce cfftake as needs can be met in other ways than selling cattle).

Model D. Households with Medium Sized Herds

- Estimated proportion of rural households: 10-20% (but large intra-regional variations: in central Ovambo and Kavango less than 10%, in western Ovambo up to 30% and in eastern Ovambo up to 70%).

- This group is practically identical to that represented by Model C: production systems, income, expenditure, survival and production strategies, and perceived problems and priorities are similar. The differentiating trait is herd size: Model D owns larger herds, from 20 to 50 and up to 100 head. This implies a much larger resource base than the first three models and consequently, increased food security, accumulation and investment capacity. This model household would, through the offtake of cattle, be able to generate resources for productive investments in, for example, agriculture. However, in practice this Model household views livestock in the same manner as Model C, i.e. as a savings account to be drawn upon only when cash is urgently needed.

- Perceived problems and priorities: similar to Model C, but with an even greater interest in cattle post development and greater benefits to be obtained from improved animal health care.

- Opportunities: similar to those of Model C. This model household is likely to benefit most from water development at cattle posts and improved veterinary care.

Wealthy rural households

5.3 This group constitutes of no more than 1 to 2 percent of the total of rural households. These households have significant off-farm income and/or means of production such as tractors, pick up trucks, stores. Often, a combination of ways to generate income is encountered. Included are government professional personnel with salaries over R1000 a month, i.e. headmasters and possibly teachers of secondary schools, higher level health care personnel, etc. Households of traditional leaders (chiefs, kings) can also be assumed to fall into this category. Income anywhere from R5000 up to R50000 a year, though households with very high incomes are likely to settle in towns rather than remain in the countryside. This group would fall outside the target group of any development effort.
Landless households

5.4 There are as yet no significant numbers of openly landless households in the rural areas of either Ovambo or Kavango. Nevertheless, two quite different Models of landless households should be identified. The first consists of small groups of Bushmen households in Kavango and eastern Ovambo who gain some income - sometimes in cash, usually in kind - from work on cropland and herding. Their mainstay, however, is probably still hunting and gathering, particularly in the dry season. 1/

5.5 The second group of households without crop land is "hidden" within households with crop land. It concerns young couples in densely populated areas where no more cropland is available. Particularly in Ovambo, lack of land may force young people to postpone setting up their own household with their own cropland. In Ovambo, this may be compounded by the fact that the man and/or his family have to pay a dowry (lobola). Thus, instead of setting up their own household adult young men may have to opt for remaining at home and helping out their parents. In the past they could have tried to obtain jobs in the urban areas, but opportunity there has decreased.

5.6 In Kavango, where there is no dowry tradition, a young couple may get married and move in with the girl’s household. It is then possible that they work their own field or alternatively, that the extra labour is used to expand the existing cropland. In the latter case two - or more - households not only live in the same compound but also work the same cropland.

5.7 Particularly in central Ovambo, the pressure on cropland may grow to such an extent that young people will be forced to move out. Adequate land and water from boreholes would be available in eastern Ovambo and inland Kavango. However, what keeps young couples from settling in these zones is the loss of security and family support, particularly with regard to essential inputs such as oxen, ploughing implements, labour (much labour is needed for clearing land while the presence of young children implies a high dependency ratio), cattle for manure and milk, and food reserves. In addition, the unsettled areas do not offer services such as schools and clinics. Nevertheless in the near future young couples may be forced to leave for these areas as the pressure on available resources, particularly the crop land of their parents, increases.

1/ As for the reasons why Bushmen do not grow crops or livestock, Ovambo and Kavango informants asserted that Bushmen lack the skills and interest to do so. In an interview with a small group of Bushmen this point of view was more or less confirmed, as two of the three interviewed Bushmen stated not to be interested in obtaining crop land because they did not know how to cultivate it. The third informant said he was considering asking the local headman for cropland, which he would like to plough with oxen. When asked if he was prepared to prepare the land by hand if he would not be able to obtain oxen he stated that that would be too much work.
5.8 The following table provides an overview of the characteristics of the four principal types of households.

<table>
<thead>
<tr>
<th>Model/Characteristics</th>
<th>Model A: Very poor</th>
<th>Model B: Poor</th>
<th>Model C: Less poor</th>
<th>Model D: Medium size cattle owning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated proportion of population</td>
<td>25-30%</td>
<td>30-40%</td>
<td>15 - 20%</td>
<td>10 - 20% *</td>
</tr>
<tr>
<td>Economic mainstay</td>
<td>Crop production</td>
<td>Crop production</td>
<td>Crop production, livestock</td>
<td>Crop production, livestock</td>
</tr>
<tr>
<td>Cropland size</td>
<td>1 - 1,5 ha</td>
<td>1,5 - 3 ha</td>
<td>3 - 6 ha</td>
<td>3 - 5 ha</td>
</tr>
<tr>
<td>Cattle ownership</td>
<td>None</td>
<td>0 - 5</td>
<td>6 - 20</td>
<td>&gt; 20</td>
</tr>
<tr>
<td>Goat ownership</td>
<td>None</td>
<td>0 - 10</td>
<td>11 - 20</td>
<td>&gt; 20</td>
</tr>
<tr>
<td>Household composition</td>
<td>Often female headed</td>
<td>Headed by pensioners, young married men</td>
<td>Usually male headed, middle aged, with grown up sons or daughters living in</td>
<td>See Model C</td>
</tr>
<tr>
<td>Labour supply</td>
<td>Lack of adult male labour. No hired labour or group exchange</td>
<td>Limited, but more ample than Model A. Organizes group work</td>
<td>Ample: if not from household hired or group work</td>
<td>See Model C</td>
</tr>
<tr>
<td>Main sources of cash income</td>
<td>Sale of gathered and processed products</td>
<td>Pensions, minor remittances, sale of gathered and processed products</td>
<td>Steady off-farm work of men, sale of cattle, oca shops, pensions</td>
<td>See Model C, but sale of cattle more important</td>
</tr>
<tr>
<td>Food sufficiency (average to good year)</td>
<td>Selfsufficient for 6 to 8 months</td>
<td>Selfsufficient for 8 to 12 months</td>
<td>Selfsufficient, small surplus</td>
<td>See Model C</td>
</tr>
<tr>
<td>Survival strategy (apart from crop cultivation)</td>
<td>Gathering, labour on cropland of others for cash or kind</td>
<td>Dependent on off-farm income such as pensions, gathering, working on other farms</td>
<td>Livestock is main security, also regular off farm income, pensions</td>
<td>Livestock is main security</td>
</tr>
</tbody>
</table>

*Central Ovambo, Kavango: less than 10%*

**Causes of Poverty and Socio-Economic Differentiation**

The causes for poverty and socio-economic differentiation are lack of access to draught power and lack of reserves to be used in times of need, namely livestock ownership and/or sources of significant off-farm income from regular employment and/or pensions. Female headed households - widows and divorcees - are in the worst predicament, as a result of not having livestock and therefore draught power. Usually
these households also face a shortage of male labour. Hence they are unable to produce enough for subsistence, let alone establish reserves or produce surpluses for sale or small livestock feed.

5.10 With regard to poverty villages can be differentiated on the basis of the prevalence of livestock ownership and possibilities for off-farm employment. The reasons for significant differentiation between villages are likely to be the incidence of disease and the availability of adequate grazing. In densely populated areas losses of cattle to drought and disease attacks may have affected cattle populations more than in sparsely populated areas such as eastern Ovambo. It is not quite clear why Kavango has such a high proportion of stockless households.

5.11 Another important element in village differentiation is that of the presence of government services such as secondary schools or clinics. These provide employment and thus off-farm income to particularly male villagers. A somewhat more developed local economy is often reflected in the presence of non-traditional housing and small stores.

Perceived Problems Constraints and Opportunities

5.12 At village level, the principal needs were perceived to be water, clinics, food aid and schools. (Since in almost every village there is a school either in the village or close by, the need refers to either infrastructure, i.e. school buildings, or to the inclusion of higher grade teaching in already existing schools). In Ovambo water for both human and livestock consumption was considered a major constraint. In Kavango water is obtained mostly from the river or from boreholes but the need for water development for cattle on the river zone grazing land was indicated. Since the wet season grazing areas are situated south of the crop land the cattle frequently has to be taken through the cropland (and homestead area) to the river, and back. Electricity was considered a need only in some of the relatively better-off Ovambo villages, while in several inland Kavango villages the need for shops to buy household essentials was indicated (Table 2).

5.13 Problem assessment among the interviewed households was strongly influenced by the drought related crop failure in 1992: lack of food was mentioned by 71% (n=49) as the main problem. Lack of income and the obviously related problem of unemployment were mentioned 26 times, while lack of water was indicated as a major problem by 8 Ovambo households (26%, n=31) (Table 34). Solutions were perceived to be providing employment, government assistance in general terms, food aid and, in Kavango, government assistance in providing crop areas (Table 35).

5.14 With regard to crops, drought and insects were the most frequently mentioned problems in Ovambo, by 42% and 45% of respondents (n=31). Kavango households mentioned bird damage, lack of draught power, poor quality seed and lack of labour 9Table 30). The use of insecticides ("medecine" or "poison") was mentioned as
a solution for insect problems, while in Kavango government assistance in providing draught power was suggested for the ploughing constraint (Table 32).

5.15 Livestock problems centered around L/S diseases (of cattle and goats), lack of grazing and lack of water. In Kavango, the labour involved in herding cattle (in the wet season) was also mentioned as a constraint (Table 33). Suggested solutions included veterinary assistance, the development of new grazing areas and in Kavango, fencing of grazing land.\(^{1}\)

5.16 The perceived problems and their causes, the models they pertain to, priority needs and possible opportunities for intervention are summarized in the following table.

---

\(^{1}\) In two Kavango villages the colonial Ministry of Agriculture had experimented with fencing in grazing land in the early eighties, with the apparent purpose of introducing rotational grazing. The village population liked the idea particularly since it obviated the need for herding, thus freeing labour and/or allowing school age boys to go to school. The advantage of grazing management through rotation was also recognized. Unfortunately in one village the fence was destructed by elephants, while in the other a major problem was that because of lack of water cattle still had to be herded to and from the river.
<table>
<thead>
<tr>
<th>Perceived problems</th>
<th>Priorities</th>
<th>Model</th>
<th>Causes</th>
<th>Possible solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of food</td>
<td>Food security</td>
<td>A,B,C,D</td>
<td>-Crop failure as a result of drought&lt;br&gt;-Low soil fertility&lt;br&gt;-Unfavourable agroecological conditions&lt;br&gt;-Limited yield potential indigenous varieties&lt;br&gt;-Ploughing constraint (Model A and B)&lt;br&gt;-Lack of income</td>
<td>-Improve agricultural productivity through:&lt;br&gt;-Improved seed&lt;br&gt;-Chemical fertilizers&lt;br&gt;-Increased use of farm yard manure&lt;br&gt;-Crop rotation&lt;br&gt;-Improve access to draught power (Model A and B)&lt;br&gt;-Surplus production for storage, sale and small livestock feed</td>
</tr>
<tr>
<td>Lack of income</td>
<td>Income generation for buying food, basic expenditure and building up reserve fund</td>
<td>A, B, to a lesser extent C</td>
<td>-Lack of income generating activities&lt;br&gt;-Low crop production</td>
<td>Small livestock production.&lt;br&gt;-Small scale irrigation projects near boreholes, dams&lt;br&gt;-Off-farm employment</td>
</tr>
<tr>
<td>Land preparation constraint reduces crop area and food self-sufficiency</td>
<td>Gain access to draught power</td>
<td>A, to lesser extent B, particularly in Kavango</td>
<td>Lack of access to draught power</td>
<td>Assistance with draught power</td>
</tr>
<tr>
<td>Labour shortages</td>
<td>Cultivate enough land to satisfy food needs</td>
<td>A, to a lesser extent B, C, D</td>
<td>-Off farm work of men&lt;br&gt;-School attendance children&lt;br&gt;-Labour requirements for herding cattle during rainy season</td>
<td>-Labour saving technology:&lt;br&gt;-Mechanical weeding&lt;br&gt;-Fencing crop land&lt;br&gt;-Intensification of crop cultivation:</td>
</tr>
<tr>
<td>Herding prevents school attendance of boys</td>
<td>-School attendance children&lt;br&gt;-Free labour for crop cultivation</td>
<td>C,D</td>
<td>Free roaming cattle causes crop damage</td>
<td>Fencing</td>
</tr>
<tr>
<td>Livestock diseases</td>
<td>Minimize deaths, maximize herd size (reserve fund)</td>
<td></td>
<td>-Vaccination and treatment not always effective&lt;br&gt;-Limited possibilities for acquiring remedies</td>
<td>-Training and extension.&lt;br&gt;-Availability of drugs</td>
</tr>
<tr>
<td>Lack of water for cattle in dry season</td>
<td>Maximize herd size (reserve fund)</td>
<td>Overstocking in densely</td>
<td>Oshanas and pans dry up, ground water hard to get at with hand dug wells</td>
<td>Boreholes, dams and other water catchment measures</td>
</tr>
<tr>
<td>Lack of grazing</td>
<td>Maximize herd size (reserve fund)</td>
<td>C,D</td>
<td>Overstocking in densely populated areas</td>
<td>-Opening up underutilized grazing areas through water development&lt;br&gt;-Cultivation of forage crops&lt;br&gt;-Improved fodder and forage species&lt;br&gt;-Quotas for cattle ownership</td>
</tr>
</tbody>
</table>
6. IMPLICATIONS FOR A LIVESTOCK PROJECT

6.1 The main components of the strategy proposed for the NCAs at the time of IFAD general identification were:

(a) **animal health.** The construction of a cordon fence across the northern international borders of Namibia and improvement of animal health services and infrastructure;

(b) **animal productivity.** The strengthening of livestock extension and introduction of a scheme of herd genetic improvement;

(c) **marketing.** Apart from benefits to be gained from relocation of the cordon fence in increasing market outlet for cattle, the establishment of a more organized and responsive marketing system and also the upgrading of bush slaughter facilities;

(d) **access to grazing land and pasture improvement.** The development of water resources in under-utilized areas, establishment of grazing rights for smallholder groups and upgrading pastures through the introduction of pasture species;

(e) **group organization.** The development of local responsibility for maintaining infrastructure, and taking an active role in extension, animal health and marketing.

6.2 Whilst the study confirmed the value of livestock in farming systems and household food security within the project area, it also identified animal production is of secondary importance to crop production, particularly in respect to low income households. The diagnostic study further suggests that greater availability of animal traction would be a principal means of increasing crop production and thus providing greater food security and could be included as a possible project component and provide linkage to the proposed future crop development project \(^1\). Opportunities also exist to increase production of all livestock species in the region. Concurrent development of crop production to provide feedgrain to pigs and poultry would support further livestock

\(^1\) Northern Crop Development Project (programmed to be prepared by IFAD in early 1993)
diversification. Fish farming and beekeeping would be additional prospective livestock activities.

6.3 The project would also need to address the present attitudes of individuals and local communities towards help from government and aim at engendering more initiative and the need for greater co-responsibility in local development. In view of the absence of good base planning maps and to assist generally in future coordination of information between donors, the project should also consider providing financial support for geographic information systems (GIS) using satellite data. Sustainable land use and project planning could benefit from such support.

6.4 The study has revealed that no tangible significant benefits could be expected in the NCAs in the short to medium term through relocation of the cordon fence. This applies particularly to small-scale livestock producers who represent the bulk of livestock owners. Whilst the relocation of the cordon fence may be considered by some elements as a national objective, it presently represents little interest to northern livestock producers and furthermore, if constructed according to present intentions, would cause social disruption and interference with present herding practices. Consequently, the mission would not recommend that IFAD support the relocation of the fence along the northern borders with or without the possible requirement for a 50 km fenced buffer zone.

6.5 In respect to the need for improvement of animal health services, the study confirms that a number of crush pens have in fact, been destroyed during the independence war or are unserviceable and will require replacement. In Ovambo there is also irregular stock inspection due mainly to disruption of planned programmes during the war years. There is therefore a possible need to recruit additional field staff and to provide housing and suitable transport and should be looked at closely during project preparation. Further in-service training to all AAHIs would be expected to be an important sub-component. No dipping of livestock is practised, or recommended by DVS and with the availability of viable treatment alternatives it is unlikely that the construction of dips would be required, except possibly in Caprivi. There only appears to be a limited requirement for establishment of animal health clinics. Greater attention to the treatment of internal parasites, would require an increased supply of veterinary drugs and could receive project assistance.

6.6 Greater animal productivity could be expected as a result of improving livestock extension. Considerable improvement to reproduction rates and livestock management is possible. The training of AAHIs could therefore be broadened to cover all management aspects of both small and large livestock improvement. Contrary to project general identification, there appeared little evidence of herd genetic degradation resulting from inbreeding and hence only limited gains could be expected through improved genetic introduction. This situation is due to the high level of male castration.
practised, the mixing of herds that occurs naturally during the dry season and the customary exchange practices of old animals for young animals that occur when beasts have to be marketed. These practices mean a natural intermingling of blood and natural selection for improvement already occurs.

6.7 With the introduction by Meateco of a uniform price for grade for both commercial and communal areas and an incentive price premium to encourage early disposal of mature livestock in time of drought, most if not all the concern of the project general identification in respect to fair pricing of animals appear to be satisfied. Whilst the upgrading of slaughtering facilities in urban areas could be considered during project preparation, improvement to present practices in rural areas is not a perceived need of the people nor do they appear to be justified on health grounds. Any requirements for improved facilities are likely to be met by the EC meat marketing project.

6.8 The further development of water resources, particularly to allow greater access to under-utilized range resources could also offer further settlement and cropping opportunities and could be expected to interest a large number of households. Collection of surface water in oshanas is feasible in many areas and can be complemented with bores to provide groundwater. Piped water reticulation from bores could enable more cost efficient supply of water and if combined with a management strategy would provide improved utilization of grazing areas. The development of water resources solely to provide access to under utilized grazing areas is however more likely to advantage cattle owners with medium to large stock numbers unless parallel development of access roads, clinics, schools and other facilities also occur and encourage households to move and resettle in the new areas.

6.9 There is little evidence that group grazing rights are presently needed to improve access of poor households to grazing areas. Stock fencing, where it occurs, is generally well removed from areas of settlement and the movement of stock of smallholders does not appear to be unduly affected at the present time. Nevertheless, the general policy of traditional authority not to allow fencing of grazing areas where it can affect future regional development is appropriate. As identified, opportunities would appear to exist to introduce improved pasture legumes to upgrade feed availability for feeding of selected animals for work or milk.

6.10 Promoting community involvement to provide greater participation and assume increased responsibility for development efforts is both appropriate and necessary and proposals should be carefully considered and assessed during project preparation.

6.11 For a successful livestock project, more households have to have a mechanism of credit to enable animal purchase. The channelling of credit for purchase of oxen and small ruminants could be facilitated through supporting the development of credit-union type groups and meeting some of the high operating costs of offering small
amount of credit. This would be seen as preferable to having a line of credit made available to existing commercial banks which may only support the purchase of additional livestock of existing livestock owners.

**Constraints Analysis: Before and After Diagnostic Study**

6.12 The following table compares findings on target group perceptions with the constraints identified by the general IFAD identification mission.
<table>
<thead>
<tr>
<th>Before diagnostic</th>
<th>After diagnostic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overgrazing in densely populated areas</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Health problems for cattle</td>
<td>Confirmed. Although reasonable effective vaccination programs are in place, curative veterinary services require development. Disease problems also affect smallstock (chickens, goats in Ovambo)</td>
</tr>
<tr>
<td>Need for translocation of fence to expand marketing opportunities</td>
<td>Local marketing opportunities more attractive. No economic or social benefits within NCAs to translocate the fence</td>
</tr>
<tr>
<td>Marketing problems for cattle</td>
<td>Marginally relevant for target groups: very little offtake even of larger herds, only in case of urgent cash needs local sales</td>
</tr>
<tr>
<td>Genetic constraints to productivity</td>
<td>Local breeds adapted and little inbreeding evident. No advantage to breed improvement at this stage.</td>
</tr>
<tr>
<td>Encroachment on communal grazing rights</td>
<td>Currently not a major problem. Although private fencing is evident in underutilized areas, target group are unaffected. In long term may limit possibilities for resettling people from overpopulated areas.</td>
</tr>
<tr>
<td></td>
<td>Large percentage of households own no livestock. Credit and delivery/recovery mechanisms required if poor households are to own stock</td>
</tr>
</tbody>
</table>
Environmental Implications

6.13 In project design, consideration would need to be given to the impact of increased livestock populations on rangeland resources. Preference for surface water storages should be given over groundwater development where this is economically and socially feasible. The siting of water points will also further influence grazing pressure and hence close co-ordination between the Department of Water Affairs and regional authorities will be necessary.

6.14 Community education of the processes of environmental degradation will become increasingly necessary as population pressure and uncontrolled harvesting of timbered areas for fuelwood and construction materials results in increased deforestation. The increased access into these areas brought about through provision of permanent water and roads is likely to delay community responsiveness to problems of the environment unless education accompanies development.

Estimated Project Cost

6.15 Based on the components as discussed, the approximate cost of a possible project would be:

<table>
<thead>
<tr>
<th>Component</th>
<th>US$ M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal health</td>
<td>0.8</td>
</tr>
<tr>
<td>Animal productivity</td>
<td>0.2</td>
</tr>
<tr>
<td>Training</td>
<td>0.2</td>
</tr>
<tr>
<td>Infrastructure (water, roads)</td>
<td>3.3</td>
</tr>
<tr>
<td>TA</td>
<td>0.4</td>
</tr>
<tr>
<td>Project management</td>
<td>0.5</td>
</tr>
<tr>
<td>Base-line study</td>
<td>0.1</td>
</tr>
<tr>
<td>Credit</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>7.5</td>
</tr>
</tbody>
</table>
7. RISKS AND ISSUES

7.1 A major risk that would be encountered during project implementation relates respect to the expectations of the people that it is the role of the government to solve their problems at no or little cost to beneficiaries. Nevertheless, many have expressed willingness to try to contribute to the cost of suggested interventions and could be given encouragement to develop initiative and vision to see possible solutions to problems. Previous administrations, unfortunately, have not encouraged initiative and community-styled self-help mechanisms to address constraints and overcome obstacles to development and production. As a result the take up of opportunities provided by the project would be slow, where beneficiaries are expected to contribute towards the cost of interventions. In many areas, traditional support has either broken down or suffered from the effects of changes required for independence and it will take many years to restore community support mechanisms.

7.2 Associated with the opportunity to provide oxen and small livestock packages is the problem of credit delivery and recovery. At preparation there will be a need to examine proposals being presently considered by Government to facilitate credit to communal farmers and how a possible project could support these mechanisms.

7.3 The government is also faced with a number of difficult decisions in respect to subsidies on services such as tractor ploughing, fertilizer and the more recently introduced - marketing of cattle. Bores are being constructed and maintained at full cost to government, not only to meet the needs of small communities but also for commercial livestock production. If subsidies were to be removed it is likely to result in a contraction of existing production and a lag phase in development until adjustment is achieved. The continuation of a subsidy on tractor ploughing, on the other hand, is likely to encourage a dependence on this form of land preparation and could be seen to support the view that ploughing with oxen is an out-moded alternative.

7.4 The continuation of the construction of the veterinary cordon fence along the northern borders and/or requirement for a 50 km buffer zone along the northern rivers will result in severe disruption to both human and animal movements without any assurance of counter balancing benefits to an IFAD target group. If the GON continues with the erection of the fence, it is only likely to benefit large scale livestock owners who would be prepared to re-settle in the southern parts of the NCAs and be away from interference caused by the fence.

7.5 The success in targeting benefits to poor households using watering points will be strongly influenced by their location and proximity to other support services such
as health clinics and schools. The siting of bores in under-developed areas which are remote from these services, or where regional planning does not make provision for these services, is only likely to interest large stock owners who are not interested in settling these areas but only to take advantage of grazing resources. Alternatively, the placement of bores in areas likely to achieve the extension of existing boundaries of the present cropping areas are more likely to benefit the greatest number of potential beneficiaries.
8. FOLLOW-UP

GON/FAOR

8.1 A preparation mission is planned to visit Namibia in early September 1992. Due to the close timing of the mission, the MAWRD was asked at the wrap-up meeting to provide a rapid response to the findings of the mission and specifically to comment on the scope of components of a possible project. It was stressed that these comments would be valuable to assist in determining the composition of the team and the emphasis that should be placed on each of the possible components. The FAOR undertook to follow-up this request to Government as a matter of urgency.

IFAD

8.2 Clarification is sought from IFAD as to the project area for the livestock project. The study, while concentrating on findings in Ovambo and Kavango, will draw conclusions addressing the needs of the NCAs in general and in the context of a livestock project. Ovambo, Kavango and Kaokoland were originally conveyed by IFAD as being the project area but, as indicated above (para 2), GON has requested that the project include Caprivi.
Table 1. Proposed Forest Reserve Areas in NCAs

<table>
<thead>
<tr>
<th>REGION</th>
<th>AREA TO BE RESERVED (sq km)</th>
<th>RESERVED (%)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ovambo</td>
<td>10,000</td>
<td>19</td>
<td>marked on ground</td>
</tr>
<tr>
<td>Kavango</td>
<td>20,544</td>
<td>45</td>
<td>not yet marked</td>
</tr>
<tr>
<td>West Caprivi</td>
<td>2,526</td>
<td>23</td>
<td>marked on ground</td>
</tr>
<tr>
<td>East Caprivi</td>
<td>3,000</td>
<td>57</td>
<td>within existing game reserve</td>
</tr>
<tr>
<td>TOTAL</td>
<td>36,070</td>
<td>31</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Summary of Human and Livestock Populations of the Northern Communal Areas

<table>
<thead>
<tr>
<th>Area (sq km)</th>
<th>Kaokoland</th>
<th>Ovambo</th>
<th>Kavango</th>
<th>Caprivi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population ('000)</td>
<td>27</td>
<td>615</td>
<td>137</td>
<td>71</td>
</tr>
<tr>
<td>Livestock numbers ('000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle</td>
<td>80</td>
<td>350</td>
<td>93</td>
<td>98</td>
</tr>
<tr>
<td>Sheep</td>
<td>35</td>
<td>12</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Goats</td>
<td>140</td>
<td>360</td>
<td>33</td>
<td>4</td>
</tr>
<tr>
<td>Pigs</td>
<td>ND</td>
<td>2</td>
<td>2</td>
<td>0.1</td>
</tr>
<tr>
<td>Chickens</td>
<td>ND</td>
<td>20</td>
<td>40</td>
<td>34</td>
</tr>
<tr>
<td>Ducks</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Donkeys</td>
<td>5</td>
<td>120</td>
<td>0.4</td>
<td>-</td>
</tr>
<tr>
<td>Horses</td>
<td>1</td>
<td>4</td>
<td>0.3</td>
<td>-</td>
</tr>
<tr>
<td>Total LSU (450 kg)</td>
<td>86</td>
<td>386</td>
<td>71</td>
<td>69</td>
</tr>
<tr>
<td>Stock density (LSU/sq km)</td>
<td>1.8</td>
<td>7.5</td>
<td>1.5</td>
<td>5.8</td>
</tr>
<tr>
<td>LSU/Head of population</td>
<td>3.2</td>
<td>0.6</td>
<td>0.5</td>
<td>1.0</td>
</tr>
</tbody>
</table>

ND: do data available
LSU calculated using population conversion factors of 0.7 for cattle, 0.17 for sheep, 0.14 for goats, 0.7 for donkeys and 0.8 for horses (equines have relatively greater impact than bovines on vegetation).
Table 3. Basic Data for Northern Areas

<table>
<thead>
<tr>
<th></th>
<th>Recent Normal Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Owambo</td>
</tr>
<tr>
<td>Population ('000)²⁄</td>
<td>640</td>
</tr>
<tr>
<td>Per capita cereal</td>
<td>140</td>
</tr>
<tr>
<td>consumption, seed and</td>
<td></td>
</tr>
<tr>
<td>waste (kg/cap/yr)³⁄</td>
<td></td>
</tr>
<tr>
<td>Gross consumption</td>
<td>89.6</td>
</tr>
<tr>
<td>(tons'000)</td>
<td>25.0</td>
</tr>
<tr>
<td>Imports (tons'000)⁴⁄</td>
<td>64.6</td>
</tr>
<tr>
<td>Normal production</td>
<td>270</td>
</tr>
<tr>
<td>(tons'000)</td>
<td>239</td>
</tr>
<tr>
<td>Composite yield (kg/ha)</td>
<td></td>
</tr>
<tr>
<td>Normal cereal area</td>
<td></td>
</tr>
<tr>
<td>(ha'000)</td>
<td></td>
</tr>
<tr>
<td>Individual cereals</td>
<td></td>
</tr>
<tr>
<td>(normal year)</td>
<td></td>
</tr>
<tr>
<td>Millet:</td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td>215</td>
</tr>
<tr>
<td>Yield</td>
<td>267</td>
</tr>
<tr>
<td>Production</td>
<td>57.4</td>
</tr>
<tr>
<td>Sorghum:</td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td>24.0</td>
</tr>
<tr>
<td>Yield</td>
<td>300</td>
</tr>
<tr>
<td>Production</td>
<td>7.2</td>
</tr>
</tbody>
</table>

³⁄ Diet more varied in several populations of Kavango and especially in wetter area of Caprivi.
⁴⁄ National commercial maize meal consumption 54,000 tons, of which 46% sold in Owambo, 9% in Kavango. Estimated 700 tons imported from Zambia into Caprivi. Wheat imports and informal movement of grain between regions not included.
⁵⁄ Maize.
⁶⁄ Includes millet.
⁷⁄ Excludes FNDC farms.
Table 4. Cattle Herd Size Distribution in Kavango

<table>
<thead>
<tr>
<th>HERD SIZE</th>
<th>NUMBER OF CATTLE</th>
<th>PERCENTAGE OF CATTLE</th>
<th>NUMBER OF OWNERS</th>
<th>PERCENTAGE OF OWNERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>5,849</td>
<td>6.3</td>
<td>752</td>
<td>21.4</td>
</tr>
<tr>
<td>11-20</td>
<td>17,505</td>
<td>18.7</td>
<td>1,091</td>
<td>31.1</td>
</tr>
<tr>
<td>21-30</td>
<td>17,018</td>
<td>18.2</td>
<td>674</td>
<td>19.2</td>
</tr>
<tr>
<td>31-40</td>
<td>13,591</td>
<td>14.6</td>
<td>390</td>
<td>11.1</td>
</tr>
<tr>
<td>41-50</td>
<td>10,080</td>
<td>10.7</td>
<td>228</td>
<td>6.5</td>
</tr>
<tr>
<td>51-60</td>
<td>6,790</td>
<td>7.3</td>
<td>125</td>
<td>3.6</td>
</tr>
<tr>
<td>61-70</td>
<td>6,394</td>
<td>6.8</td>
<td>88</td>
<td>2.5</td>
</tr>
<tr>
<td>71-80</td>
<td>4,435</td>
<td>4.7</td>
<td>58</td>
<td>1.7</td>
</tr>
<tr>
<td>81-90</td>
<td>2,554</td>
<td>2.7</td>
<td>36</td>
<td>1.2</td>
</tr>
<tr>
<td>91-100</td>
<td>1,890</td>
<td>2.1</td>
<td>24</td>
<td>0.7</td>
</tr>
<tr>
<td>100+</td>
<td>7,268</td>
<td>7.8</td>
<td>44</td>
<td>1.2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>93,374</td>
<td>100.0</td>
<td>3,510</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 5. Herd Composition data (%) for the NCAs

<table>
<thead>
<tr>
<th>CLASS</th>
<th>KAOKOLAND</th>
<th>OVAMBO</th>
<th>KAVANGO</th>
<th>E. CAPRIVI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows</td>
<td>36</td>
<td>40</td>
<td>38</td>
<td>37</td>
</tr>
<tr>
<td>Bulls</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Oxen</td>
<td>11</td>
<td>25</td>
<td>20</td>
<td>17</td>
</tr>
<tr>
<td>Steers</td>
<td>12</td>
<td>11</td>
<td>NR</td>
<td>11</td>
</tr>
<tr>
<td>Heifers</td>
<td>12</td>
<td>NR</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>Calves</td>
<td>26</td>
<td>21</td>
<td>18</td>
<td>20</td>
</tr>
</tbody>
</table>

SOURCE
A   B   C   D

NR: not recorded
Source: A - Paskin (1990)
        B - Tapscott (1990)
        C - DVS data
        D - DVS data
Table 6. Crop and Household Seasonal Calendar

<table>
<thead>
<tr>
<th>Month</th>
<th>CROP TASKS</th>
<th>OTHER HOUSEHOLD TASKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>ploughing &amp; planting contd.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>some weeding</td>
<td></td>
</tr>
<tr>
<td>Feb</td>
<td>Finish ploughing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weeding</td>
<td></td>
</tr>
<tr>
<td>Mar</td>
<td>Weeding</td>
<td></td>
</tr>
<tr>
<td>Apr</td>
<td>Finish weeding</td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>Prepare threshing floors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Start harvesting (if rain finished)</td>
<td></td>
</tr>
<tr>
<td>Jun</td>
<td>Harvesting</td>
<td>Make clay bricks</td>
</tr>
<tr>
<td>Jul</td>
<td>Threshing</td>
<td>Make baskets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dig wells</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Collect poles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Build/repair houses</td>
</tr>
<tr>
<td>Aug</td>
<td>Threshing (if good harvest)</td>
<td>as above</td>
</tr>
<tr>
<td>Sep</td>
<td>Resting</td>
<td>as above</td>
</tr>
<tr>
<td></td>
<td>Any special jobs</td>
<td></td>
</tr>
<tr>
<td>Oct</td>
<td>as above</td>
<td>as above</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Build/repair grain stores</td>
</tr>
<tr>
<td>Nov</td>
<td>Spread manure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repair crop fences</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prepare for next season</td>
<td></td>
</tr>
<tr>
<td>Dec</td>
<td>Ploughing &amp; planting</td>
<td></td>
</tr>
</tbody>
</table>

Note: Fishing takes place from January to March in Ovambo, and most times of year except when river too high in Kavango.
Table 7. Livestock Seasonal Calendar

<table>
<thead>
<tr>
<th>Month</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>Herding, Milking, Calves born</td>
</tr>
<tr>
<td>Feb</td>
<td>as above</td>
</tr>
<tr>
<td>Mar</td>
<td>as above</td>
</tr>
<tr>
<td>Apr</td>
<td>as above</td>
</tr>
<tr>
<td>May</td>
<td>as above, Castration Vaccinations, Move main herd to cattle post</td>
</tr>
<tr>
<td>Jun</td>
<td>Castration Vaccinations, At cattle post</td>
</tr>
<tr>
<td>Jul</td>
<td>At cattle post</td>
</tr>
<tr>
<td>Aug</td>
<td>At cattle post</td>
</tr>
<tr>
<td>Sep</td>
<td>At cattle post</td>
</tr>
<tr>
<td>Oct</td>
<td>Return from cattle post</td>
</tr>
<tr>
<td>Nov</td>
<td>calves born</td>
</tr>
<tr>
<td>Dec</td>
<td>Herding, calves born</td>
</tr>
</tbody>
</table>

Notes: 1. Majority of calves born during summer months but some born in winter.
2. Kavango cattle do not move to cattle post.
3. Birth and castration periods also apply to goats.
Table 8. Agro-ecological Zones (AEZ) in the NCAs

<table>
<thead>
<tr>
<th>Region</th>
<th>AEZ</th>
<th>Area (Sq km)</th>
<th>Suitability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaokoland</td>
<td>1</td>
<td>11,440</td>
<td>desert: very little possible</td>
</tr>
<tr>
<td></td>
<td>2C</td>
<td>9,300</td>
<td>semi-desert: extensive small stock</td>
</tr>
<tr>
<td></td>
<td>3A</td>
<td>564</td>
<td>bush savanna: extensive (large) stock</td>
</tr>
<tr>
<td></td>
<td>3B</td>
<td>27,678</td>
<td>bush savanna: extensive (small) stock</td>
</tr>
<tr>
<td>Ovambo</td>
<td>3A</td>
<td>515</td>
<td>bush savanna: extensive (large) stock</td>
</tr>
<tr>
<td></td>
<td>3B</td>
<td>4,976</td>
<td>bush savanna: extensive (small) stock</td>
</tr>
<tr>
<td></td>
<td>5B</td>
<td>20,150</td>
<td>Oshana area: dryland cropping</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>2,944</td>
<td>Okavango river area: dryland cropping</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>6,624</td>
<td>Etosha plains: extensive stock farming conditional on water supply - saline ground water forest: large stock with limited arable on alluvial soils, but lacks water</td>
</tr>
<tr>
<td></td>
<td>8B</td>
<td>21,164</td>
<td>forest: large stock with limited arable on alluvial soils, but lacks water</td>
</tr>
<tr>
<td>Kavango</td>
<td>4</td>
<td>255</td>
<td>plateau: marginal cropping, mainly stock</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>18,497</td>
<td>Okavango river area: crops &amp; livestock</td>
</tr>
<tr>
<td></td>
<td>8B</td>
<td>22,948</td>
<td>forest: large stock with limited arable on alluvial soils, but lacks water</td>
</tr>
<tr>
<td>Caprivi</td>
<td>10</td>
<td>11,534</td>
<td>Eastern Caprivi: extensive stock farming and crop production</td>
</tr>
</tbody>
</table>

Source: SWA, *A five year plan for development of the native areas* (Windhoek n.d. [1966]), Table xv.
NAMIBIA
RURAL SERVICES SUPPORT PROJECT

Organogram of Ministry of Agriculture, Water and Rural Development

Ministry of Agriculture, Water and Rural Development

Honorable Minister

Honorable Deputy Minister

Permanent Secretary

Deputy Permanent Secretary

Directorate: Planning, Marketing, Pricing and Cooperatives

Directorate: Agriculture

Directorate: Veterinary Services

Directorate: Rural Development

Directorate: Forestry

Directorate: Agricultural Training

Directorate: General Services
APPENDIX 4: OPTIONS FOR A DRAUGHT POWER COMPONENT

As indicated in the main report, 50 to 60% of Ovambo and Kavango farmers do not have cattle. Less than 20% of this group has goats. A livestock project, then, will not benefit the bottom half of the population unless a component is included that entails the distribution of cattle amongst this group. For the poor, this is a perceived need: many households had cattle before but lost them as a result of drought, disease and the upheaval caused by the independence war. Cattle is needed for draught, manure, milk and as a reserve fund, to be drawn upon in time of need.

Herd rebuilding should focus in the first instance on supplying stockless households with draught power, i.e., oxen. Cows could be added to give the herd growth potential (bulls could be borrowed within the community). In the longer run calves could be used for replacement of oxen. In the short run offtake for sale would allow beneficiaries to contribute to project expenses, i.e., the payment of loans. In addition to supplying draught power this project component would provide beneficiary households with milk and could contribute to improving soil fertility (or at least reduce the rate of soil deterioration) through the use of manure.

In project formulation two crucial issues have to be looked into. The first concerns payment: is cattle supplied in the form of a grant, a loan, or some intermediate form. The second issue is what would be the most adequate way of supplying cattle to households: individually or via groups.

As for payment, two fundamental arguments can be made against extending cattle in a scheme based on "commercial" credit. One is that commercial credit should be given only when there is capacity for repayment, that is, when the investment generates enough benefits both to significantly improve the situation of the beneficiaries and to pay back the loan plus interest. In the present situation, this will almost certainly not be the case. Providing draught power will enable beneficiaries to cultivate
larger crop areas, thereby increasing food production and therefore, food security. If this project component succeeds, the additional production will enable households to convert current deficits into self sufficiency. In good years, some surplus may be produced - which could be stored for poor harvest years. However, under present circumstances it is very unlikely that enough production could be obtained to significantly improve food production and pay back the loan for a pair of oxen. Only if the supply of draught power is brought into a general crop development project which would, say, double or triple production could full payback be imagined.¹/¹

It might be argued that increased food production will diminish needs for the purchase of food (mainly maize meal), thus liberating cash for repayment. However it should be taken into account that more household labour will have to be dedicated to cultivating the larger area. This would decrease availability for off-farm labour and thus, income generating capacity. To a certain extent, then, supplying stockless households with oxen would imply an overall increase of food supply as well as a shift of the source from which the food is obtained. That is, before project implementation stockless households would obtain a larger proportion of their millet from other households than after.

The second argument that can be made against extending cattle in a scheme based on "commercial" credit is that of risk. Stockless households are already living at a minimal subsistence level and have no risk absorption capacity whatsoever. In case of a crop failure, death of an

¹/¹To make a very rough estimate of repayment capacity estimate the consumptive requirements of millet, the main staple, at 2 kg a day for a family of eight. This would put the yearly requirement at 365x2 = 780 kg. Current production can be estimated at 250-300 kg/ha. For an area of 2 ha this means a total production of between 500 and 600 kg. Assume that with oxen the cultivated area could be extended to 3 ha. The production of the 250 to 300 kg produced from the extra hectare is likely to be used to obtain self sufficiency; at best a surplus of 120 kg (3x300 - 780 kg) may be obtained. Even if this is not stored but sold, obtained cash benefits would be only some R150. That would barely be enough to cover (subsidized) interest payments on a loan of some R2000 for the purchase of a pair of oxen, but not the payback of the principal.
animal or other forms of loss such as theft - all frequently occurring phenomena in the project areas - the household involved would have no way to meet repayment obligations. As households have no collateral, no effective sanctions can be taken against debt defaulting other than exclusion from future development credit or development activities. Since default is quite likely to occur while consequences for defaulters are non-observable, credit discipline would suffer. That may seriously impede future development projects where credit could be used in a more feasible and sustainable manner. The argument, then, is not to compromise credit discipline by providing project assistance in the form of credit, in a situation in which chances of default are high and no feasible sanctions for defaulters are available.

The above leads to the conclusion that providing stockless households with cattle should take place in what amounts to at least a partial grant. That makes the choice of who is to benefit, that is, who should be assisted (and who not) extremely difficult. If left purely to individual choice and if some form of (even a token) payment were required, it is unlikely that the poorest households would take up the opportunity. The heads of these households would be most prone to perceive that the risk of participation, i.e. of a loan (however lenient the conditions) would be too great, as the household would lack the reserves to needed in case of repayment problems. In addition female headed households might perceive that cattle management, a traditionally male task, would be out of their range. On the other hand, households with more repayment capacity would be more inclined to take up the opportunity - particularly if they would see potential of getting a return on their investment by providing ploughing services for non-participating households.

One way to address the above problems would be through collective rather than individual ownership: groups of households, numbering anywhere from two or three up to ten to fifteen, could own and manage a herd collectively. Participation would in the first instance be a
household choice, but collectively (in village assemblies) people could decide on who would be allowed to participate. At village level decisions could also be made on the size of the cooperative: one single group representing all interested households, or several smaller groups.

Working with groups rather than individuals would have the following advantages:

- More rational use of resources, as one team of oxen could serve two to three households
- Consequently a lesser repayment burden on individual households (important even if this form of assistance is heavily subsidized)
- Within a group arrangements could be made to assist female headed households with no adult male labour with ploughing services
- Spreading of risk: loss of one or two oxen would not mean loss of draught power and repayment capacity for a particular household but could be absorbed by the group.
- In extending a group herd the project could add a few cows to the basic herd of oxen, to provide substitute animals, milk and repayment capacity (through the sale of part of the offspring)

Obviously, group herds would also have disadvantages:

- Potential for tensions among group members, leading to poor cooperation and the demise of the group effort.
- No direct responsibility for the animals, which might result in reduced interest to take care of them. The same would be valid for the obligation to repay an incurred debt.
- Lack of experience in organization as well as literary and management skills may impede effective functioning and create possibilities for abuse by some members.
In the project preparation mission these issues will have to be looked at more closely, and pro's and cons's of group as against individual ownership must be weighed. Thereby the opinions of the target group should be a factor of primary importance. Also, if group ownership is considered a feasible alternative, indications will have to be given to optimal group and herd sizes.

One additional issue that will need to be addressed is that of access to women, i.e. female headed households, to group herds. As cattle management is perceived - by men as well as women - to be men's work, female headed households may have trouble incorporating themselves in groups. In addition, as indicated above, some form of arrangement would have to be found for the rendering of ploughing services to these households, as ploughing is typically a male task.

As a final issue the possibility of using donkeys rather than oxen should be considered in the same terms as assistance in the form of oxen (i.e. feasibility of a credit scheme, individual or group ownership, creation of repayment capacity, etc.). The veterinary department in Kavango expressed serious doubts as to the introduction of donkeys for ploughing in Kavango (they are not used currently), fearing an increase in the deterioration of grazing land. This issue will have to be assessed for both Ovambo and Kavango.
APPENDIX 5: OPTIONS TO ADDRESS THE PROBLEM OF EXCEEDING THE CARRYING CAPACITY OF GRAZING LAND

The problem of overgrazing has been discussed extensively in the main report, and the opening up of new grazing areas through water development has been indicated as a possible solution. In the longer run, however, this is not going to solve the problem that with current target group attitudes successful livestock development will compound the problem of overgrazing. There are basically two ways to address this problem. One is to develop a different perspective on cattle ownership. Cattle should no longer be considered as a savings account to be addressed only in times of need, but as a productive asset to be exploited for income generation through regular offtake. This involves a radical change in deeply ingrained attitudes and as such, can be expected to be only a long term solution.

The second possibility is imposing limits on the numbers of cattle held by households. In the longer run, this could even entail a shift from transhumance to settled cattlefarming. The latter is not such a big change as one might think, since a considerable proportion of cattle is already held permanently around the village or at cattle posts. Persuading villages to impose a quota system of heads of cattle could be one way to address the issue. Such a system would limit livestock numbers and, by dividing livestock owning rights equitably among village households and making them negotiable on a yearly basis, would offer stockless households the possibility to obtain, for example, ploughing services or income in cash or kind from stock owners who own more cattle than can be allotted under the quota system.

This option could meet with opposition from larger cattle owners. The way to address this problem would be twofold: inducement and social control. Larger scale cattle owners might be induced to cooperate or at least limit their opposition by providing them with adequate veterinary services and where feasible, improved water supply in the village, at cattle posts or both. On the other hand, negotiable cattle ownership rights would work to the advantage of non-cattle owning households and those with only a few head of cattle - a majority in most villages. This fact, as well as assuring cooperation of these households through a draught power project component, could go a long way to imposing village level control mechanisms for compliance with allocated stock numbers.

Another problem with a quota system would be that regional implementation would require establishing an administrative network that might well exceed current administrative capacity. The system might also be prone to corruption. Still, a solution to this problem can be imagined. In each village or cluster of villages making up some 40 to 50 households, a local 'livestock agent' could be appointed to keep track of livestock numbers. An adequate educational level should be required, and appointment should be on a yearly basis, to be confirmed annually by the village population. This would offer villagers a way to control anomalies. After receiving the necessary training - possibly an IFAD project component - this agent could also monitor the animal health and grazing situation and serve as a mediator in the trade in cattle owning rights. In addition this person could function as a collector of a yearly tax to be levied for each head of cattle. This tax should function both as a means to stimulate offtake of
unproductive animals as well as a way to finance government programs. One could also imagine a more general role for the livestock agent in village administration and agricultural development, as well as one in an early warning system for food supply problems and the adequate distribution of food aid.