

MOZAMBIQUE:
COUNTRY REPORT
TO THE FAO INTERNATIONAL
TECHNICAL CONFERENCE
ON PLANT GENETIC RESOURCES

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Note by FAO

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CHAPTER 1

Introduction to Mozambique and its Agricultural Sector

1.1 BRIEF COUNTRY PROFILE

Mozambique, located in the eastern coast of the Southern Africa ($10^{\circ} 30' - 26^{\circ} 52' S$ and $40^{\circ} 50' - 30^{\circ} - 31' E$) covers a land area of 800,000 km² and has a population estimated as 15.3 million in 1989. With an estimated population growth rate of 2.65% per year, the total population was expected to exceed 18 million by 1995. Over 60% of the population lives in absolute poverty. The average calorie supply per capita is about 70% of the total need and 45% of the population depended on external food aid in 1988/89.

The country is reported as one of the poorest in the world, with an average per capita annual income of US\$80. Economic decline began after the independence war, recovered temporarily and then declined again after 1981, due to internal conflicts. Recent peace agreements and changes in the country's economic policies have caused some recovery in the last five years.

Mozambique displays an altitude gradient from the coast to the mountainous areas of the west, with three major altitudinal zones: coastal (0-200 m a.s.l.); middle (200-600 m a.s.l.), and high (>800 m a.s.l.), and three major climatic zones: tropical humid, tropical dry and tropical high altitude. Rainfall ranges between 400 and 2,000 mm per year, being generally highest in the north. Although variable from region to region and year to year, precipitation is usually adequate for growing food crops, except in the southern inland (covering 1/3 of the country) and parts of Tete and Manica provinces.

1.2 GENERAL ECONOMIC CONDITIONS

Mozambique has experienced a steady decline in the AGDP since 1980, with some recovery in the last few years. There was a period of increased productivity after independence which lasted from 1977-80.

There have been marked declines in production and exports and imports, and increases in the money supply and inflation. Pricing policies and allocation



controls intended to promote social welfare discouraged production until 1987-88. The war has severely disrupted the economy, and caused displacement of the population in rural areas and around the cities, altered land use patterns and disrupted infra-structure, transportation and commerce. The country has been dependent on external emergency aid to a great extent, and donor support covers nearly half of budgetary expenditure.

In 1987, the Government initiated the Economic Rehabilitation Programme, followed by the Economic and Social Recovery Programme with IMF and World Bank support. The programme is meant to achieve macroeconomic balance through the restoration of an incentive structure, and new pricing, exchange rate and fiscal policies.

These measures, according to the IMF and the World Bank have resulted in an increase in GDP through growth in marketed agricultural production, light industrial activity and transport (World Bank 1990; IFAD 1990). The government has moderated price controls on agricultural commodities and established a minimum pricing system to support the family farmer production of export crops, in line with the ESRP strategy to strengthen the incentive system.

The World Bank (1990) identifies broad-base agricultural development and production as the priority for Mozambique. This will require increased investments by the government and donors in rural infra-structure and institutional capacity. Only the restoration of the expenditure will reduce external assistance needs in the long term.

Continued external assistance will be necessary but this assistance should provide flexibility for the government to use resources in the selection of investment projects and the use of counter-part funds. Even so, macroeconomic adjustment process will be a long-term process.

In general the ERP/ESRP has provide price incentives and stimulated GDP, but the adjustment process will entail continued foreign assistance and inflation has remained high.

1.3 DESCRIPTION OF THE AGRICULTURAL SECTOR

Roughly 85% of the labour force is employed in the agricultural sector, which accounts for about 45% of GDP. The family sector cultivates 90-96% of



cropped land (2.5-3 million ha), supplies 75% of marketed food and 80% of export earnings.

Despite the existence of different estimates for production trends, the performance of the agricultural sector has generally declined over the last decade. The most recent statistics from the Ministry of Agriculture (Ministério de Agricultura, 1992) show steady declines in commercial sector of the agricultural production from 1981-82 to 1989-90 in both area planted and total production for 21 export and food crop commodities, with some recovery in selected commodities in 1990-91. Estimates for the family sector show steady declines in yields and marketed production from 1975 to 1985. There is little data available for the period since then. In short, agricultural production is not keeping pace with the estimated population growth rate of 2.65%.

This declining performance has been due to a number of factors the most significant of which is a long war which disrupted the basic factors which support sustained production (infrastructure, human resources and government financial investments). A large proportion of land formerly under cultivation has fallen out of production. Less than 3 million ha. of the country's 31 million ha. of arable land is under cultivation.

There has also been a history of inefficient investment in large scale farms and export crops by a centrally planned economy, and a lack of attention by policy makers to family farmers. In addition drought has interrupted the agricultural development process.

In 1983, government policies were changed to emphasize the family and private sectors. These changes however, have had little effect at the farm level, and institutional adaption to the policy changes has been slow.

Necessary investment by government and donor agencies in long term institutional building and development have been vastly under-emphasized in contrast to emergency aid. Development investments have taken the form of donor program and project assistance aimed at short term objectives.

The donor efforts at institutional development have lacked a long time horizon, have been poorly coordinated and planned with respect to different agencies and government, and have relied on external technical expertise. The government, for its part, has made inadequate investments in agricultural research at an estimated 0.35% of AGDP. As a result, agricultural research institutions are understaffed, lack operating fund, and have infrastructure which is badly in need of rehabilitation. The research institutions remain significantly dependent on donor projects in terms of operational funding and the technical staffing from external sources.



1.3.1 Category of farmers

The family farming sector cultivates over 90% of agricultural land and is characterized by a subsistence orientation, with or no use of inputs, the use of family labour, some dependence on off-farm employment of men, and a low percentage of marketable supplies. The family farm averages less than 4 hectares (there is regional variation in the average farm size and other characteristics), and is characterized by the use of manual labour with hand tools, and small ruminant livestock production. Animal traction is used in limited areas of the country.

Shifting cultivation (bush fallow) is the traditional land use strategy. However, population pressure is causing substantial reductions in the fallow period in some areas, and expansion of the farming population is having negative effects on the natural resources.

A higher percentage of women are active in agriculture than men (96% of the economically active female population as opposed to 67% of the male population). Family farmers are the major producers of basic food crops and a large proportion of cash\export crops (50% of cotton and nearly 100% cashew nut).

A sub-category of significance is engaged in intensive horticultural production on small hand-watered plots around urban concentrations. This farming is done by women and production is marketed in the cities, while men support the household with off-farm income.

There are wide variations in farm conditions and production strategies. The family sector has been most affected by the war through population movement, the disruption of markets, lack of input and basic services, and destabilization of the rural economy. Family farmers are highly risk averse and this contributes to the pattern of using no inputs.

A second category is private commercial farmers who contribute 25% of marketed production. These include capital intensive farms of less than 50 ha. for the urban market (wide range of crops (e.g. rice, vegetables), poultry, pork); farms of 50-1,000 ha., less capital intensive, which produce for the commercial market (cereals, meats, fruits); and farms of more than 1,000 ha. in high potential areas for export crops (cotton, tea, tobacco, sugarcane).

The third major category of farmers includes joint venture farms and state farms up to 40,000 ha. for export crops (tea, cotton, copra, sugar) and market products (beef, pork, poultry, cereals).



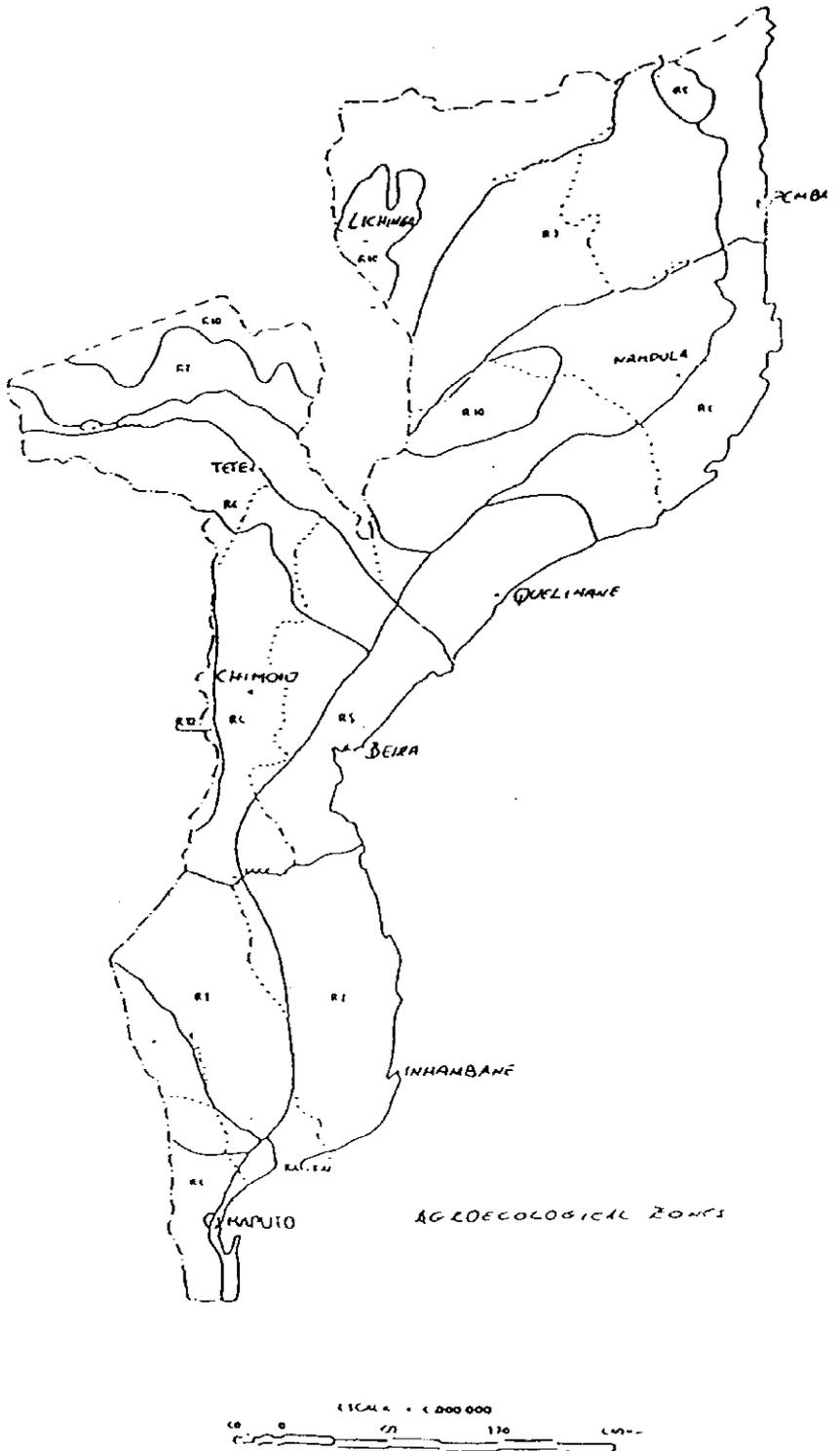
The government is in the process of transforming all state farms into joint private/government ventures or of allocating the land to family farmers.

The livestock sector in Mozambique is small (estimated cattle herd in 1992 was 200,000 herd) and contributes less than 1% to total agricultural production. Cattle production is limited to fly free areas (25% of country) and is split between the commercial and family farmers. The average family herd size is 10, and production is marketed. All goats, 75% of pigs and most sheep are produced by the family sector; marketed production is low, but these animals are an important part to farm production systems and are locally consumed. Most of indigenous breeds are raised by family farmers. Most poultry is produced by commercial farmers.

1.3.2 Agro-ecological zones and crop production systems

Considering that the existing agro-ecological zoning of the country has been either too general or too detailed, a regionalization integrating general agroclimatic characteristics, with a geographical division was chosen. In order to avoid working with too many AEZs, a simplification was chosen and, in this document, the country has been divided into 10 regions (Map 1) as follows:

- R1.** Inland Maputo and Southern Gaza
- R2.** Coastal areas South of the Save
- R3.** North and Central Gaza and Western Inhambane
- R4.** Medium altitude areas of Central Mozambique
- R5.** Low altitude areas of Sofala and Zambezia
- R6.** Dry areas of Zambezia and Southern Tete
- R7.** Mid-altitude areas of Zambezia, Nampula, Tete, Niassa and Cabo Delgado
- R8.** Coastal areas of Zambezia, Nampula and Cabo Delgado
- R9.** Northern hinterland of Cabo Delgado
- R10.** High altitude areas of Zambezia, Niassa, Angonia- Maravia and Manica



Map 1. Agro-ecological zones of Mozambique

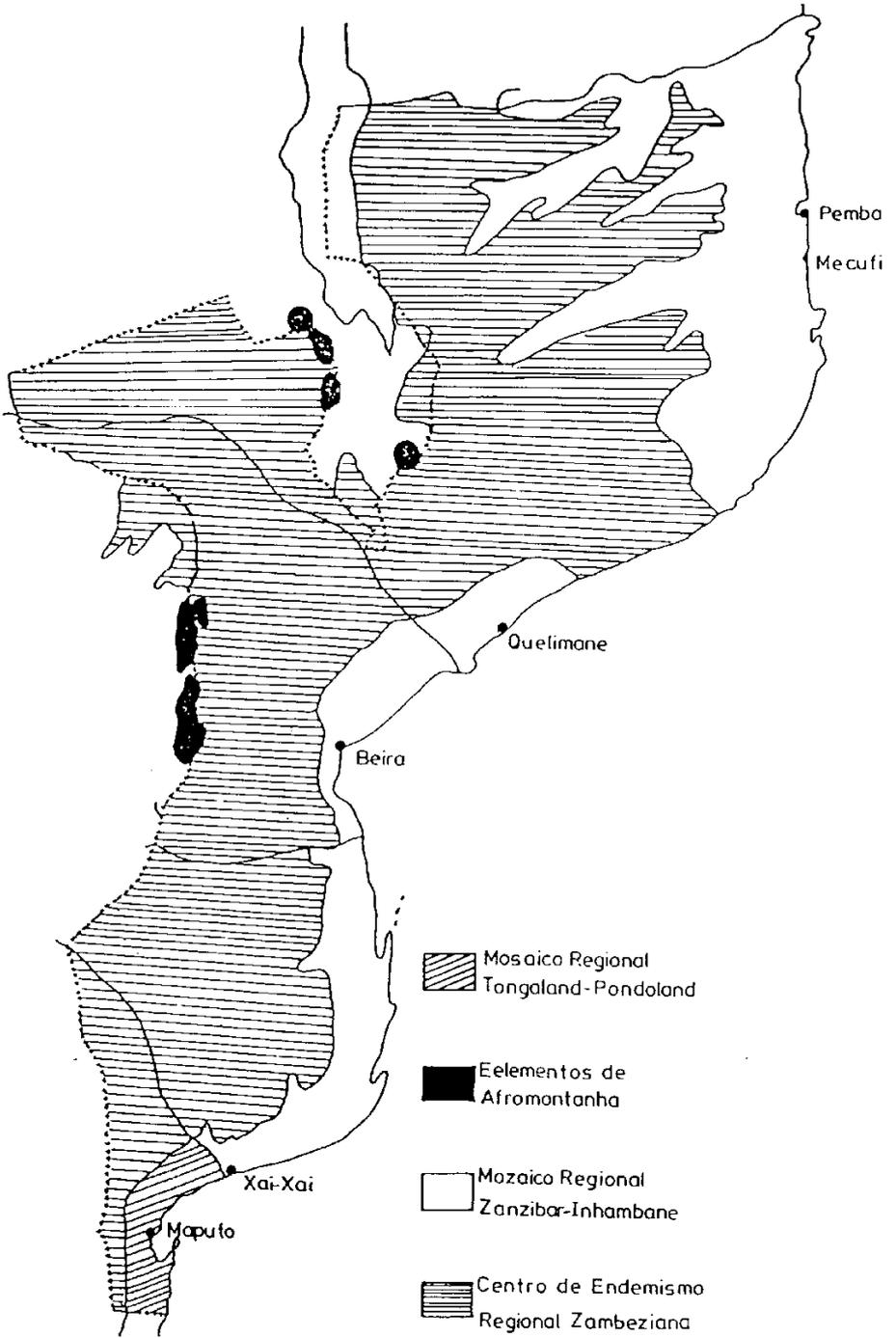


Fig.2 PRINCIPAL DISTRIBUIÇÃO FITOGEOGRÁFICA DE MOÇAMBIQUE



1.4 DESCRIPTION OF THE FOREST SECTOR

According to the updated report on the National Forest Inventory (SAKET, 1994), the vegetation cover, including the formations classified as high forest, low forest, thicket, wooded Grassland and Mangroves extends over 78% of the total land area. However, the area of potential timber productive forests is estimated as 25% of the total land of Mozambique.

The subsistence sector is the major consumer and beneficiary of the products of the forestry sector. The annual exploitation by the "informal sector" is 16 million m³ of wood fuel for energy consumption and an additional 5 million m³ of roundwood for construction materials. This exploitation has given rise to deforestation rate around the large population centres.

The overall rate of deforestation during an 18-year period was estimated in 4.27% (equivalent to 2.74 million hectares) giving an annual rate of loss of vegetation of 0.24% (this value is much higher in the most populated areas), caused mainly by shifting cultivation and clear cutting for fuel wood and construction poles.

In respect to mangroves, the annual deforestation was estimated in 0.16% or 2.9% over 18 years, caused by fuel wood and building poles harvest as well.

It is important to note the relationship that rural communities have upon forests as a source for food, medicinal and social/cultural services.

In the formal private sector, production and supply of the timber is concentrated in the north and central regions of the country. Only 10-15% of the existing volume accounts for species accepted by the international market. They are being used intensively in localized over-exploited areas and together with the selective cutting systems, tended to degrade both the productivity and floristic composition of the forest.

The forest industry in Mozambique is confined to mechanical wood working units. The only exception to this is a small paper manufacturing plant, located in Maputo, which use imported pulp and waste paper.

The production capacity of these units have begun to decline soon after independence because of lack of spare parts, maintenance and civil war.

Sawmilling is the major component of the wood industry accounting for more than 84% of the total wood industry installed capacity.



There are 50 sawmills, however only few of them are reasonably capable of producing export quality sawn timber. It should be noted that lately, log exports have been increasing as a consequence of the decline of export of sawn timber.

The harvesting systems used in Mozambique are two main types: payment of sample fee (royalties simple) and payment of concession fees. The minimum allowable cutting diameter for major harvested species is fixed above 40 cm.



CHAPTER 2

Indigenous Plant Genetic Resources

Mozambique holds an important reservoir of the indigenous plant genetic resources including the forest genetic resources, wild relative of crops, landraces, medicinal plants, pasture species and other useful wild species.

2.1 FOREST GENETIC RESOURCES

Mozambique belongs to the vegetation class of the Zambeziaca Region. The country is rich in botanical resources with approximately 6,000 species of higher plants of which only 5,500 species are taxonomically classified and kept in LMA Herbarium at INIA. The main vegetation types are:

1. The *hygrophilous* and *sub-hygrophilous* forests, composed of evergreen, dense and continuous formations. Those include mountain forests, galleries and mangroves located throughout the humid areas of the country and in the Zanzibar/Inhambane coastal mosaics.
2. The *Xerophilous* forests, composed of deciduous formations covering the greatest surface of the country. In this group the following types are identified:
 - a. Open forests, with dominance of *Brachystegia* (miombo woodland), *Strychnos*, *Combretum*, *Albizzia*, *Trichilia*, *Sclerocarya birrea*, *Uapaca*, *Colophospermum mopane*, *Adrostachys johnsonii* and dune vegetation.
 - b. Savanna, composed of grouped and/or isolated medium-size trees, dominated by *Acacia* and *Terminalia* mixed with *Combretum*, *Xeroderis*, *Kigelia*, *Syzygium* and *Albizzia*.
 - c. Thorn vegetation, normally of *Acacia* (*A. xanthophloea*, *A. nilotica* and *A. mossambicensis*), in pure stands or mixed with other species.
3. The grasslands or steppe formation, specially formed by herbaceous vegetation with few scattered shrubs.



Most timber species have been heavily harvested in Mozambique. For this reason there is an urgent need for detailed surveys, mainly for the following species:

- *Dalbergia melanoxylon*
- *Milicea excelsa*
- *Androstachys johnsonii*
- *Khaya nyasica*
- *Guibourtia conjugata*
- *Pterocarpus angolensis*
- *Spirostachys africana*
- *Azelia quanzensis*

Even though indigenous fruit trees and medicinal plants are valued and protected by local people, there is a lack of information on the present status and the level and mechanisms adopted to protect threatened forest species in Mozambique. There is an urgent need for a development programme on domestication and management of such species to guarantee their conservation and rational utilization.

2.2 WILD CROP RELATIVES AND OTHER WILD SPECIES

Several wild relatives of domesticated plants are found in Mozambique. There is limited information on this plant species due to the lack of coordinated efforts on surveying, collection and documentation of plant genetic resources. It should be also noted that some wild species are under intensive and selective exploitation. Some wild species documented in the country are listed below.



Some wild crop relatives and other useful wild species found in Mozambique

WILD CROP RELATIVES

Cereals

Pennisetum spp.
Sorghum spp.
Oryza longistaminata

Grain Legumes

Vigna unguiculata complex

Cash Crops

Gossypium spp

OTHER WILD SPECIES

Vegetable

Momordica balsamina
Amaranthus spp.
Corchorus trilocularis
Sonchus oleraceus

Pastures

Grass and leguminous species

Medicinal Plants

Aloe spp.
Catharanthus roseus, etc.

Forestry

Khaya nyasica
Azelia quanzensis
Pterocarpus angolensis
Dalbergia melanoxylon
Melletia sthulmanii
Sterculia appendiculata

Fruit trees

Uapaca spp
Annona senegalensis
Sclerocarya birrea
Trichilia emetica
Ziziphus spp.
Dialium spp.



2.3 LANDRACES AND OTHER CULTIVARS

There is a very little information on use of traditional varieties of different crops in Mozambique. An assessment process is under way in order to gather more information on this issue.

Information on improved varieties of major crops has been published by government institutions (National Agriculture Research Institute (INIA), Agriculture Training Centre (CFA), National Directorate of Rural Development (DNDR), as well by the private seed company (SEMOC).

Reasons for maintenance of landraces by farmers are various, especially quality characteristics (taste), agronomic adaptation, resistance to pests, diseases and drought tolerance. This is the case of traditional crops like cassava (*Manihot esculenta*), sorghum and cowpea (*Vigna unguiculata*).



CHAPTER 3

National Conservation Activities

The main goal of National Conservation activities in Mozambique is to conserve and promote the sustainable utilization of the country's plant genetic resources. Attempts are being made to adopt the complementary conservation strategies integrating the *ex situ* and *in situ* methods. The main target taxa for conservation are the main important crops, forestry species endemic and critical plant species.

3.1 *IN SITU* CONSERVATION ACTIVITIES

In situ conservation methods are being used to conserve both wild plants and landraces.

3.1.1 *In situ* conservation of landraces

There is no formal programme for "on-farm" conservation of landraces in Mozambique. However, farmers are still keeping and managing important reservoirs of landraces for their own use. There is a need to formalise a programme for "on farm" conservation of landraces in Mozambique where the governmental and non-governmental institutions will be involved in monitoring the farmer's fields (e.g. Community Seed Banks).

3.1.2 *In situ* conservation of wild plants

In situ conservation of the wild species is being done in National Parks, Reserves and Sanctuaries.

Mozambique has a remarkable network of conservation areas and potential for establishing further areas to stimulate tourism and protect vital biological diversity resources. There are four National Parks, five Games Reserves, twelve Hunting Areas (coutadas) and fourteen Forest Reserves covering a total area of 89,602 km² or approximately 11.4% of Mozambique total land area. The existing conservation areas are shown in the following Table.



The bulk of these areas are made up by game reserves, with 51,200 km² of land in game reserves, 16,200 km² are in national parks, 19,500 km² in hunting reserves and 2,700 km² in forest reserves .

It should be mentioned that most of the protected areas were established with the aim of protecting and conserving wild life resources, without taking into account the conservation of other important biological and inanimate resources. In addition, the present boundaries of these conservation areas do not necessarily correspond to the ecological boundaries of the areas under protection. In most cases, the decision on establishing the conservation area did not take into account the recommended land use and conflicts between different types of land use.

On the other hand, the war has lead to virtually lost of management capacity of these conservation areas. The law enforcement was lost as the existing forest and wildlife guards were forced to withdraw from many areas at the beginning of hostilities in the country. Today, it is not certainly known the status of many of these conservation areas since the control on them has been lost due to the war. However, it is believed that the situation in some of these areas has been changed due to either the total abandonment or over-exploration as a result of concentration of displaced population, burning and so forth.

The National Directorate for Forestry and Wildlife has developed a programme designed to overcome the existing problems in the conservation areas of the country. The most important activities to be carried out are:

- Surveys and assessment of these areas in order to know their present status.
- Elaboration of management plans of each taking into account the promotion of conservation and sustainable use of wildlife and forest resources which support the local and regional economies and ensures a long-term conservation of genetic resources.

Additionally, a number of new conservation areas have been proposed to fill the gaps the current conservation areas network which lacks, in particular, sites for conservation of mountain, lowland forests and inland and coastal habitats. Some of these areas are:

1. The northern shore of Panda, Cabo Delgado, with fossil coral cliffs and thickets of *Guibourtia schliebennii*.
2. Gorongoza mountain to Marromeu, mangrove estuarine ecosystem.



3. Chimanimani area, which will conserve the entire mountain ecosystem, including the lowland evergreen forests of Mozambique (the flora of this area includes over 56 endemic species).

3.2 EX SITU CONSERVATION

Ex situ conservation methods used in Mozambique include the seed conservation, field genebanks, arboreta, botanic gardens and in-vitro methods.

An existing arboreta needs additional funds to be maintained, as well as the field genebanks, the tissue culture laboratory and LMA Herbarium.

3.2.1 Seed conservation

Seed conservation is being done by the National Plant Genetic Resources Centre (NPGRC) housed and managed by INIA. The Centre was established in 1989 but still needs to be formalized. Funding of the centre is provided by the SADC Plant Genetic Resources Centre (SPGRC) and the Government of Mozambique.

The NPGRC holds 1,122 germplasm accessions of the following crops: maize, rice, sorghum, cowpea, pigeon pea, bambara groundnut, kidney bean, sunflower, soybeans, triticum (Table 3). Most NPGRC germplasm accessions were acquired through collaborative programme between INIA and International Agricultural Research Centres (CIAT, CYMMYT, IRRI and IITA). In fact, only small portion of these accessions were collected locally.

Forest seeds are being kept by the Forestry Research Centre (CEF). Conservation activities of forestry seeds are funded by the Canadian Government through SADC Tree Seed Centre Project. Examples of species maintained by this Centre include *Eucaliptus* spp. and *Pinus* spp.

Collection missions focusing single crop or groups of crops will be soon started in order to enhance the existing collections at INIA. Special attention will be paid to the over-exploited forestry species, endemic and endangered species.

The exchange of genetic resources will be done according Article 15 (access to genetic resources) of the Conservation on Biological Diversity.



3.2.2 Field genebanks

Some germplasm accessions are kept in the field as field genebanks in Mozambique. Examples of these are clones of banana kept at Umbelúzi Research Station. On the other hand, there are 576 clones of cashew nut kept country wide (in Ricathla, Nhacoongo and Nampula). Most of these collections are not properly maintained, documented and evaluated. The lack of financial resources, trained personnel and poor management capacity are the main constraints to adequate management of these field genebanks.

3.2.3 *In vitro* collections

The Root and Tuber Crops Sector of INIA is managing a tissue culture laboratory meant for rapid multiplication, maintenance and distribution of cassava and sweet potato germplasm. Strictly speaking, this is not an in-vitro genebank, as nearly all accessions are working collections.

3.2.4 Botanic gardens

Unfortunately Mozambique has no botanical gardens in strict sense of the word. The creation of botanical gardens in different ecological regions of the country is highly recommended.

3.3 STORAGE FACILITIES

Existing facilities maintained at INIA headquarters in Maputo include a cold room, deep freezers, drying machine, sealing machine, aluminium containers and an electronic balance. Storage conditions follow the international standards.

As a member of the SADC Plant Genetic Resources Centre, Mozambique will send duplicates of the accessions being maintained at NPGRC to Chalimbana, Zambia. The Ministries of Agriculture of all SADC member countries have signed a memorandum of understanding meant to the management of genetic resources.



3.4 DOCUMENTATION

All seed accessions are documented using both the manual and computer-based documentation system in use at the NPGRC. The manual system consists of two hardcover registers keeping namely, the registration data and management data. The computer-based documentation used at NPGRC is the SADC Plant Genetic Resources Documentation and Information System (SDIS).

It would be advisable that the provision of data to the users could be done by the electronic mail.

3.5 CHARACTERIZATION AND EVALUATION

Morpho-agronomic characterization is under way at the NPGRC. This is based on the IPGRI descriptor lists. For example, 66 cowpea accessions have been characterized in the 1992/93 cropping season. Some NPGRC germplasm accessions have evaluated for special traits e.g. disease and pest resistance (under field conditions) and drought tolerance by plant breeders. A closer collaboration with regional and international institutions would be of help to enhance the germplasm characterization and the evaluation of the both local and exotic germplasm. This process must take into consideration the most common constraints existing in the country.

3.6 REGENERATION

Regeneration of the seed accessions is done when germination percent, determined in representative samples, is lower than 70%. Priority for regeneration is given to accessions of the landraces of the most important crops. Land is not a constraint for regenerating materials but the Institute needs to upgrade facilities and has problems with availability of transport and funds to cover field labour. The original accessions and the regenerated materials are kept separately in order to avoid mixtures of "fresh" and "old" materials.

A total of 386 germplasm accessions (maize, cowpea and beans) have been regenerated/multiplied since 1991 (Table 1).



It is planned to regenerate 792 accessions within next 5 years.

Table 1 Number of germplasm accessions regenerated/multiplied by the NPGRC

Cropping season	Crop	No. of accessions regenerated/multiplied
1991/92	Maize	31
	Beans	26
1992/93	Cowpea	66
	Bean	51
1993/94	Cowpea	69
1994/95	Beans	36
1995/96	Cowpea	107
Total		386

3.7 FOREST GENETIC RESOURCES

An adequate information system has not yet been developed for forest genetic resources, mainly due to difficulties encountered during the war. A limited number of studies on origin and progeny trials have been established using seeds from different sources. It is known that the most important tree species have been heavily exploited after the war terminated. As mean to conserve the forest species the National Tree Seed Centre is involved in the collection of seeds of species that have been intensively harvested.

With the end of the war and the opening of the road network of the country, efforts are being done to resuming the inventory of the country's forest genetic resources.

Table 2 Estimates of personnel working on the most important food crops

Crop	INIA	SEMOC	UEM	Others	Total
Cereals	3	3	-	2	8
Root crops	3	-	2	15	20
Legumes	2	2	2	3	9



Table 3 No. of germplasm accessions held by INIA

Crop	No. of accessions
Zea mays	260
Manihot esculenta*	80
<i>Phaseolus vulgaris</i>	218
<i>Vigna unguiculata</i>	92
Ipomoea batatas*	100
Oryza sativa	152
Sorghum bicolor	72
Triticum	116
Mucuna pruriens	18
Lablab purpureus	11
<i>Vigna subterranea</i>	21
Cajanus cajan	18
<i>Vigna radiata</i>	11
<i>Helianthus annuus</i>	29
"Macadamia"	18
"Pecana"	14
Glicine max	72
Total	1,122**

*: In vitro collections maintained by the root and tuber crops sector of INIA

** : Includes only seed accessions held by the NPGRC



CHAPTER 4

In-Country Uses of Plant Genetic Resources

Plant breeders, geneticists and botanists are the main users of genebank materials, using either local or introduced materials to produce improved varieties locally adapted with high potential.

4.1 USE OF PGR COLLECTIONS

Food crops are important source of food for human consumption. The followings are some of the important crop species: maize, cassava, sorghum, cowpea, common beans, rice, sweet potato, ground nut, sunflower, etc.

Researchers involved in breeding, agronomy, botany and other research areas are the main users of the available plant genetic resources. Field extensionists and people dealing with seed multiplication and distribution, are also important users of genetic resources.

INIA has the mandate for agricultural research and DNDR the mandate for extension activities. However, due to their weak capacity in terms of human and financial resources, several NGO's and other national organizations have been actively involved on research and extension activities, being frequent and relevant users of the national genetic resources. The most important users as well as an estimate of professionals working with each crop is shown on Table 2 and in the list below.

The Main Users of Plant Genetic Resources in Mozambique

INIA
DINA/DNDR
SEMOC
Universidade Eduardo Mondlane
World Vision
Food For The Hungry
Ministerio Da Saude
IPA
FAO



The Main Users of Plant Genetic Resources in Mozambique (continued)

UNICEF

CONCERN

COCAMO

The main marketed crops are maize, rice, groundnuts, vegetables and beans. The majority of varieties released are selections of local varieties or selections of materials introduced into the national collections from different areas of the country. A few foreign materials were used in the recent past, specially in emergency situations, when large amounts of seeds were donated by foreign countries.

During the past 15 years of the war in the country, many accessions were lost, and only recently it was possible to recollect local germplasm. Most of the materials collected undergo preliminary evaluations and the majority is usually discarded from field trials. Materials not eligible for multi-locational trials are kept at the Genebank.

Due to the reasons mentioned above the national extension service does not have the capacity to meet the farmers needs throughout the country. To overcome this situation, several NGO's are playing a key role in seed distribution.

4.2 CROP IMPROVEMENT PROGRAMMES AND SEED DISTRIBUTION

The main short-term objective of the national crop improvement programmes is to adapt introduced germplasm to farmers needs. The long-term objective is to introduce specific characteristics in to local or exotic materials (especially resistance to biotic and abiotic constraints) according to local needs.

The ultimate objective of plant breeding activities in the country is to increase production and diversify production systems. The primary focus is to meet the national food needs, and secondly to increase export opportunities.

Human resources is one of the constraints faced by the government funded institutions. Low salaries, lack of adequate infrastructure and scarcity of research funds contribute for the exodus of qualified research personnel to private organizations.



Breeding activities are mainly carried out by government institutions with funds allocated by externally-funded projects. Lately, some NGOs, namely World Vision and FHI become also involved in applied research, in coordination with government institutions. The national seed company (SEMOC) is also involved in research.

Subsistence farmers are the main targeted beneficiaries of the national breeding programmes for food crops. They have been involved on variety selection specially through on-farm trials and demonstration fields.

One of the main constraints limiting the availability of improved varieties to the farmers, as mentioned earlier, is the lack of coordination and low implementation level of the extension services. Another important constraint is the high cost of seeds, which most of the farmers cannot afford.

4.3 USE OF FOREST GENETIC RESOURCES

There is a National Seed Production Centre. This centre is a Network with the SADC Countries which is supported by the Canadian government (CIDA Funded Project).

4.4 BENEFIT DERIVED FROM THE USE OF PLANT GENETIC RESOURCES

The genebank collections are kept primarily for national use. However, the access to the national germplasm will be regulated by the government taking into account the International Code of Conduct for Plant Germplasm Collecting and Transfer.

Many genetic materials have been supplied by regional/international organizations as IITA/CIP, for cassava and sweet potato, ICRISAT for sorghum, CIAT and CIMMYT for maize, IRRI for rice, etc. The materials have been locally evaluated and compared/discussed with results obtained in other countries, from similar sources.

Some crossings have been also carried out using both the local and introduced materials, to combine the best characteristics of each of them.



4.5 IMPROVING PGR UTILIZATION

The main goal of crop research in the country is to generate adequate genetic materials and technology to meet the need of sustainable increase in agricultural production. The target crops includes the important traditional food crops as well as commercial crops.

Plant genetic resources are an extremely important natural value for any country, and as any natural resource, must be properly and carefully maintained. For this reason, there is a need to utilize them in a sustainable way.

One of the most important measures to achieve this is to know what and how much we have in the country. The main constraints are human, technical and financial resources.

Improving PGR utilization requires an adequate programme for characterization, evaluation and documentation of the germplasm. Multi-disciplinary working groups should be created to carry out these important tasks. On the other hand, collaboration with regional and international institutions would contribute to the improvement of utilization of PGR within the country.



CHAPTER 5

National Goals, Policies, Programmes and Legislation

5.1 NATIONAL PROGRAMME

The plant genetic resources activities are organized into National Programme (a single government-funded programme). There is no firms involved in that programme. NGO's and farmers are also involved.

The goals and objectives of the government are to maintain a National Genetic Resources Programme to conserve the agrobiodiversity.

The National Plant Genetic Resources Committee must be formalized. The head of that sector must have a secure position. The decision to establish this position is made by the Ministry of Agriculture and Fishery (MAP). It is also up to the MAP to approve the annual programme and budget; surely the government is formally committed to secure the annual funding for the PGR Programme.

There is a regional commitment made by the governments of all countries members (SADC), to protect the regional plant genetic resources.

National Programmes and other PGR activities related to national food security are of extremely important.

5.2 TRAINING

Some training programmes have been sponsored by the SPGRC and international organizations like FAO, IITA, IRRI, CIMMYT, ICRISAT etc. These programmes included both short courses and academic courses.

However, the National Programme on Plant Genetic Resources has limited trained people in plant genetic resources, plant breeding, taxonomy and statistics. This means that more people trained in these areas are required.



The most urgent training need are scholarships for training abroad and funds for local short training courses.

The main skills in our National Programme are statistical sampling, agronomic evaluation, plant breeding and taxonomy.

No formal training on plant genetic resources exists at the country level. In future, at least the University and the National Institute of Agriculture Research may consider to offer relevant courses which will be supported by the international resources in term of funds and experts.

An effort is being done to involve both the man and woman as far as possible in the opportunities for training programme at all levels.

5.3 NATIONAL LEGISLATION

In Mozambique there is no legislation designed specifically to regulate the collection, exchange and transfer of plant genetic resources. While we are still waiting for specific legislation on this topic, the collection, exchange and transfer of germplasm will be regulated by the guide lines set out by the Code of Conduct for Collecting, Exchange and Transfer of Plant Genetic Resources.

It is worth to mention that there are some legislation and regulations which are relevant for germplasm exchange and transfer. Good examples are the quarantine regulations and the legislation on sale and distribution of seeds.

Quarantine services are very important for preventing transference of pest and disease. According to the current phytosanitary inspection and quarantine legislation, any plant material including the germplasm coming from abroad must be accompanied by a phytosanitary certificate and must be examined for the presence of pests, diseases and other harmful organisms. Plant material must meet the requirement stated in the plant import permit.

As soon as the Variety Release Committee will fully functional, the nationals breeder's rights will be protected. On the other the hand, the National Plant Genetic Resources Committee will take special measures to ensure the protection of country's plant genetic resources by setting out the necessary legislation on collecting, exchange and transfer of plant genetic resources.

It should be noted that Mozambique has signed the CITES Convention.



The government does not provide incentives to farmers for the conservation of traditional varieties.

There is not yet a legislation on Intellectual Property Rights (IPR).

Related to GATT negotiation, it is our wish that this should be in line with Convention on Biological Diversity.

5.4 OTHER POLICIES

Some incentives are given to farmers directly involved in seed multiplication in coordination with SEMOC.

The main incentives are the supply of inputs and price incentives to stimulate the production.

5.5 TRADE COMMERCIAL AND OTHER INTERNATIONAL AGREEMENTS

At present, there are no impacts on the national genetic resources programme arising from any new international policies and country's commitment in the area of trade and commerce.



CHAPTER 6

International Collaboration

Mozambique collaborates with the following international organizations: UNDP, FAO, SIDA, ICRISAT, CIMMYT, CIAT, IITA, IRRI, CIP and other governmental, inter-governmental and non-governmental organizations.

United Nations

The position of the FAO should be in line with the recommendations stated in the Convention on Biological Diversity.

FAO global system

Mozambique is not yet a member of the FAO Commission on Plant Genetic Resources. However, the collaboration in plant genetic resources takes place, mainly, in food crops, namely: maize, rice, cowpea, beans, sweet potato, cassava, sorghum. FAO also contributed for establishment of tissue culture laboratory at INIA.

International agriculture research centres

The CIAT has given a great contribution to our National Plant Genetic Resources Programme by providing genetic materials and/or enhanced materials to users within the country and selected varieties to the national crop research programmes.

We received some support from CGIAR in training course and technical assistance.

The new initiative in plant genetic resources that would be supported by CGIAR are: Training of personnel, exchange and distribution of material and technology transfer.

We think that the mechanism for communication between our national programme and the CGIAR Centre are adequate and the scientists stationed in the country have made a great contribution to the National Programme.

The most important functions for IPGRI in the next decade should be in human resources development and training and facilitating acquisition of funds and equipment.



Regional research centres

Mozambique has special relationship with the SADC ICRISAT in Zimbabwe and Vegetable Centre in Tanzania.

Regional inter-governmental initiatives

Mozambique belongs to the SADC Genetic Resources Centre and receives assistance in terms of training and equipment.

We believe that there is further potential for regionally integrated plant genetic resources programme. This would be of help for the exchange and use of plant genetic resources in the Region.

Bilateral intergovernmental initiatives

Mozambique has no bilateral agreement in plant genetic resources with any country.



CHAPTER 7

National Needs and Opportunities

7.1 NEEDS AND OPPORTUNITIES FOR THE FOREST SECTOR

As mentioned in the above sections, Mozambique holds a great biodiversity including species that are endangered in neighbouring countries. There is an urgent need for conservation and development of several studies on the ecosystems where these species inhabit. The lack of human, financial, equipment and adequate facilities are constraints to carry out the following programme.

- Updating and evaluation of the actual situation of the reserves: Validity of their limits; validity of the objectives for which they were created; vegetation description and analysis, morphology, composition and frequency of species.
- Identification, selection and surveys of forest species in the different ecosystems of Miombo, Mopane, *Acacias*, *Androstachys*, Mangroves and mountain vegetation formations.
- Establishment of *in situ* areas for the most important species and ecosystems.
- Identification and delimitation of new conservation areas for fragile ecosystem and critical plant species.
- Country-wide collection and evaluation/characterization of most important species.
- Data base management.
- Human resources development/training.
- Maintenance and up dating of the LMA Herbarium.
- Studies on indigenous plant use.



7.2 NEEDS AND OPPORTUNITIES FOR THE AGRICULTURAL SECTOR

To make the best use of the existing resources/facilities in order to conserve the genetic materials, there is a great need for:

- Exploratory surveys for collection of landraces and wild species.
- Updating of descriptors list for each crop or group of crops.
- Creation of a national catalogue of plant genetic resources.
- Improve multiplication/regeneration techniques.
 - Breeding programme: training in reproductive biology for the main crops
 - Extend tissue culture activities to other relevant crops
- Improvement of infra-structures.
 - Improve the conservation room (purchase of generators, shelves, seed containers)
 - Installation of the screen-houses
 - Define areas for maintenance of field collections and increase management capacity of these collections
- To employ competent staff to address the following technical issues.
 - Plant genetic resources management
 - Data base management
 - Plant breeding for the most important crops
 - Plant taxonomy
 - Statistical procedures
- Training of personnel.
- Maintenance and updating of the LMA Herbarium.



CHAPTER 8

Proposals for a Global Plan of Action

1. To identify biological importance of different types of forest for plants (endemism, diversity), for fauna (birds, reptiles, mammals,) and their social/cultural values.
2. To identify and quantify threats to which forests are exposed.
3. To evaluate status of existing forests.
4. To map and gazette new areas to include diversity, endemism, ecological and cultural aspects.
5. Remarking of boundaries of existing resources.
6. Establishment of the new "*in situ*" conservation areas.
7. Institutional support towards an effective management and conservation of the forests. Action is need to an effective control of illegal forest practices.
8. To identify alternative resources and technologies needed to be provided to rural communities which rely on the forest for essential materials. (e.g. better charcoal ovens, solar energy)
9. To develop management plans.
10. To develop ecotourism (well controlled and oriented).
11. Human resources development and training
12. Improvement of conservation techniques for both the orthodox and non-orthodox seeds.



References

- Da Silva, M. A. 1991.** Listagem das Plantas Alimentares Espontâneas em Moçambique, Série Investigação n.11, INIA, Maputo.
- Da Silva., M.A. & Munisse, P. (Eds.), 1993.** Conservation of Plant Genetic Resources in Mozambique. Proceedings of the First National Workshop on Plant Genetic Resources Conservation in Mozambique, INIA, Maputo, 1991.
- Ministério de Agricultura, 1992.** Linhas Gerais da Política Agrária do País. Ministério de Agricultura, Maputo, Moçambique.
- Ministério de Agricultura, 1991.** Estratégia de Produtos Agrícolas Alimentares Básicos. Ministério da Agricultura, Maputo, Moçambique.
- National Environment Commission, 1993.** The Costs, Benefits and Unmet Needs of Sustainable Biological Diversity in Mozambique. National Environment Commission, Maputo, Moçambique.
- Van Eijnatten, C., van Eijk, da Cruz e Sousa, D. & Honwana, C., 1992.** Towards Productive Agricultural Research in Mozambique. A Report on a Consultancy to INIA. INIA, Maputo, and Helsinki University Knowledge Services, Helsinki.
- World Bank, 1990.** Mozambique Restoring Rural Production and Trade. World Bank, Washington D.C., USA.



Abbreviations

AGDP	Agricultural Gross Domestic product
CEF	Centro de Experimentação Florestal
DNDR	Direcção Nacional de Desenvolvimento Rural
ERP	Economic rehabilitation Programme (1987-1990)
ESRP	Economic and Social Rehabilitation Programme (1991-1993)
GDP	Gross Domestic Product
IFAD	International Found For Agricultural Development (Nigeria)
IMF	International Monetary Fund
INIA	Instituto Nacional de Investigação Agronómica (Maputo)
LMA	National Herbarium (INIA, Maputo)
MAP	Ministry of Agriculture and Fishery
SEMOG	Sementes de Moçambique