LESOTHO:

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 Country and its Agricultural Sector

1.1 GENERAL

Lesotho covers an area of 30,355 sq. km and is completely surrounded by the Republic of South Africa (R.S.A). Over two-thirds of the country is mountains. It is divided into four agro-ecological zones, namely the mountains, foot-hills, lowlands and Orange-River-Valley. All the land in Lesotho is over 1,500 m above sea level.

- The lowlands 1,500 - 1,800 m in altitude : 15% of the country
- The foothills 1,800 - 2,200 m high : 10 - 15% of the area
- The mountains 2,200-3,000 m in elevation: over 2/3 of the country
- The Orange-River-Valley is the extension of the lowlands into Eastern mountain along the Senqu (Orange) River.

1.2 DEMOGRAPHY

The last census was in 1986 and the population was 1.6 million. The rate of population increase is estimated at 2.6 percent, leading to about 3.0 million people by year 2010. In 1991 the population density was put at 60 persons per sq. km.

But bearing in mind that two-third of the population live on less than one-third of the land area (the Western Lowland), a more realistic figure for planning purposes would be 200 persons per sq. km. This is a serious situation for a poor country like Lesotho with a small national resource base.

1.3 AGRICULTURE

1.3.1 Climate

The climate in Lesotho is semi-humid to semi-arid. The relative humidity varies from 45 to 85 percent and is lowest in the month of August and September.

It is characterized by warm wet summers and dry cold winters. Average annual rainfall varies from about 500 mm in the West and in some rain shadow areas, to over 1,000 mm high up in the mountains. The driest parts of Lesotho are the South-Western districts. Table 1 shows the average monthly rainfall. The annual average is 720 mm.

The Table shows the average monthly rainfall recorded over 17 years. The rainy season is in summer from October to April when about 83 percent of rainfall occurs. In the lowlands and foothills, this period is frost free, with cool nights and warm days. January is the hottest month. In the mountains frost can occur any time of the year even in summer. Hail storms are common and cause substantial crop losses. In winter, May to July night temperatures are below 0°C and it is generally cold in Lesotho even at day time. In the mountains, winter precipitation falls mainly as snow.

1.3.2 Agricultural production potential

Most of the soils of Lesotho are alluvial, colluvial or eolian of either sedimentary or basaltic origin.

Table 1 Average monthly rainfall (whole country)

Monthly	Rainfall (mm)
January	110
February	102
March	93
April	61
May	22
June	20
July	13
August	28
September	45
October	74
November	97

Monthly	Rainfall (mm)
December	95
Total	**760**

Those derived from sedimentary are more common in the lowlands and those from basalt and dolerite are more common in the mountains. Mixtures and variations occur throughout the country. Most soils in the flatter and gently sloping areas tend to be moderately deep to deep, and well drained, whilst those of the mountain slopes tend to be more shallow and stony. The principal arable soils of the lowlands and foothills are yellowish red to yellowish brown loans with a sandy loam topsoil. They are moderately fertile and slightly acid, and are prone to wind and water erosion.

1.3.3 Farming sector

Eighty-five percent of the people in Lesotho live in rural areas and are dependent on Agriculture in one way or another. They practice mixed farming of crops and livestock and are mainly subsistence farmers although lately commercial farming is gathering momentum.

There are no farms in Lesotho but rather fields whose average sizes are 3-4 ha. The commercial farmers lease land from these small holders on seasonal/annual or long term basis. The land in Lesotho is the property of the nation in the custody of the king and is allocated free to any adult male.

Land use may be summarized as shown in Table 2.

Table 2 Land use

Type	Area (million ha)	Proportion (%)
Cropping	0.30	10
Grazing	2.50	83
Other	0.23	7
Total	**3.03**	**100**

The arable land in Lesotho is around 400,000 ha although on the average annual planted area is about 330,000 ha of which 305,000 ha are summer crops, 25,000 ha for winter crops and 2,000 ha for vegetables. Due to various reasons the cropland in Lesotho has declined from 1950 to 1986 by 23 percent (84,500 ha). The major factors are soil erosion (donga formation), urbanization and industrialization. That means as the population increases, the land for food production is decreasing. Lesotho has no alternative but to intensify its agriculture.

The major crops grown in Lesotho in the order of importance are shown in Table 3.

Table 3 Crop areas and yields

Crop	Area (ha)	Yield (ha)
Maize	130,000	0.74
Sorghum	54,000	0.58
Spring Wheat	30,000	1.00
Winter Wheat	18,000	0.40
Beans	24,000	0.40
Summer Peas	3,000	0.40
Winter peas	6,000	0.40

At the inception of development planning in Lesotho, it was estimated that agriculture is by far the largest productive sector contributing 40% of gross domestic product (GPD). This relative contribution gradually declined averaging 19-20% of real GDP. The decline in the relative share of this sector however seems to have resulted from the rapid growth of the secondary sector as against an absolute decline in agricultural output. Fluctuations in the latter seem to have been very closely associated with climatic condition especially drought. Topography, human and livestock pressure, veld burning have also contributed to deforestation, deterioration of range, soil erosion and leading loss of fertile soil.

Despite this decline in GDP, agriculture is still regarded as having a critical contribution in the economy. Over 80% of the population lives in rural areas and derives all or part of their livelihood from agriculture. Statistical data in the late 1980' s also revealed that this sector was estimated to be employing 60% of the labour force.

The stagnation of mine labour employment in the RSA and the population growth coupled with a sluggishly developing modern sector, forces the country to intensify its efforts in agricultural development.

The present trend in crop production is to diversify instead of concentrating only on traditional crops especially crops such as maize, wheat and sorghum. This diversification includes the promotion of high value crops, intensive crop husbandry, research and technology. While self-sufficiency has always been the main objective alone, food security is gaining importance. That means while still encouraging use of hybrid seeds, improvement on traditional reliable cultivars is included in our programmes in order to improve the availability of food by the small holder farmers.

CHAPTER 2
Indigenous Plant Genetic Resources

2.1 FOREST GENETIC RESOURCES

Extend: less than 0.2% of the area of Lesotho contains indigenous trees and forest patches. The country is often considered to be "natural" grassland, but with a significant percentage of indigenous shrubs in most localities. However, the fact that planted trees have grown without attention at almost the highest altitudes of the country, and near the upper limits of the so-called "Alpine Zone", suggests that climate itself is not the factor preventing tree growth.

Social importance: the indigenous shrubs and the small trees are extremely important in the domestic economy and for the environment. By energy content, 64.6% of the fuel used in rural areas comes from trees and shrubs, and predominantly from indigenous species growing on land which is highly vulnerable to erosion. Certain species are preferred woodfuels in their own localities. A sociological survey identified the six most-preferred indigenous species in order as cheche (*Leucosidea Sericea*), Kolits'ane (*Rhus divaricata, Rhus pyroides*), mokhoamphiri (*Rhus undulata*), mosinabelo (*Rhus lancea*), mohlakola (*Euclea crispa var.crispa*) and mofifi (*Rhumnus prinoides*). However, when favoured species become scarce or extinct in any area from over-exploitation, virtually every other species within carrying distance comes to be used.

Commercial timber potential: although there are no commercial indigenous timber trees in Lesotho, certain species were handsawn into construction timber for local use in the past, namely molutu (*Celtis africana*), moluoane (*Salix mucronata*) and mohloare (*Olea europaea sabsp. africana*). In terms of its timber properties, form and dimensions to which it can grow in Lesotho, Celtis would be the most appropriate for any indigenous sawtimber afforestation. Other sawtimber species of good form which can be found growing to similar sizes are phukhu (*llexmitis*), lekhatsi (*Kiggelaria africana*) and, rather smaller and as a potential decorative furniture wood, qoqolosi (*Scolopia mundii*).

Rarity of germplasm: Lesotho experiences a rather low and erratic rainfall and is subject to periodic droughts. Its land is generally steep or very steep in many of the areas where shrubs grow and, consequently, the soil there are even

physiologically drier than the rainfall data suggest. Many of the socially-important indigenous shrub species and potential commercial tree species reach their current altitudinal limits and, therefore, it is probable that they contain unique germplasm in terms of the adaptation of the plants to low soil moisture, very low winter temperatures and high insolation.

Lekhasi (Kiggelaria africana) is particularly noteworthy in its altitude range. Individuals of several species have been measured with appreciably greater heights than are recorded for general maxima in the neighbouring country of South Africa.

There are also some indigenous trees used for medicinal purpose such as *Euclea coriaceae* (Ralikokotoana), *Rhamnus prinoides* (Mofifi), *Cussonia paniculata* (Mots'ets'e) to mention a few.

2.2 PROGRAMMES FOR SUSTAINABLE INDIGENOUS FOREST MANAGEMENT AND GERMPLASM CONVERSATION

At present, no areas of indigenous trees and shrubs have been specifically identified for sustainable use under any statutory law or formalised programme. The desirability for such programmes has been recognised in local meetings on Agenda 21 (UNDP-sponsored) and Heritage Preservation (UNESCO-sponsored) and in formal discussions on a National Forestry Action Plan being prepared under the FAO/IDA/WRI Tropical Forestry Action Programme (TFAP) procedures.

Lesotho has a traditional system for conserving indigenous trees and shrubs involving the control of their exploitation by hereditary Chiefs. Many generations ago under this system, specific, rather small and generally open-grazed areas of indigenous trees and shrubs were declared as controlled-harvesting areas. Outside these area, trees and shrubs can be exploited without prior approval of the Chief. However, it is generally considered that the system is breaking down under population pressure and loss of respect for these traditional authorities. The sustainability of the resource is at least seriously at risk from the overgrazing which limits the regeneration of the plants after their harvesting.

Concern about the loss of the natural heritage of trees and shrubs has been expressed by rural people themselves, and proposals have been made in a local consultancy report for the National Forestry Action Plan (NFAP) for the sustainable management of the resource, including its re-establishment with

the support of local communities. The NFAP itself is still being formulated, but many of the more-densely growing patches of indigenous trees and shrubs in different silvicultural zones have been visited by foresters, and the species present have been located and measured, but no trials have been made to reveal whether the specimens are genotypically superior.

In addition, a very compact arboretum has been under development since 1989 to contain examples of all Lesotho's indigenous trees and those indigenous shrubs which are found growing in the country to heights of at least 2 metres. The main purpose of the arboretum is for public information and reference. However, wherever suitable stock is available, its plants is being obtained from the areas where the tallest specimens were found - either as the indicative progeny of the measured plants, or occasionally as vegetative cuttings from them. More conventional arboreta have been proposed for other locations.

2.3 OTHER WILD SPECIES AND WILD RELATIVES OF CROP PLANTS

Lesotho is a country with a high degree of botanical diversity. Some groups like algae and fungi have not received adequate attention. Lesotho is full of mountains and mountains are known centres for endemism. With the altitudes ranging from 2,300 and 3,400 m, Drakensberg forms an important centre for endemism as well as speciation (Talukdar, 1994). The only detailed checklist for the country is of Guillarmod (1971). The number of species listed in this account is 1,651. Recent studies have shown that there are up to 2,000 species of plants in Lesotho (Arnold & De Wet, 1993).

The high risk of losing valuable indigenous plant resources due to forest clearance, collecting of firewood and medicinal plants is a serious problem in Lesotho. Furthermore, there is rapid replacement of traditional varieties by the high yielding hybrid varieties. Crop land races and threatened plant species should be the priority for future collecting missions in Lesotho.

The interesting plants in Lesotho are very many. A detailed study should be undertaken to unravel the list of plants which are quietly disappearing. The following sample list should be enough to highlight the species diversity from a botanist's viewpoint:

Bryophytes

- *Tortula pagorum*

- *Ephemerum capense* and
- *Weisiopsis involuta* (for the above mentioned 3 species, Lesotho is the third known locality in the world!)
- A *Bryum* species new to science has been recently discovered (Duckett, Personal communication).

Pteridophytes

The unique *lycophyte* with secondary growth *Isoetes* welwitschii is known from Lesotho (Jacobsen, 1983). Similarly, Kali & Hargreaves (1985) have recorded two species of *Ophioglossum, O. vulgatum* and *O. polyphyllum*.

Flowering plants

Euphorbia clavarioides
Euphorbia pulvinata (known only from Quthing)
Aloe polyphylla (endemic to Lesotho)
Aponogeton ranunculiflourus
Leucosidea sericea (important species)
Guthreia capensis (endemic to Lesotho)
Dais cotonifolia (known from Berea district only)
Salix mucronata (indigenous willow)
Helichrysum palustre (endemic to Lesotho)
Helichrysum quthlambanum (only in Butha-Buthe district)
Kniphofia hirsuta (only in Berea district)
Crassula qoatlhambensis (new species from Lesotho described by Hargreaves (1989)

Mention should be made of the immediate necessity of preparing the Flora of Lesotho so that future investigators will be able to identify the species and conserve areas of endemism and species div ersity. At present one cannot use Guillarmod's (1971), "The Flora of Lesotho" for identification because there is no key to distinguish different taxa. In the absence of an authentic flora, one has to tend to a very large extend on the herbarium specimens for identifications.

Although mention is made about the existence of three herbaria in the country, only the herbarium of the National University of Lesotho (Roma) is the largest and relatively active one. It has about 1600 specimens. The specimens have been collected from the last century by a number of missionaries interested in plants. Some of these specimens have been determined from the National Botanical Institute, Pretoria. A very large collection is in urgent need of determination by experts in herbaria of international repute. Unfortunately, there are no permanent staff to maintain the Roma herbarium. Staff members, by voluntary basis, have tried to take

care of these precious specimens. For recurring expenses, there is no allocation of funds. There are a cater to national needs. As long ago as 1977, it was proposed that all the 3 herbaria in the country be co-ordinated as units of a National Herbarium (Hoener, 1977), but nothing has been done. The suggestion of a National Botanic Garden has also been made (Machan, 1980), but to this day the small teaching garden at the University remains Lesotho's only botanic garden.

A National Herbarium is an urgent priority to study the plant diversity in Lesotho. There should be adequate space to store and display the specimens and work on them. The National Botanical Institute at Pretoria has embarked on a database program. If Lesotho wants to be in the phytogeographical grid, then a computerised database has to be established. It is our suggestion that the national herbarium should be in a separate building in the National University of Lesotho Campus, Roma.

- The building must have the following accommodation:
  - A herbarium display wing (25m x 15m area)
  - A preparation room to store the collected specimens (10m x 10m)
  - Library
  - A computer room
  - A cold room (to keep germ plasm collection)
  - 3 office rooms
  - Store room (10 x 10m)
  - A garage

- Such a building should be supported by the following:
  - A trained personnel to be the keeper of the herbarium
  - 3 assistants (2 lab technicians + 1 driver)
  - Scientific equipment (Altimeter, soil kit, camera, compass etc.)
  - Collecting equipment
  - Camping equipment
  - Medical supplies
  - Stationery
  - A vehicle preferably 4 x 4

- By establishing a national herbarium with the above-stated facilities, the following benefits could be achieved:
  - To scientifically know the plant wealth of Lesotho.
  - Preparation of the Flora of Lesotho for scientists and students.
  - The utility of information by the environmental secretariat of the Government of Lesotho.
  - The preservation of germplasm resources before they completely vanish from the country.
  - The availability of database and expertise for the country.
  - The direct use of information in relation to the biodiversity assessments.
  - Students from schools could visit and learn about the countries plant wealth.

2.4 GENETIC DIVERSITY IN FIELD CROPS IN LESOTHO

The three major cereal crops maize, sorghum and wheat are grown in different agro-ecological zones, namely, the lowlands, foothills, mountains, and the Orange River Valley (Senqu) in Lesotho. As a result of differences among these agro-ecological zones as well as the long period over which these crops have been under cultivation, genetic diversity is expected, mainly due to natural selection, aided by farmers choice of particular traits.

Wheat is of recent development in Lesotho and the area allotted to its cultivation is relatively small; thus, expected genetic diversity is not significant to warrant collection. Because of their breeding habits, sorghum and maize would offer higher diversity.

In maize, the use of hybrid varieties has already eroded some of the genetic diversity specially in the lowlands. There are some farmers who still maintain their own open pollinated varieties. Of particular interest are distinct populations of open pollinated maize varieties which are early maturing and used by farmers in the high lands. These and other land races of maize in Lesotho, need to be collected and characterized. This will have to be followed by population improvement programmes which will retain more genetic diversity within each population. Maintenance of genetic diversity in different populations can not be over emphasised.

Even though there was a considerable reduction in cultivated area allotted to sorghum in Lesotho during the last hundred and fifty years, most sorghum varieties used by farmers appear to be still land races.

Thus, in a preliminary study, in which samples were collected from seven farmers' fields in Mohale's Hoek district and compared to a recently released variety, results for days to heading and plant height, revealed that there are considerable variations in the land races for both characters. It was concluded that although the land races might be low in grain yield, they have high variability in different traits and need to be collected and characterized, before they are replaced by homogeneous varieties (**J. Mahommed. 1995**).

Future work on both maize and sorghum should emphasize population improvement of locally collected land races in addition to the presently on-going improvement efforts. The first step in this research effort will be collection and characterization of the land races. Any assistance along this line will be helpful.

A good number of teaching staff members and students of the Faculty of Agriculture of the National university of Lesotho, are interested in the above and other related activities, such as in depth study of "wild vegetables" in Lesotho. Participation can be at any stage of the different activities.

Landraces (farmers' varieties) and old cultivars regarding the history of agriculture, according to **Morojele (1963),** peasant farming in Lesotho cannot have started earlier than the beginning of the 19th century. Before this time the Basotho were essentially hunters and herdsmen. At this time the important crops were sorghum, millet, maize, sweet reed, pumpkins, melons, beans, tobacco, and wheat.

Along the way some crops were dropped by farmers and new ones introduced. Presently landraces of the following crops are still in use: Maize, wheat, sorghum, beans, cowpeas, peas lentils, lab-lab, pumpkins, tobacco, potatoes and few others.

The main reasons for the continuing use of these landraces are: the high prices of improved cultivars and hybrids, the availability of these within the vicinity of farmers in remote areas, the favourable characteristics of these like for an example, fast maturing especially in the highlands where the growing season is very short because of frost, colour (e.g. white grains for sorghum), palatability, cooking time (energy is a problem) disease resistance, tall varieties for wheat (because the straw is used for thatching) just to name some.

The government's policy has always been to promote improved cultivars, the main emphasis being on yield. But presently the emphasis is no more only on

food-self sufficiency but also on food security, the focus is on making use of those crop species which were neglected in favour of hybrids. These landraces are highly valued by these subsistence farmers who conserve these material for generations although these conservation methods are not well documented.

The government's policy is very emphatic in protecting wild genetic resources although the means of implementation are very limited because of the communal use of land resource in the country. The government tries its level best to create awareness amongst the people through its various Ministries and Departments. As a follow-up to this exercise preventive measures need to be taken which would lead to declaring protected areas in the country. Foreign assistance will be needed in this exercise.

One of the methods to be used in this endeavour will be to propagate some of these material to be sold cheaply to the community to avoid unscrupulous utilization from the wild.

Technology assistance will also be needed. Some of the material will be transferred from their original places to arbortaria or field gene banks. Our country lacks expertise and facilities in biotechnology. It needs to be developed.

CHAPTER 3
Plant Genetic Resources - National Conservation Activities

3.1 *IN SITU* CONSERVATION

Lesotho like many other countries is concerned about conservation of genetic resources, hence the establishment of the first and only one National Park in the country in 1970. This is Sehlabathebe National Park and is located in the South-Eastern part of the country. Proposals and preparations are underway to establish more reserves especially in the Lesotho Highlands Water Project areas. Sehlabathebe National Park covers 6,500 hectares and is only 0.2% of the country. It is generally an open hilly grassveld with almost 100% shortgrass and no significant cover of tall grass or woody vegetation. Grassland comprise approximately 69% while wetlands cover 11% and the rest is rocklands.

The National Park has a research station within which there is a herbarium with a collection of 1,364 plant specimens. Since the departure of Park Botanist in 1980, there has not been any good maintenance of the herbarium. There are 598 species of clubmoss, 1 species of spikemoss and 1 species of quillwort (Hoener, 1976-79).

3.2 OTHER HABITATS

There are other plant species of concern which are not physically protected even though protected by law. Lack of law enforcement and low fines have led to declining populations of these species. *Aloe Polyphylla*, spiral aloe is an endemic plant which is also facing extinction. The exploiters are selling it to tourists and the public.

There are attempts to breed it in captivity and make it available for sale. This is to undercut over exploitation and the illegal market.

3.3 CONSERVATION ACTIVITIES

Lesotho National Parks section is presently involved in nature conservation education in primary and high schools. Public gatherings are held where talks/slide shows are given/shown. This is mainly to motivate the public so that it takes responsibility and initiate to stop genetic erosion on its own. Poster of endangered species e.g. *Aloe Polyphylla* are put in all prominent places like border posts schools, hotels etc.

As far as spiral aloe is concerned, there are conservation plans already in place which are to be implemented. These are:

- To start nursery which will be designed to raise plants from seed collected from natural populations.
- To put up road signs on the road and border crossing warning people about purchasing from villagers, and
- To revise the fines and enforce protection laws.

Lesotho has historically and topographically not been recognised as a forested country in so far as indigenous trees are concerned. This is to clarify that indigenous trees have occurred in the country on mountain slopes and inaccessible ravines, and those tree species that are still found are representative of the tree culture one would expect to find at these altitudes.

It is the responsibility of the present Basotho generation to be conscious enough to look into conservation of the indigenous trees for the benefit of their land, culture, energy sources, medicinal value, landscape, amenity, and for their future generations to inherit and admire.

Basotho, through their traditional Chiefs, have their system of conserving indigenous trees and regulating their harvest. Wooded areas were claimed protected (Maboella/Liremo), and would not be exploited without the authorization of the Chief or his forest guard. This system is still practiced by some conservation conscious communities, while to some communities the system has become a thing of the past because of population increase: both livestock and human populations, thus overgrazing limits regeneration of the woods.

There are no claimed areas of indigenous trees in the country that are secluded or earmarked for genetic resources development programme so far, but there have been proposals in the TFAP programme, which are still under review.

Though no records have been publicised, Forestry National Tree Seed Centre has a record of localities where indigenous trees exist that can be sampled for genetic conservation research.

There is evident need for conserving the existing resources for the betterment of the woody ecosystem. Promotion of the Gene Bank Lesotho would play a very important role if supportive programme of gene conservation could be sort.

3.4 *EX SITU* COLLECTIONS

Lesotho has a very special genetic material due to its unique environment. As a result collection of indigenous plants in Lesotho has been going on for a long time. Uncontrolled germplasm collections by foreign scientists have also been taking place in the past whose genetic material unfortunately can not be traced.

The first coordinated and planned collection was in 1985. Eversince then all collections have been monitored by the Ministry of Agriculture. Before the establishment of National Plant Genetic resources Centre the responsible body for the conservation of endangered species was the Protection and Preservation Commission which was predominantly *in situ* conservation.

The first locally coordinated collection mission by P. Rao of the International Crops Research Institute for the Semi-arid Tropics (ICRISAT) was carried out in 1985. A total of 180 sorghum accessions were collected from different altitudes, characterized and all stored in Matopos, Zimbabwe.

This mission was followed by the second expedition by Dr. Stefane Padulous of the International Board of Tropical Agriculture (IITA) in 1988. This joint collecting mission with Agricultural Research Division (ARD) focused on sorghum, cowpeas, wheat, maize peas, beans lentils and soyabeans. All the genetic material was handed over to the Agricultural Research but due to lack of proper storage because the national-programme was not yet in place, some of the material has been lost.

The last collecting mission was done by H. Moses of the International Board of Plant Genetic Resources which is recently call IPGRI. This joint collecting mission with ARD was carried out for three years, thus from 1989 to 1991. The objective of this mission was to collect grasses and wild relatives of crops from the threatened habitats of the Afro-Alpine region of Lesotho. More than

700 samples of forage grasses, legumes wild relatives of crops and other miscellaneous crops such as Polygonum avicurlae were collected. All 101 accesions are temporarily stored at Wakehurst Place in the United Kingdom until the local genebank is in full operation and in position to handle its own genetic material. Amongst the important genetic material kept at Wakehurst Place are the following genera:

Lotonosis for which Lesotho is a major centre of diversity
Trifolium for which Lesotho is the secondary centre of diversity
Hodium capense whose centre of diversity is Ethiopia
Roa spp. from Europe
Indigenous commercial forage including the genus
Festuca
Merxmuellara
Pentaseli
Etraseli
Helictori
Eragrostis
Agrastis and *Loelieria*

Lastly in 1991/92 Dr. Letsie from Lesotho collected medicinal plants from the three districts of Lesotho namely Maseru, Quthing and Leribe.

It has been finally decided that the site for the National Plant Genetic Resources be at the Agricultural Research Division in Maseru. ARD has offered the centre an old building with four rooms into which a genebank will be incorporated. It is hoped that this building will in the near future be extended by three more rooms which will include a dry room, an additional office and most importantly a working area.

Due to the previous institutional constraints the locally available material has not been utilized hence there has not been any characterization and evaluation done so far. This material has been acquired through collection expeditions mainly by foreign scientists and local counterparts as earlier mentioned, donations, individual collections at market places or agricultural show grounds as well as introduced cultivars from the International Research Centre and Institutions.

The centre is to keep active collections only. The base collections are supposed to be delivered to the SADC regional genebank in Lusaka, Zambia. The centre has the minimum equipment for collections, documentation and storage purpose which are of international standards. However, more equipment will be procured as soon as the situation of the centre is improved in terms of a building and staff recruitment.

In a very small scale a field genebank was initiated. The activity was not really successful because of lack of land and staff. The field genebank was mainly for medicinal plants.

The centre has not so far carried out any meaningful documentation, evaluation and characterizations as well as regeneration. The little that was done on regeneration was on maize, beans and cowpeas though not properly done due to institutional constraints such as labour, land and finance. Forestry division is the only institute so far that is carrying out some of the above activities.

In conclusion, all the local genetic material is stored outside the country and will be repatriated as soon as the genebank is fully functional and in a position to handle its own genetic material. Some of the material will still be stored externally for safety.

CHAPTER 4
In-Country Uses of Plant Genetic Resources

For locally collected material, except that of forests, there has been no utilization locally or by foreign scientists.

Much is being done on introduced material in multiplication and a consequent distribution to farmers. The Agricultural Research Division is responsible for new introductions. After testing the material, it is passed on to Seed Multiplication Unit for propagation and distribution to farmers.

It has always been the Government's policy to be self-sufficient in food production. All plans and strategies in the past have been geared to achieve this goal. The Government has always realised that one of the most important aspects for increasing crop production and productivity is the constant supply of improved quality seed. Since there is no plant breeding programme in the country, a Seed Multiplication Unit (SMU) was established.

Its main task so far has been to multiply imported seed which has been found suitable for the country by our agricultural research. This Unit will eventually be the coordinating body between the Gene Bank, the breeders and the ultimate beneficiaries, that is the farmers. As mentioned earlier, the current trend is to diversify crop production aiming at food security and commercialization of the sector. Presently the single strains are encouraged for small scale farmers. Initially most of the collected germplasm will be utilized for the production of such cultivars. Through the commercialization of crop production exploring export opportunities is the ultimate aim in this sector. Commodities to be exported comprise of both seed and processed produce.

Large scale private seed companies are presently not likely to be very successful. The main focus is till now on small scale farmers for the production of seed, that is on-farm seed production. Individual farmers or associations produce seed on contract basis with the S.M.U., a government institution.

The main constraints in this sector are funds. The S.M.U. lacks funds to expand its activities in terms of area and lists of crops to be included, and for providing the Unit with appropriate facilities in storage, processing, packaging etc. The Unit also lacks trained staff to implement its planned programmes.

Close linkages between the NPGRC, other agricultural research sections, seed production institutions and seed retailers would be very beneficial to the farmers. That will definitely improve the utilization of our plant genetic resources.

That means, improving or strengthening the plant genetic resources centre without improving the capacities of the Agricultural Research and the S.M.U. will not serve the purpose.

Without the services of one of these three, the whole system will not function. All of them have common constraints, facilities, funds and qualified staff.

CHAPTER 5
National Goals, Policies, Programmes and Legislation

In the previous chapters, a mention of the existence of national plant genetic resources programme is made. The centre responsible in this programme is governmental institution within our research system. It was established in 1989 as counterpart to the regional programme, the SADC Plant Genetic Resources Centre (SPGRC).

Similar programmes are found within other governmental and non-governmental departments. This centre is supposed to coordinate all activities related to Plant Genetic Resources conservation and utilization. Presently there is a lot of duplication of efforts by different institutions. Better coordination will be achieved by strengthening and improving the capacity of the NPGRC.

Genes are basic material for present future improvement of crop plants. The conserved gemplasm will be utilized by breeders and researchers and for the development of country's agriculture. Conservation of environment and natural resources ranks high in government priorities. Plant genetic resources is but one component of this broad government programme. The national programme is supposed to collect information and material of all endemic and indigenous plants and plants with possible national evolution history. This material might be landraces or of potential use as well as wild relatives of such species.

The programme is expected to characterize, evaluate, rejuvenate, multiply and document such material. It is within its mandate to handle the *in situ* conservation including field gene banks. The government expects the centre to serve the breeding and research programmes and to promote the utilization of underutilized plants for food production and industrial use.

The government is disturbed by the extinction of medicinal plants because it is striving to integrate traditional and modern health care in the country. The programme has to take care of these valuable plants.

At the moment, there are no established posts for the centre. The curator, who is the head of the programme is responsible to the Director/Deputy Director of Agricultural Research and is at the same level as all sectional heads. A national committee selected from diverse government

ministries/departments, parastatals, educational institutions and NGO's gives direction on activities and policies while the staff of the centre is supposed to implement these on the day to day basis.

Some institutional constraints are the main source, that the programme lacks its own budget line. After removing these obstacles, the government is committed to secure some funding for the programme.

5.1 NATIONAL LEGISLATION

There is no legislation on plant genetic resources as such. There are some Acts for the protection of some declared species. But Lesotho is a signatory in the Memorandum of Understanding establishing the SADC Plant Genetic Resources Centre and of the Convention on Biological Diversity.

There is no legislation governing the import or export of both plant genetic material and seeds in the country. Such legislation is only in a form of draft to be discussed first by parliament. This situation affects the programme in two ways. Firstly, the transactions of such material over the border is not well documented. That means we are not able to make a follow up on any crop species that have been taken out of the country or those which have been imported. Secondly, there have been some outbreaks of pests and disease which were normally non-existent in the country. The suspicion has been that they were brought in through imported material.

The country has to seek assistance for the formulation of policy as well as legal matters concerning plant genetic resources programme and the whole plant production sector. The centre is supposed to take over the decision making of imports and export of plant material. Formerly the Preservation and Protection Commission was to some extend responsible.

The International Board for Plant Genetic Resources (IBPGR) through Ms Helen Moss of the Zimbabwe office, together with ARD, collected grasses and other plants in 1989 and 1991. Helen prepared a very good report of her collection. She also made arrangements with ARD to take all she collected, including a share which was supposed to remain in Lesotho, for cleaning and preparation for storage, where facilities are available. She would then keep Lesotho's share until the country is ready to take care of its own material. In 1991/92 Dr. Letsie of Lesotho, collected some medicinal plants in three districts of Maseru, Quthing and Leribe. His record is also available at the National Tree Seed Centre.

5.1.1 Legal protection of some plants in Lesotho

In Lesotho the "Commission for Preservation of Natural and Historical Monuments, Relics and Antiques, and Protection of Fauna and Flora" was established through Act 41 of 1967. Following its establishment the Commission through, Legal Notice Number 36 of 1969 proclaimed the following flora as protected:

1. All aloes, with particular reference to the *aloe polyphylla*, including its seeds and flowers
2. All bamboos
3. All *protea*
4. All wild olive
5. All *cussonia*
6. All *rhus burchelli*
7. All *celastrus*
8. All *leucoxilo*
9. All *heteromorpha*
10. All *euleia*
11. All *grewia*
12. All *chiliantus*
13. All *gladiolus* species

We sincerely believe there is still a lot more important plants to Lesotho, which if their economic importance is realised could also be protected.

A well coordinated and effective effort is needed in Lesotho, in order to bring under control the ever eroding Plant Genetic Resources of Lesotho.

With regards to the Document under review, on international transfer of seeds, Section 9(2) does state that no person shall without a written consent of the Commission remove the item from its origin or export it from Lesotho.

It has to be noted there that the Commission does not give permits for sale of any plant or animal. Permits are limited to quantities on research or educational materials.

There exists in Lesotho, intellectual property law. In this case, I will to refer to the industrial property law under the administration of the Law Office, but on the Copyright and Neighbouring Rights Law which is administered by the Ministry of Tourism, Sports and Culture. It would therefore be advisable for the Department of Research to note that they can move for the expansion of

the existing law to make sure that Genetic Resource Programme is covered by copyright law.

5.2 TRADE COMMERCIAL AND OTHER INTERNATIONAL AGREEMENTS

As far as the Department of Culture is concerned, there are no adverse impacts which have been identified as the result of the international agreements, as we do not have trade or commercial agreements with any one of the international organisations.

5.3 TRAINING

Before the establishment of the regional centre on Plant Genetic Resources, IBPGR (IPGRI) was responsible for training. In 1989, the regional centre took over the task. So far two people were trained at M.Sc. level, 5 attended short courses in Denmark, Royal Agricultural and Veterinary University in Sweden, in Britain, University of Birmingham, in Ethiopia at ICCA. All but one of these are women.

Training has been on conservation and utilization of plant genetic resources, taxonomy as well as documentation.

Local training is not foreseen in the near future. Lesotho will always rely on overseas institutions and the envisaged regional training in one of the universities.

The major constraint is the lack of officially established positions for this section. After training, the candidates return to their substantive positions in various departments. In that case, the programme does not benefit much from this training. The only solution is therefore for the government to recognize this need.

5.4 OTHER POLICIES

In Lesotho, crop production is generally not subsidized except as a relief measure after adverse weather conditions like drought which affected production negatively. In such cases input subsidies are provided as an incentive for increased production for the following season. These are normally tied up to use of improved varieties for major crops.
The development banks are responsible to offer credits for agricultural inputs and operations. In addition most projects offer the same facilities at area based level. All these are done in collaboration with the Ministry of Agriculture in some certain issues.

In all these credit and subsidy schemes, the programme is not involved in decision making. These are done at a high management level where the plant genetic resources section is not represented, though at this development stage it would be not of much use to consult the programme staff in such matters.

CHAPTER 6
International Collaboration

6.1 REGIONAL AND BILATERAL INTERGOVERNMENTAL INITIATIVES

The national programme through the SADC regional centre on plant genetic resources is collaborating with NGB (Nordic Gene Bank) in scientific and management expertise. This collaboration is very beneficial to our programme in terms of training of our staff and funding to establish our national centres.

Funding is by the Nordic countries collectively as well as bilaterally especially for the procurement of equipment of our programme. Improvement of facilities is also through bilateral funding.

Lesotho is likely to benefit a lot by strengthening bilateral intergovernmental and institutional initiatives with Republic of South Africa because we have much in common to benefit both countries.

Republic of South Africa has an experience and expertise in this field.

6.2 COLLABORATION WITH INTERNATIONAL AGRICULTURAL RESEARCH CENTRES

Plant Genetic resources Centre in Lesotho is a section of the Agricultural Research Division. As a part of the on-going regional and international research activities, it has all the potential to work hand-in-hand or to exchange genetic materials with the different international organizations with whom we are currently collaborating.

Some of the organizations worth mentioning in this regard are: CYMMIT, IITA, ICRISAT, IFAD, ICRAF, University of IDAHO, and several other international centres as well as other Universities.

CHAPTER 7
National Needs and Opportunities

Lesotho needs a comprehensive national plant genetic resources project to develop our centre. To accomplish that donor assistance will be needed to compliment the government's initiatives. Such an assistance should be in a form of technical expertise and finance.

The existing building is adequate only to initiate the activities of the centre. When fully operational extensions, reconstructions and renovations will be inevitable. A need for a new building may arise in the future with the introduction of biotechnology techniques.

In full operation the need for land in various ecological zones in the country will lead to the expansion of the programme. A well secured land will be needed for rejuvenations, multiplication, characterization and evaluations. Field gene banks are also to be established to compliment the *in situ* and *ex situ* conservation activities.

Although a herbarium will not necessarily be part of the centre, the development or strengthening of one is necessary. The strengthening of the University herbarium will serve as the national herbarium. The establishment of a botanic garden above the level of just a teaching aid should be considered alongside this development.

The present seed testing laboratory will need to be strengthened and upgraded to the capacity that it could cope with activities of the seed production, the farming community and the NPGRC. The assistance expected is in the form of staff training and procurement of additional equipment.

The ultimate goal of the programme is the utilization of conserved germplasm. In this respect the most important institutions are the Agricultural Research Services and the National Seed Services. Without the development of the capacity of these two, the whole programme will not achieve the expected output. A comprehensive project to strengthen these sectors alongside that of the centre is very necessary. The two need to be upgraded in form of staff and supply of facilities as well as funding of its activities. The linkages between the NPGRC, Research-Seed Services (presently Seed Multiplication Unit) need to be developed or strengthened. It should be strived at upgrading and reorganising the S.M.U. to a national seed service to cope up with the future challenge. The research capability should not be confined to only field and horticultural crops but also forestry included.

An inventory to assess the country's naturally occurring plant genetic resources assets to facilitate germplasm collections is one of the top priorities of the programme.

The present prevailing drought, the overgrazing in rangelands, veldburning, the on-going Lesotho Highlands Water Project activities and other factors which threaten the existence of our plant genetic resources determine this exercise to be treated as an emergency.

Lack of legislation governing the activities of both the plant genetic resources and seed services is one of the problems which need to be attended to. Closely related is the establishment of the quarantine facilities in the country. All these should be in line with the government policy on such issues, which also still needs to be formulated.

Training needs have been raised in several chapters in the paper. It is because one of the major reasons why our programme is not operational is the lack of qualified staff. This applies for the NPGRC as well as Agricultural Research and the National Seed Service. Training should be inclusive from germplasm collection to ultimate distribution to the users as well as related fields in facilitating such activities, for example botanists, taxonomists, breeders and so on. For long term projections, training should not be confined to the NPGRC staff only, although in the initial stages that should be a priority.

7.1 SUMMARY OF NATIONAL NEEDS

- Establishment of National Plant Genetic Resources Centre (NPGRC)
  - Construction or renovation of building
  - Establishment of Field Gene Banks, Herbarium (National) and Botanic Garden
  - Staff Training
  - Two year project to initiate the programme (TCP)
- Inventory
- Collections - Assistance in the Highland Water Project

- Project (TCP) to establish a National Seed Service to facilitate the utilization of conserved material
- Establishment of quarantine facilities
- Strengthening of Research Services
- Establishment of biotechnology expertise and facilities
- Policy formulation