



UGANDA:

**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

Introductory Background

1.1 SIZE AND LOCATION

Uganda is a land locked country, located on the East African plateau, lying between latitude 4° 12' N and 1° 29' S and longitude 29° 34' E and 35°E. It is therefore astride the equator. It is bordered by Sudan to the North, Kenya to the East, Tanzania to the South, Zaire to the West and Rwanda to the South West. The total land area is 236,000 km² of which 33,926 km² is permanent water and 7,674 km² is permanent swamp. Dry land accounts for 194,000 km². Most of the country lies within altitude 900 - 1,500 m above sea level.

1.2 TOPOGRAPHY

Towards the South, the characteristic scenery consists of flat topped mesa-like hills and broad Intervening valleys frequently containing swamps. Towards the North, the landscape is more subdued, consisting of gently rolling open plains and interrupted by occasional hills, mountains and inselbergs. The East African Rift Valley runs near the Western border where it is represented by two troughs; at lakes George and Edward and at Lake Albert. Between the troughs, lies the glaciated horst mountains of the Rwenzori range, rising to the highest peak in the country at 5,100 m. The lowest point in Uganda is at Nimule on the Sudan boarder in the North Western part of the country. Altitude here is 600 m ASL.

1.3 CLIMATE

Over most of the country, mean annual maximum temperatures range between 18-35°C; while mean annual minimum temperature range is 8-23°C. Relative humidity is often high, ranging from 70% to 100%. Mean monthly evaporation rates range between 125-200 mm. Much of the country receives average mean rainfall of 1,000 - 1,500 mm. The Southern parts of the country has two rainy seasons, April - May, and October - November. The reliability of rainfall generally declines Northwards; where there is only one rainy season July - September. The Wettest part of the country is the Lake Victoria



shores, and the mountains uplands of the East and Western parts of the country. Here, mean annual rainfall varies between 1,250-1,500 mm. The driest part of the country is the North Eastern part, inhabited by the semi-nomadic KaramoJong tribe. Here, the mean annual varies between 625-1,000 mm. The rainfall in almost all parts of the country adequately supports agriculture, soil types range from fertile volcanic ash sandy gravel acidic or shallow poor soils.

Vegetation In Uganda may be classified in the following categories:

Forests. This covers 13.9% of the total country area. Stretching from around lakes Victoria, and the Albert to me Rift Valley and on mountains in all parts of the country.

Savanna. This covers 34.7% of the total country area, corresponding to the areas of the country with declining rainfall.

Thicket. This predominates the driest parts of the country.

1.4 AGRICULTURE

Uganda's population as at 1991 census was 16.5 million people. The estimated yearly growth rate is 2.9%. Most of this population is supported by agriculture which is by far the main economic activity in Uganda, and will remain so far the foreseeable future. According to the Ministry of Finance and Economic Planning of Ugandan Government, 1988 figures, agricultural sector accounted for about 50% of the Gross Domestic Product; almost 40% of total government revenue, 90% of the country's export; and employed 80% of the working population.

The majority of farmers are small holders, living in scattered homesteads, and employing traditional agricultural techniques. The tools of these farmers are generally limited to the hand hoe, the axe and the panga. Average acreage per small holding is between 1-10 ha. Mechanisation is still in its infancy. Irrigation of crop is almost negligible, and the use of fertilisers and pesticides is minimal. The systems of cultivation for annual crops usually included fallow periods, but due to an inexorable increase in population, the fallow phase has been continuously shortened to unsatisfactory lengths, and in some areas it has been completely eliminated. Of the total dry land available in the country, only 30% is under crop production represented by 4,000,000 ha.



The main food crops are maize, finger millet, bananas (cooking), sorghum, sweet potatoes, cassava, beans, peas, groundnuts, solanum potatoes, rice and sesame. The main traditional cash crops are coffee, cotton, and tea. In addition to these are various arrays introduced and native, semi-wild vegetables. Most fruits grown are introduced. For indigenous ones are usually collected from the forests.

Of the cereal crops, maize, sorghum and finger millet are very important. In many regions, maize, an introduced crop is replacing the traditional millet and cooking bananas as the main food crop. Of the root crops, cassava is increasingly becoming popular, since it gives good yields even in poor soil and under drought conditions. In general, these crops are grown under four main farming systems. (Figure 1).

In the coffee-banana farming system, in the wetter areas of Southern, Western, and Eastern parts of the country, perennial crops and exotic fruits and vegetables are grown. The main food crop is bananas and the main cash crops are tea and coffee.

The upland areas of the Western and Eastern parts of the country; high reliable rainfall and fertile volcanic ash is characteristic. Main crops grown are exotic fruits and vegetables, bananas and temperate crops such as wheat and barley.

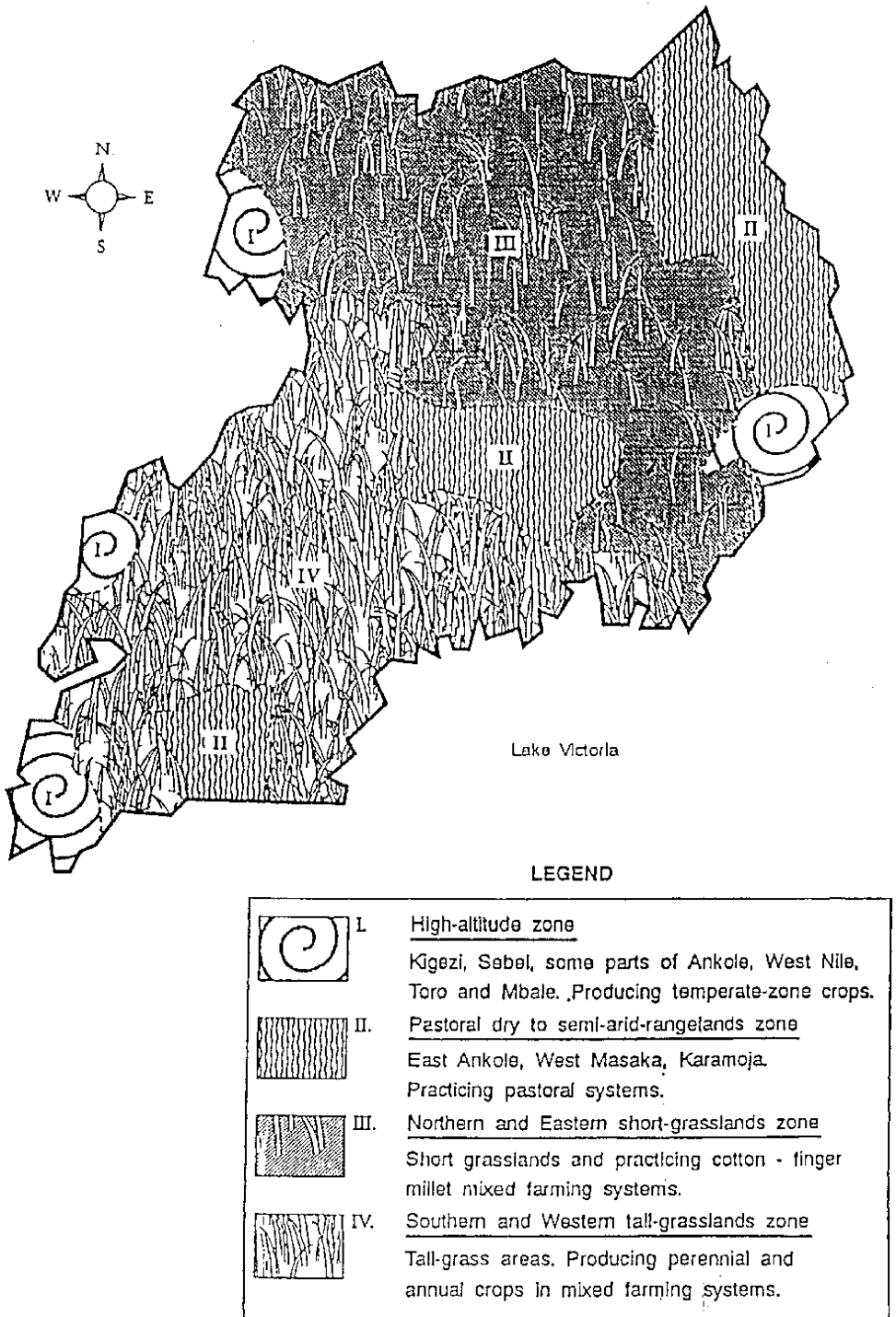
In the drier-savannah areas of the North, East and Western parts of the country, the main crops are the annuals, few drought resistant perennials, and both local and introduced legumes. The main food crop is millet, and the main cash crop is cotton.

The semi-arid rangelands of the North East and the South West parts of the country forms the fourth type of agricultural zone. Here the main agricultural activity carried out is cattle keeping, in a semi-nomadic pastoral system.

Although agricultural crop production trends have shown increases over the years, yields/ha have continued to drop. Increase in production levels has thus been due to increases in acreages rather than yields. Production constraints include pests, diseases and the lack of access to technologies and inputs necessary to increase yields.



FIGURE 1 *Distribution of the four major agro-ecological zones of Uganda*



Source: Strengthening of Agricultural Research in Uganda
Agricultural Task Force, Agricultural Research Group 4,
March 1987



CHAPTER 2

Indigenous Plant Genetic Resources

2.1 FOREST GENETIC RESOURCES

Uganda is faced with a problem of high degradation rate of the tropical high forest. By 1,900 there was 10m ha (45% of the country) of forested land, but today there is 3.5 m ha.

The following indigenous species are of economic importance and yet heavily exploited through selective harvesting:

All mahoganies
Chlorophora excelsa
Olea wlewitschi
Cordia mellenii
Newtonia buchananii
Lcrraes brownii
Podocarpus millanjanus
F. calhoes rolifolia
Alstonia boonei
Maesopers eminii
Funtamia elastica
Funtamia atrican
Antraris toxicaria

The forest rehabilitation project has a component known as "National Forest Management and Conservation" with the aim of ensuring the *in situ* conservation of the natural high forest through:

- Opening and demarcating of the external reserve boundaries
- Evicting of encroachers and replanting of the degraded areas.
- Increasing the 10% Natural Reserves to 20% strict nature reserves.
- Establishment of Forest Parks to address problems of bio-diversity conservation by local communities.
- Establishment of sites of special interest (SSI).



2.2 OTHER WILD SPECIES AND WILD RELATIVES OF CROP PLANTS

Uganda is richly endowed with various genetic resources which could potentially improve the food security, provide better nutrition, generate income, provide cheap medication or dyes and enable utilization of ecological zones considered unsuitable for crop production. Table 2 lists some of the wild species and wild relatives of crop plants.

The plant species in Table 2 above and many others not listed here still do occur in the wild. However, they are exposed to dangers of genetic erosion and the magnitude of the risk of loss of this material varies from species to species depending on distribution and location. The causes of genetic erosion may also vary from species to species but the major known causes of genetic erosion are:

- Over-exploitation.
- Indiscriminate utilisation.
- Destruction of natural ecosystem.
- Change on land use.

Government can only control this genetic erosion to a limited extent because of limited policies. General public awareness on issues concerning Plant Genetic Resources conservation and utilisation is most crucial if the trend is to be reversed. External assistance (technical and financial) would be required in this respect.

As indicated in Table 2 there exists unique genetic diversity that could be of great economic and social importance. The major constraint however, is that exploration, collection and evaluation of these resources has been limited. Therefore, the range of 'unique' diversity and 'adaptive' traits cannot be accurately quantified. The range and variability in Uganda's agro-ecologies is one indicator of presence of important adaptive traits considering that some of the plant species cut across several diverse ecologies.



2.3 LAND RACES (FARMERS' VARIETIES) AND OLD CULTIVARS

At crop level, especially with food crops, information is available on the traditional agricultural systems and the different 'farmers' varieties and old cultivars being grown by the farmers. However, this information is not at the moment properly documented. Estimates by the Uganda Seed project (USP) indicate that seed sources for the Ugandan farmer are:

- 20% Uganda Seed Project
- 40 - 50% Other Commercial Sources
- 30 - 40% On-farm

These estimates only refer to those crops being handled by USP which include:

Maize
Beans
Sorghum
Finger millet
Groundnuts
Sunflower
Simsim

Uganda Seed Project provides purely improved seed. Commercial seed may not be pure varieties and on-farm seed is a mixture of improved and local farmers' varieties. Therefore many farmers still grow their varieties and this may accordingly to the farmers be due to:

- Lack of access to improved seed.
- Better palatability of farmers' varieties.
- Better adaptability of farmers' varieties.
- A mere traditional conservation and lack of consciousness of new varieties.



The following crops have the greatest number of old cultivars still maintained and used by farmers.

Sorghum
Cassava
Finger millet
Sweet potatoes
Pearl millet
Yams
Cowpeas
Coffee
Pigeon peas
Bananas
Ground nuts
Castor
Simsim
Forage crops
Bambara nut

Government policy is to increase food production. Therefore it encourages growing of higher yielding improved varieties. Government does not, have a direct policy on discouraging use of old cultivars.

Local people value indigenous plant genetic diversity and this is exemplified In their efforts to conserve it. Many homesteads upcountry have special plants either for medicine, food or other uses that they maintain in the back-yard gardens. However, due to lack of scientific knowledge, many times the plant populations maintained are too low to give a viable population.

Government land use policies do protect wild genetic resources but only in the designated protected areas. Outside such areas a few plant species (that are being threatened) such as *Vitellaria paradoxa*, Mvule etc. are protected. In the past some protected areas were encroached upon by unregulated land use, threatening these resources. The remedy to avert this threat is.

- Reforestation
- Public awareness



Table 2 Some Wild Species and Wild Relatives of Crop Plants in Uganda

Species	Uses	Remarks
<i>Dioscorea spp.</i>	Food and source	12 wild relatives occur in of dioscrine Uganda
<i>Plectranthus esculantus</i>	Food	Under serious genetic erosion May have disappeared
<i>Vitellaria paradoxa</i>	Source of edible oil	Threatened by charcoal burning
<i>Ricrows comunis</i>	Source of industrial oil	Occurs with great diversity
<i>Coffee spp.</i>	Beverage	Diversity not fully exploited
<i>Sansevieria spp.</i>	Fibre	No commercial exploitation No research
<i>Lagenaria siceraria</i>	Vegetable	Contributes to rural nutrition
<i>Luffa Cylindrica</i>	Vegetable	Contributes to rural nutrition
<i>Corchorus Olicorius L.</i>	Vegetable	Contributes to rural nutrition
<i>Asystasia schimeri</i>	Vegetable	Utilisation is fading out
<i>Hibiscus sabdariffa</i>	Vegetable	
<i>Phytolaca dodecandra</i>	Medicinal	Contributes to rural health
<i>Dracaena fragans</i>	Medicinal	Contributes to rural health
<i>Alriosa simplex L.</i>	Medicinal	Contributes to rural health
<i>Datura Stramonium</i>	Medicinal	Source of scopolamine
<i>Vernonia amygedalina</i>	Medicinal	Used widely in the treatment of malaria
<i>Tamarindus indica</i>	Fruit	
<i>Atomum sanguineum</i>	Fruit	Very little known about its nutritional status
<i>Physeuis peruviana L.</i>	Fruit	Very little known about its nutritional status
<i>Tristemuna incompetum</i>	Fruit	Very little known about its nutritional status
<i>Acalypha bipartite</i>	Vegetable	Very little known about its nutritional status



CHAPTER 3

Conservation Activities

3.1 NATIONAL CONSERVATION ACTIVITIES

Plant genetic resources (PGR) are a critical national asset. Their conservation and development is an important base to advance in productivity and long term food security. The strategy is to protect the plant genetic resources in their natural habitat (*in situ* conservation) and to facilitate collection, preservation, evaluation and utilization as well as exchange within and without the nation materials/species of economic, cultural and ecological value.

3.2 *IN SITU* CONSERVATION ACTIVITIES

The Uganda forest estate composed of 1.5m ha covering 17% land surface area, is managed by the Forest Department. Prior to 1987 efforts to conserve the forest genetic resources concentrated in ten Natural Reserves which represent 10% of the forest estate. No consumptive activity was taking place in the Nature Reserves but only research observations and data recording.

The policy on the forest estate promotes genetic resources conservation. Part of the policy is addressed by the Natural Forest Management and conservation a component of the Forest Rehabilitation Project. The component's objective is to ensure *in situ* conservation through.

3.3 *EX SITU* COLLECTIONS

There are limited national plant genetic resources collections because the national genebank proposed to be sited at the Makerere Agricultural Research Institute Kabanyolo (MUARIK) is not fully operational. Also limited collections are maintained by:

- The agricultural research institutes (Serere Agricultural Research Institute, Kawanda Agricultural Research Institution, Namulonge Agricultural Research Institution) under the newly established National Agricultural Research Organisation (NARO). The collections are normally restricted to the institute's mandates, and this has led to the tendency to neglect Indigenous crops such as castors, vinas, sheanut butter trees etc. Also individual researchers have concentrated on their programme goals.



- **Botanic Gardens.** The collections housed were colonial and therefore historical. They were not used as plant genetic resources collections but only for economic purposes. There is therefore need to introduce plant genetic resources activities that are systematic and comprehensive.
- **Herbaria.** These were established at Kawanda Agricultural Research Institute (KARI), Botany Department, Faculty of Science, Makerere University and National Chemotherapeutic laboratory, Ministry of Health. These collections were also historical as those housed in the botanic gardens; they were however destroyed by unfavourable circumstances in the past and presently need to be rehabilitated.

In 1992, a site was proposed at MUARIK for the National genebank and two freezers were donated by the International Plant Genetic Resources Institute (IPGRI) for initial storage.

However, the genebank is now constrained by:

- Non-deployment of trained manpower.
- Lack of operational and capital funds.
- Lack of active programme in PGR.

The recommendation for a national genebank came out of the First National Plant Genetic Resources Workshop: Conservation and Utilization, 9-11 November, 1992 held at Mukono D. F. I. on the realization of the need to conserve and utilize plant genetic resources. Government signed the RIO convention on Bio-diversity, June 5 1992, under which PGR fall and it therefore considers a national genebank a worthwhile investment.

In general terms it is not possible to ascertain the composition of the collections held at the various institutes, Botanic gardens and herbaria. The categories of the collections may include:

- Cultivars in current use.
- Obsolete cultivars.
- Primitive cultivars.
- Wild and weedy species.
- Breeding stocks.

Some of these are normally duplicated and kept in world centres such as IITA, CIAT, CYMNIT, ICRISAT, ILCA, Kew etc. They are freely available for use by breeders, researchers at the national and international levels. The diversity



that exists In these materials is probably not representative of the existing environmental variation because no proper exploration of such areas has been carried out. Many of the collecting missions, in the past, have either been not well planned or confined mostly to roadside, and the more accessible areas and sometimes biased. Moreover the maintenance and documentation of these collections is constrained by factors such as inadequate funding, non-deployment of trained manpower etc.

Planning to-collect plant genetic resources of this country is, not a major problem because trained manpower is available but the deployment of this manpower is not yet focused. But otherwise collection should be policy mission-oriented, conducted using random sampling techniques, based on a planned collecting programme; mainly derived from markets, stores, drying floors, roadsides, backyard gardens as well as from more remote localities.

3.4 STORAGE FACILITIES

A national genebank, is not yet fully established. The various Institutes, botanic gardens and herbaria are therefore responsible for the storage of germplasm collections. The storage conditions at these places are either substandard, lacking or broken down. Maintenance of the collections is mainly out in the fields. For example at Serere Agricultural and Animal Production Research Institute (SAARI) the cold storage facility that used to conserve cereals (sorghum, finger millet and pearl millet germplasm) broke down more than ten years ago. This situation has forced the cereals germplasm to be maintained by growing out all collections in the field every season, a technique which is unsuitable for maintaining genetic integrity. There is therefore need to rehabilitate the storage facilities immediately to be able to conserve germplasm at the short and medium terms initially in containers such as sealed aluminium foil containers, glass bottle Jars with screw tops and other equipment associated with drying and processing of genetic materials.

3.5 DOCUMENTATION

Documentation of the Ugandan collections under the present conditions is inadequate, fragmented, unsystematic and incomprehensive. There is lack of computerized data base, published catalogues, or card index. The only alternative documentation system is by record books and file, a system that is prone to all kinds mishaps.

For *in situ* collection the status and adequacy of documentation will be enforced by the current activities with the forest policy of promoting forest genetic



resources conservation. It is hoped that these activities will have a computerized data base as a priority.

In documenting samples of wild and weedy relatives, taxonomic expertise is essential at each institute, botanic garden and herbarium.

3.6 EVALUATION AND CHARACTERIZATION

There is no systematic and comprehensive evaluation and characterization of germplasm samples. But some programmes use IPGRI descriptors as guidelines. Farmers have not been involved in the evaluation of collections but their information is taken as passport data. Most of the evaluation and characterization has not been done at locality of origin because of lack of adequate funding; the evaluation does not include adequate biochemical data, physiological responses, microbiological data, nutritional aspects, and finger printing. However, disease and pest susceptibility evaluation is significantly done.

All available characterization and evaluation may be published in workshop and conference proceedings, and local Journals if funded/sponsored. Collecting and conservation strategies can be improved by evaluation data indicating extent of the diversity that exists within the samples/collections.

International collaboration could help to achieve better results in evaluation and characterization. The organization of activities could be based on the international centres like ICRISAT collaborating with NAARI on cereal improvement, IITA, with NAARI collaborating on cassava improvement etc. The leading role should be Uganda through NARO, Ministry of Agriculture Animal Industry Fisheries, Ministry of Health and Ministry of Natural Resources and Environment. Initially a crop-based approach then a regional approach would be favourable and appropriate. For *in situ* evaluation and characterization the approach is inadequate and greater emphasis, or outside assistance is therefore worthwhile.

- Fixing reserve boundaries.
- Replanting degraded areas.
- Raising Natural Reserves from 10% to 20% to allow research activities.
- Involvement of local communities in the utilization and management/conservation of the forest parks.

The rich bio-diversity is internationally recognised, but the higher rate of degradation is depriving the country of these riches. One of the solution could



be to create public awareness, on the importance of bio-diversity in the nation's livelihood.

3.7 REGENERATION

It has been stated that in the absence of an operational genebank, well managed botanic gardens, herbaria and adequate funds regeneration of the accessions in the various institutions is haphazard. However, regeneration should be done when the viability falls to 90% of the previous viability test.

The facilities to carry out this activity are either lacking or limited for all types of accessions. Regenerating pasture seed (legumes and grasses) may not be satisfactory due to their dormancy period.



CHAPTER 4

In-Country Uses of Plant Genetic Resources

4.1 USE OF PLANT GENETIC RESOURCES COLLECTIONS

The national genbank which will house the PGR collections of the country, is not yet fully operational. The PGR collections are therefore presently held by various institutions in the country. Introductions, exchange and requests of PGR is not yet centrally coordinated and hence there is no accurate record of these activities. Each institution has mandate crops to work on and therefore you would find different PGR collections in the institute. For example:

1. Serere Agricultural and Animal Production Research Institute (SAARI) has collections of:
 - Cereals (sorghum, finger millet, pearl millet, other, millets).
 - Oil seeds (Groundnuts, sesame, sunflower, and Bambara nuts).
 - Grain legumes (pigeon pea, cowpea and green gram).
 - Cotton.
 - Livestock production systems (pasture grasses and legumes).
2. Kawanda Agricultural Research Institute (KARI) has collections of:
 - Coffee and other tree crops.
 - Bananas and plantains.
 - Horticultural crops (mangoes, pawpaws, pineapples, oranges, local and exotic vegetables).
 - Sugar cane.
3. Namulonge Agricultural and Animal Production Research Institute (NAARI) has collections of:
 - Cereals (maize).
 - Rootcrops (cassava, sweet potato, yams, irish potato).
 - Gram legumes (phaseolus beans, soybean).
 - Cotton.



- Yams.
- Pasture grasses.

4. Forestry Research Institute (FORI) has collections of:

- Indigenous timber spp.
- Exotic timber spp.

5. Makerere University Agricultural Research Institute Kabanyolo (MUARIK) has collections of:

- Cow peas and pigeon peas.
- Sorghum and finger millet.
- Tomatoes.
- Pasture grasses and legumes.
- Others.

Since national projects are derived from the mandates of a given institute the list of collections above are the most utilised in the national projects. At SAARI, NAARI and KARI each crop has an average of four full-time scientists working on it, but depending on the size of the project some crops may have slightly more.

The major external sources of germplasm include: IARC's i.e

- ICRISAT
- IITA
- CIAT
- ILCA
- CIMMYT
- CIP

At the moment community seed banks have not evolved in Uganda. Farmers access material through informal exchanges and buying from Uganda seed project or other commercial sources.



4.2 CROP IMPROVEMENT PROGRAMMES AND SEED DISTRIBUTION

The major function of plant breeding programmes is to provide the farmer with high yielding well adapted pest and disease resistant and appealing varieties. And depending on germplasm availability and nature of constraint to be tackled different approaches are used by different breeders to achieve the set objectives. The primary focus of national breeding activities is to enhance and sustain food productivity so as to ensure food security for the nation but also increase export earnings in the crop sector. The Ministry of Agriculture, Animal Industry and Fisheries, in the early 1980's realised that research as a whole in crops and animals was not satisfactory. An idea was therefore conceived to set up a separate institution from the Ministry to under-take and considered the country's Agricultural Research needs. In 1992 the National Agricultural Research Organisation (NARO) was formally instituted. NARO is now charged with, among other things, ensuring that the amount and quality of scientific plant breeding is adequate to meet national needs and goals. Apart from lack of funds, the other major constraint to plant breeding in Uganda is the very low level of application of modern bio-techziological approaches to solve problems. This slows down research output.

The Uganda Seed Project (USP) is charged with distribution and multiplication of seed of major crops. These include maize, sorghum, finger millet, groundnuts, soybean, phaseolus beans, sunflower and and sesame. USP employees several channels in distribution of seed:

- District extension services.
- Cooperative unions.
- Religious organisations.
- NGOs.
- Relief organisations.
- Private businessmen.

USP aims at catering for all categories of farmers although not all farmers are served.

Twenty (20%) Uganda's total seed requirement is met by USP. Forty to fifty (40-50%) by other commercial sources; and 30-40% by on-farm seed.

Farmers always participate in plant breeding activities at the initial stages of a given breeding programme and at the stage before a variety is released. At the initial stage information is collected from farmers through surveys, which information portrays the farmers' needs and constraints. These needs are incor-



porated into the breeding programme. At the late stages farmers participate in the on-farm trials.

The major constraints to better seed production and distribution as far as USP is concerned are:

- High prices of seed due to high production costs.
- Poor infrastructure communication facilities, roads, storage facilities upcountry.
- Institutional problems-being a government unit the USP is affected by government problems.
- Lack of regular release of new varieties and more so hybrids.
- Marketing problems-uncertainty of price stability for produce, changes in demands for produce from year to year.
- Farming practices-Most farmers grow a range of crops thus rendering cereals and legumes subsidiary.

4.3 USE OF FORESTRY GENETIC RESOURCES

A UNSO funded Tree Seed Project has been running for about 3 years now. The objectives of the project are:

- To revamp the existing seed unit.
- To supply improved seed in reasonably adequate quantities.
- To establish improved seed sources with emphasis on indigenous species.

4.4 BENEFITS DERIVED FROM THE USE OF PGR

Uganda derives very clear and direct benefits from the indigenous PGR. These include:

- Food
- Medicine
- Fuel
- Pasture



- Construction Material
- House-hold utensils and property
- Foreign Exchange

In the process of exchange germplasm with international institutions, Uganda has and continues to indirectly benefit from its PGR. This is especially so with collaborative research programmes.

Uganda also derives clear benefits from the use of non-indigenous materials held by different national programmes. These benefits may not be directly shared by the countries of origin of the genetic resources because collaboration is mainly between national programmes and international institutions.

4.5 IMPROVING PGR UTILISATION

Uganda's main achievements in PGR activities have been:

- Production of improved varieties which have boosted both commercial traditional plant production in specific crops. Some of these crops varieties have been successfully adopted even in neighbouring countries.
- The relationship between genetic conservation and improvement, breeding, seed production and utilisation systems in Uganda is not satisfactory at the moment. This is mainly due to lack of a financially supported central Genebank which would coordinate PGR activities and thus enhance PGR, utilisation. A financially sound and technically supported Genebank is a major prerequisite for a successful PGR utilization.
- Uganda is largely an Agricultural country. The greatest value of PGR to Uganda therefore is food sufficiency and food production sustainability. Explanation of especially indigenous material has been very limited therefore knowledge of their potential is still scanty and thus so is their profitability. In order to realise the profitability of due resources in the short-term there is need to improve on policies affecting PGR activities. This would strengthen the National PGR activities and hence lead to better collection, characterisation evaluation documentation and conservation efforts.
- In the effort to improve titilisation of PGR, acquisition of modern biotechnological.



- Skills, and facilities is paramount. These skills, can be acquired through, training in appropriate institutes in the world; collaborative research work with other research institutions and universities.

Financial support for biotechnological advancement would best be sought preferably from international donor agencies in addition to Uganda government.



CHAPTER 5

National Goals, Policies, Programmes and Legislation

5.1 NATIONAL PROGRAMMES

In 1992, a Ugandan National Plant Genetic Resources (PGR) coordinating Committee was formally constituted with a mandate to plan and co-ordinate a national PGR programme in consultation with experts in relevant fields. In November of the same year, the committee organised a National PGR workshop to help identify, areas that needed attention. This marked the beginning of organised PGR activities in Uganda.

This committee was given the following as terms of reference:

- To set up priorities in PGR collection, characterisation conservation, and evaluation.
- To identify training needs and the deployment of trained manpower.
- To plan/conduct workshops, seminars, field days etc.
- To strengthen linkages with other national institutions, gene banks, regional or, international organisations.
- To ensure information dissemination through exchange of documents, newsletters, with relevant institutions.
- To develop policies on germ plasm exchange with other countries.
- To formulate policy on germplasm collection.
- To determine various methods of conservation *ex situ* and *in situ*.
- To initiate and develop research programmes.
- To ensure Inventory and proper germplasm collected.
- To identify funding sources in programmes.
- To set up offices to facilitate activities.



The PGR committee is headed by a Chairman, who is the Director General of The National Agricultural Research Organisation (NARO). NARO is an autonomous body responsible for the promotion, and co-ordination of research activities and programmes in all aspects of crops, forestry, livestock and fisheries. The Co-ordination activities of PGR is managed by the National Co-ordinator, who is now the Dean of the Faculty of Agriculture and Forestry of Makerere University, Kampala.

Members of the Committee are drawn from relevant sectors in Agriculture, forestry, and Natural chernotherapeutics department.

Though one of the terms of reference the committee was setting up a facilitating office and strengthening national linkages of activities, to date PGR programme remains a series of different elements; some informally funded and has not yet been integrated into sustainable managed programmes, within the relevant Departments of Agriculture, Forestry or Natural Chemotherapeutics. The Ugandan government has not yet committed herself to the funding of PGR activities through the NARO, or has any major donor agency.

IPGRI under the umbrella of FAO has donated 2 deep freezers to act as seed storage facility and a sealing machine. This has facilitated collection and storage of some seeds. USAID provided a humidifier, installed air conditioners and some renovations on the national genebank.

5.2 NATIONAL POLICIES AND LEGISLATIONS

The need to sensitize policy makers in the country, to recognize the importance of the role played by PGR in the future of the country can not therefore be over emphasized. There is also need to sensitise farmers to conserve on-farm PGR for the future. There is urgent need for the plans of the committee on PGR to be translated into functional programmes with adequate funding and facilitation; before any effective conservation of PGR in Uganda can take place.

Uganda is a signatory to international convention on Biological Diversity and has a duty to implement the convention by changing it's laws and policies where it is applicable. Since Plant Genetic Resources are a component of biological diversity, legislations governing it's sustainable management need to be implemented according to guidelines of the convention. However, the Ugandan legislations in force in the area of biological diversity is mostly out dated. They do not take into account all current needs for sustainable management,



as provided by the convention. This is because these legislations originates from the colonial era.

In the area of Forest Plant Genetic Resources, there has been an attempt in recent years to reform the existing legislations to take, into account current needs for their conservation. Parliament has been slow in passing legislations related to Natural Resources. Progress in legislation change has been mostly in Politically related areas.

The plans, and policies related to Forest PGR that have been approved include the following:

- The Plant Protection Act of 1964 provides for the prevention of the introduction of plant diseases and the spread of weeds and pests. The act empowers the commission of Agriculture to prohibit, regulate and restrict the importations of any plant, soil or related articles including pests which is injurious to crops. This act also forbids the cultivation of Elchharmia (the water hyacinth) and Datura stramonium. It is very limited in that it does not cover the subjects of Conservation of PGR, Patent rights (Breeders' and Farmers').
- Exchange of material, between Uganda and other contracting parties, and does not impose any limitations on access to PGR of Uganda by foreigners.

The Forest Act (1964) prohibits cutting, and removal of forest produce without a licence. This Act makes certain species of trees "Reserved Forest Produce". It does not cover species outside protected areas, nor does it have limitation on smaller plants in the forests. Some of these species have potential for medicinal use. National Environmental Action Plan (NEAP) of 1993.

The Wetbunds Bill of 1994

In the area of crop genetic resources, and smaller plants outside protected areas, there has been virtually no current legislation change for their sustainable management, nor conservation. The Patent Statue of 1994, governs the granting, registration and protection of patents, which relates to new inventions. PGR are not covered under this statute.

The seed low was revised and passed in 1994. It broadly attempts to protect farmers from acquisition of sub-standard seeds from traders. It however is silent on aspects of breeders rights and exchange between Uganda and other contracting parties. This means at the moment there is free access to Ugandan material, hybrids and the land races by foreign countries.



Uganda is not a party to UPOV and does not have in place, a parallel statute, that brings benefits to private breeders.

Private breeders are non-existent in Uganda. Breeding work is carried out by government; and farmers get these seeds at subsidised prices. Generally the farmers are usually small holder farmers who would not afford to pay for hybrids.

The farmers in the country generally obtain seeds on farm. The Government controlled seed project distributes 20% of all farmers seeds, are controlled prices, to cater for all categories of farmers. The seeds are distributed through government district extension services, co-operative unions, NGO's, and relief organisations. However, it is estimated that another 40% of farmers seeds are purchased and does not come from on farm exchange. This is due to the fact that some farmers would have used up seeds as domestic dietary consumption. According to the Uganda Seed Project, the following constrains stand in the way of development of private commercial breeders:

- Majority of farmers would not afford hybrid seed prices.
- Lack of infrastructure, roads and trucks for fast communication and seed transport.
- Farming systems 70% of Ugandan practice agriculture which tend to depend on perennial crops. There is therefore no need to purchase seeds at every planting season.

Marketing it is difficult to implement breeders rights since the seeds are marketed in super markets and purchased as food staff. These would not be practised by breeders rights. There is therefore need for Uganda and other countries of the south to evolve separate laws, for protection of their farmers, which are applicable to the prevailing conditions in their countries.

In order to benefit from her PGR, there has to be in place a protocol for the exchange of PGR between her and other contracting parties.



CHAPTER 6

International Collaboration

6.1 UNITED NATIONS INITIATIVES

"No country or region can be self-sufficient in conserving plant genetic resources and according to current academic studies the average interdependence between all regions of the world is more than 50%" (Esquinas-Alcazat, 1991). In that case the developing and maintaining of international arrangements to facilitate the exchange of plant genetic resources is clear evidence that everybody has a role to play. The fair and equitable exchange of plant genetic resources is expected to be one important theme of ICPPGR process.

Uganda has considerable experiences internationally in the field of plant genetic resources.

6.1.1 United Nations Convention on Environment and Development (Unced)

Uganda was among those countries that adopted Agenda 21 by signing the convention on Biological Diversity in June, 1992. On conservation and sustainable utilization of plant genetic resources for food and sustainable agriculture, the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), the Ministry of Natural Resources and Environment (MNRE), Ministry of Health (MOH), the National Agricultural Organization (NARO) and Makerere.

University (MU) have been charged with the responsibility of implementing government medium and long-term objectives of improving, through international efforts, the effectiveness of research inputs (eg. Genetic resources) into the rehabilitation and development of the agricultural sector.

In the conservation of biological diversity, government is aware that the concern in bio-diversity is to protect forests and to permit plant genetic options through conventional or bio-technologies to adjust environmental changes.



The convention on Biological Diversity forum could complement or strengthen the role of the FAO commission through the facilitation of bio-diversity conservation and access. These roles are connected to bio-diversity but has a concern on plant genetic resources and UNCED has concerns on biotechnology and bio-diversity as "tools". Uganda was also a signatory in the establishment of IPGRI.

6.1.2 FAO Global System

Uganda became a member of FAO commission of an plant Genetic Resources in the early 80s by signing the International undertaking on Plant Genetic resources of economic and on social interest, particularly for agriculture, will be explored, collected, characterised, evaluated and conserved and made available for plant breeding and scientific purposes.

FAO through IBPGR (NOW IPGRI) has funded exploration and collection missions, training for short courses and M.Sc degrees at the University of Birmingham. By 1989 there were seven persons trained up to M.Sc level. IPGRI has also assisted in purchase of some equipment, provided news letters, abstracts, general literature, and sponsored workshops, conferences and seminars.

It is further expected that the commission will establish or strengthen the capabilities and capacity of the country so that during the next decade chapter 14G and chapter 15 in Agenda 21 will be fully implemented.

It is planned that further changes on the National Programme will be to suit the Global Plan of Action. The national programme activities will be reprioritized.

The role foreseen for an "International fund" if one is established as part of the Global system, is the "owner ship" connection, being in the Third world and in the south. The country envisages benefits through FAO assistance to conserve the plant genetic resources for today and tomorrow. It is also envisaged being in the south, supplies of bio-diversity to the North will be patent FAO advocated for farmers right.

Before IBPGR became IPGRI, FAO had assisted collecting, and conservation of PGR. FAO also assisted in training programme personnel on the conservation and utilisation of plant genetic resources.



6.2 INTERNATIONAL AGRICULTURAL RESEARCH CENTRES (THE CGIAR)

1. IPGRI

- As a specialized institute within the CGIAR system IPGRI has contributed through training, collection and conservation of PGR, supply of conservation facilities such as refrigerators and PGR literature and sponsoring of workshops, conferences and seminars.

2. ITTA Contribution

- Short course in conservation and utilization PGR. A number of Ugandans have participated.
- Exchange of cowpea germplasm with SAARI, NAARI, MUARIK.
- Exchange of root and tuber crop germplasm (cassava, yam) with NAARI.

3. ICRISAT Contribution

- Exchange of germ plasm. sorghum and minor millet groundnuts pigeon pea chick pea Literature news letters journals SAT news Funding of national collecting missions.

4. ILCA (ILRI) Contribution

- Exchange of forage germ plasm.
- Training in forage seed production and genebank management.

5. CIMMYT Contribution

- Exchange of maize germ plasm.

6. CIAT Contribution

- Exchange of bean germplasm.
- Training.
- Exchange of literature.



7. CIP contribution

- Exchange of potato (*solanum tuberosum*) germplasm.
- Training.
- Exchange of information.

The support from CGIAR centres comes mainly from centre staff based in the region and sometimes from further away depending on the type of contribution requested. A limited number of Institute programme staff have received training from CGIAR centres through attendance and in-service training.

CGIAR centres cannot provide all the assistance sought because a regional approach may over ride a national strategy on PGR-activities.

Uganda would like to see that exploration and collecting of IPGR is handled by national programmes.

The CGIAR should act as repositories for long-term conservation and would also provide back stopping.

6.2.1 Regional Research Centres

Uganda has collaboration links with a number of regional research centres. This collaboration is essentially the same as in the roles played by the CGIAR centers. A formal agreement between the government and the centre is important to the success of the collaboration both at the technical and scientific level.

6.3 REGIONAL INTERGOVERNMENTAL INITIATIVES

The Uganda National Programme on Plant Genetic Resources is being developed and clearly requires a lot of technical and financial support in germplasm acquisition through collection and characterization; establishment of conservation facilities; documentation of genetic resources; regeneration of germplasm, training, development of crop networks and working groups and raising awareness on genetic resources conservation and utilization. Further, the potential for regionally integrated PGR programme would be to train personnel up to Ph.D level. This would definitely strengthen the capacity of the programme. By 1991 there were seven people trained up to M.Sc level but up



to the present no training up to PhD has been facilitated. There is therefore need to upgrade the Uganda National Programme on PGR along those lines.

With regard to the function that will be developed for National Programme, storage of collections as base collections would be appropriate on a centralized regional basis. Regionalizing a function would have some advantages:

- Characterization and evaluation activities at multi- location.
- Plant quarantine.
- Networking at crop level facilitating exchange of material and information.
- Establishment of a regional advisory committee.
- Establishment of regional responsibility for long term.
- Regionalizing capacity building.

However, some disadvantages may arise:

- Political climate of the country where the regional centre is based may be diplomatically poor.
- Sharing of infrastructure development.
- National crop priorities may be different.

6.4 BILATERAL INTERGOVERNMENTAL INITIATIVES

Initiatives accruing to bilateral Intergovernmental agreements existed during the defunct East African Community where collaboration relationships with neighbouring countries, promotion of sharing of resources and benefits were bonded by the community treaty. That principle should be used in handling PGR issues.



CHAPTER 7

National Needs and Opportunities

Although there exist various efforts in different sectors in Uganda geared at conservation of PGR, these efforts are fragmented, uncoordinated and in many instances individualistic and not fully supported through government institutional programmes. There are many needs to be addressed and many opportunities to be exploited, before Uganda's PGR can be conserved and fully utilized for the benefit of her people and the world at large. Efforts need to be consolidated In the following areas for the effective conservation of PGR in Uganda.

7.1 POLICIES AND LEGISLATIONS

- There is need to review and update the existing policies and legislations that govern conservation of PGR to take into account current needs.
- There is a special need to review these policies taking into account the provisions of Agenda 21 and the convention on biological diversity to which Uganda is a signatory and which she has ratified.

7.2 NATIONAL PGR PROGRAMMES

A national programme on PGR should be developed, implemented and facilitated through the appropriate ministries which are the custodians of PGR in the country namely:

1. Ministry of Agriculture, Animal Industry and Fisheries.
2. Ministry of Health, Department of Chemotherapeutics.
3. The Department of Forestry in the Ministry of Natural Resources.



Such a programme would take into consideration *inter alia*, of the following:

- Coordination of National and International activities for the effective conservation of PGR.
- Indepth assessment of conservation infrastructure institutions and germplasm in Uganda.
- Collection, characterization and evaluation of P.G.R for proper conservation and utilization.
- Development of documentation programmes and facilities for P. G. R.
- Facilitation of consultations for initiations, and strengthening of crop net works and working groups.
- Promotlon of research into germplasm utilization.
- Development and dissemination of public awareness through mass and private media.
- Development of human capacity through training at various levels, i.e technicians, (M.Sc. and Ph.D) for the handling all aspects of PGR.



7.3 DEVELOPMENT OF FACILITIES

- To develop a National PGR centre in Uganda to an international level to handle, storage of germplasm.
- To develop a National gene bank with facilities for conservation of PGR in form of tissues, seeds and pollen, for short term, mid term and long term storage.
- To develop field gene banks for the conservation of tree crops and vegetatively propagated crops.
- To develop and upgrade the existing *ex situ* conservation facilities of Botanic gardens and herbaria in the country to be able to address current roles of *ex situ* conservation of Uganda's PGR by scientific collection, identifying, classification and display.

7.4 ACCESS TO PLANT GENETIC RESOURCES

To put in place guidelines and mechanisms for the exchange of PGR between Uganda and other contracting parties that will enhance the sharing of benefits arising from research and biotechnology in a fair and equitable way.



CHAPTER 8

Proposals for a Global Plan of Action

1. There is need addressing poverty alleviation throughout the world internationally.
2. There is need for capacity building in biotechnology and resource conservation in parts of the world where the resources occur.
3. There is need for fair representation of the developing countries at International Centres and foras.
4. There is need for development of appropriate technology in the third world as an alternative to fuel wood and incentive to plant conservation.
5. There is need for equal sharing of benefits arising from PGR.

In this respect, Uganda government is committed to:

1. Formulation of policies that favour natural resource conservation, and to alter those that favour waste and their destruction.
2. Develop research programmes in areas of natural resource management.
3. To disseminate awareness and impact assessment progrannines on the subject of PGR.



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