

**FAO International Technical Conference
on Plant Genetic Resources**

**CONSERVATION AND
SUSTAINABLE UTILIZATION OF
PLANT GENETIC RESOURCES IN
SOUTHERN AFRICA**
Sub-Regional Synthesis Report

**Annex 1 of the Report of the
Sub-Regional Preparatory Meeting for
Southern Africa,
Kadoma, Zimbabwe
19-21 September 1995**



**Food
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Note by FAO

This Sub-Regional Synthesis Report was adopted by the Sub-Regional Meeting for Southern Africa, Kadoma, Zimbabwe, 19-21 September 1995, preparatory to the FAO International Technical Conference on Plant Genetic Resources, Leipzig, Germany, 17-23 June 1996. The meeting noted that the report was a useful input for the preparation of the Report on the State of the World's Plant Genetic Resources. It constitutes Annex 1 of the Report of the Preparatory Meeting. The Report is being made widely available by FAO as requested by the International Technical Conference, as a joint publication of the Department for Special Services, Ministry of Agriculture, Zimbabwe (DSS), the Plant Genetic Resources Centre of the Southern Africa Development Community (SPGRC), FAO and IPGRI.

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I. INTRODUCTION

A. The Sub-Region and its Agricultural Sector

1. The southern Africa sub-region comprises the following member States of the Southern Africa Development Community (SADC): Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. It should be noted that although Tanzania is located in East Africa, it has been considered for the purpose of this report in the Southern African sub-region, given that Tanzania is a member State of the SADC. Mauritius recently became the twelfth member of SADC. However, this country is covered by the sub-regional report for the African Indian Ocean countries. The region stretches from about 2 degrees south to 35 degrees south and from 12 degrees east to 40 degrees east.

2. The physiogeographic features of the region are very diverse, varying from hilly and mountainous in the case of Lesotho, parts of Angola, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe to almost flat plateau in the case of Botswana. The region contains the largest plateau on earth, namely the Great African Plateau which extends from South Africa to Tanzania and Zaire. Most of this plateau is more than 900m above sea level, the highest parts, being Drakensberg in Lesotho (Thabana-Ntlenyana, 3,482 m), Mt. Rungwe (2,691 m) in southern Tanzania, Mt. Mulanje (3,002) in southern Malawi and Mt. Moco (2,620 m) in Angola. The annual average rainfall varies from 0-50 mm in the Namib Desert, which extends to part of Angola, to over 1,400 mm in parts of Angola, Malawi, Mozambique, Swaziland, Tanzania and Zambia. Large parts of the region are arid and semi-arid, and are severely affected by droughts.

3. The Southern African region has a wide range of vegetation types from tropical rainforests in western parts of Tanzania, dry forests and woodlands in the Zambebian region, evergreen and semi-evergreen bushlands and thickets in the Cape, coastal east and south east Africa, extensive shrublands in the Karoo-Namib region and the Cape (Fynbos), montane forests, savanna grasslands in the Kalahari part of the Kalahari-Highveld zone, to semi-deserts and deserts in parts of Karoo-Namib and in the Namib and Kalahari deserts. (WWF & IUCN, 1994).

4. The sub-region has a total population estimated at 120 million and an average growth rate of 3.17% (Table 1). South Africa has the highest population in the region, with about 40 million inhabitants while Swaziland has the lowest with 0.79 million. Malawi has the highest population density



with 93 inhabitants/sq.km and Namibia has the lowest population density at 1.7 inhabitant/sq.km.

Agriculture sector

5. The agricultural sector plays a dominant role in the economies of all the countries of the region, with the exception of South Africa which has a diversified economy. For most countries, the sector provides main livelihood for 70-85 % of the population and is an important foreign exchange earner. In Malawi and Mozambique, agriculture contributes up to 80% of the foreign exchange earnings. In all the countries the farming structure is made up of mainly small holder farmers holding between 0.25 to 4 ha and accounting for more than 70% of the farming community. The remainder are commercial farmers mostly growing cash crops over extensive areas.

6. The most important cash crops of the SADC region include tobacco, coffee, cotton, maize, tea, sisal and sugarcane. Other cash crops grown in the region include banana, coconut, cashew nut, and pyrethrum. Important food crops in the region include sorghum, maize, finger and pearl millet, sweet potatoes, wheat, cassava, beans, cowpeas, bananas, groundnuts, maize, bambaranuts and rice.

Table 1: Population data in SADC countries

Country	Population (Millions)	Population Density (Nos./Km ²)	Population Growth %	% of labour force in agriculture*
Angola	10.02	8.0	2.7	73
Botswana	1.3	2.3	3.71	na
Lesotho	1.77	58.5	2.85	85
Malawi	8.75	93.0	3.52	90
Mozambique	15.66	20.0	2.65	85
Namibia	1.4	1.7	3.19	60
South Africa	40.0	32.6	2.22	10
Swaziland	0.79	45.8	3.44	90
Tanzania	27.32	30.8	3.66	80
Zambia	8.45	11.4	3.75	85
Zimbabwe	9.71	25.1	3.16	26

Source: World Resource Institute (1992); * Obtained from country reports; na = not available.

Forest sector

7. Although the sub-region is not endowed with rich natural closed canopy, tropical rain forests, wooded savannah and shrublands are widespread. Timber production is mainly from planted exotic forests such as



Pinus, *Cupressus* and *Eucalyptus*. Table 2 gives the annual production of wood and wood products in the SADC countries.

Table 2: Annual production of wood and wood products in SADC (1987-1989)

Country	Fuelwood and Charcoal (1,000 m ³)	Industrial roundwood (1,000 m ³)	Sawn and other processed wood (1,000 m ³)	Paper (1,000 m ³)
Angola	4,217	1,045	7	15
Botswana	1,197	79	na	na
Lesotho	579	na	na	na
Malawi	7,016	351	37	0
Mozambique	15,022	979	44	2
Namibia	na	na	0	0
South Africa	7,078	12,168	2,225	1,614
Swaziland	560	1,663	144	0
Tanzania	30,019	1,947	169	28
Zambia	11,424	606	76	3
Zimbabwe	6,226	1,530	213	82

Source: WWF/IUCN (1994).

8. In general, forest clearing for agriculture, firewood collection, and burning of vegetation, are the major causes of forest degradation in the region. In Angola, the annual rate of deforestation is estimated at 0.4% of the existing vegetation. More than 50% of domestic energy needs in the region are met through the burning of fuelwood and charcoal; in Lesotho, Angola and Zimbabwe, 65%, 58% and 53% of the total energy usage comes from wood supplies respectively. Most of the wood is cut from natural woodlands and forests. In general cutting for fuelwood is practiced on an unsustainable basis and is a major contributor to the general degradation and loss of the woody vegetation. In Zimbabwe it is estimated that 75,000 ha of forest is being lost per year through deforestation to meet fuelwood needs and crop land expansion.

B. Plant Genetic Resources of the Sub-region

9. With the exception of Ethiopia, none of the regions in Africa are represented in Vavilov's world centres of diversity of cultivated crops. However, secondary centres of diversity exist for beans, particularly around the great lake states. Botswana is considered as a centre of diversity of wild *Vigna* and *Sesamum*, while Namibia (Kalahari) is a centre of origin and diversity for *Citrullus*. A summary of some wild relatives of the important crops in the region is shown in Table 3.



Table 3: Most locally important crop plants with wild relatives in SADC countries

Crop	Wild relative
Amaranth (<i>Amaranthus</i> spp.)	Mostly weedy species widely distributed in the region
<i>Cleome gynandra</i>	
<i>Cleome monophylla</i>	
Coffee (<i>Coffea</i> spp.)	<i>Ligustrioides</i> , <i>C. zanguebariae</i> , <i>C. mufindiensis</i>
Cotton (<i>Gossypium</i> spp.)	Wild species known to exist in Tanzania, Swaziland, Malawi and Namibia
Cowpea (<i>Vigna unguiculata</i>)	Species of the genus <i>Vigna</i> representing two sections and five subgenera
<i>Cucumis</i> spp.	
<i>Dioscorea</i> spp.,	
Egg plant (<i>Solanum melongena</i>) African Eggplant (<i>S. aethiopica</i>)	Numerous species including <i>S. aculeastrum</i> , <i>S. nigrum</i> , <i>S. panduriforme</i>
<i>Ensete ventricosa</i> (false banana)	
Finger millet (<i>Eleusine coracana</i>)	<i>Indica</i> (2 subspecies), <i>E. jaegeri</i> , <i>E. multiflora</i>
Jute (<i>Corchorus</i> spp.)	Numerous species of the genus <i>Corchorus</i> exist in the region
Kenaf and Okra (<i>Hibiscus</i> spp.)	<i>Acetosella</i> , <i>H. articulatus</i> , <i>H. cannabinus</i> , <i>H. diversifolius</i> , <i>H. physaloides</i> , <i>H. sabdariffa</i>
<i>Lactuca</i> spp.	
<i>Momordica balsamina</i>	
Pearl Millet (<i>Pennisetum glaucum</i>)	<i>Purperium</i> , <i>P. mezianum</i> , <i>P. polystachyon</i>
<i>Phoenix reclinata</i>	
Rice (<i>Oryza sativa</i> , <i>O. glaberima</i>)	<i>Barthii</i> , <i>O. longistaminata</i> , <i>O. brachyantha</i> , <i>O. punctata</i> , <i>O. eichingeri</i>
<i>Saccharum spontaneum</i>	
Sesame (<i>Sesamum indicum</i>).	<i>Angolensis</i> , <i>S. angustifolium</i> , <i>S. prostrutum</i> , <i>S. laciniatum</i> , <i>S. grandiflorum</i>
<i>Sonchus oleraceus</i>	
<i>Sorghum</i> (<i>Sorghum bicolor</i>)	<i>Arundicum</i> , <i>S. rigidifolium</i> , <i>S. versicolor</i> , <i>S. verticilliflorum</i>
Crop	Wild relative
Tobacco (<i>Nicotiana tabaccum</i>)	<i>Nicotiana africana</i>



Crop	Wild relative
<i>Vitex</i> spp.	
Water melon (<i>Citrullus lanatus</i>)	Wild relatives known to exist in South Africa, Botswana and Namibia

10. In addition, there is also a great diversity of wild root crops and leaf vegetables used by local people; there are also many other minor crops, spices, aromatic, medicinal and forage species. Over 90% of the population in the countries uses plant species in traditional medicines.

11. Among the forage species, there are a great number of wild indigenous grasses and legumes that are have potential uses. Examples of grasses include *Brachiaria* spp., *Andropogon*, *Digitaria*, *Eragrostis*, *Cynodon* spp., *Panicum* spp., *Setaria* spp., and while legumes include *Neonotonia wightii*, *Macrotyloma* spp., *Trifolium*, *Desmodium*, *Sesbania* spp., *Paracheus*, *Melilobus*, *Teramnus*, *Alysicarpus*.

Landraces

12. Perhaps the most immediately useful and most threatened crop genetic resources in the region are the wealth of landraces of all kind of crops, including indigenous crops such as sorghum, millet, cowpeas, bambaranuts, watermelons etc, but also species introduced into the region over several centuries: maize, cassava, beans etc. In the difficult or unpredictable growing conditions which characterise much of the region (inter alia: poor or erratic rainfall, very long or short growing season, no external inputs), it is these landraces that provide the small holder farmer with a more reliable crop.

Indigenous forest genetic resources

13. The SADC region contains some areas which are exceptionally species-rich, notably in the Cape area. In some cases the wide altitudinal ranges, as in the Drakensberg, increases the number of habitats available. Other sites of high species richness include the Karoo, an area of semi-desert which contains a wealth of succulents and other xerophytic plants. The Fynbos, the evergreen bushland and thicket of the Cape region, is said to have the highest concentration of species per unit area in the world (WWF and IUCN, 1994). The region also contains one of the highest number of endemic families in Africa; of the 27 families endemic to Africa, 14 are found in the region, mainly in the Cape area in South Africa and in the eastern arc in Tanzania. Table 4 gives the number of vascular plants and level of endemism in the countries of the SADC.



Table 4: Species richness and level of endemism in the SADC countries

Countries	Flowering plants	Gymnosperms and ferns	Number of endemics	% Species endemism
Angola	5,000	185	1,260	24.3
Botswana	2,000	15	17	0.8
Lesotho	1,567	15	2	0.1
Malawi	5,500	165	49	1.3
Mozambique	5,500	192	219	3.8
Namibia	3,128	46	-	-
South Africa	13,669	265	[16,500]	[70-80]
Swaziland	2,636	79	4	0.2
Tanzania	10,000	-	1,122	11.2
Zambia	4,600	147	211	4.4
Zimbabwe	4,200	240	95	2.1

Source: WWF/IUCN (1994).

Table 5: Some important timber species occurring in the SADC region

Rodendron calsamiferum

Terminalia superba

Entandophragma spp.

Pterocarpus angolensis

Marquesa macronoa

Guibourtia coleosperma

Guibourtia conjugata

Periccopsis angolensis

Erythrophieum africanum

Albizia antunesiana

Faurea speciosa

Baikiaea plurijuga

Afzelia quanzensis

Berchemia discolor

Diospyros mespiliformis

Celtis africana

Salix mucronata

Olea europaea subsp. africana

Olea capensis

Ilex mitis

Kigelia africana

Scolopia mundii

Khaya nyassica



Some important timber species (continued)

Dalbergia melanoxylon

Milicea excelsa

Androstachys johnsonii

Colophospermum mopane

Ocotea usambarensis

Bivinia jalbertii

14. The indigenous flora of the region consist of many potentially useful species, not only timber species but also a wide diversity of plants providing non-timber products such as edible fruits, food plants, medicinal plants, soap, insecticides and other uses. Table 4 provides a list of some of the most important timber species in the region.

15. Most of these species listed in Table 5 have been over exploited in the past and have now become rare and are threatened with extinction. For example *Pterocarpus angolensis*, *Dalbergia melanoxylon*, *Khaya nyassica*, *Azelia quanzensis* are threatened in most of their ranges.

II. ASSESSMENT OF PLANT GENETIC RESOURCE PROGRAMMES AND ACTIVITIES

A. National Programmes, Policies and Legislation

National programmes and institutional arrangements

16. In the SADC region, the SPGRC has provided the impetus for initiation and development of national programmes. All countries in the region have operational national programmes with the exception of South Africa which has not been fully integrated into the SPGRC Programme. The Southern African Centre for Cooperation in Agriculture and Natural Resources, Research and Training (SACCAR) has very much influenced agricultural policies in many of the member countries. Most countries of the region have established National Plant Genetic Resources Centres (NPGRC) as counterpart to this Regional project. Appendix 2 presents some information about the status of national programmes in the SADC region. In most cases, national programmes have been developed and implemented mainly by the NPGRC which is based within relevant Governmental departments. In the case of Malawi, for instance, it is based in the Department of Agricultural Research; in Namibia it is under the subdivision of National Botanical Research Institute of the Department. Tanzania has established a NPGRC in 1991 as a project of the Ministry of Agriculture and is semi-autonomous. The national programmes generally cover all aspects of



genetic resources conservation and use, including medicinal plants and *in situ* conservation as in Lesotho and Malawi. In most countries the PGR activities are centralized in the respective NPGRCs. In Namibia, however, conservation work is implemented by NPGRC while utilization is undertaken by research scientists in the Agronomy division of the Ministry of Agriculture. The view expressed by South Africa is that the PGR National activities should be decentralized to different institutions concerned with different divergent activities such as agriculture, forest and wildlife.

17. In Angola, the government has developed a National Forestry Action Plan, whose objective is to carry out a survey to define the present situation of existing conservation areas, to develop guidelines for their management and to prepare a code of conduct for the conservation and utilization of natural resources.

Funding

18. Funding for the national programmes comes from government sources principally through budgetary allocation to Ministries of Agriculture. In some cases such as Zambia and Mozambique, the National programme has its own budget line, while in others the programme receives its funding through the department under which it is based. Because of inadequate funding of NPGRCs there is need for additional funding from treasury and secondary sources both from the private and public sector institutions and organizations. In Tanzania the funding of the programmes and activities of the NPGRC is funded both by government and private organizations. Some funds are also obtained from SPGRC. In several countries, significant contributions in the form of scientific equipment have been received from the Swedish International Development Agency (SIDA), IPGRI, and SPGRC.

PGR committee

19. All countries except South Africa have set up National PGR Committees (NPGRCom), which include representatives from different government departments, universities, research institutions. Others such as Mozambique still have to formalize their NPGRCom. In some countries, such as Lesotho and Zimbabwe NGO institutions are also members of NPGRCom. In most countries where NPGRCom exists, their function is to monitor and appraise the work of NPGRC and to provide directions on PGR activities and policies.

Human resources development

20. Most of the countries do not have adequately trained staff and thus training and capacity building is a major priority for the region. In some countries like Zimbabwe, Angola and Lesotho, there are no established posts for PGR activities and often officers in different departments are nominated



by governments to obtain PGR training. After their training, they return to their respective posts. In Botswana and Zambia, staff are relatively well trained. In Zambia most of the staff have been trained to M.Sc. level under sponsorship from IPGRI, SPGRC, Zambia Agricultural research and Extension Programme (ZAREP). The training needs are at postgraduate (Ph.D.) level in order to strengthen research capacities. Another problem which is common to many countries, is the high turnover which is caused by low salaries and lack of incentives in government employment.

21. Considerable capacity for training exists in the region, but financial assistance to strengthen infrastructures is required from international sources. Malawi, Zambia and South Africa may play a lead in this field. In collaboration with IPGRI the University of Zambia has developed a detailed curricula for an M.Sc. optional course in PGR. Further the university is organizing short term courses in PGR with the help of University of Birmingham, IPGRI and SPGRC. In Malawi, tertiary institutions such as Bunda College of Agriculture (University of Malawi), the Natural Resources College and the Malawi College of forestry can develop curricula which are strong in the field of conservation. In addition, SPGRC will coordinate plant taxonomy course based at the University of Malawi with financial support from SIDA.

National policies and legislation

Seed legislation

22. Legislation on sale and distribution of seeds exists in several countries of the region such as Malawi, South Africa and Zimbabwe. The seed legislation in South Africa and Zimbabwe provides for compulsory registration of cleaners, sellers and testers of seeds, naming of varieties, seed quality, seed bulking, import and export of seeds etc. Other countries of the region in particular Namibia, Angola, Lesotho do not have legislation governing the sale and distribution of seeds.

Phytosanitary laws

23. Most countries also have phytosanitary legislation for preventing the introduction and spread of plant pests and diseases. In general quarantine regulations are not rigorously enforced which leads to illegal importation and exportation of wild plants and sometimes to the introduction of diseased plant material in the country. Botswana does not have quarantine facilities, but has a Plant Disease and Pest Act.



Intellectual property rights

24. With the exception of Zimbabwe and South Africa, countries in the region do not have any specific IPR legislation relating to plant genetic resources. A legislative proposal to establish PBR has been prepared and is being reviewed. In South Africa and Zimbabwe, the legislation relates to new plants varieties and the protection of interests of persons who register such rights. Zambia is in the process of developing PBR legislation. The Union for the Protection of Plant Varieties (UPOV) provides some assistance for drafting PBR legislation.

Exchange of PGR

25. In southern Africa, germplasm was freely exchanged in the past, but as countries become more aware of the potential value of their genetic resources, greater restriction is now being placed on the access to these material. Angola, Tanzania and Zambia are considering the adoption of the draft FAO International Code of Conduct for collection of PGR. In Tanzania collection of PGR materials is allowed under set criteria. In Malawi, there is a Plant Genetic Resources and Biotechnology Committee which is charged with the responsibility of regulating the collection and exportation of plant materials. As in Tanzania, there are set criteria which foreign collectors need to meet. Namibia also has legislation to govern collection of and research on plant materials which is administered by Ministry of Environment and Tourism.

Other policies

26. Most countries have legislation to regulate the management of natural resources, conservation of forests and for the establishment of protected areas such as National parks, Nature reserves etc.. In Malawi, a new Environmental management Act is being prepared which will improve the conservation of wild plants.

27. Most countries in the region have elaborate National Environmental Action Plans (NEAP). This is being undertaken as a first step in the implementation of Agenda 21. The NEAP emphasises among other things rational development and use of forest resources, promotion of alternative sources of energy, development of national biodiversity profile and enactment of legislation for environmental protection in general.

28. Most countries of the region have enacted mechanisms and frameworks which facilitate promotion and securing of bank loans to farmers who cultivate improved varieties, with the aim of increasing food production. In most countries, loan scheme are available for communal and commercial farmers. In Malawi the policy adopted favours farming of improved seed varieties. Farmers obtain subsidies in the form of loans for inputs, but only



for seeds of improved or pure varieties. In Lesotho, however, there are in general no subsidies for crop production except as a relief measures after adverse climatic conditions. Such policies could lead to narrowing of the genetic base and reduce options for farmers in terms of choices of planting material.

29. In some countries, structural adjustment has increased prices and promoted the use of traditional food crops, resulting in crop diversification policies. In Zambia, for instance, with the liberalisation of the economy in 1991, the withdrawal of subsidies on agricultural production has resulted in the reduction of areas under production of high input crops like maize, wheat and cotton and is likely to increase the cultivation of traditional crops.

30. None of the countries provides any incentives to farmers for the conservation of traditional varieties. However, the Tanzanian government is contemplating to establish a Farmers Right Fund in recognition of the important role played by farmers as custodians of traditional cultivars of plants. Farmers also get credit facilities with the Ministry of Agriculture through the Department of Cooperative Development for buying agricultural inputs. The national seed policy in Tanzania provides 5% of earnings from Foundation Seed sale to be given to breeding programmes that developed the variety.

31. Most countries have a National tree planting day to highlight the importance of planting and conservation of forest trees. Schemes also exist to provide farmers with trees at subsidised rates to encourage them to plant trees with the aim of increasing wood production and rehabilitation of degraded lands.

Trade agreements

32. Trade policies can have an impact on the use of plant genetic resources in two ways, firstly through the effects of the agreements of Trade Related Intellectual Property Rights (TRIPS), and secondly through increased competition between countries in agriculture due the reduction of subsidies. The GATT agreement could have an negative impact on wheat, maize, wool, tea, coffee in SADC countries. In Malawi, trade liberalisation on groundnuts has affected the seed availability for planting, due to the export of the crop commercially. Countries in the region have not yet developed comprehensive policy frameworks in compliance with the GATT agreement related to plant biodiversity.



B. Sub-Regional Programmes, Networks and International Collaboration

Regional programmes

SADC Plant Genetic Resource Centre Network

33. The primary objective of the project is to establish, over a 20-year period, a Regional Plant Genetic Resources Centre, the SADC Plant Genetic Resources Centre (SPGRC) in Lusaka, Zambia and its network of National Plant Genetic Resources Centres (NPGRCs) in each SADC member State, to conserve the indigenous plant genetic resources material and natural crop heritage of the region, and train personnel in plant genetic resources.

34. Following a recommendation of a consultation arranged by the International Plant Genetic Resources Institute (IPGRI), then the International Board for Plant Genetic Resources (IBPGR), in Lusaka, Zambia, in September 1986, it was proposed that the Southern African Centre for Cooperation in Agriculture and Natural Resources Research and Training (SACCAR) be the implementing agency, the Nordic Genebank (NGB) be the executing agency, the Nordic countries be the major donor countries and that IPGRI and the other International Agricultural Research Centres (IARCs) provide technical assistance in establishing the facilities. A memorandum of understanding establishing SPGRC as an independent institution was signed by the SADC member States on 17 August 1993.

35. According to the memorandum of understanding, the SPGRC maintains the base collection of the region whilst the NPGRCs, which function as national counter-parts of the SPGRC maintain the active collections, and handle collection, *in situ* conservation and promote germplasm utilization at the national level.

36. The project is building up competence in germplasm collection, characterization, documentation, storage and promotion of utilization. A unique element of this project is the national support on a cost-sharing basis. The SADC member States contribute to the operations of the project. The SPGRC is located in Lusaka, Zambia.

37. The initiative is a great benefit to the region. It provides training opportunities, develops activities on PGR in a coordinated manner and provides opportunities for exchange of information and expertise in the region. The SPGRC has developed an information system to facilitate the exchange of information and provides training courses in PGR conservation and utilization. SPGRC is a reference centre for member States on matters of PGR.



38. SADC Tree Seed Centre Project: Another important regional project in the SADC is the SADC Tree Seed Centre Project, which is sponsored by the Canadian International Development Agency (CIDA). Most countries of the region participate in this regional initiative. The main objective of the project is to provide national self-sufficiency in quality seeds for both exotic and indigenous species. These seeds are to provide a secure basis for the success of future programmes of reforestation, research and regional exchange. Some of the activities to be developed in the framework include the rehabilitation of the institutions responsible for tree seed production, procurement of materials and equipment for treatment and production of tree seeds, setting up of a tree seed bank, forestry library and herbarium, training of staff and the collection, testing and selection of tree seeds at the national level.

Other SADC regional programmes

39. SACCAR coordinates a number of networks whose aim is the development, through research and training, of regionally and locally adapted improved varieties. The networks are on agroforestry, beans, cowpea, groundnuts, millet, sorghum, maize, vegetables and wheat. They are implemented by several IARCs including ICRAF, CIAT, IITA, ICRISAT, CIMMYT and other agricultural research centres such as AVDRC.

40. There is also the Southern African Regional Commission for the Conservation and Utilisation of Soil (SARCCUS) whose role is in the conservation and development of agricultural resources within southern African countries. Negotiations to integrate the functions of SARCCUS into other SADC regional programmes are under way and a final decision in this regard will be taken by the Council of Ministers (FANR) during January 1996.

FAO and CG Centres' activities in the region

41. The Food and Agricultural Organization of the United Nations (FAO) has for a long time been active in supporting agricultural and forestry projects and programmes in different countries in the region. All the countries of the sub-region are members of FAO. South Africa has only recently (1994) become a member of the FAO.

42. In Namibia, FAO has assisted in establishing a seed supply and testing system with the ultimate goal of farmer seed co-ops and has been involved in strengthening the phytosanitary and quarantine system. In Zambia FAO, through IPGRI has participated in germplasm collection missions and provided training scholarships to national genetic resources programme as well as conservation facilities.



FAO Global System

43. Not all the SADC countries are members of the FAO Commission on Plant Genetic Resources and have adhered to the International Undertaking on Plant Genetic Resources. Appendix 1. provides information on which countries of the region are members and signatory to the FAO Commission and Undertaking.

44. The FAO PGR Commission is perceived by the SADC countries as a useful global forum for the discussion of appropriate ways to protect and utilise national and global PGR and as a means of obtaining information on the state of PGR conservation in the world. Furthermore the International Code of Conduct on collection and transfer of PGR is being used as a basis for drawing up a national code for some countries of the region such as Angola.

CGIAR Centres

45. There is, in general, strong collaboration between CGIAR centres and national programmes in the countries of the region. Most of the countries have good working relations with a number of International Agricultural Research Centres, in particular ICRISAT, IITA, CIAT, CIMMYT, ICRAF, ICARDA, IPGRI, IRRI, CIP and ILRI. Table 6 provides the details of the networks in the SADC region.

46. CGIAR centres are seen to play an important role in providing the necessary expertise and know-how to strengthen the national programmes particularly providing training for countries of the region. They are seen as custodians for the safe keeping of germplasm of developing countries which do not yet have the capability to maintain long term storage at acceptable standards. For example in Malawi, CGIAR centres have been involved in seed collection missions and duplicate sample left in the country. However the national collections have been lost due to poor storage conditions. Now that the MPGRC has been established, Malawi is making arrangements to repatriate duplicate samples back from these CGIAR Centres. Many collections from Lesotho are held at ICRISAT, Centre for Southern Africa at Matopos, Zimbabwe, pending the establishment of a genebank. For countries such as Namibia, Malawi and Zambia, CGIAR centres provide assistance and advice in PGR activities carried out by national programmes and should have basic information particularly on characterisation and evaluation information on materials originating from the countries that can be passed on to national programmes; they should also be involved in carrying out basic research. Tanzania suggests that CGIAR should devote more attention to lesser known crops as alternatives to the major crops in the same environment.



Table 6: Regional programmes in SADC region supported by CGIAR Centres

CGIAR Centre	Regional programmes/countries
ICRISAT	SMIP (11 SADC Countries); Regional Groundnut Programme (most SADC countries) and Regional Pigeon pea programme (some SADC countries).
IITA	Regional rootcrops programme, regional cowpea programme etc.
ICRAF	Regional agroforestry projects in four SADC member States
CIMMYT	Wheat and maize network in most member States
CIAT	Bean Research Network
AVDRC*	Regional Vegetable Research and training project

*A Regional Research Centre, not a CG member.

47. CGIAR Centres also support many countries in providing enhanced materials such as maize, cassava, sorghum groundnuts and pigeon peas. ICRAF with ILCA, CIFOR and ICRISAT supported Tanzania in research in multipurpose trees for fodder, fuelwood and improvement of soil fertility.

IPGRI

48. IPGRI has played a major role in the region in advancing the conservation and utilisation of plant genetic resources through catalysing development of national programmes and provision of scientific and technical advisory services in germplasm inventory, collection, conservation, documentation, multiplication and characterisation. IPGRI has also assisted several countries in the region to develop capacities for conservation of genetic resources in terms of provision of storage facilities and training. IPGRI's support for training has been through provision of scholarships, organization of regional specialised short courses and workshops on PGR as well as strengthening the capacity of local tertiary institutions to develop and conduct short courses and M.Sc. programmes on PGR. Some of the regional courses include the PGR conservation and genebank management course of Namibia in 1994 and the Plant Exploration course in collaboration with UK Darwin Initiative in 1995.

49. Documentation materials (descriptors lists, documentation systems, international directories, PGR Newsletter) on PGR prepared by IPGRI have provided invaluable information to countries. This has helped countries to define their activities and take decisions on germplasm conservation projects.

50. IPGRI has the global mandate to promote the conservation and utilisation of PGR activities for present and future generations. It is seen as the principal agency to identify and provide training opportunities on PGR



matters as well as baseline data and information on PGR. Tanzania suggests that IPGRI should create more awareness on the value of marginalised PGR and ensure their conservation through appropriate modern and traditional technologies. It should assist countries to use biotechnology for conservation and safe movement of plant genetic resources. Angola would like to see IPGRI setting up training courses in Portuguese in cooperation with Brazil and Portugal.

IPGRI and SPGRC

International and bilateral agreements

51. There are few bilateral agreements with countries in the North. Several countries, including Lesotho, have relations with Nordic countries both collectively as well as bilaterally to fund the establishment of national centres. Some countries have developed bilateral relations with a number of international organizations. Zambia has bilateral initiatives with SIDA, NORAD, CIDA, and GTZ. Malawi collaborates with some regional research centres outside the region e.g. Asian Vegetable Research and Development Centre (AVRDC) and has benefited from training programmes on vegetable production. South Africa maintains a bilateral agreement with Zimbabwe in respect of the protection of Intellectual Property Rights of plant breeders in the two countries. In some countries of the region, international conservation NGOs like UNESCO, IUCN and WWF play an important role in the conservation of flora in the region.¹

C. Conservation Activities

***In situ* conservation of plant genetic resources**

52. There are several approaches to *in situ* conservation of plant genetic resources which give varying degrees of protection. On the one hand, there is the reservation of natural areas in protected area system such as National Parks, Nature Reserve etc., where indigenous species often including wild relatives of crops receive protection, and on the other hand there is on-farm conservation where cultivated varieties, cultivars and land races are conserved *in situ*.

¹ Appendix 1 provides information on membership of countries to international conventions and agreements.



53. In all the countries of the region, with the exception of Lesotho, there seems to be a good network of protected areas. Table 6 below gives the number of protected areas set up in the countries of the region. Botswana has the largest percentage of protected areas with 17.4% of the total land area while Lesotho has only one National Park covering only 0.2% of their land area.

Table 7: Protected area systems in SADC countries

Country	Land area (km ²)	Nos. protected sites	Total protected area (km ²)	% of country protected
Angola	1,246,700	10	69,604	5.58
Botswana	574,978	9	100,250	17.43
Lesotho	30,344	1	68	0.22
Malawi	94,276	9	19,798	21.0
Mozambique*	784,961	34	89602	11.4
Namibia	824,293	11	103,706	12.58
South Africa	1,225,100	229	73,895	6.24
Swaziland	17,366	4	459	2.64
Tanzania	930,700	28	130,000	13.83
Zambia	752,617	20	63,609	8.45
Zimbabwe	389,361	25	30,678	7.86

Source: WWF & IUCN (1994). * Data from country report of Mozambique.

54. In general the management of forest ecosystems and habitats is not very effective for the specific aims of conserving many non-tree economically useful plants and wild relatives of crops. Several countries have developed National Forestry Action Plans to survey the forest resources of the country and to define guidelines for their management. In Zambia, there was a project entitled the "Dry Forest Management project" initiated in 1987 under the Forest Research Division. Some surveys have also been done and 59 botanical reserves have been described.

55. In several countries of the region, satellite imagery has been used in the mapping of vegetation. For instance, in Malawi the Forestry department in collaboration with Swedish Space Corporation has carried out a forest mapping exercise using this method to produce a vegetation map. Also inventories of various forest ecosystems have been carried out to determine species composition, stocking and structure. This has helped to identify areas where genetic diversity conservation of specific species can be done *in situ*. It has also helped in having certain areas gazetted as forest reserves. Regional floras and vegetation maps may provide useful information for the identification of species rich areas. Despite the above it is felt that the amount of inventory preparation and species distribution survey is still incomplete to



adequately plan for *in situ* site demarcation. In Namibia an attempt to update a vegetation map of the country has been initiated.

56. With regard to on-farm conservation of crop PGR there are no formal *in situ* programmes or projects in the region. This is due to the lack of awareness of the role of *in situ* PGR conservation and also to shortages of human resources and funding. In countries like Angola, as a result of war, farmers have become isolated and hence cannot get access to exotic seed and are forced to conserve their landraces *in situ*. In other countries, farmers informally continue cultivating their local varieties for various reasons. Many farmers prefer the taste, cooking qualities and storage characters of traditional varieties of pearl millet to improved varieties.

57. In Zimbabwe non governmental community based organizations have been playing a major role in the promotion of the conservation and utilisation of plant genetic resources among local farmers. The Swedish Agency for Research and Cooperation in Developing countries (SAREC) has been involved in the *in situ* conservation network in the country; their work has focused primarily on sorghum landraces. It is considered important that greater collaboration between government and NGOs on national PGR programmes is encouraged. SAREC is also supporting *in situ* conservation of threatened commercial indigenous forest species.

***Ex situ* conservation**

Collection

58. In the SADC region, all countries except Lesotho, South Africa and Zimbabwe have established centralised national collections of their principal plant genetic resources usually under their National Plant Genetic Resources Centres. In Zimbabwe and South Africa, collections are held on a decentralised system at plant breeding institutes. The principal crops held in national collections include inter alia: Sorghum, Pearl millet, maize, cowpea, groundnuts, bambaranut, sunflower, rice and soybean. In some countries like Angola and Zambia, the main emphasis has been on the collection of indigenous landraces of crops and locally adapted traditional crops. Duplicate samples should be sent to the regional SADC Genebank in Lusaka. However, due to insufficient numbers of seed, or other constraints, this is not always carried out. Appendix 3 indicates some of the constraints in the conservation and utilization of collections as identified in the Country Reports.

59. Collecting missions have been carried out in most of the SADC countries either locally by national research institutions or by regional and international organizations such as FAO, SPGRC, CGIAR Centres and national NGOs. Appendix 4 gives a list of plant species collected in SADC countries by CGIAR Centres. Local missions in general tend to be multicrop



based and focus on land races threatened with genetic erosion, while regional and international missions are more crop specific or concentrate on groups of crops. In Lesotho there have been since 1985 four major collecting missions undertaken by ICRISAT (for Sorghum 180 accessions collected), IITA (for Sorghum, cowpeas, wheat, maize, peas, bean lentils, and soyabeans) and IPGRI on grasses and wild relatives of crops in the Afro-alpine region. Due to poor storage conditions many of these collections are held in genebanks outside the country at ICRISAT, Matapos and Kew Garden Genebank at Wakehurst Place.

60. In Malawi two major collection missions have been undertaken in two of the three regions of the country. IPGRI has assisted also with three collecting mission in Namibia, two on wild species and one on Cucurbitaceae. IRRI and ICRISAT have also been conducting collection missions on wild rice and sorghum and pearl millet respectively in Zambia and Namibia. In Zimbabwe, most collections of crop germplasm are in the hands of plant breeders. The maize collection is held at the Crop Breeding Institute. Collections of other important crops including sorghum, millet, wheat, cowpeas, field beans, bambaranuts, soy beans and industrial crops like tobacco, cotton etc. have been made and are held in store by the national breeding programme. Collecting activities have also been carried out by NGOs; for instance ENDA-Zimbabwe has collected over 500 accessions of sorghum and millet. In addition the University of Zimbabwe also holds collections of some 1,000 accessions of *Triticum*.

61. The special situation prevailing in Angola deserves mention. The germplasm collection held at the Agriculture Research Institute at Huambo was destroyed during the war and the only collection remaining is now found at Luanda Genebank, which contains 599 accessions, almost entirely collected over the past 4 years. There are also a number of field genebanks of coffee, fruits, forage species, forest species and ornamentals, but the state of these collections is presently unknown. There are great limitations for the collection of germplasm in terms of accessibility to certain areas and financial support. The government is unable to provide necessary support for PGR conservation work because of emergency commitments caused by the war. Support for PGR work has come from some International bodies, in particular the European Union, Oxfam, and British Petroleum.

62. In most of the countries, the existing collections do not represent the entire diversity found in the respective countries. Only in Namibia does the pearl millet collection (about 1,000 accessions) represent a substantial part of the available millet diversity, but even in this case the collection is by no means complete. There is a need for organizing more prospecting missions to collect germplasm in areas that have not previously been visited. Some countries like Namibia and Malawi have prepared a priority list of species for



collection which includes wild as well as cultivated varieties under threat of genetic erosion. In Namibia, use of satellite imagery/remote sensing has recently been used for wild species. A proposal for a project on the use of remote sensing has been put forward to the National Resources Institute of UK for funding.

Storage facilities

63. Under the regional SADC Plant Genetic Resources Centre project, most countries have set up NPGRCs, equipped with seed storage facilities. Genebank infrastructures and facilities vary from country to country. Both Namibia and Botswana have recently constructed new genebanks which are well equipped for seed storage. Other countries like Malawi, Mozambique and Zambia also have reasonably good conservation facilities. In South Africa and Zimbabwe there is no National Genebank and collections are maintained by several research organizations scattered in the country, but there are plans in both countries for the establishment of National Base collections and in Zimbabwe this is now at an advanced stage.

64. In general, seed storage is done in domestic freezers which generally operate at -18 deg. C. Botswana and Mozambique have in addition to freezers cold room facilities which operate between 5-10 deg. C. In most countries seeds are packed in laminated aluminum foil. Seed drying seem to be a limiting factor for most genebank activities. With the exception of Mozambique and Zambia, silica gel is used for drying seeds. This has proved to be a very slow process and limits the number of incoming accessions that the bank can handle. Erratic power supply is a major problem for the maintenance of the seed collection in most NPGRCs. Collections often have to be moved to other sites where there are standby generators. Only Namibia has a standby generator permanently connected.

65. Besides the NPGRCs facilities, most countries hold working collections at various research stations for utilisation in crop improvement programmes. In Namibia, for instance, the germplasm is stored either in cold rooms at 4 deg C in plastic bottles or at ambient temperature in a variety of containers from bottles to paper or cloth bags. There are also field genebanks for root crops. In Mozambique, field genebanks of cassava and sweet potato, introduced from IITA and CIP, are maintained at Umbeluzi. Mozambique has also developed in-vitro facilities for the propagation and maintenance of root and tuber crops.

66. As with the SPGRC, the SADC Tree Seed Centre Network has provided the impetus for the SADC countries to develop National Tree Seed Centres (NTSC). Most of the NTSCs in the region has some basic storage facilities, intended for short term storage for both natural and exotic tree species which are maintained at low temperatures in sealed plastic containers,



as in Namibia, Malawi and Zambia. For exotic species *ex situ* conservation is also through provenance and progeny tests and seed orchards. In countries with advanced breeding programmes *ex situ* conservation is also achieved through pollen storage and establishment of clonal archives.

Documentation

67. With regards to documentation systems, the SADC Documentation and Information System (SDIS) based on DBase IV programme has been adopted by all countries except South Africa. In parallel, hand written accession registers and other manual records are still being maintained in some countries. This SPGRC documentation system presently enables countries to enter their passport and accession management and data. A characterisation data module and a computer based regional information network to facilitate exchange of information among the SADC NPGRCs is under development at SPGRC.

68. The safe keeping of all passport data and other information concerning the collection as well as any characterisation and evaluation data cannot be over emphasised. It is of great importance that all documentation be adequately duplicated and be safely kept in a different location, other than the genebank. In Namibia for instance, information stored on diskettes is duplicated, and kept in a different location in the same building as well as at another place outside the building. Also back ups of the entire database are to be sent to the regional facility (SPGRC) once a year. In Malawi duplicate sets of information are stored in the building, but arrangements will be made for safe keeping of the sets at a different location.

69. Herbarium facilities in the region vary from country to country. While Malawi, Namibia, and South Africa have good herbaria facilities and taxonomic expertise, Zimbabwe and Mozambique also have some capacity. The identification of wild relatives of crops and other indigenous plants is a major problem for many countries. Some countries such as Lesotho and Zambia, have emphasised the need to develop good herbarium facilities and the training of staff in taxonomic identification of plants. There is also a regional GEF-funded project for strengthening Botanic Gardens and herbaria.

70. Documentation on *in situ* collections is lacking in all countries and is often not considered a priority in the national programmes. In Namibia *in situ* documentation, may however be addressed under the Biodiversity Country Studies in which Namibia is participating. Also the computerised "Botanical Research and Herbarium Management System (BRAHMS)" which will be implemented at the National Herbarium, may facilitate *in situ* documentation considerably.



Characterisation and evaluation

71. The importance of characterisation of plant genetic resources is to describe the material held in collections. Characterisation refers to the morphological phenotypic and genotypic expressions of characters that are highly heritable and expressed in all environments. On the other hand evaluation involves the agronomic performance, pathological reactions and chemical and genetic analysis and observable responses to stress factors. Malawi stresses that Genebanks have to be active establishments capable of safe keeping of the plant accessions, capable of generating useful information on the accessions held and being able to share this information with other scientists in order to encourage utilisation of the germplasm under storage.

72. In most of the countries of the region only minimal characterisation and preliminary evaluation of the accessions has been done. The major reason for this is the lack of personnel, financial resources and land, although the latter is not limiting in some countries. Full evaluation has yet to be carried out anywhere.

73. In most cases, IPGRI descriptor lists have been used for characterisation and preliminary evaluation. In general no modification is made except for some cases, where some modification and addition have been made to fit specific requirements. Malawi draws attention to the need for evaluators to liaise with crop specialists and other genebank scientists to obtain explanation on certain characters. In Botswana and Namibia, collections of sorghum, pearl millet, cowpea, bambara and groundnuts have been characterised. Zambia has characterised about 14% of the total material in their collection and is contemplating making use of biochemical and molecular markers in future. Some characterisation have been done in Angola and Mozambique.

74. In most countries, evaluation work is carried out by breeders as part of their crop improvement programmes. Emphasis is mostly on traits of high priority to the commodity, in particular for resistance to disease, insect and other environmental stresses. In some countries like South Africa, evaluation is undertaken with the collaboration of local farmers. In Namibia accessions of sorghum, groundnut, and bambara nuts have been evaluated for yield at a single location and at 3 locations for yield and days to heading as part of the Sorghum and Pearl Millet Improvement Programme. In Zambia, preliminary evaluation of finger millet, maize and beans has been undertaken with a view of identifying materials with desirable traits which could be used in their breeding programmes.



75. Characterisation and evaluation is often performed by crop experts in research institutions, since often no expertise is available at the NPGRCs itself. In some countries the NPGRCs have developed measures to ensure that any information obtained from characterisation and evaluation work undertaken by crop experts is fed back to the NPGRC. Thus in Namibia for example, before seeds are supplied, the recipients are asked to sign an agreement so that they have to communicate the results of their research back to the NPGRC. Zambia also specifically requests that such results be returned to the genebank. In South Africa, characterisation and evaluation work is carried out by research institutes such as ARC and seed companies developing new cultivars. Some seed companies have special on-farm test sites where farmers are involved in the evaluation of newly bred lines.

Germplasm regeneration and multiplication

76. Regeneration is considered by most countries as a very expensive and time consuming activity that requires skilled personnel, land, specialised equipment, in particular for cross pollinated species. This puts great limitations on many countries to carry out regeneration work.

77. However in most SADC countries some regeneration work has been carried out, albeit on a small scale. In Malawi germplasm rejuvenation, seed multiplication and seed processing for storage in long term environment receives a greater priority than other genebank activities. In Mozambique, priority is given to accessions representing important endangered landraces. In Botswana, regeneration has been done for cowpea which is susceptible to damage by the cowpea storage weevil, while in Angola, due to staff shortage, no regeneration and multiplication has been carried out. The collection in Namibia is relatively recent and thus no regeneration has been done so far.

78. In NPGRCs, regeneration is carried out when germination falls below 85%, while multiplication of germplasm is carried out mainly for materials received from international and regional genetic resources centres. Most of the material regenerated is of self-pollinated crops. Inadequate facilities have made it difficult to handle cross pollinated crops; lack of irrigation facilities can also be a problem since drought stress during the regeneration process could introduce differential survival of individual within an accession and lead to selective elimination of valuable variation.

79. Malawi has experienced some problems with the regeneration of cross-pollinated species especially sunflower. The use of pollination bags was not considered a good option for this species because it encourages in-breeding depression. Malawi raises the point about mixing of samples from different regenerations, whether or not this should be done. They argue that there is inevitable loss of genotypes with shorter longevity. They also point out



that there is a lack of guidelines derived from scientific investigation on this issue.

D. Uses of Plant Genetic Resources in The Sub-region

80. The main objective of most countries policy on plant breeding is to increase food productivity by developing new varieties with high yields and improved resistance to pest and diseases, primarily for food security and self-sufficiency. To achieve the above most breeders have recourse to germplasm collections to look for desirable traits for their breeding programmes. Much of this involves the adaptation of imported germplasm to local conditions and by introducing specific characters. A distinction needs to be made between utilisation of plant genetic resources in genebanks and wild relative of crops, cultivars and land races. While germplasm collections are mainly used by breeders, it is believed that local farmers, specially small holder farmers are the principal users of wild plants and genetic resources of landraces and cultivars.

81. In some countries, due to institutional constraints and lack of characterisation, local collections of germplasm have not been utilised in breeding programmes. In Angola and Mozambique for instance, due to the insecurity caused by the war, the plant breeding department has been unable to function with the result that PGR is hardly used. In Malawi, germplasm accessions from 3 different crop species (maize, sunflower and ground beans) have been supplied to research workers. In Namibia PGR collections are under-utilised by local scientists. Some accessions of pearl millet and sorghum are used in the Sorghum and Millet Improvement Programme; some accessions of bambara nuts, groundnuts and indigenous Cucurbitaceae have also been used. In the region not much of the collected germplasm has been requested for by breeders because little characterisation and evaluation work has been done and lack of awareness of PGR activities. Genetic variability in crops like cowpea, finger millet, sorghum and amaranthus have been used in developing and improving different varieties of crops adopted by various farmers.

82. The major crop breeding programmes are run by government institutions or by crop-specific research institutions, such as in South Africa. In most cases the programmes are funded by external sources. In Malawi, some breeding work is also carried out by the university, international organizations, and private seed companies.

83. In most countries of the region farmers are involved in breeding programmes either through on-farm trials and demonstration fields or active participation in production of new varieties. In Malawi for instance farmers



are allowed to make their options on palatability, and cooking quality tests of crop. On an informal and unstructured basis farmers are to some extent also responsible for crop improvement through selection of their own seeds for the next season from individuals with superior performance.

84. Natural forest species of major commercial importance are mainly timber species used for furniture production. Those for non-commercial purposes are fuel wood, fruit trees, and those for medicinal uses. Major exotic commercial species are the *Pinus* and *Eucalyptus* genera and are used for timber and pole production. *Pinus* species are used as structural timber for furniture and poles. Breeding activities are confined to the exotic commercial species and attention needs to be given to indigenous wood.

Seed production and distribution

85. One of the main objectives of national breeding programmes is the production of high quality seeds of improved varieties and their distribution to farmers. Although farmers are the main targeted beneficiaries of national breeding programmes, the resulting high costs of seeds of these improved varieties, and other factors, make them inaccessible to the small holder farmers. In most countries, the national plant breeding programme primarily services the commercial agricultural sector and small holder farmers benefit very little, while in Zambia the high cost of seeds supplied mainly by the commercial seed companies prohibits their utilisation by small scale local farmers. In Malawi some credit facilities are provided to farmers to get access to improved varieties. Another method has been to give free seeds to agricultural extension workers which then multiply them for distribution to farmers. With the exception of maize, in all areas small scale farmers are often obliged to rely on their own seed sources from local landraces to meet their needs in seeds.

86. In the SADC region seeds are produced either through specialised institutions put in place by governments like the Seed Multiplication Unit (SMU) in most countries or by commercial companies as in Zambia. In Lesotho, the SMU multiplies imported seeds and distribute to farmers; small scale farmers are also contracted by the SMU to produce on-farm seeds to the SMU for distribution. In Botswana, seed distribution is done by the Botswana Agricultural Marketing Board. In Tanzania there is a National Seed Industry for the distribution of seeds of food, oil seeds, vegetable, pulses, and of potatoes and other tubers. Cash crop seed delivery system is through Marketing Boards for various cash crop types such as cotton, coffee, tobacco, pyrethrum, tea etc.

87. In countries like Angola and Mozambique, which have been affected by war, seeds have been mainly imported from abroad by the government authorities or have been procured with emergency aid from international UN



agencies, or donations from countries and NGOs. In Mozambique several NGOs like the World Vision and FHI have played a key role in seed distribution to local farmers.

88. In Namibia, a seed testing and distribution system is being established. Seeds of an improved variety of pearl millet are distributed on an ad-hoc basis by extension workers, research stations and NGOs, mainly during periods of seed shortage. Seed is produced on research stations and by selected farmers. Namibia is planning to form a farmer's seed co-op with government support. None of the countries, has any formal mechanisms in place for production and distribution of landraces. However, some limited activities on seed production and distribution have been carried out by such NGOs as ENDA-Zimbabwe (NGO) under the guidance of the formal system.

89. In the forestry sector, National Tree Seed Centres, as part of the regional SADC project on Tree Seeds, have mainly been involved in the collection and distribution of seeds of forest species.

III. IDENTIFICATION OF NEEDS, OPPORTUNITIES AND CONSTRAINTS

90. Based on the assessments made in the previous section, the following needs and constraints have been identified for the sub-region as a whole.

A. National Programme Needs

National programme

- Need to develop and strengthen national PGR programmes.
- Need for national programs to cater for the use of local PGR, particularly landraces and cultivars well adapted to local conditions.
- Need to develop linkages between major players: private sector, NGOs, farmers organizations, women's groups, as well as governmental institutions.

National policies

- Need to develop policies on PGR related issues including access, biotechnology transfer etc.
- Need to recognise the role of traditional farmers in PGR conservation.



- Need to provide incentives for the *in situ* farmer level conservation efforts by traditional farmers in crop productivity and rangeland management.
- Need to recognise the importance of indigenous knowledge concerning PGR use and conservation.
- Need for sustained funding as direct budget line.
- Need for adequate financial incentive for attraction and retention of staff.

NPGR Committees and Centres

- Need to develop and strengthen NPGRComs.
- Need to co-ordinate PGR activities between sectors and institutions.
- Need for well-defined terms of reference for the NPGRComs to oversee all PGR activities.
- Need for semi-autonomy for NPGRComs.
- Need for sustainable funding to enhance the co-ordinating role of NPGRComs.

National PGR legislation

- Need to develop and strengthen PGR legislation in harmony with regulations relating to seed services, phytosanitary matters, collecting and exploitation (IPR legislation); to ensure better protection and utilization of PGR.
- Need to develop PGR legislation to enhance the availability of PGR to farmers.
- Need for expert legal assistance for the development of legislation on IPR, plant breeders rights; farmers rights and patents.
- Need to review effectiveness of phytosanitary legislation.
- Need for legal agreements to protect national sovereign rights over national collections located in international genebanks.
- Need for legislation governing biosafety and issues on PGR.

Awareness of the importance of PGR

- Need for education and awareness campaigns at all levels of the community, in particular policy makers.
- Need to mobilize political will with respect to PGR.



B. Training & Institutional Capacity Building Needs

Training

- Need for adequately trained human resources to ensure continuity of national PGR programs.
- Need for training education in PGR related to:
 - systematic botany
 - plant breeding
 - population genetics
 - biotechnology
 - seed technology
 - seed physiology
- Need for practical PGR training.
- Need to increase capacity of regional institutions involved in PGR training.
- Need to include PGR conservation and utilization in current educational curricula.
- Need to incorporate indigenous knowledge into PGR training.
- Need to train and educate the informal agriculture sector and users of PGR for conservation and utilization work for transfer of PGR technology.
- Need to organize PGR training courses in Portuguese.

Capacity building

- Need to strengthen the research capabilities of institutions and crop working groups involved in PGR conservation and utilization.
- Need to develop and strengthen the capacity for seed science and technology of tropic and subtropical species.
- Need to ensure inter-disciplinary and inter-institutional approach to research.



C. Technical Needs

Conservation

- Need for inventories of:
 - existing PGR collections
 - *in situ* conservation sites
 - wild relatives of crops
 - endangered plant species etc.
- Need to undertake research and extension to support sustainable agriculture.
- Need to identify major gaps in existing collections.
- Need to ensure adequate representation of genetic variability in collections.
- Need to collect and conserve forage species to ensure sustainable animal production systems.
- Need to re-evaluate existing systems of protected areas with respect to important species and ecosystems.
- Need to establish and appropriately manage existing and additional *in situ* conservation areas in reserves and on-farm.
- Need for prioritisation of areas of PGR activities.

Infrastructure

- Need to develop and improve facilities and infrastructure for PGR conservation:
 - genebanks
 - seed testing laboratories
 - documentation facilities including computers
 - screen houses
 - multiplication, characterization and regeneration facilities
 - field genebank
- Need for quarantine facilities.
- Need for additional herbarium facilities and botanical gardens.



D. Need for Documentation

- Need for documentation of all aspects of PGR activity, ranging from database systems, publications, to descriptor lists.
- Major needs include:
 - guidelines on regeneration methods for both open and cross pollinated crops
 - guides on identification, collecting and conservation methods
 - development of capacity for database maintenance
 - production of bibliographies and catalogues on PGR and dissemination of information to public and users of PGR
 - documentation of indigenous knowledge
 - update of descriptor lists
- Need for essential PGR documentation in Portuguese.

E. Utilization Needs

- Need to develop local capacity for characterization and evaluation, with particular emphasis on the properties and value of local genetic resources.
- Need to support conservation and sustainable development of under-utilized plants and medicinal plants.
- Need to develop mechanisms to multiply landraces for distribution to farmers.
- Need to develop an efficient seed production and supply system which caters for the needs of small scale farmers.
- Need to strengthen link between breeders and scientists.

F. Regional & International Needs

- The SADC initiative needs to be strengthened to full capacity for efficient and effective execution of tasks.



G. Opportunities

Training

Opportunities exist in the region for training on different aspects of PGR but these must be effectively mobilized.

Technical aspects : conservation

Herbaria in the region provide essential services for the identification of plants from the local flora used in PGR programmes.

Technical aspects : utilization

There is a great potential in the region for the use of local landrace in marginal environment.



APPENDIX 1 COMMITMENT TO INTERNATIONAL AGREEMENTS RELATED TO PGR

Countries	Member FAO CPGR	Signed FAO International Undertaking	Signed Convention on Biological Diversity	Ratified Convention on Biological Diversity	CITES	World Heritage Convention	Ramsar Convention	African Convention on Conserv. of Nature and Natural Resources
Angola	✓	✓	✓					
Botswana	✓		✓		✓			✓
Lesotho			✓	✓	✓			✓
Malawi		✓	✓	✓	✓	✓		✓
Mozambique		✓	✓		✓	✓		✓
Namibia			✓	(✓)	✓		✓	
South africa	✓	✓	✓		✓			
Swaziland			✓					✓
Tanzania	✓	✓	✓		✓	✓		✓
Zambia	✓	✓	✓		✓	✓	✓	✓
Zimbabwe	✓	✓	✓	✓	✓	✓		

(✓): in process.



APPENDIX 2

STATUS OF NATIONAL PROGRAMMES, POLICIES AND PGR LEGISLATION IN THE SUB-REGION

Countries	PGR Committee	National Programme on PGR	National Conservation Strategy	PGR Workshop	PGR Legislation	IPR Legislation
Angola						
Botswana	✓					
Lesotho	✓	✓				
Malawi	✓	✓				
Mozambique						
Namibia	✓	✓		✓		
South africa						✓
Swaziland						
Tanzania	✓	✓				✓
Zambia	✓	✓				
Zimbabwe	✓					



APPENDIX 3

LIMITATIONS IN CONSERVATION AND UTILIZATION OF *EX SITU* COLLECTIONS (AS IDENTIFIED IN THE COUNTRY REPORTS)

(Part 1)

Countries	Collections incomplete	Lack of or poor facilities	Delays in seed drying	Limited capacity	Power supply interruptn.
Angola	✓	✓	✓	✓	✓
Botswana		✓		✓	
Lesotho		✓		✓	
Malawi	✓	✓	✓		✓
Mozambique	✓	✓		✓	
Namibia	✓		✓		
S. Africa		✓		✓	
Swaziland					
Tanzania	✓	✓		✓	
Zambia		✓	✓		✓
Zimbabwe	✓	✓			

(Part 2)

Countries	Lack of procedures for regeneratn. of OPP	Insufficient seed numbers for duplication	Lack of characterization and evaluation	Poor utilization of collections	Lack of sufficient trained staff
Angola				✓	
Botswana			✓		
Lesotho			✓	✓	
Malawi					
Mozambique	✓				
Namibia		✓	✓	✓	✓
S. Africa				✓	
Swaziland					
Tanzania					✓
Zambia	✓	✓		✓	✓
Zimbabwe			✓		



APPENDIX 4

PLANT SPECIES COLLECTED (IN COLLABORATION WITH NARS, SPGRC, IPGRI) IN SADC COUNTRIES BY CGIAR CENTRES

(Part 1)

CGIAR Centre	ANG	BOT	LES	MAL	MAU	MOZ
ICRISAT	PP Sorghum PM	Sorghum PM	Sorghum	Sorghum PM PP G'nut	G'nut	Sorghum PM G'nut
IITA		Cowpea	Beans Cowpea Peas Lentils		Rice	Cowpea Cassava Rice Sweet-potato
CIAT					Beans	Beans
CIMMYT	*				Maize	Maize
IRRI		Wild Rice		Rice	Rice	Rice
ICRAF		Sesbania		Sesbania		
ILRI					Fodder	Forage
CIP						

(Part 2)

CGIAR Centre	NAM	SWA	SA	TAN	ZAM	ZIM
ICRISAT	Wild PM Cowpea Ba'nut PM Sorghum	PP Sorghum PM		Sorghum PM PP	Sorghum PM PP	Sorghum PM G'nut
IITA		Cowpea Sweet-potato		Cowpea Cassava	Cowpea Ba'nut G'nut	Cowpea Rice
CIAT		Beans		Beans		Beans
CIMMYT		Maize		Maize Wheat		Maize Oats Wheat Barley
IRRI				Rice	Rice	Rice
ICRAF	Sesbania			Agroforestry	Sesbania	
ILRI				Fodder		Forage Fodder
CIP				Sweet potato		

* Angola - CIMMYT may have a few samples, but no formal collection made.

PP= Pigeon pea; PM= Pearl millet.