AUSTRALIA:

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

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Note by FAO

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Table of Contents

CHAPTER 1
Introduction

1.1 ORIGIN OF THE REPORT

This report to FAO is in response to all members to describe national arrangements for plant genetic resources as part of the preparation for the Fourth International Conference and Programme for Plant Genetic Resources (ICPPGR) to be held in Leipzig, Germany in June 1996.

Chapter headings follow the broad format suggested by the FAO. However the Australian report differs from the suggested guidelines insofar that material dealing with relevant national policies and programs has been brought forward to Section 1.2 in the document. Australia's approach to genetic resources for food and agriculture needs to be considered in the light of Australian national circumstances. These include resource endowments, economic and social conditions, political structures and ecological processes and Australia's approach to sustainable development.

1.2 THE AUSTRALIAN CONTEXT

Australia is the only nation to occupy an entire continent. In land area it is the world's sixth largest nation. Australia covers a land area of 768 million hectares, lies in the Southern Hemisphere and has seven external territories including the Australian Antarctic Territory.

The population of Australia is 18 million with a density of two people per square kilometre. It is a highly urbanized population with more than 6 million people, about 35 percent of the total population, living in the two major cities, Sydney and Melbourne. Nearly 75 percent of Australians live in or within 50 kilometres of Australia's coastal cities.

Australia's climate ranges from tropical monsoon in the north, to Mediterranean in the south, to temperate in Tasmania, with a vast, arid region in the interior. The continent has a generally flat land surface, with relatively low precipitation and runoff rates. Mountain ranges in the south-east are often snow covered in winter, but Australia generally experiences mild winters and hot summers. Drought is a recurring climatic feature over most of the continent.

The biological diversity of Australia is rich and unique. As a large island continent encompassing a number of biogeographic provinces, Australia has habitats which range from tropical rainforests to alpine heath, spinifex grassland, woodlands and coral reef. Australia is considered to be one of the world's megadiverse countries.

Since European settlement about 200 years ago, considerable changes have occurred to Australia's ecosystems. As an example, within the intensive land use zone 52 percent of forests and woodlands had been cleared or thinned by 1990. Over 48 percent of the Australian continent is either significantly or substantially disturbed and there are no vegetation types that remain completely undisturbed from the effects of human activity.

The Australian economy has undergone considerable diversification and expansion over the last 30 years, much of the expansion being related to the tertiary sector. There has been significant investment in export oriented mining and energy products and in a large and diversified modern agriculture sector.

By world standards, Australia enjoys a high standard of living, a robust economy, a peaceful and well educated society, an open and democratic political framework and a high level of personal freedom. Australians value these characteristics, just as they value their unique natural heritage.

System of Government and Decision Making

Australia is a federation of six self-governing States and two self-governing mainland Territories. The Commonwealth Government's powers and responsibilities are defined in the Australian Constitution and the State and Territory governments are responsible for all other matters.

The Commonwealth Parliament is bi-cameral with a House of Representatives and a Senate; its powers encompass, among other things, trade and commerce, taxation, postal and telecommunications, defence, external affairs, banking, immigration and social welfare. The State and Territory governments also have established systems of local government. There are shared responsibilities between the Commonwealth (Australian) and State and Territory governments in agriculture, forests and biological diversity matters.

Environmental powers are not specifically dealt within the Australian Constitution and are not the sole province of any one sphere of government. Most environmental legislative responsibilities rest with the State and

Territory governments, although the Commonwealth does have substantial powers to enact laws affecting the environment and sustainable development. The Council of Australian Governments (COAG) provides a forum for the different spheres of government to discuss and develop nationally consistent approaches to issues.

The Intergovernmental Agreement on the Environment (IGAE), signed in May 1992, is an agreement between all spheres of government concerning their roles and responsibilities in the decision-making process on environmental issues. The Agreement outlines the roles and responsibilities of the three spheres of government and provides for the establishment of mechanisms that are aimed at contributing to a more cooperative approach to environmental decision making.

Ministerial Councils play a key role in implementing nationally consistent policies and programs. Councils which have major responsibilities in respect of agriculture, biological diversity and forests are:

- Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ);
- Australian and New Zealand Environment and Conservation Council (ANZECC); and
- Ministerial Council of Forests, Fisheries and Aquaculture (MCFFA).

Approach to sustainable development issues

Australia's aim is the long term and ecologically sustainable development of Australia's land, water, vegetation and other natural resources to meet the needs of current and future generations. There is a recognition in Australia that many sustainable development issues need to be dealt with on a local, national and international scale.

A consultative approach is the cornerstone to Australia's policy development and considerable effort is devoted by all three spheres of government, non-government organizations and community groups to cooperative approaches to sustainable development issues. This is reflected in the development of national strategies, agreements and organizations and fora which specifically deal with national and international sustainable development matters.

Australia has a number of key national strategies in place to support sustainable development. The principal and overarching strategy is the National Strategy for Ecologically Sustainable Development (NSESD), which

seeks to address sustainable development issues from a distinctly Australian perspective.

Recognising a core goal of development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends, the NSESD has three core objectives:

- to enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;
- to provide for equity within and between generations;
- to protect biological diversity and maintain essential ecological processes and life-support systems.

The Strategy has nine guiding principles which, together with the core objectives, form the basis of a balanced and integrated approach to sustainable development in Australia.

The Strategy was endorsed by the Council of Australian Governments in December 1992.

Other key strategies and programs which focus on agriculture, forests and biological diversity include the National Forest Policy Statement, the Decade of National Landcare Plan, the National Drought Policy and the National Strategy for the Conservation of Australia's Biological Diversity.

Biological diversity and genetic resources policy

Australia has a rich and diverse biological diversity and is considered to be one of the mega diverse countries. Biological diversity issues form a major element of Australian industry and natural resources policy, both domestically and internationally. Australia ratified the Convention on Biological Diversity in June 1993 and is committed to implementing the Convention's provisions on conservation, sustainable use and benefit sharing.

Providing access to Australia's biological resources has important implications for Australia in many fields, including conservation, agriculture, medicine and scientific research.

The jurisdiction, and hence the control, over Australia's indigenous biological resources, including their conservation and sustainable use, currently vests in State, Territory and Commonwealth governments. All the State and Territory governments have taken steps to regulate the collection of flora and fauna,

whether for research or other purposes. Ownership of indigenous biological resources may be held by governments or individuals.
A Commonwealth/State working group is examining the benefits of a more nationally consistent approach on access to Australia's genetic resources, the principles which should underpin it, and mechanisms which can be adopted to achieve better consistency in access management. The group will report to the Commonwealth, and to State and Territory governments.

Australia has finalized a National Strategy for the Conservation of Biological Diversity. It aims to provide a comprehensive approach to the effective identification, conservation and management of Australia's biological diversity.

The Strategy highlights:

- the need for the development and implementation of coordinated strategies, policies and programs for the conservation of biological diversity;
- strengthening the practical skills and knowledge of land managers;
- completing strategies for the management of plant and animal pests;
- conserving native vegetation, including encouraging off-reserve conservation, in particular in agricultural lands.

The Strategy recognizes that major initiatives are required in the areas of compilation and assessment of existing knowledge, conservation biology, achieving ecologically sustainable use in a range of sectors, rapid assessment and inventory, long-term monitoring and ethnobiology. The Commonwealth and the States, under the National Forest Policy Statement, are addressing *in situ* conservation issues through this national approach to the conservation and sustainable management of Australia’s forests.

Australia is a net importer of genetic resources for many food and agriculture species. However Australia is also a net exporter of genetic resources of some species and a net exporter of seed of improved (finished) cultivars of temperate and tropical forage species.

Forest tree seed represents Australia's largest export of a genetic resource originating from wild populations. Conversely, a wide range of European, North American and Asian trees have been introduced into Australia for amenity purposes and for timber production. The softwood genus *Pinus* is now the basis of a large wood processing industry. The flowers of some native Australian species are now being exported.

Australia has significantly increased the commercial value of introduced species by selective breeding and genetic manipulation. This improved material is readily accessible to the world.

Australia signed the International Undertaking on Plant Genetic Resources for Food and Agriculture in April 1992. Australia sees the revised Undertaking as providing the framework through which the global community will continue to facilitate access to, and promote conservation and sustainable use of, genetic resources for food and agriculture. This is an essential element in providing for global food security in harmony with the objectives of benefit sharing, conservation and sustainable use of genetic resources of the Convention on Biological Diversity.

1.3 AUSTRALIA'S AGRICULTURAL SECTOR

The Commonwealth Government's agricultural policies and programs are focused on economic and environmental sustainability. This focus is integrated into all facets of agriculture including primary production, research and development, industry strategies, trade and the development of rural communities.

The pattern of Australian agriculture is determined to a large extent by Australia's climate, which is characterized by scarcity of rainfall and high evaporation rates in many areas. Rainfall can also be highly variable, both within and between years, with falls being extremely heavy or very scarce. Severe drought is a regular occurrence and a constant risk for Australia's agricultural industry. For example, large areas of eastern Australia are still recovering from the effects of a severe drought which began in 1991 and which halved Australia's exports of wheat in 1994-95. The total cost of this drought to the Australian economy has been estimated to be about $A5 billion.

A second determinant of Australian agriculture is the quality of its soils. Much of the western and central portion of the continent has been continuously exposed for the last 600 million years and even in the eastern portion back 55 million years to the separation of Australia from Antarctica. There has been negligible glaciation since and only limited volcanic activity in eastern Australia. Consequently Australian soils in general are derived from ancient, deeply weathered materials, and have low chemical and physical fertility. Significant parts of the continent have salt occurring in association with groundwater and trapped in old marine-deposited rocks. In effect, many soils in Australia do not compare with those of much of Europe and North America.

Some 70 percent of Australia's land area falls into zones referred to as rangelands where pastoralism predominates. About 10 percent of Australia's sheep flock of about 120 million head and around half the country's 26 million beef cattle herd are carried in these regions. Stocking rates are relatively low by world standards, but the total grazing pressure includes grazing by artificially inflated numbers of macropods and by exotic feral mammals, including rabbits and goats.

Australian rangelands are made up of a diverse array of environments and ecosystems shaped by strong climatic and geological forces. The climate is unpredictable and the scale of management immense. The rangelands are also significant to Aboriginal communities and contain nationally and internationally significant conservation areas.

The orientation of Australia's agricultural policies is towards market responsiveness and self reliance rather than towards influencing market prices and risk. The Commonwealth Government's approach is essentially to compensate for market failure by providing an integrated package of rural policies and programs aimed at improving farm profitability and international competitiveness, encouraging sustainable agricultural practices and enhancing social and economic opportunities for rural communities. Australia is also working through international fora to address reform of international markets for agricultural products.

There are about 120,000 commercial farms in Australia, plus about 50,000 low-income and hobby farms where the majority of income is earned off-farm. By far the majority of farms are owned and managed by families. Only about 6 percent of commercial farms have corporate or similar business structures.

Since the early 1980s, considerable restructuring of Australian agriculture has taken place. Until this time, the agriculture industry was production oriented and dominated by the wheat, sheep and beef industries supplying bulk products through regulated marketing arrangements. The declining terms of trade for the traditional commodities, together with the increased exposure of Australian agriculture to world markets, has resulted in enterprise diversification and the adoption of new agricultural practices and technologies.

Australia currently exports approximately 80 percent of its agricultural produce. Major agricultural exports include grains, wool, beef, sugar, dairy products and cotton. The total value of Australia's agricultural exports in the financial year 1995-96 is estimated at $A19.4 billion. Exports of horticultural products are relatively low, but the total value of production is now approaching the value of production of grain crops.

There has also been increasing recognition of the need for the agricultural resource base to be environmentally, as well as economically, sustainable. Natural resource management practices have undergone significant change over the past fifty years. The early decades were characterized by closer settlement, extensive clearing, mechanization of farm operations and intensive use of fertilizers and chemicals. As a consequence, the productive capacity of some soils has been declining due to salinization, erosion, breakdown in soil structure and acidification.

To encourage farmers, other land users and resource managers to take more responsibility and be skilled in the sustainable management of the resources they own or control, the Commonwealth Government has established the National Landcare Program whereby grants are provided to develop and demonstrate local solutions to local problems. To date, about 30 percent of all Australian farmers are members of Landcare groups of which over 2,500 have been established around Australia. Land use and resource use decisions are also being influenced through more appropriate natural resource valuations. For example, water resources management and environmental flow considerations are being pursued through COAG water pricing reforms.

CHAPTER 2
Indigenous Plant Genetic Resources

2.1 AUSTRALIA'S INDIGENOUS PLANT GENETIC RESOURCES

Australia is one of only twelve countries which together contain 60 to 70 percent of the world's biological diversity. As a party to the Convention on Biological Diversity, Australia has an obligation to balance conservation and utilization of biological resources.

Australia has been geographically isolated from other countries for 35 million years and as a result the flora of Australia are characterized by high natural diversity and high endemicity. Australia has the world's fifth highest number of flowering plant species at about 23,000, of which over 85 percent are endemic. There are also over 12,000 species of non-vascular plants namely mosses, algae, lichens and fungi.

Knowledge of the Australian flora, uniquely adapted to Australia's harsh climate and impoverished soils, for actually or potentially useful plants is extremely variable. It is known that Australia's indigenous plant biological diversity is, or potentially is, important for forestry, pastoral, agricultural, horticultural and medicinal purposes.

Aboriginal and Torres Strait Islander peoples utilize indigenous plant material in a wide range of situations, including for food, medicinal and cultural purposes.

Wild species and relatives of crops

Much of Australia's plant genetic resources remain to be discovered and identified. It is likely that future research will reveal a large genetic diversity, given the enormous variation in the geographic distribution of known species across environments, combined with the size and isolation of the continent, evolutionary history, climate and impacts of human occupation.

For the species belonging to the same genera to which important crop plants belong (wild relatives of crops), for instance cotton, soybean and sorghum, knowledge of their diversity is steadily increasing in terms of taxonomy, systematics and biogeographical characterization.

New species are still being discovered in remote areas and named. Little is known about intraspecific variation in particular characters that might prove useful in improving related crops. Little is known, too, about the genetic diversity of plants used by indigenous peoples as food sources, or the pasture species of native heathlands and rangelands.

A government and industry funded study is underway to develop a native bush foods industry. This work is examining a range of issues including sustainable production and harvesting methods.

Forest genetic resources

Australian forests are among the most species diverse in the world and Australian tree species demonstrate adaptability to a wide range of environments, reflecting different climates and soil types. The high demand for Australian species reflects this wide adaptability and hence ability to thrive in a wide range of overseas environments.

As a genetic resource, only 5 to 10 percent of Australian tree species have been thoroughly researched for their potential for commercial utilization. Of a total of 2,500 tree species some 200 are of current commercial significance in Australia or overseas.

Reliable statistics on the movement of forest germplasm into and out of Australia are lacking. Nevertheless, it is known that in recent years at least 14,000 individual seed lots from more than 600 tree species have been exported for research purposes through institutions such as the Australian Tree Seed Centre (ATSC - within the CSIRO Division of Forestry), State Forest Services, Botanic Gardens and Universities. This represents about a ten fold increase in the number of seed lots exported for research over the last two decades. Most of these species are within the genera *Eucalyptus, Acacia* and *Casuarina*.

CHAPTER 3
National Conservation Activities

Australian conservation efforts in relation to plant genetic resources for food and agriculture are a combination of *ex situ* and *in situ* activities. *In situ* conservation activities are dealt with in the context of Australia's approach to the conservation of indigenous biological diversity.

Conservation and use of indigenous plant material for horticulture, food production, medicinal and forest operations is determined through integrated, but not differentiated, activities within this approach.

3.1 *EX SITU* CONSERVATION OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Ex situ collections are by far the most significant for conservation and use of genetic material concerned with agriculture and food. The material in these *ex situ* collections predominantly covers material not indigenous to Australia.

Ex situ conservation mechanisms include botanic gardens, seed/gene banks and a few field collections maintained at several plant genetic resources centres. Botanic gardens and herbaria play a significant role in the conservation of native plant genetic resources. Most material held in *ex situ* collections is seed storage, but there is also tissue culture and DNA storage. Fruit genetic resources are conserved in public and private orchards.

Major crop species

Australia and New Zealand have an organized and coordinated program for managing plant genetic resources for food and agriculture which covers the major crop and pasture species. The mechanism for coordinating activity is through the Australian and New Zealand Network of Plant Genetic Resources Centres which consists of nine centres managed by Commonwealth, State/Territory, or New Zealand government agencies. Most base collections belong to the Centres.

The Centres have four major functions:

- to conserve samples of genetic resources to provide material for research programs (both breeding and investigation) and as a strategic reserve;

- the introduction and quarantine of new genetic resources (to reduce duplicated efforts);
- to supply material on request both in Australia and overseas; and
- be the major contact for international collections and networks.

The gene banks around Australia conserve some 94,000 accessions of 517 species that contribute to 147 crops. These gene banks are maintained either as working collections to supply the needs of active breeders and range from low-cost, short term storage to base collections under strictly controlled, expensive to maintain, long term storage.

Up to 1992, twenty-nine percent of the 23,700 despatches went overseas including 300 indigenous relatives of crop species. No detailed analysis of material despatches has been undertaken, but it is likely a considerable portion of Australian material is re-exports of introduced varieties requested because of ease of access, purity of seed and added knowledge from Australian research.

The Commonwealth Government maintains a Plant Introduction Unit which keeps a register of plant introductions to Australia and stores backup samples from many of the Centres.

Annex A provides information on the crop species and the taxon coverage of material held in the collections. This includes those indigenous resources which form part of domestic and international commercial breeding activities.

In addition to the collections on major species, Australia has significant collections of rhizobium, for research on pasture establishment.

Australian Indigenous Forest Genetic Resources - Australian Tree Seed Centre

In 1961 the FAO asked the Australian Government to establish a seed clearing house (now Australian Tree Seed Centre) for seeds of valuable Australia tree species for use in developing countries.

The original objectives were to:

- assemble and disseminate technical information on eucalypt species most suitable for wood production and for sheltering field crops, for use in countries outside Australia;
- to assist in the procurement of seeds of eucalyptus species suitable for use in countries outside Australia; and

- to conduct research in genetics of eucalyptus and in tree breeding for improved varieties.

The Australian Tree Seed Centre has sent more than 200,000 certified seedlots from over 1,000 tree/shrub species to researchers in over 100 countries.

Indigenous resources collections

The following activities in relation to *ex situ* collections are not specifically aimed at genetic resources for food and agriculture, but reflect the broader approach which Australia adopts to characterization and understanding of indigenous biological diversity. The work undertaken would *de facto* include material for food and agriculture.

The Australian Biological Resources Study (ABRS) is a national government program to stimulate and guide studies in the taxonomy and distribution of Australia's flora and fauna. It does this by supporting the systematic biological community in Australia through a grant scheme for research and scientific writing and the production of scientific books and databases on the systematics, taxonomy and distribution of the Australian biota. These publications include the Flora of Australia, the Fauna of Australia and the Zoological Catalogue of Australia. To date, 16 volumes have been published on flora, two on fauna and 12 in the zoological catalogue series. These cover 25 percent of Australia's vascular flora and 8 percent of fauna.

In each State or Territory, there are government herbaria and museums, ranging in size from 100,000 to 10 million specimens. In addition to these, there are a number of smaller regional, teaching or specialist collections associated with universities and other public institutions.

Linking of herbarium collections is achieved through the Integrated Botanical Information System (IBIS) and the Australian National Botanic Gardens (ANBG) computer data base which also links the collections to an extensive photographic collection. In conjunction with ERIN (Environmental Resources Information Network), the ANBG undertakes to catalogue the biodiversity of Australian plants by maintaining as an integral part of IBIS the Census of Australian Plants and the Australian Plant Name Index and making this information available to researchers.

Endangered species

Australia has specific programs which deal with endangered species management. *Ex situ* conservation plays a role in this work. The Australian Network for Plant Conservation has been established to coordinate *ex situ* conservation activities for threatened native plant species. Botanic gardens have a role in plant reintroduction activities and developing an understanding of the cultivation and growing of Australian plants.

3.2 *IN SITU* CONSERVATION

Since the mid-1980s, Australia has been developing systems and practices to integrate environmental and developmental concerns in decision-making. Outcomes of these developments are reflected in the various national strategies, such as the National Strategy for ESD, the National Strategy for the Conservation of Biological Diversity and the National Forest Policy Statement and through policy reforms such as water pricing reform, being pursued through COAG.

In situ conservation, together with the adoption of land management practices suited to Australian circumstances, are fundamental elements of this approach. The Australian approach involves all major stakeholders. Drawing on the definitions in the Convention of Biological Diversity, in an Australian context *in situ* conservation primarily means "the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings", rather than the second part of the definition and in the case of domesticated or cultivated species, "in the surroundings where they have developed their distinctive properties".

The following sections illustrate some key features of the Australian approach to *in situ* conservation, which make up complementary strands to the Australian approach to *in situ* conservation of biological diversity. They have been drawn from the National Strategy for the Conservation of Australia's Biological Diversity, the National Forest Policy Statement and the Landcare concept.

National Strategy for the Conservation of Australia's Biological Diversity

This Strategy provides the framework for the conservation of Australia's biological diversity. A key feature is its focus on ecosystem management and the adoption of sustainable land use practices.

An important element of the draft Strategy is the management of biological diversity on a regional basis. This type of planning and management will facilitate the integration of conservation and production oriented activities and take biodiversity conservation approaches beyond the limited confines of reactive measures dealing with specific problems.

The actions aim to address one of the key contributors to the erosion of Australia's biodiversity -incremental loss as a result of resource use decisions made without awareness or adequate concern for the larger picture- the distribution of biodiversity and natural boundaries at the regional scale. These measures are intended to achieve the integration of biodiversity conservation into planning mechanisms at all levels, from property management and community activities to local, State/Territory and Commonwealth government processes.

The Strategy also recognizes the importance of developing and improving integrated management techniques, extending across protected and other areas. There is emphasis on research into practical, cost-effective methods for the conservation of natural habitat, including remnants and corridors, and techniques for management at catchment and regional levels.

Central to the conservation of Australia's biodiversity is the establishment of a comprehensive, representative and adequate system of ecologically viable protected areas integrated with the sympathetic management of all other areas, including agricultural and resource production systems.

A major focus is also identifying the major categories of processes and activities which have significant adverse impacts on biological diversity and the need for better understanding, regulating and/or managing the process. This includes: the clearing of native vegetation, management of alien species (feral animals and weeds) and genetically modified organisms, pollution, fire, and climate change.

The National Forest Policy Statement (NFPS)

The NFPS provides a framework for governments to take action to implement ecologically sustainable management of forestry in Australia. The Statement is a primary means by which the objectives of the National Strategy for the Conservation of Australia's Biological Diversity will be accomplished in forest habitats. Under the NFPS, a national working group has been developing criteria for a comprehensive, adequate and representative forest reserve system.

An integral component of the NFPS is a process of joint Comprehensive Regional Assessments (CRAs) leading to the negotiation of Regional Forest Agreements (RFAs) between State and Commonwealth governments, including a review of the existing reserve system and forest management to ensure that Australia has in place a comprehensive, adequate and representative (CAR) reserve system and ecologically sustainable management of the forest estate.

RFAs are agreements between the States/Territories and the Commonwealth and recognize the range of economic and environmental obligations both tiers of government have regarding the long term management and protection of forest values in specific regions. RFAs aim to bring stability to the timber industry by guaranteeing a sustainable resource base, whilst at the same time ensuring the conservation of Australia's biodiversity through a CAR reserve system and complementary management of off-reserve areas.

Landcare

The Landcare approach has attracted international interest as a practical example of how to implement sustainable natural resource management use on a community wide basis.

The term 'Landcare' is used to describe a philosophy or approach to ecologically sustainable resource management to protect long-term productive and environmental values. It is most evident at the local level through community or Landcare group activities involving all of the community. 'Landcare' also refers to a national program which involves all spheres of government, landholders and managers, and business and community groups in resourcing and undertaking a range of sustainable resource management activities. The National Landcare Program (NLP) represents an important step in natural resources management policy in Australia, as it seeks to move towards a 'whole-systems' integrated approach, rather than addressing individual resources as separate issues.

The strengths of Landcare lie in its community based, self help approach, reflecting its grass roots origins. Public policy makers have responded by providing a framework, through the NLP, which capitalizes on these strengths. Key elements of the NLP are the identification of shared problems via a group approach, allocation of responsibilities and coordination of activities. Planning processes, at the local, regional and national levels, play a key role in integrating approaches and actions across Australia.

The NLP seeks to focus on causes, rather than symptoms, of natural resource degradation. Often these causes are found in socio-economic factors,

institutions, education and skilling which influence resource management decision making. The NLP is also based on the premise that land users and managers take responsibility for the resources they own or control. An enterprise must generate the income to adopt sustainable natural resource management methods from its own operation. If the move to sustainability requires additional resources, then industry adjustment may be required. Australia's approach, therefore, also relies on policies and programs which are designed to address broader industry development and adjustment issues. Ways of integrating these policies with measures aimed at natural resource management, for example, through regionally based initiatives, are receiving increasing attention.

Landcare is not static. It has evolved, and will continue to evolve, in response to community perceptions and improvements in our understanding of natural resources processes and how best to manage them.

CHAPTER 4
In-Country Uses of Plant Genetic Resources

Industry development, for domestic and export markets, is the primary focus of Australia's national (in country) use of plant genetic resources for food and agriculture. This covers a range of industry sectors, including broadacre cropping and grazing, intensive agriculture, horticulture and viticulture and forestry, and ranges across the full spectrum of Australia's tropical to cool temperate climatic conditions. National use of plant genetic resources is market oriented and essentially demand driven, with governments acting as a catalyst to facilitate the sustainability of the agriculture sector.

Maintaining and improving the economic and environmental viability of food and agriculture industries is partly dependent on continued access to plant genetic resources for food and agriculture. Australian agriculture, and an important part of the commercial forestry industry, are based on introduced species. The commercial value of varieties of these introduced species has been significantly increased by selective breeding and genetic manipulation, both within Australia, the International Agricultural Research Centres and other countries. This enhanced value has been shared with the world.

Plant breeding programs are directed at a range of end objectives, including adaptation to local conditions, better quality, pest and disease resistance, and salinity and drought tolerance. This work includes utilization of indigenous material from related wild relatives. An important objective of national use of genetic resources for food and agriculture is to improve the sustainable productive capacity of agricultural lands by crop diversification and improving pastures and land management practices.

Plant breeding and improvement is undertaken mainly by State and Territory departments with responsibilities for agriculture, forestry and land management, but also by the Commonwealth Scientific Industrial Research Organization, universities and industry programs.

Plant breeding work is funded through private and public sectors. Funding from public sector sources is coming under increasing pressure, in line with the overall reduction of government expenditure and moves towards cost recovery. Cooperative arrangements exist with governments and industry, contributing to the funding of research.

There is no information readily available on the total number of users of genetic resources or the objectives of their research work. Records are maintained of despatches of material from collections. Detailed monitoring of material accessed from collections is not undertaken, in part a consequence of resource and cost constraints, but mainly reflecting the fact that existing arrangements are working well.

The dependence on overseas sources of unimproved genetic material to supplement domestic breeding programs varies. In some cases, such as winter cereals, the national breeding programmes are largely serviced from domestic collections and improved breeding lines. In contrast, for tropical forage and pasture Australia is still significantly dependent on access to material from other countries.

CHAPTER 5
National Goals, Policies, Programs and Legislation

The previous sections have provided information on the broad national goals, policies and programs. This section briefly summarizes some key legislative features which play a role in genetic resources conservation and utilization.

Barrier Control

At the Federal level, the *Wildlife Protection (Regulation of Export and Imports) Act 1982,* the *Customs (Prohibited Exports) Regulations* and *Quarantine Act* regulate the export and import of a large range of living organisms and specimens derived from them.

The import and movement of plant genetic material is particularly controlled. Australia requires restricted material to be accompanied by IPPC International Phytosanitary Certificates as a condition of an import permit and, when required by other countries, issues Phytosanitary Certificates under the Ministerial Orders of the *Export Control Act, 1982.*

A major new focus is on increased assessment of importation of plant material which has the potential to become a weed and hence threaten indigenous biological diversity.

Land use controls

A wide range of legislative mechanisms, planning controls and policy instruments are applied to effectively conserve biological diversity at all levels of government in Australia, and to control land use.

None of these approaches specifically focus on genetic resources for food and agriculture, but the control and planning mechanisms can have an impact on the nature of the agricultural activity and/or utilization of indigenous plant material from the wild.

Federal, State and local governments have planning systems that provide a basis for negotiating with land owners to encourage nature conservation. A number of States have enacted legislation for the protection of endangered

species and, in some cases, wilderness. Some States have also recently reviewed their vegetation clearance controls to include criteria relating to biodiversity significance. Land use controls exist which specifically protect components of biological diversity.

All Governments have taken active steps to regulate the collection of flora and fauna, whether for research or other purposes. They have legislated to control access to flora and fauna on public land and, in some cases, private land through nature and wildlife conservation legislation. Permits may be required for the removal of flora and fauna and an administration fee may be charged for granting access.

Intellectual Property Protection for Plant Breeders

Intellectual property protection for plants in Australia can be through patents for plants in general and for specific cultivars and plant breeders rights for plant cultivars only. Another way is trade secrets.

Australia is a member of the International Union for the Protection of New Varieties of Plants (UPOV). Australia has implemented a scheme to grant and protect plant breeder's rights through the *Plant Breeders' Act 1994.* This Act complies with the 1991 UPOV Convention. The Act establishes a scheme of intellectual property rights which provides limited monopoly for breeders of new varieties, while safeguarding the rights of the wider community:

- protected varieties remain freely available for research, non-commercial purposes and for breeding other new varieties;
- naturally occurring varieties, i.e. ecotypes of native species, cannot be protected;
- the public cannot be denied access to protected varieties of commercial value; and
- farmers may save seed of protected varieties for sowing on their own land.

There is a genetic resource conservation element in the legislation in that reproductive material of protected varieties must be deposited and stored in an Australian genetic resources centre. Breeders' rights under the UPOV Convention encourage international trade in improved agricultural and horticultural cultivars.

Under the patent system, the range of patentable subject matter for plants includes:

- new plant varieties;
- plant components (e.g. genes, chromosomes);
- reproductive material (e.g. seeds, whole plants, cuttings, cells, protoplasts);
- products from plants (e.g. fruit, flowers, oils, starches, chemicals, pharmaceuticals);
- plant material used in industrial processes (e.g. cell lines to produce chemicals);
- and processes related to plants (e.g. genetic engineering techniques, plant tissue culture, cell and protoplast culture, mutagenesis and breeding and cultivation methods).

A patent will only be granted for subject matter that meets the following tests:

- it involves the technical intervention of a technologist applying inventive ingenuity to produce something distinguishable from the natural source material;
- it is new in the sense of not being publicly available (i.e. a patent cannot be granted for materials in their naturally occurring state);
- it has been fully described in the sense that allows a technologist to make the product or perform the process; and
- it has a demonstrated industrial use.

CHAPTER 6
International Cooperation

Australia contributes in various ways internationally to plant genetic resource activities, including:

- core funding of multilateral food and agriculture research centres;
- bilateral research and project activity;
- making available material from Australian *ex situ* collections for research; and
- providing unrestricted access to samples of genetic material for further scientific improvement in line with the terms of the International Undertaking on Plant Genetic Resources.

In 1994-95, Australia contributed $A8.68 million to the International Agricultural Research Centres of which $A7.74 million was allocated to centres supported by the Consultative Group for International Agricultural Research (CGIAR). The total Australian contribution allocated specifically for Plant Genetic Resources in 1994-95 to both CGIAR and non-CGIAR centres through multi-lateral funding arrangements is estimated at $A954,000.

Australia currently has a number of scientific and technical cooperation agreements with other countries, some of which cover the exchange of genetic resources and joint cooperation on research based on those resources. These agreements can provide for the sharing of results and/or benefits of research based on genetic resources. Collecting missions are conducted with research personnel from the country where collections are being made and there may be agreements to jointly explore, collect, characterize and to undertake a preliminary evaluation of material. Australia also trains overseas graduates including, in particular, training in the science and methods of pasture improvement and in respect of gene bank collection management.

Australia, through the Australian Centre for International Agricultural Research, undertakes bilateral research projects with developing countries, primarily in South and South-east Asia, Papua New Guinea and the Southwest Pacific. This research is undertaken by commissioned Australian institutions in collaboration with institutions in the developing countries. In 1994-95, the estimated total expenditure on Plant Genetic Resources research was $A3.6 million.

An example of gene bank training is the operation of the Australian Winter Cereals Collection. This Centre has been very active in the development of information systems for genetic resources in collaboration with various international agencies and individuals to assist users of genetic resources in identifying the appropriate genetic resource for their plant improvement programs. Just as importantly, these information systems help researchers to avoid cluttering their programs with inappropriate genetic resources. These systems basically address the need for improved efficiencies in the utilization of genetic resources.

The current Forages for Smallholders Project, in conjunction with CIAT, Columbia, is of benefit to Laos, Vietnam, Philippines, Indonesia, Malaysia, Thailand and South China. As well as providing adapted forages to those countries, the Project is active in training in extension methodology and pasture agronomy. The total cost met by Australia is $A800,000 per annum.

More generally Australia is making significant progress in implementing Agenda 21 from the UNCED Rio Conference in 1992. Australia has committed $A43 million over 1994-97 to the Global Environment Facility to assist developing countries address world environment issues. Several projects relate specifically to the conservation of plant genetic resources. In our region Australia is co-financing the South Pacific Biodiversity Conservation Program, which is a $US10 million Global Environment Facility project.

Australia is involved in a number of other projects of global significance. The Rapid Assessment of Biodiversity Resources project, for instance, will lead to outcomes that will aid countries (and others) to rapidly appraise areas and determine priorities for the management of biodiversity. It is being carried out by a consortium of Australian agencies - CSIRO, Environment Resource Information Network, the Australian National University Centre for Resources and Environmental Studies and the Great Barrier Reef Marine Park Authority under funding from the Global Environment Facility and the World Bank.

CHAPTER 7
National Needs and Opportunities

The FAO requested sections identifying national needs and proposals for a GPA. These two sections have been combined.

Australia has identified two sets of needs, technical and policy. Unless the policy objectives are resolved, the technical objectives will not be easily attained.

Technical

There are considerations in common between the technical needs of the researchers involved in the conservation and sustainable utilization of genetic resources for food and agriculture, and biological diversity more generally.

In undertaking an international conservation program, the international community should also seek to collaborate with the Convention on Biological Diversity, in particular the Subsidiary Body on Scientific, Technical and Technological Advice, to avoid duplication of effort in key areas.

For example, there are common skills needed in *ex situ* collection management, taxonomic research and characterization work. There are also likely to be common skills and approaches to natural resource management which will be relevant to *in situ* conservation. Some of the collaborative effort should address matters such as:

- improving means of processing and sharing data on plant genetic resources;
- better coordination between the plant genetics industries and agricultural industry to refine PGR requirements;
- improved coordination and rationalization of collections in genebanks on both a national, regional and international basis; and
- determination of guidelines for *in situ* conservation that specifically address food and agriculture conservation so that practical programs can be implemented.

Policy

Australia considers that revision of the Undertaking is a prerequisite for implementation of the Global Plan of Action. The Global Plan of Action can only be implemented if the policy principles for terms of access, conservation, sustainable use and benefit sharing in accordance with the Convention have been elaborated through a revised Undertaking.

Without progress on these matters, the FAO Global System cannot contribute to the achievement of global objectives such as food security, conservation, sustainable use and benefit sharing in the spirit of the UNCED outcomes.

ANNEX

TAXA WHICH ARE USED IN AGRICULTURE AND/OR ARE CONSERVED IN GERMPLASM STORES

Taxa conserved in collections

Amaranth
Anacardium
Ananas
Annona
Arachis
Astragalus
Atriplex
Avena
Averrhoa
Brassica
Cajanus
Capsicum
Carica
Carya
Castanea
Cicer
Citrus
Coffea
Coronillac
Corylus
Cyamopsis
Cydonia
Diospyros
Duo
Durio
Eremocitrus
Eugenia
Euphoria
Feijoa
Fragaria
Glycine
Gossypium
Hedysarum
Helianthus
Hibiscus
Hippocrepis

Taxa conserved in collections

Hordeum
Hymenocorpus
Ipomoea
Jacaratia
Juglang
Lathyrus
Lens
Litchi
Lolium
Lotus
Lupinus
Lycopersicon
Macadamia
Maireana
Malus
Manilkara
Medicago
Mespilus
Microcitrus
Monfiera
Monilkara
Musa
Nephelium
Nicotiania
Onabrychis
Orinthopus
Oryza
Passiflora
Persia
Phaseolus
Pistachia
Prunus
Psidium
Pyrus
Ribes
Rubus
Scorpiurus
Secale
Segurigera
Sesame
Sesamum
Sesbania
Solanum

Taxa conserved in collections

Sorghum
Syzygium
Tetragonlobus
Trifolium
Trigonella
Triticum
x-Triticale
Vaccinium
Vicia
Vigna
Vitis
Zea

Abbreviations

ABRS	Australian Biological Resources Study
ANBG	Australian National Botanic Gardens
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ATSC	Australian Tree Seed Centre
CGIAR	Consultative Group for International Agricultural Research
CIAT	Centro Internacional de Agricultura Tropical
COAG	Council of Australian Governments
CRAs	Comprehensive Regional Assessments
CSD	Commission of Sustainable Development
CSIRO	Commonwealth Scientific Industrial Research Organisation
ERIN	Environmental Resources Information Network
ESD	Ecologically Sustainable Development
FAO	(United Nations) Food and Agriculture Organization
IBIS	Integrated Botanical Information System
ICPPGR	(Fourth) International Conference and Programme for Plant Genetic Resources
IGAE	Intergovernmental Agreement on the Environment
IPPC	International Plant Protection Convention
MCFFA	Ministerial Council of Forests, Fisheries and Aquaculture

NFPS	National Forest Policy Statement
NLP	National Landcare Program
NSESD	National Strategy for Ecologically Sustainable Development
RFAs	Regional Forest Agreements
UNCED	United Nations Conference on Environment and Development
UPOV	(International) Union for the Protection of (New) Varieties (of Plants) Convention