

THE STATE
OF THE WORLD'S
FOREST GENETIC RESOURCES
COUNTRY REPORT

REPUBLIC OF
SOUTH AFRICA

This country report is prepared as a contribution to the FAO publication, The Report on the State of the World's Forest Genetic Resources. The content and the structure are in accordance with the recommendations and guidelines given by FAO in the document Guidelines for Preparation of Country Reports for the State of the World's Forest Genetic Resources (2010). These guidelines set out recommendations for the objective, scope and structure of the country reports. Countries were requested to consider the current state of knowledge of forest genetic diversity, including:

- Between and within species diversity
- List of priority species; their roles and values and importance
- List of threatened/endangered species
- Threats, opportunities and challenges for the conservation, use and development of forest genetic resources

These reports were submitted to FAO as official government documents. The report is presented on www.fao.org/documents as supportive and contextual information to be used in conjunction with other documentation on world forest genetic resources.

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State of the World's Forest Genetic Resources

Republic of South Africa



agriculture,
forestry & fisheries

Department:
Agriculture, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

Table of contents

Acronyms

Executive summary

PART 1: INTRODUCTION TO SOUTH AFRICA AND ITS FORESTRY SECTOR

- 1.1. Location and Administrative Framework
- 1.2. Physiography
- 1.3. Climate
- 1.4. Soils
- 1.5. Wildlife
- 1.6. Forests
- 1.7. Population
- 1.8. Economy
- 1.9. Land Use
- 1.10. Report Background
 - 1.10.1. Purpose of the Report
 - 1.10.2. Report Outline

PART 2:

Chapter 1: THE CURRENT STATE OF FOREST GENETIC RESOURCES

- 1.1. The Extent and Distribution of Forests in South Africa
 - 1.1.1. Natural Forests
 - 1.1.2. Savannah Woodlands
 - 1.1.3. Commercial Plantations
- 1.2. Factors affecting the state of forest diversity
 - 1.2.1. Veld and Forest Fires
 - 1.2.2. Pests and Diseases
 - 1.2.3. Alien Invasive species
 - 1.2.4. Development

Chapter 2: THE STATE OF IN SITU GENETIC CONSERVATION

- 2.1. In situ conservation activities
 - 2.1.1. Forest Biodiversity Conservation Planning Process
 - 2.1.2. Protected Trees
 - 2.1.3. The Champion Tree Project
 - 2.1.4. Protected Areas
 - 2.1.5. Sacred Forest

Chapter 3: THE STATE OF EX SITU GENETIC CONSERVATION

- 3.1 Ex Situ conservation Activities
- 3.2 The National Botanical Gardens
- 3.3 The National Herbarium
- 3.4 The Arboreta
- 3.5 The Nurseries and Seed Centres

Chapter 4: THE STATE OF USE AND SUSTAINABLE MANAGEMENT OF FGR

- 4.1 The state of Forest Genetic improvement and Breeding Programmes

Chapter 5: THE STATE OF NATIONAL PROGRAMMES, RESEARCH, EDUCATION AND LEGISLATION

- 5.1 National Programs
- 5.2 Education, Training and Research
- 5.3 Institutions involved in FGR research
- 5.4 Legislation

Chapter 6: THE STATE OF REGIONAL AND INTERNATIONAL COLLABORATION

- 6.1 Regional and Sub-regional networks
- 6.2 International Programs
- 6.3 International Agreements
- 6.4 Access to FGR and Sharing benefits arising from their use

Chapter 7: THE CONTRIBUTION OF FGR TO FOOD SECURITY, POVERTY ALLEVIATION AND SUSTAINABLE DEVELOPMENT

- 7.1 Contribution to Poverty Alleviation
 - 7.1.1 Contribution to Employment
 - 7.1.2 Contribution to People's welfare
 - 7.1.3 Contribution to Food Security
- 7.2 Contribution to the Economy
 - 7.2.1 Contribution to GDP
- 7.3 Conclusion

ANNEXES

- A. Trees of Conservation Concern
- B. List of Protected Trees in South Africa, 2011
- C. List of Species in Tokai Arboretum
- D. Forest Nature Reserves
- E. List of Culturally Protected Plants in Venda

TA BLES

Table 1 Extent and distribution of indigenous forests and woodland area by forest type and class

Table 2 Status of woodland by subcategories in South Africa

Table 3 Suggested IUCN endangerment categories for forest types in South Africa

Table 4 Protection status of woodlands in South Africa

Table 5 Extent and distribution of plantation areas (ha) in South Africa

Table 6 Forest sector and related employment in South Africa, 2008

Table 7 Wilderness Areas of South Africa, legally declared under the forest act

Table 8 Institutions involved in FGR research

Table 9 Forest sector and related employment in South Africa, 2008

FIGURES

Fig. 1 Map of South Africa showing neighbouring countries

Fig. 2 Land use in South Africa

Fig. 3 Extent and distribution of all forest types in South Africa

Fig. 4 Total number of people dependent on forestry industry by region; 2008

Fig. 5 Total roundwood production from plantations by province 2008

Fig. 6 Value of roundwood production from plantations by product 2008

EXECUTIVE SUMMARY

South Africa is located, 29 00 S, 24 00 E, on the southern tip of Africa. It is considered to be a "hotspot" for biodiversity and more than 22,000 plant species occur within its boundaries. This represents 10% of the world's species, although the land surface of South Africa is less than 1% of the earth. Forests genetic diversity provides the fundamental basis for the evolution of forest tree species and for their adaptation to change. Conserving forest genetic resources is therefore vital, as they are unique and irreplaceable resources for the future. At this point in time, there is no comprehensive picture on the state of the world's forest genetic resources although concerted effort is being made to address the grey area with the leadership and guidance of the United Nations Food and Agriculture Organization. This South African chapter of the World' Forest Genetic Resources seeks to provide data and information on the status of genetic resources in the country, how these are conserved and what the challenges and opportunities are in terms of sustainable forest genetic management., as these play a crucial role towards food security and poverty alleviation.

Forest genetic resources (FGR) in the country are conserved through three main forest types, namely: natural forests, woodlands and commercial plantations. The Natural forest is the smallest biome making up approximately 0,4% of the land surface in South Africa. However, this biome encompasses extensive areas and contains valuable resources and the highest biodiversity of any temperate forested region in the world. Savannah woodlands cover an area between 29 million and 46 million hectares depending on the classification used. They also provide essential resources for sustaining the livelihoods of rural people, especially in the communal areas of South Africa. Commercial Plantations which are exotic species cover approximately 1.3 million ha of the country and they have greatest industrial value and produce almost the entire supply of roundwood. Generally, the total timber plantation area has been declining for the past five to eight years for various reasons

The concept of in-situ and ex-situ conservation has been embraced by many countries including South Africa. Furthermore, like other countries, South Africa has forest reserves, national parks and game reserves which serve to conserve the forest genetic resources in situ. A network of protected areas is well established and serving to conserve a significant portion of the biodiversity and forest resources in South Africa. Another attempt made by the country through the DAFF is to protect or reserve some tree species just like forests. In this regard, DAFF has a champion tree project aimed at identifying and protecting individual trees of national conservation importance. Moreover DAFF declared a list of 47 protected tree species. These include species such as the camel thorn (*Acacia erioloba*) and leadwood (*Combretum imberbe*), which are currently under pressure in some areas owing to harvesting for the braaiwood. There are about 16 sacred forests in the country that do not only enjoy protection status bestowed upon all natural forests in the country but also through a mechanism of beliefs, taboos, prohibitions and restrictions. Well-established ex-situ facilities exist in the country, but Government acknowledges the need for additional attention. These are an assortment of national botanical gardens, 403 formally protected areas, Herbaria, Arboreta, Seed centres and Nurseries.

Since the late 1800 century, Forestry research has been conducted in South Africa through ex situ conservation, growth studies and long-term improvement programmes to ensure sustainability of resources. Tree improvement programmes have been the backbone of forestry research bringing significant advances in forestry and has always been applied rather than theoretical and aimed to harness genetic gains for operational forestry programmes since 1947. Forestry research is done by the Council for Scientific and Industrial Research (CSIR), the Plant Protection Research Institute (PPRI – University of Pretoria), Institute for Commercial Forestry Research (ICFR), universities and forestry companies. Most of the forestry companies have significant in-house capacity to do the research. The larger forest growers, namely, SAPPI, MONDI, KOMATILAND FORESTS (KLF) and HANS Merensky, have their own nurseries with their own seed and clone sources whereas private small nurseries serve co-operatives on a dedicated supplier arrangement.

In the area of education and training, there are currently a few programmes run in different universities and other tertiary institutions that deal with issues related to forest genetic resources. Although forestry training is offered at various institutions in South Africa but there is no formal training offered in tree genetics. However, aspects of tree genetics are offered through most genetics and plant science departments at South African universities. The main obstacle to providing the required education and training is the availability of qualified foresters with adequate forest genetic resource training or tree breeding. This needs attention.

South Africa has passed a number of laws especially in the environmental and agricultural sector whose over all effect is to streamline and improve on a number of biodiversity related issues including those relevant to forest genetic resources. Strengthening forestry education on forest genetic resources remains a priority. South Africa is also a signatory to a number of international conventions and protocols on the protection of the environment and biodiversity convention and regional agreements. FGR contributes significantly to curbing poverty in the country with regards to contribution to the economy, rural livelihoods and providing employment to the rural poor.

Acronyms

AFWC	African Forestry and Wildlife Commission
AsgiSA	Accelerated and Shared Growth Initiative for South Africa
BBBEE	Broad-Based Black Economic Empowerment
CAMCORE	Central America & Mexico Coniferous Resources Cooperation
CGRFA	Commission on Genetic Resources for Food and Agriculture
CIDA	Canadian International Development Agency
CITES	Convention on International Trade in Endangered Species of wild Fauna and Flora
COFO	Committee on Forestry
COP	Conference of Parties
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DFID	Department for International Development (UK)
DPE	Department of Public Enterprises
DWAF	Department of Water Affairs and Forestry (now DWA- Department of Water Affairs)
FAO	Food and Agriculture Organization of the United Nations
FSA	Forestry South Africa
GDP	Gross Domestic Product
GHG	Greenhouse gas
GIS	Geographical Information System
ICFR	Institute for Commercial Forestry Research
IPPC	International Plant Protection Convention of Food and Agricultural Organisation
IUCN	International Union for Conservation of Nature (World Conservation Union)
ITTO	International Tropical Timber Organization
KLF	Komatiland Forest
KZN	KwaZulu-Natal
MDG	Millennium Development Goal
MTO	Mountain to Ocean
MTSF	Medium Term Strategic Framework
NCT	Natal Cooperative Timber
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NFA	National Forests Act, 1998 (Act No. 84 of 1998)
NFAC	National Forests Advisory Council
NFAP	National Forestry Action Programme (1997)
NFI	National Forest Inventory
NLC	National Land Cover

NFP	National Forest Programme
NVFFA	National Veld and Forest Fire Act (Act No. 101 of 1998)
R&D	Research and Development
RSA	Republic of South Africa
SADC	Southern African Development Community
SADCTSCN	SADC Tree Seed Centers Network
SAFCOL	South African Forestry Company Ltd
SAFORGEN	Sub-Saharan Africa Forest Genetic Resources program
SAFRI	South African Forestry Research Institute
SANBI	South African National Biodiversity Institute
SAPPI	South African Pulp and Paper Industries
SFM	Sustainable Forest Management
SOW-FGR	State of the World's Forest Genetic Resources
SPGRC	SADC Plant Genetic Resources Centre
SSA	Sawmilling South Africa
UNCBD	United Nations Convention on Biological diversity
UNCCD	United Nations Convention to combat desertification
UNFCCC	United Nations Framework Convention on Climate Change
UNCSD	United Nations Commission on Sustainable Development
UNEP	United Nations Environment Programme
UNFF	United Nations Forum on Forests
WoF	Working on Fire Programme
WfW	Working for Water Programme
WfF	Working for Forests

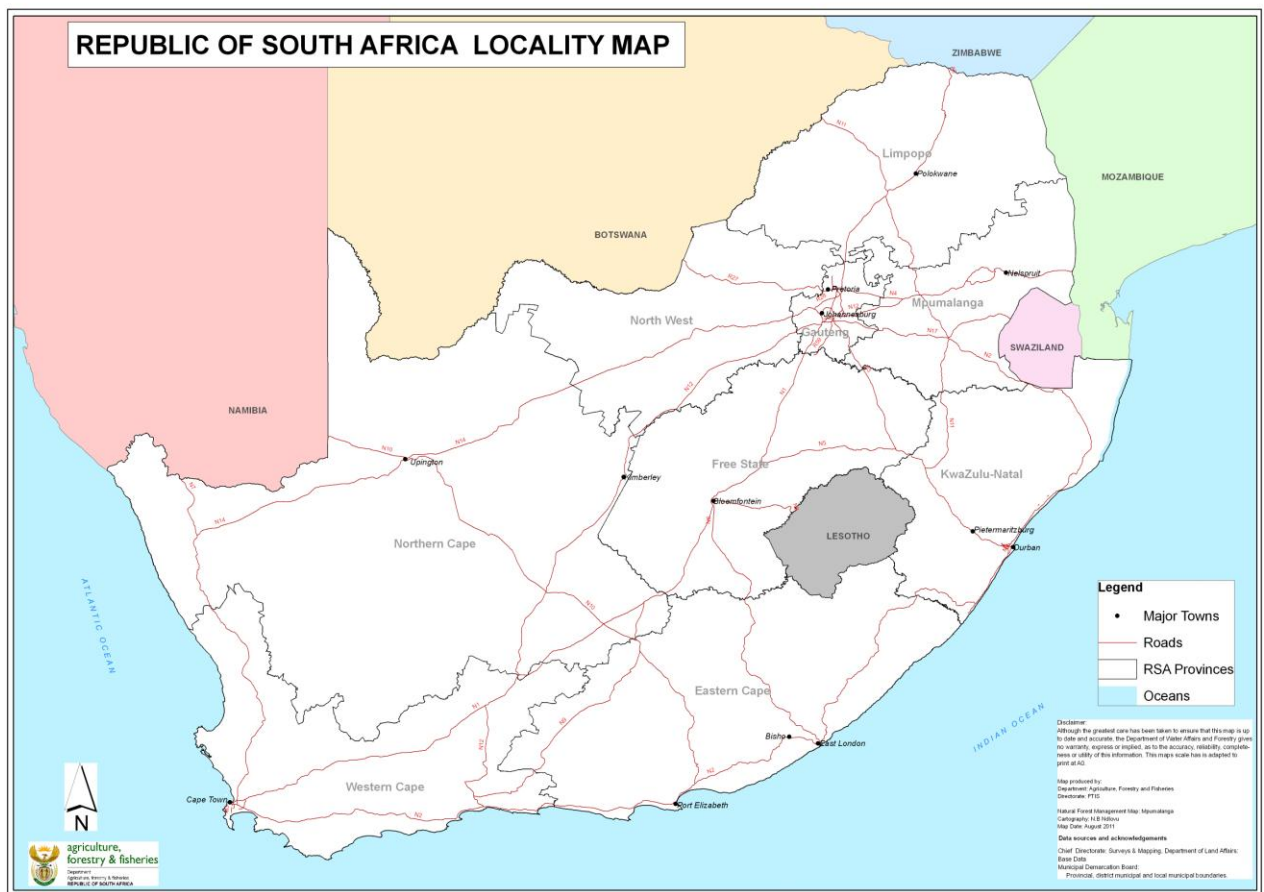
Introduction: Background Information

1.1 Location and Administrative Framework

South Africa is located, 29 00 S, 24 00 E, on the southern tip of Africa. It is bordered by the Atlantic Ocean on the west, the Indian Ocean on the south and east. Along its northern border, from west to east, lie Namibia, Botswana, and Zimbabwe, and to the northeast are Mozambique and Swaziland. Wholly-enclosed by South Africa, and situated in its eastern central plain, is the independent kingdom of Lesotho.

South Africa has nine provinces, each with its own legislature, premier and executive council - and distinctive landscape, population, economy and climate.

Figure 1: Map of South Africa showing neighbouring countries.



Source: DAFF, 2011

1.2 Physiography

Almost all of South Africa's 472,000 square miles (1.2 million sq. km.) lie below the Tropic of Capricorn, and the country is geographically composed of three primary regions: an expansive central plateau, a nearly continuous escarpment of mountain ranges that ring the plateau on the west, south, and east, and a narrow strip of low-lying land along the coast. Most of the central plateau (and most of the country) consists of high (4,000-6,000 ft/1,220-1,830 m), rolling grassland known as Highveld. The highest points of the mountainous escarpment are found in the stunning Drakensberg (dragon's back) Mountains, where the tips of dragon's back can exceed heights of 10,000 ft (3,050 m).

1.3 Climate

The temperatures in South Africa are strongly determined by elevation and distance from the sea. The high elevation (1500-1700m) inland regions experience warm summer and cool winter with frost during the coolest months. These regions experience occasional snow. The northern parts of the coastal zone experience warm winter and warm summer and the climate is strongly sub-tropical. The vast interior, represented by the Kalahari basin and the Nama-karoo, experiences a more extreme climate, with low winter mean daily minima (0-2 oC) and high mean daily summer maxima (32-34oC). The southern and south-western coastal zone experiences moderate winter as a result of the circum-polar westerlies which bring moist, cold air from the southern oceans during June, July and August. The temperatures on the west coast, from Cape Town to Port Nolloth, are influenced by the cold Benghuela current. This arid region experiences July mean daily minima of 6-8 C, but little or no frost, and is able to support a rich succulent flora. The cold ocean current favours the development of fog during the winter months, bringing cold, moist air onto coastal plain.

Although South Africa's climate varies considerably across its various regions and environments, temperatures remain comfortable throughout the year, the sun shines on average for 8 to 10 hours a day throughout the year.

1.4 Soils

The soils of South Africa have been classified using a hierarchical system and include a large number of soil bodies which range from soil bodies black, smectitic clay on dolerite to yellow, kaolinitic clay on Beaufort sediments. The classification system contains two main levels, soil form and soil family. There are currently 73 soil forms, defined by the nature of the topsoil (organic, humic, vertic, melanic or orthic), and numerous diagnostic sub-soil horizons.

1.5 Wildlife

South Africa remains blessed with abundant wildlife. Best known are the mammals and the best known of these are the famous Big Five: elephant, lion, rhino, leopard and buffalo. Other quintessentially African large animals are the hippo, giraffe, kudu, wildebeest and zebra.

The Kruger National Park is just one of twenty national parks dedicated to conserving South Africa's wild animals, plants and natural environments. South Africa aims to increase land under formal conservation to 8% by 2010 (from 5.4% in 1994) and marine protected areas to 20% (from 11% in 1994).

1.6 Forests

Forests include plantations, natural/indigenous forests and woodlands/savannas. Forestry includes all activities linked to these forests and woodlands. Forests and woodlands are crucial to the protection and conservation of the soil, and play a vital part in water cycling. They also help moderate water flows and reduce sedimentation in streams and reservoirs. The nation's forests and woodlands contribute significantly to South Africa's remarkable range of fauna and flora, much of it unique. Many national parks and eco-tourism ventures use forests and woodlands.

Plantations cover approximately 1, 3 million ha of South Africa. Over 80 percent of them are found in three provinces: Eastern Cape, KwaZulu-Natal and Mpumalanga.

Indigenous forests cover a very much smaller area of approximately 0,5 million ha. Almost three-quarters of these forests are conserved either as declared State forests or within formal protected areas.

Savannas/woodlands contribute the bulk of the wooded land area of South Africa, and are characterised by a co-dominance of trees and grasses. Depending on how woodlands are classified, the area in South Africa ranges between 29 million and 46 million hectares.

1.7 Population

According to the annual mid-year estimates from Statistics South Africa, in July 2011 the country's population was 50 586 757 of which 26 071 721 (52%) were female and 24 515 036 (48%) male. Africans are in the majority at 40 206 275 million, making up 79.3% of the total population. The white population is estimated at 4 565 825 million (9.0%), the coloured population at 4.5-million (9%) and the Indian/Asian population at 1.2-million (2.5%). Statistics indicates that the rate of growth for the South African population has declined between 2001 and 2011. The estimated overall growth rate declined from approximately 1,33% between 2001–2002 to 1,1% for 2010–2011. The growth rate for females is lower than that of males. According to Statistics South Africa, nearly one-third (31, 3%) of the population is younger than 15 years and approximately 7, 7% (3,9 million) is 60 years or older. Of those younger than 15 years approximately 23% (3, 66 million) live in KwaZulu-Natal and 19,4% (3,07 million) live in Gauteng. The province with the smallest population namely Northern Cape has nearly one-third (30%) of its population aged younger than 15 years.

Gauteng, South Africa's economic powerhouse, is the most populous of the country's provinces, although it is by far the smallest geographically. Some 11.3-million people live in the province, or 22.3%

of the total. It is followed by KwaZulu-Natal, with 10.81-million people (21.3%), the Eastern Cape with 6.82-million (13.5%), Limpopo with 5.55-million (10.9%), the Western Cape with 5.28-million (10.5%), Mpumalanga with 3.65-million (7.2%), North West with 3.25-million (6.4%), the Free State with 2.75-million (5.4%) and the Northern Cape with 1.09 million (2.2%).

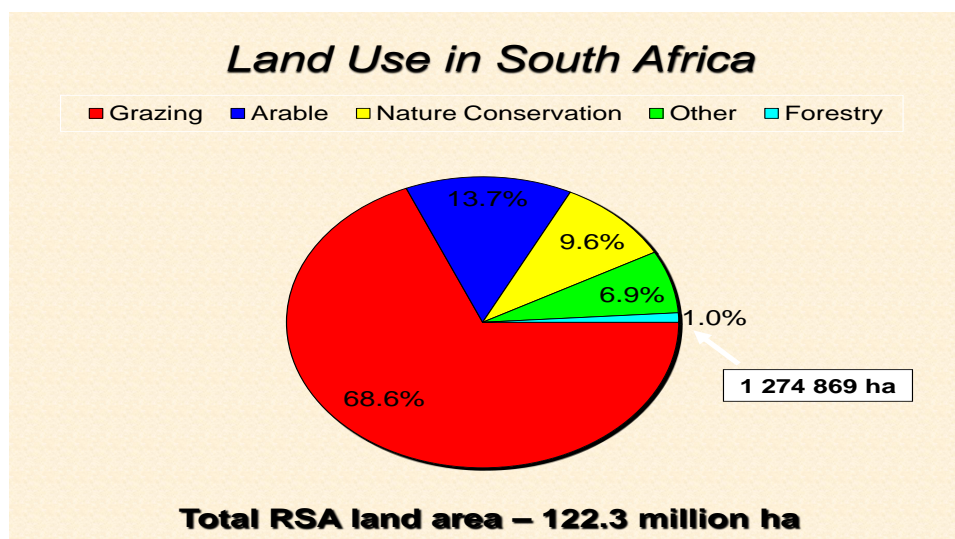
1.8 Economy

South Africa's economy has been growing at almost 5 % a year for the past several years - 32 consecutive quarters of positive growth. Following the global economic recession, this figure was expected to drop, but will accelerate moderately in 2010 and beyond. Accelerated and Shared Growth Initiative for South Africa (AsgiSA) was launched in February 2006. Government and stakeholders identified six "binding constraints on growth" that needed to be addressed to achieve its target of halving unemployment and poverty between 2004 and 2010.

1.9 Land use in South Africa

The Republic of South Africa has a total land area of 122.3 million hectares. Arable land makes up 13.7%, 68.6% for extensive grazing, 1% for forestry and 9.6 % for nature conservation (see fig 2 below). More than 70% of the total land area in seven of the nine provinces is used for agricultural purposes. High-potential arable land is concentrated on the eastern seaboard of the country including KwaZulu-Natal and Mpumalanga, while the Western Cape, Eastern Cape and Free State provinces have medium-potential agricultural land. Most of the southern and the western interior of the country is semi-arid, the south-western Cape having winter rainfall, the southern Cape, perennial rain and the rest of the country, summer rains.

Fig. 2 Land Use in South Africa



Source, Forestry South Africa, 2010

1.10 REPORT BACKGROUND

Genetic diversity provides the fundamental basis for the evolution of forest tree species and for their adaptation to change. Conserving forest genetic resources is therefore vital, as they are unique and irreplaceable resources for the future. Forest genetic resources management can be effective only if treated as an integral element of overall sustainable forest management. Conservation concerns should be integrated into broader national and local development programmes, such as national forest programmes, rural development plans and poverty reduction strategies, which promote cooperation among sectors.

However, there is no consolidated global picture on the status and trends of forest genetic resources, and a lack of estimators of the rate of genetic diversity loss. This limits the capacity of countries and the international community to integrate forest genetic resources management into overall cross-cutting policies. It is recognized that reliable general data on forest status and trends is of great importance to the efficient management of forest genetic resources. Forest-related information, however, largely refers to forest resources in general rather than to forest diversity and variation. Availability of specific information on the status and trends in forest genetic resources is today woefully inadequate.

Recent decades have seen the establishment of a number of international agreements aimed at safeguarding the world's natural resources. These agreements have a direct bearing on forest management and place obligations on individual states. The impact of these agreements and conventions on member states is not limited to the obligations they impose in terms of the sustainable use of resources. In most cases, they also open the door to new opportunities for strengthening national and regional economies. As part of the global village, South Africa has ratified some international agreements and conventions. The department actively participates at the Committee on Forestry (COFO). Continuous participation will ensure that the country benefits from the programmes of the FAO in the region, such as Forest Resources Assessments.

At its Eleventh Session in June 2007, the Commission on Genetic Resources for Food and Agriculture (CGRFA) of FAO acknowledged the urgency to conserve and sustainably utilize forest genetic resources. The Commission requested that a State of the World's Forest Genetic Resources (SOW-FGR) report be prepared and presented to the Commission at its Fourteenth Session, in 2013. At its Nineteenth Session (March 2009), the Committee on Forestry discussed and supported the preparation of the SOW-FGR, urging member countries to collaborate with FAO and partner organizations in producing the Report. The SOW-FGR is prepared through a country-driven approach. The primary source of data and information will be Country Reports on the State of Forest Genetic Resources (FGR).

COP 10 of the Convention on Biological Diversity, recognized the importance of forest genetic diversity for the conservation and sustainable use of forest biodiversity, including in the context of addressing climate change and maintaining the resilience of forest ecosystems; and in this context welcomed the preparation by FAO of the country driven report on the SOW-FGR; and invited Parties, other

Governments, and relevant organizations to support the preparation of the country-driven first report the SOW-FGR.

1.10.1 PURPOSE OF THE REPORT

The country report is intended to be a strategic tool to guide the conservation and sustainable use of forest genetic resources. The purpose of this report is:

- To contribute to the state of the world's forest genetic resources.
- To indicate the status, needs and priorities of the contributions of forest genetic resources to food security, poverty alleviation and sustainable development.
- To identify new and emerging issues and opportunities.
- To identify the main challenges and opportunities to achieving the conservation and sustainable use of forest genetic resources where possible.

1.10.2 OUTLINE OF REPORT

The report is divided into 7 chapters

- **Chapter 1: The Current State of the Forest Genetic Resources**

The main objective of this chapter is to describe the current state of the forest genetic resources diversity in the country, and indicate future needs and priorities.

- **Chapter 2: The State of in situ Genetic Conservation**

This chapter describes the current state of in situ conservation of forest genetic resources and the needs and priorities for improving it.

- **Chapter 3: The State of ex situ Genetic Conservation**

The main objective of this section is to describe the current state of ex situ conservation of forest genetic resources and the needs and priorities for improving it.

- **Chapter 4: The State of Use and Sustainable Management of Forest Genetic Resources**

The main objective of this section is to describe the use and sustainable management of forest genetic resources.

- **Chapter 5: The State of National Programmes, Research, Education, Training and Legislation**

The main objective of this section is to describe the state of national capacities in research, education, training and legislation as well as coordination and information mechanisms for forest genetic resources.

- **Chapter 6: The State of Regional and International Collaboration**

The main objective of this section is to describe the current state of regional and international collaboration for forest genetic resources in your country and to indicate future needs and priorities.

- Access to Forest Genetic Resources and Sharing Benefits arising from their Use.

The main objective of this section is to describe the state of access to forest genetic resources, transfer and sharing benefit arising out of their use.

- **Chapter 7: The Contribution of Forest Genetic Resources to Food Security, Poverty Alleviation and Sustainable development.**

CHAPTER 1

The Current State of the Forest Genetic Resources

1.1 THE EXTENT AND DISTRIBUTION OF FORESTS IN SOUTH AFRICA

South Africa, as a dry country, is covered by dry savannah woodlands and bushveld. Most natural¹ evergreen forests are found in areas of higher rainfall, along the southern and eastern coastline and in the country's mountainous regions towards its eastern borders with Swaziland and Mozambique. Estimates of the area covered by indigenous (closed canopy) forests vary between 0,25% (Low & Rebelo 1996) and 0,59% of the land surface (DEAT 1997), with woodlands between 35% and 40% and plantations at about 1,4% (Grundy & Wynberg 2001).

1.1.1 The Natural forest is the smallest biome making up approximately 0,4% of the land surface in South Africa. However, this biome encompasses extensive areas and contains valuable resources. According to Silander (2000) South African natural Forests have the highest biodiversity of any temperate forested region in the world. The national biodiversity significance of these forests is incomparable. They are between three and seven times richer in tree species than other forested areas of the southern Hemisphere, even though these forests cover a larger area. Moreover, when it comes to the richness of genera and families of trees, natural forests are unmatched containing highest density of species i.e. 3 000 species in approximately 5 052 Km (DWAF, 2005).

Predominantly located in the Eastern Cape and KwaZulu-Natal (KZN) provinces, apart from their high biodiversity, are also valued for ecotourism, timber production and non-timber forest products, particularly firewood and medicine.

South Africa is home to more than 1 700 indigenous species of trees and shrubs, some of which are currently threatened on account of their rarity as well as the pressure of commercial and subsistence use. The main tree species occurring in natural forests and have economical or medicinal value are:

- *Curtisia dentata*,
- *Encephalartos villosus*,
- *Ocotea bullata*,
- *Podocarpus falcatus*,
- *Podocarpus latifolius*,
- *Cassipourea gerrardii*,
- *Cryptocarya latifolia*,
- *Prunus africana*.
- *Acacia erioloba*
- *Combretum imberbe*
- *Protea comptonii*

¹ Natural forests are also referred to as indigenous forests in this report

- *Bruguiera gymnorrhiza*
- *Sclerocarya birrea subsp.caffra*.
- *Rapanea melanophloeos*

1.1.2 Savannah woodlands² also provide essential resources for sustaining the livelihoods of rural people, especially in the communal areas of South Africa. Products utilised from the woodlands include wood and non-wood products for, among others, fuel, building material, household utensils, traditional fencing and a variety of food and medicinal items. Woodlands are also characterised by their rich biodiversity, which often provides opportunities for tourism. Furthermore, woodlands serve valuable environmental purposes, which include soil protection and carbon storage. Maintenance of these ecosystem services, protection of the biodiversity in woodlands and ensuring the continued flow of wood and non-wood forest products are therefore important measures that would support the well-being of South African society, especially poor rural people living in close proximity of woodland areas.

However, the intensive use and consequent degradation as well as transformation of woodlands remain challenges that government should address, although there is no information to ascertain the severity of the threats. According to expert opinion, woodlands are increasing in some areas at the expense of grasslands and in other areas they are decreasing. However, it is not known whether the increase equals the decrease. No significant changes based on the two country NLC data sets have been noticed.

The main woodland tree species vary greatly from area to area, for there are different sets of indicator species for each of the woodland types. Generally, Camel thorn (*Acacia erioloba*) is very prominent in the Northern Cape area, Marula (*Sclerocarya birrea*) is prominent in parts of the Lowveld areas, Baobabs (*Adansonia digitata*) are prominent in the far northern bushveld, Mopani (*Colophospermum mopane*) in some of the eastern and northern parts, Sweet thorn (*Acacia karroo*) occur in many of the tree stands in the central grassland areas, and Paperbark thorn (*Acacia sieberiana*) is common in the KZN midland areas and foothills. In the thicket biome Spekboom (*Portulacaria afra*) is famous as an indicator of good veld condition. The distribution of indigenous forests in South Africa is presented in Table 1.

TABLE 1 Extent and distribution of indigenous forests and woodland area by forest type and class

Natural forest type ³	Area (ha)	Woodland class ⁴	Area (ha)
Albany	22 046,37	High Altitude Acacia	18 442 443
Amatole Mistbelt	64 221,09		
Drakensberg Montane	1 926,39		

² Savannah woodlands and woodlands are used interchangeably in this report

³ Source: Berliner & Benn 2004; Systematic conservation for forest biome of South Africa (revised after data cleaning by Geoterrimage 2005)

⁴ Source: Baseline study on woodlands in South Africa 2003

Eastern Cape Dune Eastern Mistbelt	10 940,58 41,841,86	Low Altitude Acacia	4 092 504
Eastern Scarp KwaZulu-Natal Coastal	33 750,17 21 089,11	Ghaap Plateau	2 335 628
KwaZulu-Natal Dune Licuati Sand	12 395,89 24 275,67	Kuruman	1 294 580
Lowveld Riverine Mangrove	11 401,28 2 392,70	Southern Rhenosterveld	129 293
Mpumalanga Mistbelt Northern KwaZulu-Natal Mistbelt	32 772,36 5 323,42	Waterberg	967 868
Northern Mistbelt Pondoland Scarp	19 203,65 12 337,00	Combretum	8 390 374
Southern Cape Afrotropical Swamp	68 563,35 3 021,77	Soutpansberg	395 874
Transkei Coastal Platform Transkei Mistbelt	61 484,01 30 249,84	Spekboom	1 493 276
Western Cape Afrotropical Western Cape Milkwood	4 731,06 2 499,74	North Succulent	1 279 392
Total area⁵	492 699,76	South Succulent Mopane Total are^{6a}d	920 317 1 230 299 40 971 848

^a Source: Berliner & Benn 2004; *Systematic conservation for forest biome of South Africa* (revised after data cleaning by Geoterraimage 2005)

Table 2 shows estimates of the extent of woodland degradation in the country. However, these figures may change once the land degradation project is finalised.

TABLE 2 Status of woodland by subcategories in South Africa

Woodland class	Degraded (ha)	Actual woodland (ha)	Total area ^a (ha)
High Altitude Acacia	1 858 908	10 234 306	12 093 214
Low Altitude Acacia	470 337	2 351 012	2 821 349
Ghaap Plateau	81 241	2 163 103	2 244 344
Kuruman	2 831	752 674	755 505
Southern Rhenosterveld	1 701	18 056	19 757

⁵ The total area of natural forests is 497 101,23 ha according to the National Forest Inventory (NFI), including the patches noted by the Vegmap 2005

⁶ The Vegmap (2005) reports a total area of 39 957 209,55 ha for woodlands

Woodland class	Degraded (ha)	Actual woodland (ha)	Total area ^a (ha)
Waterberg	11 396	1 224 270	1 235 666
Combretum	1 139 426	7 929 347	9 068 773
Soutpansberg	49 657	429 213	478 870
Spekboom	57 331	801 883	859 214
North Succulent	202 028	521 366	723 394
South Succulent	82 827	552 637	635 464
Mopane	26 887	2 324 449	2 351 336
Total area	3 984 570	29 302 316	33 286 886

Source: *Baseline study on woodlands in South Africa*, 2003

Since there has been no comprehensive national forests assessment in the country, it is not possible to establish trends or the change rate in woodlands and indigenous forests.

According to the National Forest Act (1998), all natural forests are protected. However, according to the National Land Cover (NLC) data sets, natural forests are stable but evidence on the ground shows that they are declining for various reasons in some areas, while in many other areas they are expanding. However, there are no concrete data to back up these claims at a national level or to quantify the loss or gain. Although forest cover in some indigenous forests is becoming thinner, there is no documentation to support this. The effect of land invasions has seriously affected the extent and cover of forests like Dukuduku in KZN but no proper assessment is done. As mentioned earlier in this document, many of the woodlands and natural forests are found in poorer areas of the country where they play an important role in the local economy, livelihoods and culture of the people. In as much as they play this important role but they are also heavily utilised, particularly for medicinal use, firewood and building materials, placing them under threat for deforestation. High-value species, such as *Ocotea bullata*, *Siphonochilus aethiopicus* and *Warburgia salutaris* are facing increasing rarity or extinction due to medicinal plant trade.

To attest to the above, in 2006, the department commissioned a resource use study on 4 natural forests in the Eastern Cape. The results showed that the demand for different forest products for subsistence and/or commercial purposes impacts on the natural forest ecosystem, the conservation status of targeted species and the sustainable harvesting of particular tree and non-tree species, whether legal or illegal. The household study showed that the main species used in the house construction, fences and firewood (the main uses for wood), are *Millettia grandis*, *Ptaeroxylon obliquum*, *Brachylaena discolor*, *Margaritaria discoidea*, *Buxus macowanii* and *B. natalensis*, *Englerophytum natalense*, *Strychnos usambarensis*, *Duvernoia adhatodioides*, *Combretum kraussi* and two *Tricalysia* species, and the alien *Eucalyptus* species, *Pinus* species and *Cestrum laevigatum* (an invader species).

Berliner & Benn (2004)⁷ suggested endangerment categories derived from the multi-criteria assessments. The assessment resulted in the list of 21 national forest types that are under severe threat with the coastal belt of KwaZulu Natal taking a hard knock due to coastal developments, over-harvesting and dune mining. The assessment once more highlighted the need to protect forest genetic resource. The affected natural forest types are as follows:

TABLE 3 Suggested IUCN endangerment categories for forest types in South Africa

Forest type	Endangerment category
Western Cape Milkwood	Critically Endangered
Mangrove ⁸	Critically Endangered
Pondoland Scarp	Critically Endangered
Transkei Coastal Platform	Critically Endangered
KwaZulu-Natal Dune	Critically Endangered
Lowveld Riverine	Critically Endangered
KwaZulu-Natal Coastal	Endangered
Licuatii Sand	Endangered
Eastern Mistbelt	Endangered
Swamp	Endangered
Transkei Mistbelt	Vulnerable
Western Cape Afrotropical	Vulnerable
Eastern Scarp	Vulnerable
Albany	Vulnerable
Northern KwaZulu-Natal Mistbelt	Vulnerable
Amatole Mistbelt	Near Threatened
Northern Mistbelt	Near Threatened
Drakensberg Montane	Near Threatened
Eastern Cape Dune	Near Threatened
Mpumalanga Mistbelt	Near Threatened
Southern Cape Afrotropical	Low Concern

Source: Berliner & Benn 2004; *Systematic conservation for forest biome of South Africa* (revised after data cleaning by Geoterrimage 2005)

In 2009, The South African National Botanical Institute (SANBI) released the South African Red List based on the IUCN Red List Categories and Criteria Version 3.1 (finalized in 2001), amended to include additional categories to indicate species that are of local conservation concern. The Red list has 122 listed tree species of conservation concern. Of this, 13 tree species are listed as critically rare, 11 are declining; 24 are endangered; 26 are near threatened; 17 are rare, 26 are vulnerable; *Encephalartos brevifoliolatus* Vorster; *Encephalartos nubimontanus* P.J.H.Hurter; *Encephalartos woodii* Sander are extinct in the wild whilst *Cryptocarya liebertiana* Engl. is the only tree species listed as threatened. A Red Tree List is attached as Annexure A.

In terms of protection, only about five million ha of woodlands are thought to have some form of protection status. DAFF and the South African National Biodiversity Institute (SANBI) are involved in a process to identify threatened forest ecosystems. The list of threatened ecosystems that was published

⁷ Source: Berliner & Benn 2004; *Systematic conservation for forest biome of South Africa* (revised after data cleaning by Geoterrimage 2005)

⁸ Mangroves are few in the country estimated to be only 2387 hectares according to the National Forest Inventory (2005). Because of their rarity and threat from developers, they are strictly protected in the country.

for comment on 6 November 2009 in terms of the National Environmental Management Biodiversity Act (Act No. 10 of 2004) includes three forest types as endangered and six as vulnerable. Several individual threatened forest patches of high conservation value were also listed for protection under this Act, which gives such listed ecosystems enhanced status in the Integrated Development Plans of local and regional authorities. Table 3 shows protection status of woodlands in the country.

TABLE 4 Protection status of woodlands in South Africa

Woodland class	Actual woodland (ha)	Protected area (ha)	Protected (%)
High Altitude Acacia	10 234 306	1 205 132	12
Low Altitude Acacia	2 351 012	751 712	32
Ghaap Plateau	2 163 103	3 496	0
Kuruman	752 674	9 410	1
Southern Rhenosterveld	18 056	4 582	25
Waterberg	1 224 270	267 798	22
Combretum	7 929 347	1 404 760	18
Soutpansberg	429 213	82 996	19
Spekboom	801 883	84 379	11
North Succulent	521 366	11 652	2
South Succulent	552 637	39 160	7
Mopane	2 324 449	1 121 037	48
Other	4 700 000 ⁹	Unknown	
Total area (ha)	34 002 316¹⁰	4 986 114	17

The area of woodlands that is transformed still needs to be verified and confirmed. Experts assert that the annual change rate for woodland is about 0,015%.

1.1.3 Commercial Plantations cover approximately 1.3 million ha of the country with over 80% being in the three provinces of Mpumalanga, Eastern Cape and Kwa-Zulu Natal. It is the plantations which have greatest industrial value and which produce almost the entire supply of roundwood - more than 18.9 million cubic meters, worth an estimated R6, 7 billion annually (FSA, 2010). Despite covering a relatively small share of the land, South Africa's forestry sector contributes R20.4 billion per annum to the GDP. In 2009, the commercial plantations produced 18,9 million m³ of roundwood worth R6.7 billion (7,7 million m³ of softwood and 11,2 million m³ of hardwood). By value, pulpwood (68, 5% of the total) was the biggest contributor, followed by sawlogs (23,2%).

⁹ Within the remaining parts of SA there are scattered patches of woodlands (including thickets) totaling approximately 4,7 million ha.

¹⁰ This total excludes 3 984 570 ha of degraded woodlands.

TABLE 5 Extent and distribution of plantation areas (ha) in South Africa

Province	Area (ha)		
	2002	2005	2009
Eastern Cape	146 996	156 847	141 819
Free State	0	0	0
Gauteng	0	0	0
KwaZulu-Natal	529 433	539 909	504 393
Limpopo	66 840	51 987	49 668
Mpumalanga	545 747	525 140	519 513
North West	107	101	304
Northern Cape	0	0	0
Western Cape	62 279	59 577	59 171
Total	1 351 402	1 333 562	1 274 869

Source: DAFF, Commercial Timber Resources annual reports

Commercial plantations are of exotic species or introduced in the country. The main tree species planted in the country are:

Eucalyptus Grandis

Eucalyptus nitens

Eucalyptus Macarthurii

Pinus Patula

Pinus Elliotti

Pinus Radiata

Pinus Taeda

Pinus Pinaster

Wattle (*Acacia mearnsii*)

Poplars (*Populus x canescens*)

Generally, the total timber plantation area has been declining for the past five to eight years. This decrease in total timber plantation area can be attributed to various factors. The key drivers include the following:

- More accurate mapping methods based on improved technology, such as GIS, are being utilised.
- Plantations that have been bought and given to communities under the land redistribution programme may have been left out.

- Some emerging growers are known not to be included in the timber survey distribution list, and some people sell their plantations but fail to advise DAFF of this development.
- With regard to the delineation of riparian zones, a large portion of the area converted from timber to agriculture and other uses relates to the introduction of environmental audits, FSC certification, etc., which ensures that riverine areas, river valleys and wetlands are restored to their natural vegetation.

However, an increase in plantation area has been noticed in KZN, Limpopo and North West whilst the area in Eastern Cape continued to shrink in 2009.

In 2008, the industry provided employment for about 107 000 employees (Godsmark, 2009) as illustrated in Table 6 below. Importantly, plantation forestry provides the raw material for downstream activities such as pulp milling, paper manufacturing, saw milling, wood chip exports, timberboard, mining timber and treated poles.

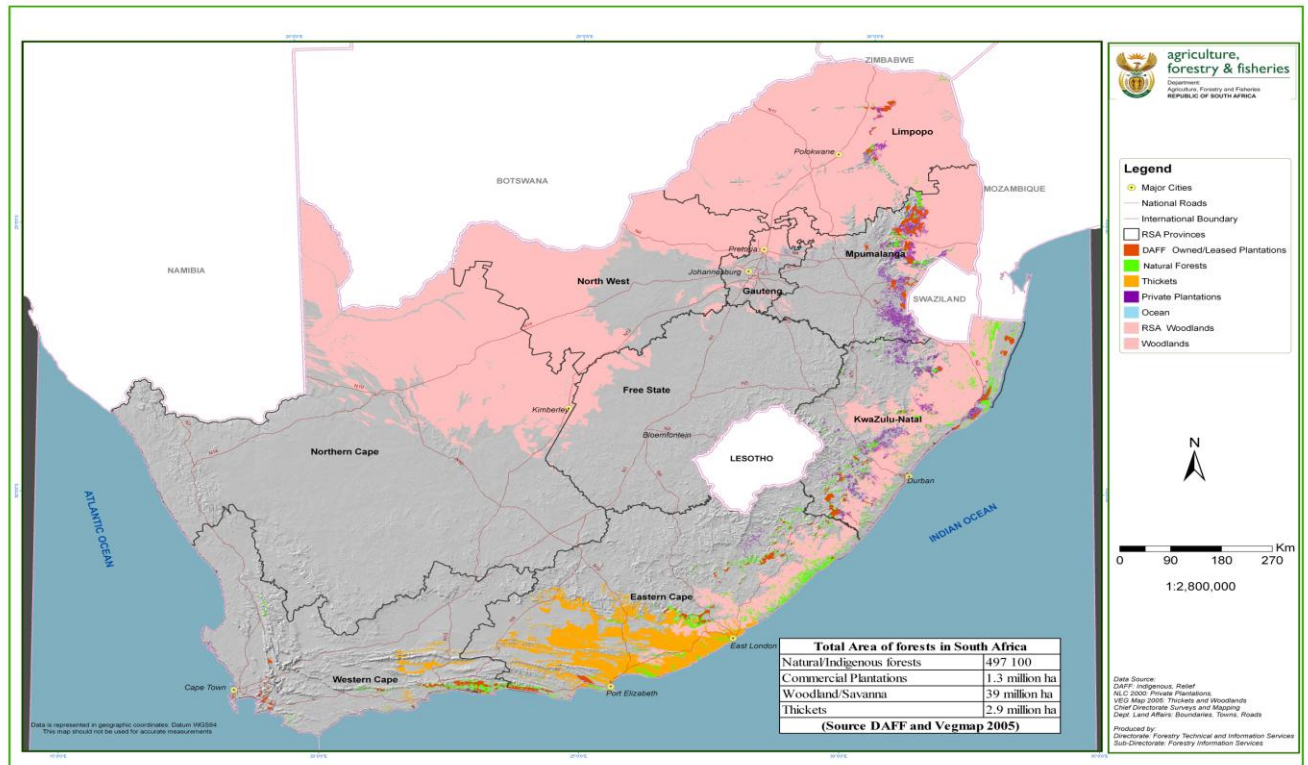
TABLE 6 Forest sector and related employment in South Africa, 2008

Subsector	No. of employees		Total employment
	Direct	Indirect	
Forestry	76 844	30 000	106 844
Pulp and paper	13 200	10 781	23 981
Sawmilling	20 000	20 000	40 000
Timber board	6 000	3 000	9 000
Mining timber	2 200	2 000	4 200
Other	11 000	6 000	17 000
Total	129 244	71 781	201 025

Source: Sawmilling South Africa (SSA) 2010

The ownership of plantations is mainly in the hands of corporate growers and individual commercial timber farmers. It is also envisaged that the ownership of the industry will change dramatically – more than 50% of the current plantation area could be under land claim, so ownership will shift towards communities. Figure 3 illustrates the extent and distribution of forest genetic resources in the country.

Fig. 3: Extent and Distribution of all Forest Types in South Africa



Source, DAFF, 2009

1.2 FACTORS AFFECTING THE STATE OF FOREST DIVERSITY

1.2.1 Veld and Forest Fires: These are a common feature of the South African landscape and also an inevitable consequence of the country's fire-prone vegetation and warm, dry climate. Fire losses experienced by the Forestry Industry have escalated dramatically in more recent years. Over the last 25 years forest fires have affected an average of 13, 437 hectares of timber plantations annually.

1.2.2 Pests and Diseases: The invasion of many pests such as the Fusarium pitch canker on mature pine trees, sap sucking thaumastocoris peregrinus on Eucalyptus trees, Eucalyptus gall wasp is a threat to forest genetic resources. The Sirex wood wasp remains a serious threat to Pinus plantations in South Africa.

1.2.3 Alien invasive species: Invasive alien plants (IAPs) pose a direct threat not only to South Africa's biological diversity, but also to water security, the ecological functioning of natural systems and the productive use of land. According to Working for Water programme (WfW), the total area invaded by aliens is approximately 10.1 million hectares. If the invaded area is 'condensed' to adjust the cover to 100%, of about 1.7 million hectares are fully invaded. The plants invade at a rate of 5% per annum, doubling their impact every 15 years. The woody invasive species being Acacia spp, Lantana camara, Hakea spp, Eucalyptus spp and Caesalpinia *decapetala*.

1.2.4 Infrastructure Development: Development needs affects the forests even though natural forests are protected by law.

Even though the above factors remain a challenge in the country, significant measures are taken to curb the impact.

CHAPTER 2

The State of *In Situ* Genetic Conservation

This chapter describes the current state of in situ conservation of forest genetic resources and the needs and priorities for improving it.

2.1 In Situ Conservation Activities

The concept of in-situ conservation has been embraced by many countries including South Africa. South Africa is globally renowned for its nature conservation practices, a reputation it has gained primarily through the well developed system of protected areas in the country, and its efforts towards conserving threatened species. Furthermore, like other countries, South Africa has forest reserves, national parks and game reserves which serve to conserve the forest genetic resources *in situ*.

According to the Department of Environmental Affairs (DEA), 403 formally protected areas (national parks, provincial reserves or equivalents) constitute some 6% of the land surface area, placed under the control of 13 different management agencies, and falling under some 11 pieces of national legislation (DEAT 2001). The extent to which viable populations are conserved in such areas is not known but 74% of plant, 92% of amphibian and reptile, 97% of bird, and 93% of mammal species of South Africa are estimated to be represented in the present protected area system (Siegfried 1989).

Of particular importance have been the extensive efforts over the past thirty years to expand nature conservation functions to private and communal lands, through conservancies, natural heritage sites, community conservation areas, and cooperative conservation models such as biosphere reserves.

Three of the seven described biomes (desert, fynbos and savannah) have more than 10% of their area conserved, with the forest biome approaching 9%, and 14 of the 70 vegetation types have more than 10% of their area conserved (Rebello 1997). The Nama Karoo, grassland and Succulent Karoo biomes have less than 3% of their area conserved. Of the nine forest vegetation types, only three fall below the recommended 10% conservation target. However, one of these, the Ngongoni Veld, has been identified as a top priority for conservation in South Africa (Grundy & Wynberg 2001).

So far, the Kathu forest is the only woodland type that has been provided protected status in accordance with the National Forest Act's requirements. This woodland is about 4 000 ha in extent and consists mainly of camel thorn trees (*A. erioloba*), is known for its exceptional size and density of the tree cover and is one of only two such woodlands in the world, the other one occurring in Namibia.

The department has made strides in ensuring the protection of forest genetic resources *in situ*, discussed as follows.

2.1.1 Forest biodiversity conservation planning process in the country

Following the completion of the national forest type classification in 2002, a continuous project was initiated to develop a systematic protected area planning framework for the forest biome in 2004. Such a decision-support tool would help DAFF to select and design a protected area network that is representative of forest biodiversity (including the protection of representative samples of the national forest types). This would enable DAFF and the relevant conservation agencies (national and provincial) to follow a more objective and systematic approach to forest protected area planning. The main objectives of this process were to determine the forest conservation targets (percentage of each forest type to be included in protected areas to conserve 75% of biodiversity), to determine relative conservation values (irreplaceability ratings) of forest patches, to assess the relative socio-economic values of forest patches and threats to these forests, to identify priority forests for protection and to propose appropriate *International Union for Conservation of Nature* (IUCN) protection categories for the various forest patches.

Experts developed the decision-support system with the aid of GIS-based and expert data analysis computerised systems, with funding support from the UK's *Department for International Development* (DFID). This process followed the well-tried C-plan model applied to other biomes such as the Cape Floral Kingdom and the Succulent Karoo. Biodiversity data on the forest biome were collected as a first step (the forest patches of the National Forest Inventory were used as units of analysis) and were supplemented with other data to fill in some gaps of the NFI.

Conservation targets were determined for forest groups through the species-area curve methodology. This methodology could not be used for the refined 26 national forest types, because some types lacked floristic data. A more rudimentary method was used to determine base biodiversity targets at this level, and the targets were increased by the use of multiple criteria such as relative rarity or historic loss of forest types. These outcomes were included in the National Protected Area Expansion Strategy and an overall national target of 23% was set for all natural rainforests. However, certain forest types are under-represented in protected areas and will receive priority in future protected area network planning.

2.1.2 Protected trees

The Protection of biodiversity and ecosystems has become a high priority following South Africa's ratification of the Convention on the Protection of Biological Diversity.

Another attempt made by the country through the DAFF is to protect or reserve some tree species just like forests. In this regard, DAFF declared a list of 47 tree species (see annex B) as protected some years ago under section 12 of the NFA and republishes this list each year. These include species such as the camel thorn (*Acacia erioloba*) and leadwood (*Combretum imberbe*), which are currently under pressure in some areas owing to harvesting for the braaiwood and charcoal markets, rare species such as the Barberton mountain sugarbush (*Protea comptonii*), keystone species important to the functioning

of ecosystems such as the black mangrove (*Bruguiera gymnorrhiza*), and species of great cultural and use value like the marula (*Sclerocarya birrea* subsp. *caffra*). In terms of section 7 of the NFA, all trees in a natural forest are also protected. No protected trees or forest trees may be cut down or damaged nor may their products be transported, sold or exported without a licence.

2.1.3 The champion tree project

The champion tree project is aimed at identifying and protecting individual trees of national conservation importance under the NFA. In terms of section 12 of this Act the Minister can declare individual trees or groups of trees as protected, apart from the protection of tree species. Trees can be nominated on the basis of their size, age, aesthetic value, cultural-historic value or importance for tourism. Only trees of national importance will be protected. In the long run, provincial and local authorities will be encouraged to develop their own local champion tree lists. So far, about 60 champion trees have been declared as protected by notice in the Government Gazette and in national newspapers. Once listed as protected by notice, champion trees have special protected status in terms of the NFA. No such trees may be cut, disturbed or damaged without a licence. A strict approach will be taken to their protection, and licences will be issued only under exceptional circumstances, for example if a tree poses a danger to life or property.

2.1.4 Protected Areas

The network of protected areas is well established and serving to conserve a significant portion of the biodiversity and forest resources in South Africa. The National Environmental Management: Protected Areas Act, No. 57 of 2003 guides the system of protected areas in the country. The Minister of Environmental affairs is required by the Act to maintain the Register of Protected Areas of the country. Protected areas system consists of the following kinds of protected areas:

- (a) Special nature reserves, nature reserves (including wilderness areas) and protected environments;
- (b) World heritage sites;
- (d) specially protected forest areas, forest nature reserves and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and
- (e) Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970)

According to this register, there are 39 forest reserves, including wilderness areas; under various management authorities and covering an area of 370 286 hectares. These are depicted in Annexure C

According to Elliot (1996)¹¹ wilderness areas in South Africa cover a total of 947 100 hectares. These are listed in Table 7 below. Wilderness areas are strictly protected for conservation of biodiversity, plantations for production and others for multi purpose.

¹¹ INTERNATIONAL JOURNAL OF WILDERNESS/Volume 2,Number 2, August 1996

Table 7: Wilderness areas of South Africa, Legally declared under Forest Act

Wilderness areas in Natural Forests	Area in hectares ¹²
	1990
Mdedelelo	27 000
Mkhomazi	48 000
Ntendeka	5 200
Mlambonja	14 000
Mzimkulu	28 300
Wolkberg	17 400
Cedarberg	64 400
Groendal	21 800
Boosmansbos	14 200
Grootwinterhoek	23 600
Doringrivier	11 000
Total wilderness areas in Natural Forests	274 900
Wilderness areas in Kruger National park	672 200
Total wilderness areas	947 100

Source: Elliot, (1996) Wilderness in the new South Africa

2.1.5 Sacred Forests:

Khorommbi (2001)¹³ lists 16 sacred forests in Venda, Limpopo Province. Of note is the Thathe Vondo Forest; an indigenous forest that is deemed sacred by the local Venda community. This forest doesn't only enjoy protection status bestowed upon all natural forests in the country but also through a mechanism of beliefs, taboos, prohibitions and restrictions. Human disturbances, burning, cutting of grass and fuelwood are strictly prohibited in this area. The forest has giant hardwoods (*Diospyros mespiliformis*, yellowwood), a wide variety of ferns, creepers and a wealth of plants and trees which makes the forest nearly impenetrable on foot. Some important chiefs from the Thathe clans have apparently been buried in a cave in this forest, protected by the white lion and Ndadzi. Most of these areas, such as the Vhutanda, Thathe and Musanzhe forests, still remain pristine in the middle of the pine forests and tea plantations. There are cultural beliefs that prevent some tree species from being used as firewood or being brought home for this purpose as they act as wind breaks or believed to attract rain or bad luck (See Annexure D). It can be argued that the Venda culture plays an important role in conservation of forest genetic resources in situ.

The country has taken significant strides to protect forest genetic resources in situ. In terms of monitoring, a national forest inventory was done in 2002 and the next field inventory and remote survey is planned to be completed in 2012. Various monitoring programmes are also conducted by the private sector.

¹² There is a difference in hectares reported by Elliot and the Protected Areas register

¹³ Khorommbi, KC (2001) "The role of Venda culture in nature conservation: A case study of the Inhabitants of the Tshivhase Area".

CHAPTER 3

The State of *Ex Situ* Genetic Conservation

The main objective of this section is to describe the current state of ex situ conservation of forest genetic resources and the needs and priorities for improving it.

3.1 Ex situ conservation activities

The White paper on the conservation and sustainable use of SA's biological diversity (DEAT, 1997) stipulates that the responsibility for ex-situ conservation in South Africa lies with a variety of government departments, parastatal and private concerns. Some important steps have already been taken in this regard, and well-established ex-situ facilities exist in the country, but Government acknowledges the need for additional attention, especially with regard to the management and coordination of genebanks. Gene banks are mainly servicing commercial/exotic trees. A small number of endangered fynbos species are held in collections by the University of Cape Town.

3.2 National Botanical Gardens

South Africa has about 30 to 40 botanical gardens countrywide that have tree species in their collections contributing to ex-situ conservation of the forest genetic resources. Nine of these are managed by the South African National Botanical Institute namely:

1. **Kirstenbosch National Botanical Garden** which grows only indigenous South African plants. The cultivated part of Kirstenbosch garden covers 36 hectares and supports a diverse fynbos flora and natural forest.
2. **The Free State National Botanical Gardens**, Bloemfontein covers 70 hectares and contains woodland; some magnificent examples of wild olive and karee trees, an orange blossom arbour and a petrified tree, thought to be over 150 million years' old.
3. **The Harold Porter National Botanical Garden** has 10 hectares of cultivated fynbos garden, and a further 190 hectares of natural fynbos. The garden includes; amongst other things; four vegetation types that occur naturally in the Overberg - afro montane forests, wetlands, coastal dunes and fynbos.
4. **The Walter Sisulu National Botanical Garden** in Roodepoort, Gauteng, is almost 300 hectares of landscaped and natural veld.
5. **The Pietermaritzburg Botanical gardens** were established in the early 1870s and essentially focus on conservation and propagation of rare and endangered indigenous plants, and the cultivation of east coast grasslands. There are some northern hemisphere plants, such as tulip and camphor trees, giant figs, magnolias and swamp cypresses. The Garden is also famous for its long avenue of plane trees, planted in 1908.
6. **The Pretoria National Botanical Garden was founded in 1946.** The Fifty hectares of the total area are devoted to developed garden, using almost exclusively South African plants.

This garden is a tapestry of about 50% of the country's tree species and different biomes such as Savanna, forest, fynbos and some plants of other biomes.

7. **The Lowveld Botanical Garden in Mpumalanga** covers 159 hectares. The river banks of the crocodile and the Nels River are dominated by evergreen forest belts, and the eastern bank of the Crocodile River is a tropical African rainforest, representative of the rapidly diminishing rain forests in central and West Africa, and a world first for the Lowveld Garden. Aside from this, the Lowveld Botanical Garden is alive with trees and creates a wonderful haven for visitors. Around 650 tree species indigenous to South Africa dominate the garden
8. Established in 2007, the **Hantam National Botanical Garden** is found just outside the town of Nieuwoudtville. Hantam National Botanical Garden is regarded as one of the world's most special biodiversity treasures, and forms the first National Botanical Gardens in the Northern Cape, and the ninth National Botanical Garden in South Africa.
9. **Karoo Desert National Botanical Garden** is found on the outskirts of Worcester and it displays one of the largest collections of indigenous succulents in South Africa. The garden covers about 155 hectares of semi-desert vegetation, 11 of which are cultivated, presenting the plants of the drier parts of the country

The rest of the botanical gardens are managed by an assortment of universities and local authorities. Other notable gardens are:

1. **The Durban Botanical Gardens** are famous for the original specimen of a Cycad (*Encephalartos woodii*) that is still widely acknowledged as probably the rarest plant in the world.
2. **The Johannesburg Botanic Garden** has some of the finest plant collections in the world that include indigenous trees and succulents. Interestingly, the Johannesburg Botanic Garden is also one of the youngest gardens in the country at only just over 30 years of age with over 30 000 trees.
3. **North-West University Botanical Garden** in Potchefstroom lying on the banks of the Mooi River. The three-hectare North-West University Botanical Garden is home to mostly over 1500 indigenous plants species.
4. **The Makana Botanical Gardens**, said to be the second oldest such gardens in South Africa and a national monument, lie adjacent to the Rhodes University campus in Grahamstown.
5. **The Stellenbosch Botanical Garden** is the oldest university botanic garden in South Africa and yet very small at only 1.8 hectares. Renowned for being an educational garden, with both indigenous and exotic plants in amongst the specimens. An enviable list of trees that include the copperbeech, red alder, St John's bread tree, yellowwood, camphor, mango, sweet thorn myriad trees and tulip trees are found in the garden.

3.3 The National Herbarium

The country has a **National Herbarium**, situated within the South African National Botanical Institute in Pretoria founded in 1903. It is the largest herbarium in Africa and the fourth largest in the southern

hemisphere housing the largest collection of plant specimens in southern Africa with over one million specimens. It focuses its collections on southern Africa (South Africa, Lesotho, Swaziland, Namibia and Botswana), although substantial collections from the rest of Africa and a small collection from other continents are found. Beside the national herbarium, there are various herbaria throughout the country i.e. Natal Herbarium in Durban and Compton Herbarium in Cape Town which is claimed to be the second largest herbarium in southern Africa with collections of only pteridophytes, gymnosperms, and angiosperms.

Moreover, each institution has its herbarium. For an example, The Bolus Herbarium, established in 1865, is the oldest functioning herbarium in South Africa. As part of an academic institution (university of Cape town) its primary function is to aid in the teaching and research of the diversity of the southern African flora, particularly that of the Cape Floristic Region. Research associated with the herbarium focuses mainly on taxonomy, systematics, biogeography and endemism. With a collection of over 350,000 specimens, it is the third largest herbarium in South Africa and the third largest university Herbarium in the southern Hemisphere. The collection is recognized for its superb representation of the Cape Flora and the large number of type specimens housed.

3.4 The Arboreta

Furthermore, in an endeavour to conserve genetic resources, a number of Arboreta were established throughout the country as far back as during the 1800s. Some were abandoned and some are still in existence. However, there is little information on the remaining Arboreta with regards to number and size mainly because information is thought to be lost due to various institutional changes the Forestry unit underwent in the past 20 years. Nonetheless, the unpublished document by Poynton RJ & Rycroft HB (1986)¹⁴ lists 74 arboreta. On the other hand, experts estimate that there are approximately one hundred arboreta countrywide but many of these arboreta are privately owned; managed and mostly focus on commercial exotic species. The Arboretum of note is the Tokai Arboretum situated near Cape Town in the Western Cape Province. Established in 1885 by Joseph Storr Lister, the conservator of forests for the Cape Colony with the aim to research and understand the economic viability of which plants will be able to grow in South Africa. The forests and plantations in and around South Africa is a direct result of this project. The arboretum is world famous among foresters, botanists, horticulturists and silviculturists on account of the large variety of exotic and indigenous trees found in it. It is estimated to be receiving 20 000 visitors per annum. It is a declared national heritage forming part of the Table Mountain Park (van der Merwe, 2011, Pers Comm). This Arboretum is home to 1555 different trees representing 275 tree species ranging from Yellowwoods, Pines, Oaks, Gums etc (see attached list).

Another Arboretum of special interest is the Jessievale Arboretum near Carolina in Mpumalanga Province. It was established in 1907 with first trees planted from 1907 to 1936 for research purpose. It covers an area estimated to be about 13 hectares. This arboretum has 132 plots with unknown number

¹⁴ Report of the Planning Committee for Arboreta (South African Forestry Research Institute, unpublished document)

of species. It has an excellent collection of coniferous and eucalypt species, some of which apparently date back to 1907 when the arboretum was first established. It is believed that this arboretum has potential in serving society in several ways; including the value of its genetic resources and potentially it can serve a purpose of education, and even more.

On the contrary, some arboreta in the country unfortunately remain unkempt, abandoned or otherwise changed to other land uses. Others were destroyed by fire like the Arboretum in Piet Retief. Audits also revealed that some of the arboreta are not clearly marked and this could lead to accidental felling.

3.5 Nurseries and Seed Centres

To cast a net further, there are about **37 nurseries** that grow forest trees producing almost 200 million plants per annum (DPE, 2006). The larger forest growers like SAPPI, MONDI, KOMATILAND FORESTS (KLF) and Hans Merenky, have their own nurseries with their own seed and clone sources whereas private small nurseries serve co-operatives on a dedicated supplier arrangement. The nurseries are mainly found in KwaZulu natal and Mpumalanga. The main species found at KLF nursery are, *P.patula*, *P.elliottii*, and *P.elliottii* / *P.caribaea*. All the *P.elliottii* / *P.caribaea* are produced from cuttings (± 4 million) and all the other species are produced from genetically improved seed from the Research Centre.

Seed always play an important role in the forest industry. Private companies, like KLF, have **seed centers** which are an integral part of research which serves to supply the nurseries with seed of improved genetic quality. The genetic material that is being used for the production of seed from the seed orchards is the best material available from the different breeding programmes. The seed is supplied to nurseries to generate seedlings for commercial planting and for the generation of hedge plants which are used to produce cutting. Excess seed is sold to local nurseries and a small amount is exported. KLF is managing an area of 89.9 hectare of fifteen first- and second-generation seed orchards of pines and eucalypts. These orchards have the capacity to produce approximately 2000 kg of improved seed annually.

A controlled-pollination programme is executed annually in the *P. elliottii* seed orchards for the production of hybrid seed with *P. caribaea*. As the seed set is invariably low, seedlings are raised by the research nursery from the seed produced, multiplied and supplied to the KLF nurseries as hedge plants for production of cuttings for commercial use. The aim is to harvest enough seed to replace a third of the total hedge plants of the nurseries annually. Controlled pollination seed orchards for *P. patula* were established in 1996. Female flowers are isolated and pollinated with the best pollen from the breeding programme. Controlled Pollination seed orchards are used for inter- and intra-species crosses.

The South African National Botanical Institute (SANBI) in partnership with Royal Botanic Gardens (RBG), Kew, have established The Millennium Seedbank (MSB) Project in 2000 which is a ten year global conservation programme (2000-2010), conceived, developed and managed by RBG-Kew's Seed

Conservation Department. Through this partnership, SANBI aims to have at least 2 500 of South Africa's seed-bearing flora conserved at the MSB and to duplicate collections at a national seed banking facility in South Africa by 2010. Currently, the MSB already holds seed collections of over 2 000 of South Africa's plants species at the RBG-Kew's Millennium Seed Bank facility in Wakehurst Place, UK. Amongst the collections, there are also tree seeds

According to Denison (2001)¹⁵ South Africa participates in the CAMCORE (Central America and Mexico Coniferous Resources Co-operative) programme. SAFCOL receives seeds from CAMCORE members and then lays out trials, namely conservation banks and genetic tests. Conservation banks are unreplicated family row plots of 10 trees each planted at 3m x 5m spacing which serve as genetic reserves for the species. These seeds have been fumigated according to prescribed fumigation treatments by CAMCORE to prevent diseases spreading to other countries and a phytosanitary certificate is issued by the American authorities Efforts are made to sample as many provenances within a species geographic range as possible. Once the location of a provenance has been identified, between 20 and 50 trees are selected for volume, stem straightness and branches. A distance of approximately 100 metres is kept between selected trees. Each tree receives an identification number that maintains the pedigree of progeny in field conservation banks and progeny tests. A database with measurements for all mother trees exists at North Carolina State University along with edaphic and climatic data on the collection sites.

According to DAFF (2008)¹⁶ Forestry Gene Bank uses a card index system and the documentation is not duplicated. A number and date is allocated to each collection so that it is possible to trace the origin of the seed. A simple computer programme exists, indicating the localities and the month of the year when seed should be collected. No specific obstacles exist for the general documentation of samples, as local expertise is readily available for the identification of such material.

Moreover; the DAFF managed a tree seed center up till 2001. The tree seed center used to supply tree seeds of both indigenous and exotic species to both commercial and departmental nurseries. Over and above the supply of seed in the country, the center provided seed for other countries in the SADC region. The tree seed center was part of the larger SADC tree seed Centers Network (SADCTSCN). The network was funded by the Canadian International Development Agency (CIDA). This network was fully operational and its main intention was to ensure sufficient supply of seed and information exchange on scientific seed matters within the SADC region. The reasons for the termination of the center operations was that the center was running at a loss and that seed supply was no more seen as a departmental responsibility.

CHALLENGES:

¹⁵ Denison, N.P (2001) Tree Improvement: What has South Africa Achieved; Southern African Forestry Journal – No. 190, March 2001

¹⁶ A South African Report on Plant Genetic Resources for Food and Agriculture (Unpublished document).

Although the quantity of seed supplied by the Seed Centre to the KLF nurseries is decreasing, the genetic quality is increasing

At the moment, Arboreta are not receiving attention from the authorities due to other priorities. Consequently, it was learnt from the plantation staff that there has been plans of converting the arboretum site to a production stand. However this has not happened. This highlights the importance of the involvement and intervention from the authorities nationally to protect these arboreta. The department is developing a national strategy to monitor Arboreta.

CHAPTER 4

The State of Use and Sustainable Management of Forest Genetic Resources.

The main objective of this section is to describe the use and sustainable management of forest genetic resources.

4.1 The state of Forest Genetic Improvement and Breeding Programmes

Since the late 1800 century, Forestry research has been conducted in South Africa through ex situ conservation, growth studies and long-term improvement programmes to ensure sustainability of resources. Forestry research is done by the Council for Scientific and Industrial Research (CSIR)¹⁷, the Plant Protection Research Institute (PPRI – University of Pretoria), Institute for Commercial Forestry Research (ICFR), universities and forestry companies. Most of the forestry companies have significant in-house capacity to do the research.

Tree improvement programmes have been the backbone of forestry research bringing significant advances in forestry and has always been applied rather than theoretical and aimed to harness genetic gains for operational forestry programmes. According to Prof van Wyk (CSIR, 2010)¹⁸ Tree breeding research in South Africa started around 1947 with the establishment of the Wattle Research Institute (now the Institute for Commercial Forestry Research). Although a *Pinus patula* trial was planted in the early 1950s by Dr Hilmar Luckhoff, the government tree breeding research only formally started with the establishment of the D.R. de Wet Tree Breeding Station near Sabie in 1958. This was soon followed with three more stations, namely Futululu, Saasveld and J.D.M. Keet. The early years saw selection of plus trees, seed orchards and the planting of some progeny trials. It is also during this time that the South African Forestry Research Institute (SAFRI) started with the improvement of pines in 1957. Of the 23 eucalypt and 28 pine species that were tested by SAFRI and the CSIR, only eight eucalypt and eight pine species are now being managed as breeding populations by the CSIR. These are:

EUCALYPT HYBRIDS	PINE HYBRIDS
<i>E.grandis</i> F4	<i>P.patula</i> F3
<i>E.camaldulensis</i> F3	<i>P.elliottii</i> F2
<i>E.urophylla</i> F2	<i>P.radiata</i> F2

¹⁷ It is also important to note that in 1990, the forestry research function and research assets of government (South African Forestry Research Institute) were transferred to the CSIR, to form a new forestry division, Forestek.

¹⁸ Source: CSIR, 2010 "Twenty years of tree breeding at the CSIR for commercial germplasm "

<i>E.tereticornis</i> F1	<i>P.taeda</i> F4
<i>E.globulus</i> F1	<i>P.caribaea</i> F1
<i>E.saligna</i> F1	<i>P.maximinoi</i> F1
<i>E.resinifera</i> F1	<i>P.oocarpa</i> F1
<i>E.longirostrata</i> P0	<i>P.tecunumanii</i> F1

Source: CSIR, 2010

The programme is built on the large scale introduction of foreign plantation species in the 18th and 19th centuries and the provenance research which had started in 1927.

South Africa's forestry industry is almost exclusively based on three exotic species, namely, **pin**es (*Pinus spp*), **gums** (*eucalyptus spp*) and **wattle** (*acacia spp*). The most notable tree improvement efforts or vigorous research in the country have therefore been directed more on these species, mainly for pulp wood and timber production. In CSIR, many new eucalypt hybrids had been tested, evaluated and deployed nationally and internationally. Moreover, the development of the low-splitting *E. grandis* population has significantly increased its value as a solidwood species. Today the Tree Improvement Research Group of the CSIR continues to develop quality genetic material of advanced generations of subtropical eucalyptus and pine species

SAFRI also established a large number of species and provenance trials to determine the best provenances within a species. These trials were also undertaken to identify trees suitable for specific niche products or for specific environments. Examples of provenance trials for niche products include a eucalypt furniture species/provenance trial established by SAFRI in Frankfort and species and provenance trials of indigenous species planted to evaluate wood for fuel-wood purposes. The CSIR continued to establish new progeny and provenance trials. On the other hand, the Biotechnology centre of Komatiland Forests is currently focusing on the initiation and multiplication of somatic embryogenetic tissue from immature pine gametophytes. The tissue is stored cryogenically for future use. The objective is to produce pine clones, mostly hybrids, for commercial production. Somatic seedlings are generated in the laboratory and transferred to the nursery where they produce hedges, once this is done cuttings are set and trials established. The trials will be evaluated at 3, 5 and 8 years of age after which the best clones will be identified for commercial production. These clones will be revived from Cryopreservation and multiplied for commercial forest establishment.

Provenance trials were not only done on exotic species but also on indigenous tree species. For example, *Podocarpus falcatus* provenance trials were established in 1982 by the then Department of Water Affairs and Forestry and SAFRI (CSIR, 2010). The trial at de Hoek in the Magoebaskloof area is still standing (on the land of Komatiland Forests) and is a potential source for both conservation and selecting genetic material.

A cooperative research project to breed *Eucalyptus hybrids* of high value for the saw-timber industry; using the best available germplasm and quantitative genetic and selection methodologies was

strategically initiated by the CSIR and Merensky in 2007. The main aim was to develop new generation germplasm with highly-desirable growth, adaptability and saw-timber wood properties (particularly low splitting) to meet market demand for greater volumes of high quality products. At the same time, the project would obtain even greater genetic improvements than those achieved with pure species breeding. Researchers used advanced generation elite selections of *E. saligna* and *E. urophylla* to serve as parents for the hybrids. The selections were based on growth and wood property assessments.

Five *E. grandis* clones with low log-end splitting and low brittle heart were developed as a high-value timber resource. The objective was to produce rapidly-growing *E. grandis* material suitable for good quality, economic, solid wood processing. The clones have rapid growth and more stable wood than current eucalyptus resources due to the very low log-end splitting. Furthermore, eight years of research, has produced the first eucalypt hybrid clone in South Africa to be submitted for protection by Plant Breeders' Rights. The project started in 2002 as a partnership between the CSIR and NCT Forestry Co-operative Limited to develop novel Eucalyptus hybrids with improved fibre quality and high pulp yield. To date, 18 trials with hybrids produced by the project have been planted in Limpopo, Mpumalanga and KwaZulu-Natal.

Despite the focus on Eucalypts, the research at ICFR also focused on ***Acacia mearnsii***, a leading commercially grown tree species in South Africa even though it is also an alien invasive species. The research aims at improving the quality and quantity of timber and bark in South Africa. Ultimately this knowledge enables the South African wattle growers to remain competitive within the domestic and international forestry Industries. Classical and other breeding methods are used to continually improve the quality of the *Acacia* germplasm, and make this available to growers. The ICFR's Multiple Population Breeding Strategy was developed to meet the shift in emphasis in the black wattle industry from production of bark yield alone, to production of both timber and bark. It comprises of three projects namely:

1. *Acacia* breeding using classical breeding methods and vegetative propagation.
2. Sterile wattle developed for commercial deployment by 2015, and to guarantee that all seed sold or distributed to growers will produce sterile trees to limit the spread of wattle. This is done by producing triploid trees (sterile) through chemical treatment, and Gamma irradiation of seeds to induce sterility.
3. *Acacia* species testing

Results from progeny trials have shown that the improved material has significant gains over commercial seed; trees grown from improved seed showed, on average, an 8.5% increase in height, a 19% increase in diameter, 112% increase in volume, 85% increase in bark yield and 10% increase in survival at felling. To quantify the gain made in each orchard, and for each orchard to be given a value representing its genetic quality or stage of improvement, genetic gain trials have been established over time to compare the performance of each of the Production Seed Orchards from which seed has been collected, across the three main black wattle growing areas in South Africa.

Private companies on the other hand continue to contribute to scientific knowledge in the country. Komatiland Forests (KLF) has a research centre and nursery that is currently managing various trial plots in several plantations across the Limpopo, Mpumalanga and Kwazulu-Natal provinces. The nursery produces plants for all of the plantations operated by KLF. The key responsibilities of the centre are on tree improvement, the production, storage, testing and distribution of improved seed, research on somatic embryogenesis in pines and nursery practices. Genetically improved material has been generated from seed orchards (seedling and clonal) and through vegetative multiplication (vm).

Even though so much has been done in the country there still lies a widening road ahead in terms of ex situ forest genetic resources conservation. There are no established national/regional forums for stakeholders involved with ex situ conservation that are recognised by the National Forest Programme. However, local and international stakeholders are given the opportunity to use applied tree-breeding and genetics expertise of the CSIR to develop their own knowledge or to acquire better trees at a faster rate. The benefits of the genetic research and development are shared in two primary forms, both in South Africa and abroad.

- 3 The first is in the form of partnering with the industry in breeding programmes as well as releasing the very best genetic seed and clones to the forestry industry for testing and commercial use.
- 4 The second is the sharing and development of technical skills and experience gained by means of services such as research partnerships, and the provision of courses.
- 5 CSIR also develop software to assist tree breeders in optimising gains and selecting the best genetic material from their populations using advanced selection methodologies such as BLUP.

South Africa, as a participating member of CAMCORE, enjoys access to the most extensive CAMCORE database in sub-tropical and tropical pines. CAMCORE program was born in 1980 upon realising that unique population of Pinus species, including several prominent commercial species, were under threat of extinction through indiscriminate over-cutting, uncontrolled fires and shifting agriculture. CAMCORE focuses on conserving, testing and developing forest tree species, collects seed of both conifer and broad-leafed species throughout Central America and Mexico and distributes seed to its members for field trials and conservation bank.

Challenges

Research is happening in the country but the volume and capacity for research on commercial forestry has declined by an estimated 20 % to 30 % in the past five years, with budget reductions, retrenchments or reassignments.

CHAPTER 5

The State of National Programmes, Education, Training and Legislation

The main objective of this section is to describe the state of national capacities in research, education, training and legislation as well as coordination and information mechanisms for forest genetic resources.

5.1 National Programmes

South Africa developed and implemented its National Forestry Action Programme (NFAP) framework of 1997 as its strategy for achieving the policy goals set in the White Paper on Sustainable Forest Development in South Africa (1996). The NFAP was meant to be a three three-year programme, and was replaced when South Africa adopted the international standard, National Forestry Programme (NFP) as the framework for national policy development and planning to ensure conservation and sustainable use of forests. A South African NFP Framework was therefore compiled during 2004 to meet local requirements. Guiding principles, vision and goals, approach and methodology were all included in this NFP framework. The NFP is an integral part of the country's National Sustainable Development Strategy. The approach is to use the NFP to co-ordinate and integrate policy and strategy development initiatives within a single programme.

The National Sawlog strategy and National Integrated Forest Protection Strategy for the forest sector are some of many strategies developed to address the challenges identified by, amongst others, the Forest Sector BBBEE Charter .Even though a focus on conservation of the forest genetic resources has not been prominent on the agenda of the NFP, it will focus on ensuring implementation of the above mentioned strategies and REDD+ programmes for the 2011 programme.

For 2011, the Committee on Forest Access, a sub-committee of the National Forestry Advisory Committee¹⁹ is focussing on the establishment of an Environmental Centre in Pietermaritzburg which will entail a rehabilitation programme for the natural forest and an environmental educational centre aimed at teaching young learners the importance of forests. The success of this project will indirectly lead to the conservation of forest genetic resources

¹⁹ The National Forestry Advisory Committee advises the Minister on forestry related issues.

South Africa, through the ex Department of Agriculture became a member of the SADC Plant Genetic Resources Centre (SPGRC) in 1995. A National Plant Genetic Resources Coordinating Committee coordinated by the then Department of Agriculture was established in the late 1990's. This was the only committee that prioritised genetic resources and attended by most organisations dealing with genetic resources i.e. SANBI. Forestry was represented in this forum though much focus was on agricultural genetic resources. However, the forestry section stopped its participation on this forum due to changing priorities of the department and the fact that Forestry got rid of the seed centre did not help much.

5.2 Education, Training and Research

Education, Training, Research and public awareness are very important in understanding the dynamics involved in the conservation, improvement and sustainable use of forest genetic resources.

In the area of education and training, a collaboration between the ex Department of Water Affairs and Water affairs (DWAF) and ex Department of education (DoE) to integrate environmental education which encompasses forestry in primary school education curriculum helps to encourage learners to be aware of forestry and stimulate the interest of learners to future career opportunities in the forestry sector thus addressing the skills shortage in the long run.

There are currently a few programmes run in different universities and other tertiary institutions that deal with issues related to forest genetic resources. These are:

- University of Stellenbosch
 - The institution offers programmes in Forest and Resource Management and wood products sciences.
- Nelson Mandela Metropolitan University
 - This university offers a 3 year diploma and a 4 year degree in Forestry. Programmes offered include Forest Botany, Forest Protection, Forest Engineering, Silviculture and Forest management.
- University of Venda
 - The university offers a 4 year BSc Forestry degree.
- Fort Cox College focuses mainly on social forestry and teaches forestry to diploma level.
- Forestry education has been discontinued at the University of KwaZulu-Natal. This institution used to offer two 4-year forestry programmes namely BSc Agriculture (Community Forestry) and BSc (Commercial Forestry) within the School of Sciences and Agribusiness.
- University of Pretoria
 - The university offers a Forest Science Postgraduate Programme that is coordinated by the SAFCOL Chair in Forest Management. While the program aims to train postgraduate students to be proficient in forest science and management, the emphasis is on environmentally sound and sustainable use and management of forest resources. The programme has a multidisciplinary approach. There are 2 Masters options offered: the traditional Masters of Forest Science by research and a

new part taught and research MSc Option: Forest Management and the Environment. Students can also register for a PhD Degree in Forest Science in their chosen area of specialization.

Although forestry training is offered at various institutions in South Africa but there is no formal training offered in tree genetics. However, aspects of tree genetics are offered through most genetics and plant science departments at South African universities (population genetics, plant systematics, conservation biology, etc.) e.g. “Tree breeding” is part of the Silviculture curriculum. Post-graduate training in tree breeding is being planned at the University of Pretoria. Moreover, there will be two dedicated modules for forest genetic resources training at Stellenbosch University as from 2012. It can thus be concluded that the state of education and training in forest genetic resources is not adequate at the moment.

5.3 Institutions involved in Forestry Research

The conclusive **budget for research** in the country is unknown. The Government does not provide any funding pertaining to genetic resources. However, tree Improvement makes up a significant portion of the in-house R&D expenses for the private sector with ICFR having budgeted R3.1m for 2011. Hence, the private sector and parastatals contributes significantly to the research regarding forest genetic resources. The institutions involved are:

Table 8: Institutions involved in Forestry Research

Private Sector	Public sector
Institute for Commercial Forestry Research (ICFR) ICFR is a privately funded forestry research institute funded by direct contributions from companies and organizations in the forestry industry.	The Forestry Programme of The Council for Scientific and Industrial Research (CSIR) conducts interdisciplinary research and development in plantation forestry and forest products to support local industries in South Africa and also internationally.
SAPPI Forests	South African National Biodiversity Institute (SANBI)
Mondi Forests	
Natal Cooperative Timber (NCT)	
Merensky	
Komatiland Forests (KLF)	
York Timbers	
Mountain to Ocean(MTO)	

The University of Stellenbosch concluded 5 projects whilst the ICFR has done the following research on forest genetic resources:

Breeding Eucalyptus nitens
Breeding E smithii
Breeding E dunnii
Breeding E macarthurii
New eucalypt species testing
Breeding sub-tropical eucalypt species.
Site-species Interactions
Breeding Black Wattle (Acacia mearnsii)
Development of sterile Black Wattle

As a result of the inadequate support and participation by the government in the past, intellectual property produced by research bodies (often the fruit of private funding) is not accessible to all. There is a large body of intellectual property that has accrued from government's investment in forest sector R&D over the past century. This includes tangible and intangible property as well as tacit knowledge among R&D practitioners. Although much of this is in the public domain, for example in the form of publications, much is not public or is otherwise inaccessible. Information on patents is not readily available because genetic material, new hybrids, clones are normally regarded as intellectual property by companies. As such, this information is not divulged by companies.

Even though the scientific knowledge base underpinning tree breeding has been increased and the researchers, technologists and field staff enjoying international recognition and credibility in CSIR but there remains a shortage of knowledgeable researchers in the country.

The main obstacle to providing the required education and training is the availability of qualified foresters with adequate forest genetic resource training or tree breeding. Currently, post graduate students and an extraordinary professor (from North Carolina State University) are assisting with training. As mentioned above, the need for Funding for research projects and infrastructure (lab equipment, lab facilities, greenhouse facilities etc.) to educate students cannot be overemphasized. Currently funding is non-existing.

As a move towards building the capacity, the private sector i.e. ICFR collaborated with the North Carolina State University to provide in-house training of tree breeders. The government has a National Research Fund (NRF) to fund research and to participate in training opportunities worldwide. However, limited funding is available and applicants have to compete with other sectors.

There are various **needs and priorities** for education and training in order for the country to support the sustainable use, development and conservation of forest genetic resources. Some of these are:

- Funding for research projects to educate students. There is a dire need for funding toward forest research in general. Of the current budget, no budget is specifically dedicated to genetic resources.
- Funding for research infrastructure (lab facilities, lab equipment, greenhouse facilities, proper nursery facilities to maintain genetic resources, field studies etc.)

- Support system (support staff, funding for travelling to collect genetic resources etc.)
- Support to establish a forest genetic resource unit within the universities.
- Staff capacity with specialised knowledge on genetic resources.

5.4 Legislation

To support an effective institutional framework for a national programme that ensure sustainable conservation and utilization of forest genetic resources in the country, relevant policy intentions and legislative tools are a pre-requisite requirement. South Africa does not have legislation with explicit focus on forest genetic resources. However the country has various environmental laws covering genetic resources. This sub section highlights the major laws that have been passed or amended in the last decade with a strong bearing on forest genetic resources.

- **The Constitution of the Republic of South Africa; Act No. 108 of 1996:** The first and most important legislation governing issues to do with genetic resources in the country is the Constitution of the Republic of South Africa. While the Constitution does not explicitly provide for forest genetic resources, it contains statements in the Bill of rights that touch on forest genetic resources i.e. everyone has the right:
 - to an environment that is not harmful to their health or well-being and
 - to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:
 - prevent pollution and ecological degradation;
 - promote conservation; and
 - secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.
- **White Paper on the conservation and Sustainable Use of South Africa's biological Diversity of 1997** confirmed South Africa's intent to secure under protection at least 10% of each habitat and ecosystem within the seven biomes. Chapter 1 of this policy document gives reference to the importance of ex situ and in situ conservation as a cornerstone to conserving genetic resources of the country.
- **The National Forests Act of 1998:** The NFA contains a set of principles that guide sustainable forest management. Of particular bearing to genetic resources of natural forest are the following principles:
 - Natural forests must not be destroyed save in exceptional circumstances where, in the opinion of the Minister, a proposed new land use is preferable in terms of its economic, social or environmental benefits.
 - Forests must be developed and managed so as to conserve biological diversity, ecosystems and habitats

The NFA is mainly intended to promote and enforce the sustainable management and development of forests for the benefit of all, to promote the sustainable use of forests, and to provide special measures for the protection of forests and trees. To balance the protection of forests with sustainable use, the Act regulates a wide range of uses and sets out the right of everyone to have reasonable access to state forests for non-consumptive purposes. The rights to the use, management, control and operation of state forests and the produce in them rest with the Minister and are regulated by the department through this Act, which was amended in 2005 by the Forestry Laws Amendment Act, 2005 (Act No. 35 of 2005).

- **The National Veld and Forest Fire (NVFFA) Act of 1998:** aims to prevent and combat veld, forest and mountain fires throughout the country and thereby limit and reduce the damage and losses caused by fires to life, fixed property, infrastructure, movable property, stock, crops, fauna and flora and veld in South Africa. The NVFFA is the primary legislation currently governing integrated veldfire management in South Africa. It was amended by the National Veld and Forest Fire Laws Amendment Act, 2001 (Act No. 12 of 2001). Even though more than two-thirds of the ecosystems of South Africa are fire prone and fire-dependent, severe fires may result in permanent loss of species or habitat. It has the potential to degrade ecologically important forest margin vegetation exposing the interior part of the forest to further fires. Alien invasive species often germinate after fires and often increase their infestation in terms of numbers compared to the pre-fire density.
- **National Environmental Management Biodiversity Act (Act No. 10 of 2004)²⁰:** The overall management and conservation of South Africa's biodiversity is provided for in this Act within the framework of the National Environmental Management Act, 1998. The act includes three forest types as endangered and six as vulnerable. Several individual threatened forest patches of high conservation value were also listed for protection under this Act, which gives such listed ecosystems enhanced status in the Integrated Development Plans of local and regional authorities. The Act focuses on the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources and the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources.
- **National Environmental Management : Protected Areas Act (Act no. 57 of 2003)** provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes, for the establishment of a national register of all national, provincial and local protected areas, for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; and for matters in connection therewith.

²⁰ Including the National Environmental Management: Protected Areas Amendment Act (Act 31 of 2004)

- **The Patents Amendment Act, 2005:** aims to provide for a disclosure requirement whether an invention in a patent application uses or is directly derived from an indigenous biological resource or genetic resource, information regarding the nature and origin of such indigenous biological resource or genetic resources and whether the invention relied on any traditional knowledge or traditional use of the indigenous biological resource or genetic resources.
- **The Plant Improvement Act, 1976 (Act No. 53 of 1976)** provides for the registration of premises from which the sale of certain plants or the cleansing, packing and sale of certain propagating material may be undertaken; to prescribe the conditions subject to which such plants or propagating material may be sold for the purposes of cultivation; to provide for the recognition of certain varieties of plants; for a system of certification of plants and propagating material with the object of maintaining the quality of certain plants and propagating material, and ensuring the usefulness of the products. Section 26 of the Plant Improvement Act prohibits the importation of any plant (which include seed) or propagating material unless the variety is one which is permitted by the Act, is duly packed, marked and labelled and is imported through a prescribed port of entry, unless the Registrar has allowed the importation of plants (including seeds) or propagating material which does not comply with all of those requirements. No permit is necessary for the importation of Pine Seed. A valid phytosanitary certificate must accompany all seed when imported.

From the above highlight, it is clear that though Government has not specifically enacted legislation on forest genetic resources, it has passed a number of laws especially in the environmental and agricultural sector whose over all effect is to streamline and improve on a number of biodiversity related issues including those relevant to forest genetic resources. Strengthening forestry education on forest genetic resources remains a priority.

CHAPTER 6

The State of Regional and International Collaboration

The main objective of this section is to describe the current state of regional and international collaboration for forest genetic resources and to indicate future needs and priorities. South Africa ratified several conventions that have a bearing on conservation of forest genetic resources. These are listed as follows:

6.1 Regional and Sub-regional networks

- **The Sub-Saharan Africa Forest Genetic Resources (SAFORGEN) programme.**

South Africa is a member of SAFORGEN. However, it has not been actively participating in this forum due to capacity problems. This is a voluntary instrument of international cooperation in research and development. It aims at promoting collaboration and catalysing action among national and regional institutions to bring about the effective conservation and sustainable use of forest genetic resources in Sub Saharan Africa. South Africa needs to revive its participation in this forum.

- **The Southern African Development Community (SADC) Protocol on Forestry:**

The SADC sub region developed the SADC Protocol on Forestry, which was signed in Angola in 2002 and which is the overall policy framework for collaboration among member states on forest development that also covers the substantive matters of the UNFF. Article 17 of the protocol states that member states should adopt national policies and implement mechanisms to ensure that access to the forest genetic resources is subject to prior informed consent and mutually agreed terms and that there is equitable sharing of the benefits derived from the use of these resources. There is a draft implementation plan for the protocol but it is yet to come into force.

- **The African Forestry and Wildlife Commission**

The government continues to play a leading role in all regional forestry initiatives, including the African Forestry and Wildlife Commission (AFWC). The AFWC is one of six regional forestry commissions established by the FAO to provide a policy and technical forum for countries to discuss and address forest issues on a regional basis. It meets every two years. The department has also chaired this commission and actively participates. Continuous participation will ensure that the country benefits from the programmes of the FAO in the region.

6.2 International Programs²¹

The sector is involved in various programmes regionally and internationally with regards to forest genetic resources. The country through SANBI participates in the **Millenium seed bank project**. This is the largest global ex situ conservation programme pioneered by the Seed Conservation Department at the Royal Botanic Gardens, Kew. The seeds collected in this programme include indigenous tree species.

The South African Forestry Company (Ltd), known as SAFCOL, also participates in the **CAMCORE** (Central America and Mexico Coniferous Resources Co-operative) program. The seed is collected from these countries by CAMCORE based at North Carolina State University then packed and dispatched by CAMCORE to SAFCOL. After receiving the seed, SAFCOL lays out trials, namely conservation banks and genetic tests.

6.3 International Agreements

South Africa is a signatory to a number of international conventions and protocols on the protection of the environment and biodiversity convention. These include:

- **Convention on International Trade in Endangered Species of wild Fauna and Flora (CITES):**

South Africa ratified the Convention on Trade in Endangered Species of wild Fauna and Flora (CITES) in July 1975. Only one true South African tree species, the red stink wood (*Prunus Africana*) appear on the CITES list, which limits trade in this species. The species is heavily used for medicinal purposes in Africa. The red stinkwood has been listed as a protected tree species under the National Forests Act of 1998, and is less threatened locally than in the rest of Africa due to better monitoring and control. As a CITES signatory, South Africa has an obligation to monitor and control CITES timber moving through its borders.

A Timber Monitoring Group initiated by the non-government organization, TRAFFIC in cooperation with

²¹Comprehensive information on international programs the forest sector is participating in was not available at the time of writing the report.

the Department of Agriculture, Forestry and Fisheries undertakes periodic monitoring of cross-border timber movement, and has trained customs officials at several ports in timber identification processes. Timber monitoring focuses mainly on detecting CITES timber harvested in tropical countries and checking whether permits for these are in place. There is a periodic monitoring of products of locally protected tree species imported from neighbouring countries, such as camel thorn (*Acacia erioloba*) and leadwood (*Combretum imberbe*) braaiwood imported from Namibia, Botswana and Mozambique. These species are also protected in some of the neighbouring countries, and cooperation on monitoring these within the SADC region is essential. The Department of Environmental Affairs (DEA) is the lead agent for both CITES and the UNCBD. Officials of the Department of Agriculture, Forestry and Fisheries participate or give input into the Conference of the Parties on the Convention on Biological Diversity. This includes inputs into South African position papers, and an evaluation and report-back on the implementation of the Extended Programme of Work on Forests and the conservation targets of the UNCBD.

- **United Nations Convention on Biological Diversity (UNCBD)**

At the Convention on Biodiversity (CBD) the world recognised the growing concern on sustainable development as well as the global value of the world's biodiversity to present and future generations for economic and social development. South Africa ratified the CBD on 2 November 1995 and actively participates in this forum. The aim of the CBD is to effect international cooperation in the conservation of biological diversity and to promote the sustainable use of living natural resources worldwide. It also aims to bring about the sharing of the benefits arising from the utilisation of natural resources.

From this convention the most comprehensive Multilateral Environmental Agreement came into being. This agreement covers all plant and animal species, genetic variability and all ecosystems and is a legally binding international treaty that commits all signatories to its objectives. Article 8 of the 1993 Convention on Biological Diversity (CBD), which deals with in situ conservation, calls on each Contracting Party to establish a system of protected areas or areas in which special measures are undertaken to conserve biological diversity.

South Africa as a signatory to this treaty must uphold the following objectives:

- The Convention of Biological Diversity
- The sustainable use of South Africa's biodiversity
- The fair and equitable sharing of benefits arising out of the use of our natural genetic resources.

South Africa signed the legally binding Nagoya protocol in February 2012 and is in the process of ratifying it.

- **United Nations Convention to Combat Desertification**

South Africa ratified this convention on 30 September 1997. Desertification is the degradation of land in arid, semi-arid and dry sub-humid areas and does not refer to the expansion of existing deserts. It is caused primarily by human activities, through over-exploitation and inappropriate land use, and by

climate variations. Deforestation in natural forests is said to be insignificant in South Africa but the country cannot afford to ignore this because of the size (about 492 000 ha) and the fragmented nature of the resource. It is estimated that in the savannah woodland biome (covering just over 40 million hectares), an area of between 50 000ha and 100 000ha is lost (deforested) every year. Deforestation in the country needs to be curbed as much as possible given the minute size of our natural forests. If left unabated, deforestation will have negative effects which include alteration of local and global climatic patterns as both the carbon and water cycles are disturbed as a result of tree removal. Soil erosion accelerates once trees are removed from the land surface with resultant silting of water courses, lakes and dams. Certain species are dependent on forests thus removal of forests may lead to the extinction of such forest-dependant species. Deforestation also contributes to desertification.

- **United Nations Framework Convention on Climate Change (UNFCCC):**

This is an international environmental treaty for the promotion of reforestation to create carbon sinks for greenhouse gases. South Africa ratified this convention in August 1997. The department supports the lead department (the DEA) and actively participates in this forum. Forestry is identified as important in terms of both climate change mitigation and adaptation. The forestry sector thus contributes to reducing South Africa's greenhouse gas inventory, although not enough to compensate fully for emissions made by all other sectors of the economy.

- **United Nations Forum on Forests (UNFF):**

The UNFF was established in 2000 by the Economic and Social Council (ECOSOC) of the United Nations to establish an instrument for the management, conservation and sustainable development of all types of forests and to strengthen long-term political commitments made in the Rio Declaration in 1992, taking into account the Forest Principles, Chapter 11 of Agenda 21 and the outcome of the IPF/IFF processes and other global forestry commitments and agreements. South Africa through the Department of Agriculture, Forestry and Fisheries (DAFF) actively participates in this forum.

- **United Nations Commission for Sustainable Development (UNCSD):**

The UNCSD was created in December 1992 to ensure effective follow-up from the United Nations Conference on Environmental and Development. The Commission ensures the high visibility of sustainable development issues within the UN system and helps to improve the UN's coordination of environment and development activities. The Department of Environment Affairs is the focal point. The DAFF is working on strengthening its participation in this forum.

- **International Tropical Timber Organization (ITTO):**

ITTO is an intergovernmental organization promoting the conservation and sustainable management, use and trade of tropical forest resources. Despite having a very small area of natural forests, South

Africa can benefit from ITTO's best practices and projects. The country is in the process of affiliating; it is hoped that this process could be finalised soon.

- **International Plant Protection Convention (IPPC) of the Food and Agricultural Organisation (FAO)**

South Africa is a signatory member of IPPC. As a member of the IPPC, it undertook to:

- Implement common and effective measures on national and international level to prevent the importation and distribution of pests of plants²² and plant products
- Promote the methods for the control of pests
- Establish legal, technical and administrative measures necessary to achieve the goals of the Convention.

South Africa is also bound by the following agreements:

- The Agreement on the Application of Sanitary and Phytosanitary Measures of the World Trade Organisation (WTO-SPS)
- Codex Alimentarius Commission (Codex)

To strengthen regional and international collaboration with regards to forest genetic resources, The DAFF needs to revive its participation on SAFORGEN. Exchange visits to institutions on forest genetic resources in developed countries and within the region to be looked at.

6.4 Access to Forest Genetic Resources and Sharing Benefits arising from their Use.

As mentioned earlier, South Africa is party to key international instruments governing access to genetic resources including sharing of benefits arising from their use. In particular, South Africa is party to the Convention on Biological Diversity and has signed the Nagoya Protocol. By being a signatory to this treaty; it also aims to bring about the sharing of the benefits arising from the utilisation of natural resources. Chapter 3 of the White Paper on the conservation and Sustainable Use of South Africa's biological Diversity of 1997 echoes the commitment of the country to ensuring that there is controlled access to the resources and that the benefits derived from the use of these serve national interests.

The National Forest Act also regulates a wide range of uses and sets out the right of everyone to have reasonable access to state forests for non-consumptive purposes. The rights to the use, management, control and operation of state forests and the produce in them rest with the Minister and are regulated by the department through this Act. Moreover, the biodiversity Act has regulations on bio prospecting access and benefit sharing.

²² Plants include forests and wild flora

In South Africa, plant breeders rights²³ are recognized and protected under the Plant Breeders Rights Act 1976 (Act no. 15²⁴). The Act aims at providing for a system through which plant breeders rights relating to varieties of certain kinds of plants may be granted and registered; for the requirements which have to be complied with for the granting of such rights; the protection of such rights and the granting of licences in respect of the exercise thereof; and other incidental matters. The scope of the right is defined to restrict any unauthorised use of the protected material which may prevent the right holder from reaping financial reward. However, this right does not limit the use of the protected variety for private and non-commercial purposes, experimental use and the breeding of new varieties (except where essentially derived varieties are concerned). The duration of a Plant Breeders' Right is 25 years (for trees and vines). The implementation of plant breeders' rights system in South Africa has been a major stimulus for the plant breeding industry.

Moreover, In recognition of people's land rights and the broader public interest in forests, lease rental money is handed over to several communities whose land has been rented by private companies for forestry business. The Government leases the land on which the plantations are located to private commercial forestry companies. This is the land that has been returned to rightful owners through the land restitution programme or waiting to be returned. This is another tool that is used by the government to ensure benefit sharing.

²³ A plant breeder's right is a form of intellectual property right granted to breeders of new plant varieties as one way of ensuring equitable sharing of benefits arising from the use of plant genetic resources.

²⁴ Soon to be replaced by Plant Breeders' Rights Act, 2010

CHAPTER 7

The Contribution of Forest Genetic Resources to Food Security, Poverty Alleviation and Sustainable development

The objective of this chapter is to indicate the status, needs and priorities of the contributions of forest genetic resources to food security, poverty alleviation and sustainable development.

7.1 Forestry's contribution to poverty alleviation

There are general inequalities in South Africa owing to the past apartheid system. Rural areas were neglected for a very long time and forestry continued to serve as a safety net for the rural poor. It is only recently that the democratic government introduced a comprehensive programme to alleviate poverty in rural areas in an integrated manner.

7.1.1 Contribution to employment

In 2008, the industry provided employment for about 107 000 employees (Godsmark 2009). This is illustrated in Table 9

TABLE 9 Forest sector and related employment in South Africa, 2008

Subsector	No. of employees		Total employment
	Direct	Indirect	
Forestry	76 844	30 000	106 844
Pulp and paper	13 200	10 781	23 981
Sawmilling	20 000	20 000	40 000
Timber board	6 000	3 000	9 000
Mining timber	2 200	2 000	4 200

Other	11 000	6 000	17 000
Total	129 244	71 781	201 025

Source: Sawmilling South Africa (SSA) 2010

The recent global economic crisis posed a threat to employment in the sector. The lower income groups/ rural communities have been more sensitive to the pressures brought on by the crisis. As a large portion of the South African forest sector is located in rural areas and serves the rural community, the impact on the industry has been directly experienced by these rural communities. However, employment has decreased by as much as 21% in rural areas that are reliant on the forest sector (Tomaselli 2009). Leading South African economists predicted job losses of between 207 000 and 304 000 and suggested that, although the crisis was felt across the board, elementary workers were the hardest hit (Mail & Guardian 2009). In contrast, from anecdotal evidence gathered from its members, FSA maintains that very few jobs were lost in the forestry sector. A survey conducted by FSA indicated that about 800 people had lost their jobs. Furthermore, the South African Forestry Contractors' Association (SAFCA) has reported that 70 contractors closed their doors in the last year. Fortunately, however, SAFCA also reported that the total number of people employed by contractors remained stable at 32 000. This indicates that the forestry contractors sector has been able to absorb the employees of those contractors that had closed shop.

However, the forest sector could be utilised to curb an increase in unemployment and create opportunities in rural areas. The *Genesis report* (2005) states that there are great opportunities for plantation expansion through small grower and community schemes in KZN and the Eastern Cape. The bulk of development will be on communally owned land, based on community or small grower schemes, creating an estimated 43 000 jobs in low-income areas in these provinces. This will add an estimated R739 million to the annual output of these provinces.

Although forestry will not be able to take households completely out of poverty, it could contribute substantially to household income and reduce the impact of the economic crisis on low-income rural communities. Fig. 5 below indicates the total number of people dependent on the forestry sector. They include directly and indirectly employed persons and the dependants of these workers.

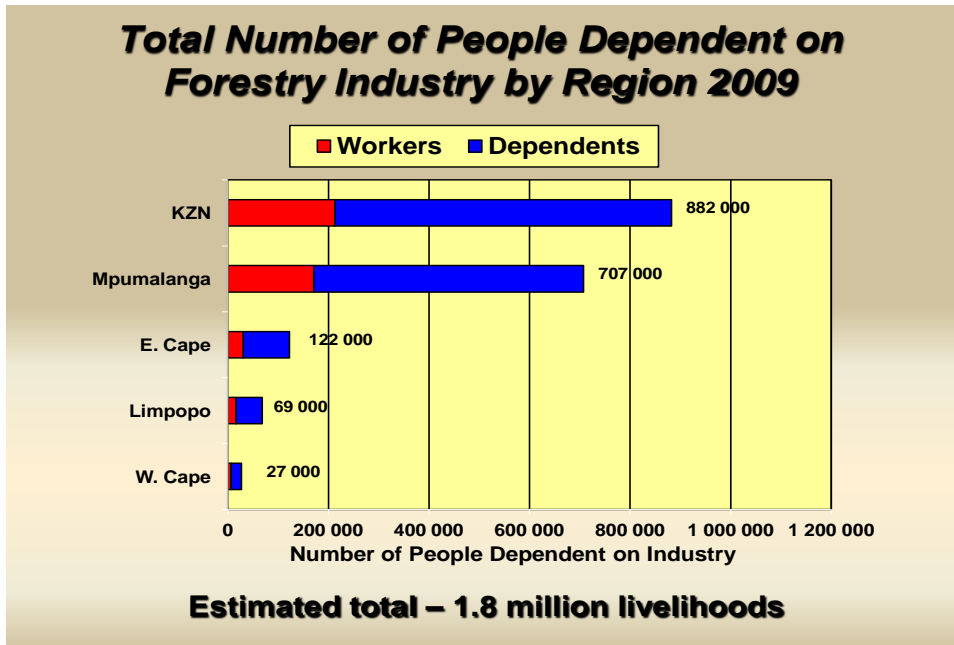


FIG. 5 Total number of people dependent on forestry industry by region 2009

Source: Forestry South Africa (FSA) 2010

In KZN, areas identified for afforestation are in close proximity to pulp processors and wood chipping plants. It is expected that all the plantations established will be short-rotation hardwood for pulping. This is an added advantage as the pulping sector is currently affected at a lower level than are a number of the other sectors in the industry. The creation of employment through afforestation in this province will significantly help in combating the jobs lost in this province because of the current economic crisis. In the Eastern Cape, the pole production sector has been identified as a possible market. This is also advantageous as this sector has been minimally influenced by the current economic crisis.

The department endorses a combination of measures for public and private sector employment and training to help avoid massive job losses in the period ahead. Under the auspices of the Expanded Public Works Programme, the department will accelerate the implementation of labour-intensive programmes such as Working for Woodlands (to rehabilitate degraded woodlands), WfW (a programme for removing invasive species) and WoF. Through these programmes, appropriate training courses are offered and accredited by the relevant authorities. In these identified forestry projects, the equitable representation of unemployed youth, women and disabled people will be sought to satisfy social as well as environmental needs. These fields of training are structured in such a manner that the chances of post-training employment are good. In August 2009 South Africa announced a major public investment programme of approximately R787 billion over the three financial years to March 2012 to assist in these processes.

7.1.2 Forestry's contribution to people's welfare

Supplying basic needs is a function that forest resources perform for a large number of poor people. Firewood, building poles, medicinal plants and edible fruit are all critical to the livelihoods of the rural poor. Over 80% of rural households use fuelwood as their primary source of energy. Nearly all of this fuelwood, some 13 million m³ annually, is taken from savannahs, indigenous forests and plantation off-cuts. This fuelwood use has a gross national value of approximately R3 billion annually, or just under R2 000 per user household per annum. The unsustainable use of fuelwood resources is therefore a threat not only to the resource base, but also to rural livelihoods. With a predicted 1,5 million rural households remaining without electricity for the next 20 years, continuing reliance on fuelwood can be expected.

Primary health care for the poor is also heavily dependent on forest resources. Some 28 million people use traditional plant medicine in South Africa and they need to be assured of a continuing supply. Over 65% of the plant material in urban markets comes from forest or savannah species and the most favoured species come from forests. Approximately one-third of medicinal plant material is tree bark. Forests also make an important contribution to the nutritional wellbeing of many poor people, with edible fruit and other forest foods being important sources of nutrition at various times of the year. User households extract considerable volumes of these woodland resources on an annual basis. There are also clear indications that it is the poorer and more isolated communities, as well as households that are less well off or headed by women, which are more dependent on these resources.

Without a doubt the eradication of poverty and underdevelopment are still the biggest challenges facing the country. The government was mandated in 2004 through the Millennium Development Goals (MDGs) to halve poverty and unemployment by 2014. Informed by the election manifesto, government in 2009 adopted policies such as the Medium Term Strategic Framework (MTSF) to tackle this challenge and is now developing programmes aimed at the following:

- Encouraging the growth and development of the first economy, thereby increasing its possibility to create jobs
- Implementing a programme to address the challenges of the second economy
- Building a social security net to meet the objective of poverty alleviation
- Ensuring sustainable resource management and use

The department, as well as other government departments, therefore has a role to play in availing these services to fast-track access to opportunities in the entire value chain for emerging entrepreneurs and for those growers who do not wish to be linked to a market but want to establish themselves independently.

7.1.3 Contribution to food security

South Africa initiated “the million trees programme” as part of the bigger initiative of greening the country. This project was born out of a need to address poverty alleviation by directly tackling issues of food security and malnutrition. Since its inception the programme has succeeded in planting over 2 million trees. The majority of these trees were planted in poor areas of the country. About 40% of the trees are fruit trees. Recently, DAFF has through its million trees programme, partnered with LOVE

LIFE to plant trees for nutritional purposes. This is taking place at areas where LOVE LIFE has programme on HIV and AIDS. Fruit Trees are being introduced within existing food plots. The introduction will help in strengthening the ability of the foodplots to cater for a variety of products

Trees in general are important for the well-being of, in particular, rural people. Fruit and leaves provide nutrients and are used every day in households. They also provide vitamins and sometimes proteins that are not always found in other crops. Diets in these areas are dominated by cereal crops that are mainly rich in starch. Therefore fruits are needed to keep a balanced and healthy nutrition.

Fruit trees are multi purpose, they help clean the air, reduce heat, provide nutrition, and support good mental health and well-being. For these benefits to happen, fruit trees must be planted strategically, guided by careful planning and leadership. At the same time, the ongoing survival of these trees is dependent on support from local government structures, engaged residents and ability to curb attack by pests and diseases.

7.2 The contribution of the forest sector to the economy

The forest resources represent a considerable natural asset for economic growth, based upon enterprise and employment opportunities. At the same time, significant constraints that hinder the poor from benefiting from forestry have been noted. If these were diminished there is the prospect that significant gains in national poverty reduction could be achieved. It is important to recognise that these forest resources are not uniform and therefore there is considerable differentiation within the sector. Natural forests also contribute to the national economy in ways that are more difficult to measure in monetary terms. The small area of natural forests of South Africa certainly makes a positive economic contribution. For example, the specialist furniture industry in the Knysna area, based on only 2 500 m³ of indigenous timber per annum, contributes an annual amount of R20 million to the Gross Domestic Product (GDP).

7.2.1 Contribution to GDP

Commercial (exotic) plantations and associated processing plants are major contributors to the economy. Despite covering a relatively small share of the land, South Africa's forestry sector contributes R20.4 billion per annum to the GDP. In 2009, the commercial plantations produced 18,9 million m³ of roundwood worth R6.7 billion (7,87million m³ of softwood and 11,2 million m³ of hardwood). By value, pulpwood (68,5% of the total) was the biggest contributor, followed by sawlogs (23,2%). There has been an increase of R1.7 billion from the R5 billion averages in the previous three years. This is depicted in Figs 9 and 10 below.

Fig 9: Total Roundwood Production ex Plantations by Species 2009

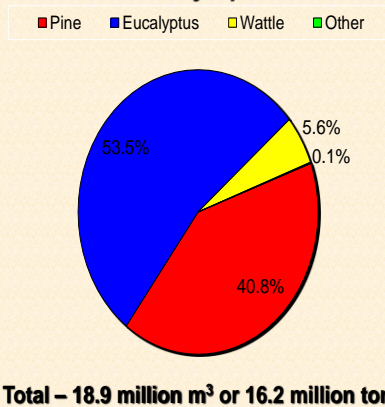
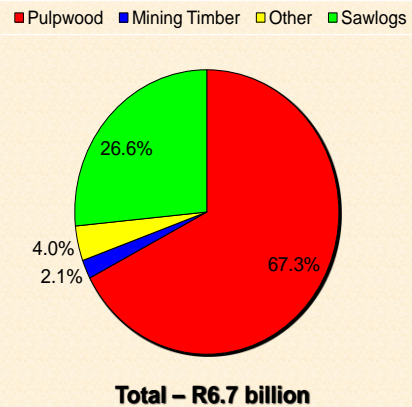


Fig 10: Value of Roundwood Production 2009



Source, FSA, 2009

7.3 Conclusion

The Government of South Africa has shown its commitment to the cause of forest genetic resource conservation, biodiversity conservation and environment protection. However, some key concerns and priorities that need to be met in short term or long term period are as follows:

- Research is happening in the country but the volume and capacity for research on commercial forestry has declined by an estimated 20 % to 30 % in the past five years, with budget reductions, retrenchments or reassignments. The department needs to provide adequate financial resources to undertake research.
- Funding for research projects to educate students. There is a dire need for funding toward forest research in general. Of the current budget, no budget is specifically dedicated to genetic resources.
- The involvement and intervention from the authorities nationally to protect arboreta. The national strategy to monitor Arboreta that is developed to be implemented.
- Need to develop a coordinated conservation approach amongst sectors.
- Restoration of the membership of the department to major cooperatives and networks like SAFORGEN.
- Build the capacity of local scientists and provide incentives to keep them in the public sector and in the country.
- Funding for research infrastructure (lab facilities, lab equipment, greenhouse facilities, proper nursery facilities to maintain genetic resources, field studies etc.)
- Support system (support staff, funding for travelling to collect genetic resources etc.)
- Support to establish a forest genetic resource unit within the universities.
- Staff capacity with specialised knowledge on genetic resources.

ANNEXURE A: TREES OF CONSERVATION CONCERN

FAMILY	Taxon	NATIONAL STATUS
CUPRESSACEAE	<i>Widdringtonia cedarbergensis</i> J.A.Marsh	CR
FABACEAE	<i>Acacia sekhukhuniensis</i> P.J.H.Hurter	CR
OCHNACEAE	<i>Brackenridgea zanguebarica</i> Oliv.	CR
ZAMIACEAE	<i>Encephalartos aemulans</i> Vorster	CR
ZAMIACEAE	<i>Encephalartos dolomiticus</i> Lavranos & D.L.Goode	CR
ZAMIACEAE	<i>Encephalartos dyerianus</i> Lavranos & D.L.Goode	CR
ZAMIACEAE	<i>Encephalartos heenanii</i> R.A.Dyer	CR
ZAMIACEAE	<i>Encephalartos hirsutus</i> P.J.H.Hurter	CR
ZAMIACEAE	<i>Encephalartos inopinus</i> R.A.Dyer	CR
ZAMIACEAE	<i>Encephalartos laevifolius</i> Stapf & Burtt Davy	CR
ZAMIACEAE	<i>Encephalartos latifrons</i> Lehm.	CR
ZAMIACEAE	<i>Encephalartos middelburgensis</i> Vorster, Robbertse & S.van der Westh.	CR
ZAMIACEAE	<i>Encephalartos msinganus</i> Vorster	CR
PASSIFLORACEAE	<i>Adenia fruticosa</i> Burtt Davy subsp. <i>simplicifolia</i> W.J.de Wilde	DDD
ANACARDIACEAE	<i>Loxostylis alata</i> A.Spreng. ex Rchb.	Declining
AQUIFOLIACEAE	<i>Ilex mitis</i> (L.) Radlk. var. <i>mitis</i>	Declining
CELASTRACEAE	<i>Elaeodendron croceum</i> (Thunb.) DC.	Declining
CELASTRACEAE	<i>Pterocelastrus rostratus</i> (Thunb.) Walp.	Declining

CYATHEACEAE	<i>Alsophila capensis</i> (L.f.) J.Sm.	Declining
FABACEAE	<i>Acacia erioloba</i> E.Mey.	Declining
FABACEAE	<i>Newtonia hildebrandtii</i> (Vatke) Torre var. <i>hildebrandtii</i>	Declining
LAURACEAE	<i>Cryptocarya latifolia</i> Sond.	Declining
LAURACEAE	<i>Cryptocarya transvaalensis</i> Burt Davy	Declining
MYRSINACEAE	<i>Rapanea melanophloeos</i> (L.) Mez	Declining
RHIZOPHORACEAE	<i>Cassipourea malosana</i> (Baker) Alston	Declining
ARECACEAE	<i>Jubaeopsis caffra</i> Becc.	EN
ASPHODELACEAE	<i>Aloe pillansii</i> L.Guthrie	EN
ASPHODELACEAE	<i>Aloe ramosissima</i> Pillans	EN
CANELLACEAE	<i>Warburgia salutaris</i> (G.Bertol.) Chiov.	EN
CELASTRACEAE	<i>Lydenburgia abbotii</i> (A.E.van Wyk & Prins) Steenkamp, A.E.van Wyk & Prins	EN
CELASTRACEAE	<i>Maytenus abbotii</i> A.E.van Wyk	EN
CELASTRACEAE	<i>Pseudosalacia streyi</i> Codd	EN
FABACEAE	<i>Acacia ebutsiniorum</i> P.J.H.Hurter	EN
FABACEAE	<i>Albizia suluensis</i> Gerstner	EN
FABACEAE	<i>Aspalathus macrantha</i> Harv.	EN
FABACEAE	<i>Psoralea peratica</i> C.H.Stirt.	EN
FABACEAE	<i>Tephrosia pondoensis</i> (Codd) Schrire	EN
LAURACEAE	<i>Dahlgrenodendron natalense</i> (J.H.Ross) J.J.M.van der Merwe & A.E.van Wyk	EN
LAURACEAE	<i>Ocotea bullata</i> (Burch.) Baill.	EN
MYRTACEAE	<i>Eugenia umtamvunensis</i> A.E.van Wyk	EN
PROTEACEAE	<i>Leucadendron argenteum</i> (L.) R.Br.	EN
PROTEACEAE	<i>Leucospermum conocarpodendron</i> (L.) H.Buek subsp. <i>conocarpodendron</i>	EN
PROTEACEAE	<i>Mimetes arboreus</i> Rourke	EN
PROTEACEAE	<i>Protea laticolor</i> Salisb.	EN
RHIZOPHORACEAE	<i>Cassipourea flanaganii</i> (Schinz) Alston	EN
RUBIACEAE	<i>Tricalysia africana</i> (Sim) Robbr.	EN
SAPOTACEAE	<i>Manilkara nicholsonii</i> A.E.van Wyk	EN
ZAMIACEAE	<i>Encephalartos eugene-maraisii</i> I. Verd.	EN
ZAMIACEAE	<i>Encephalartos lebomboensis</i> I. Verd.	EN
ZAMIACEAE	<i>Encephalartos brevifoliolatus</i> Vorster	EW
ZAMIACEAE	<i>Encephalartos nubimontanus</i> P.J.H.Hurter	EW
ZAMIACEAE	<i>Encephalartos woodii</i> Sander	EW
ASPHODELACEAE	<i>Aloe thraskii</i> Baker	NT
CELASTRACEAE	<i>Elaeodendron transvaalense</i> (Burt Davy) R.H.Archer	NT
CELASTRACEAE	<i>Lydenburgia cassinoides</i> N.Robson	NT
COMBRETACEAE	<i>Combretum mkuzense</i> J.D.Carr & Retief	NT
CORNACEAE	<i>Curtisia dentata</i> (Burm.f.) C.A.Sm.	NT
CUPRESSACEAE	<i>Widdringtonia schwarzii</i> (Marloth) Mast.	NT
FABACEAE	<i>Acacia ormocarpoides</i> P.J.H.Hurter	NT
FABACEAE	<i>Bauhinia bowkeri</i> Harv.	NT

ICACINACEAE	<i>Apodytes abbottii</i> Potgieter & A.E.van Wyk	NT
LAURACEAE	<i>Cryptocarya wyliei</i> Stapf	NT
MALVACEAE	<i>Grewia pondoensis</i> Burret	NT
MYRTACEAE	<i>Eugenia erythrophylla</i> Strey	NT
MYRTACEAE	<i>Eugenia verdoorniae</i> A.E.van Wyk	NT
PASSIFLORACEAE	<i>Adenia fruticosa</i> Burt Davy subsp. <i>fruticosa</i>	NT
PROTEACEAE	<i>Leucadendron conicum</i> (Lam.) I.Williams	NT
PROTEACEAE	<i>Leucospermum conocarpodendron</i> (L.) H.Buek subsp. <i>viridum</i> Rourke	NT
PROTEACEAE	<i>Protea comptonii</i> Beard	NT
PROTEACEAE	<i>Protea obtusifolia</i> H.Buek ex Meisn.	NT
RHYNCHOCALYCACEAE	<i>Rhynchoscalyx lawsonioides</i> Oliv.	NT
RUBIACEAE	<i>Alberta magna</i> E.Mey.	NT
SALICACEAE	<i>Pseudoscolopia polyantha</i> Gilg	NT
SAPINDACEAE	<i>Atalaya natalensis</i> R.A.Dyer	NT
ZAMIACEAE	<i>Encephalartos lehmannii</i> Lehm.	NT
ZAMIACEAE	<i>Encephalartos longifolius</i> (Jacq.) Lehm.	NT
ZAMIACEAE	<i>Encephalartos natalensis</i> R.A.Dyer & I.Verd.	NT
FABACEAE	<i>Erythrophleum lasianthum</i> Corbishley	NT*
ARALIACEAE	<i>Cussonia gamtoosensis</i> Strey	Rare
CELASTRACEAE	<i>Gymnosporia devenishii</i> Jordaan	Rare
CELASTRACEAE	<i>Maytenus oleosa</i> A.E.van Wyk & R.H.Archer	Rare
COMBRETACEAE	<i>Combretum petrophilum</i> Retief	Rare
DRACAENACEAE	<i>Dracaena transvaalensis</i> Baker	Rare
EUPHORBIACEAE	<i>Euphorbia grandialata</i> R.A.Dyer	Rare
EUPHORBIACEAE	<i>Euphorbia sekukuniensis</i> R.A.Dyer	Rare
FABACEAE	<i>Calpurnia reflexa</i> A.J.Beaumont	Rare
ICACINACEAE	<i>Apodytes geldenhuysii</i> A.E.van Wyk & Potgieter	Rare
MALVACEAE	<i>Sterculia alexandri</i> Harv.	Rare
MYRTACEAE	<i>Syzygium pondoense</i> Engl.	Rare
PICRODENDRACEAE	<i>Hyaenanche globosa</i> (Gaertn.) Lamb. & Vahl	Rare
PROTEACEAE	<i>Faurea macnaughtonii</i> E.Phillips	Rare
PROTEACEAE	<i>Mimetes fimbriifolius</i> Salisb. ex Knight	Rare
RUTACEAE	<i>Empleurum fragrans</i> P.E.Glover	Rare
SAPOTACEAE	<i>Vitellariopsis dispar</i> (N.E.Br.) Aubrév.	Rare
VIOLACEAE	<i>Rinorea domatiosa</i> A.E.van Wyk	Rare
LAURACEAE	<i>Cryptocarya liebertiana</i> Engl.	Threatened
ARECACEAE	<i>Raphia australis</i> Oberm. & Strey	VU
ASPHODELACEAE	<i>Aloe dichotoma</i> Masson	VU
CELASTRACEAE	<i>Gymnosporia bachmannii</i> Loes.	VU
FABACEAE	<i>Aspalathus capitata</i> L.	VU
FABACEAE	<i>Aspalathus pendula</i> R.Dahlgren	VU

FABACEAE	<i>Stirtonanthus taylorianus</i> (L.Bolus) B.-E.van Wyk & A.L.Schutte	VU
FABACEAE	<i>Umtiza listeriana</i> Sim	VU
LAURACEAE	<i>Cryptocarya myrtifolia</i> Stapf	VU
LAURACEAE	<i>Ocotea kenyensis</i> (Chiov.) Robyns & R.Wilczek	VU
PROTEACEAE	<i>Leucadendron coniferum</i> (L.) Meisn.	VU
PROTEACEAE	<i>Leucadendron pondoense</i> A.E.van Wyk	VU
PROTEACEAE	<i>Leucospermum patersonii</i> E.Phillips	VU
PROTEACEAE	<i>Leucospermum praemorsum</i> (Meisn.) E.Phillips	VU
PROTEACEAE	<i>Protea curvata</i> N.E.Br.	VU
PROTEACEAE	<i>Protea laetans</i> L.E.Davidson	VU
RHAMNACEAE	<i>Colubrina nicholsonii</i> A.E.van Wyk & Schrire	VU
ROSACEAE	<i>Cliffortia dichotoma</i> Fellingham	VU
ROSACEAE	<i>Prunus africana</i> (Hook.f.) Kalkman	VU
ZAMIACEAE	<i>Encephalartos altensteinii</i> Lehm.	VU
ZAMIACEAE	<i>Encephalartos friderici-guilielmi</i> Lehm.	VU
ZAMIACEAE	<i>Encephalartos ghellinckii</i> Lem.	VU
ZAMIACEAE	<i>Encephalartos lanatus</i> Stapf & Burtt Davy	VU
ZAMIACEAE	<i>Encephalartos paucidentatus</i> Stapf & Burtt Davy	VU
ZAMIACEAE	<i>Encephalartos princeps</i> R.A.Dyer	VU
ZAMIACEAE	<i>Encephalartos senticosus</i> Vorster	VU
RHIZOPHORACEAE	<i>Cassipourea gummiflua</i> Tul. var. <i>verticillata</i> (N.E.Br.) J.Lewis	VU*

SOURCE: SANBI, 2011

ANNEXURE B: LIST OF PROTECTED TREES IN SOUTH AFRICA IN 2011

Botanical Name	English Common Names	Other Common Names Afrikaans (A), Northern Sotho (NS), Southern Sotho (S), Tswana (T), Venda (V), Xhosa (X), Zulu (Z)	National Tree Number
<i>Acacia erioloba</i>	Camel thorn	Kameeldoring (A) / Mogohlo (NS) / Mogôthô (T)	168
<i>Acacia haematoxylon</i>	Grey camel thorn	Vaalkameeldoring (A) / Mokholo (T)	169
<i>Adansonia digitata</i>	Baobab	Kremetart (A) / Seboi (NS) / Mowana (T)	467
<i>Azelia quanzensis</i>	Pod mahogany	Peulmahonie (A) / Mutokota (V) / Inkehli (Z)	207
<i>Balanites subsp. maughamii</i>	Torchwood	Groendoring (A) / Ugobandlovu (Z)	251
<i>Barringtonia racemosa</i>	Powder-puff tree	Poeierkwasboom (A) / Iboqo (Z)	524
<i>Boscia albitrunca</i>	Shepherd's tree	Witgat (A) / Mohlôpi (NS) / Mothôpi (T) / Muvhombwe (V) / Umggomogqomo (X) / Umvithi (Z)	122
<i>Brachystegia spiciformis</i>	Msasa	Msasa (A)	198.1
<i>Breonadia salicina</i>	Matumi	Mingerhout (A) / Mohlomê (NS) / Mutu-lume (V) / Umfomo (Z)	684
<i>Bruguiera gymnorrhiza</i>	Black mangrove	Swart-wortelboom (A) / Isikhangati (X) / Isihlobane (Z)	527
<i>Cassipourea swaziensis</i>	Swazi onionwood	Swazi-uhout (A)	531.1
<i>Catha edulis</i>	Bushman's tea	Boesmanstee (A) / Mohlatse (NS) / Igqwaka (X) / Umhlwazi (Z)	404
<i>Ceriops tagal</i>	Indian mangrove	Indiese wortelboom (A) / Isinkaha (Z)	525
<i>Cleistanthus schlechteri</i> var. <i>schlechteri</i>	False tamboti	Vals-tambotie (A) / Umzithi (Z)	320
<i>Colubrina nicholsonii</i>	Pondo weeping thorn	Pondo-treurdoring (A)	453.8
<i>Combretum imberbe</i>	Leadwood	Hardekool (A) / Mohwelere-tšhipi (NS) / Motswiri (T) / Impondondlovu (Z)	539
<i>Curtisia dentata</i>	Assegai	Assegai (A) / Umgxina (X) / Umagunda (Z)	570
<i>Elaeodendron transvaalensis</i>	Bushveld saffron	Bosveld-saffraan (A) / Monomane (T) / Ingwavuma (Z)	416
<i>Erythrophysa transvaalensis</i>	Bushveld red balloon	Bosveld-rooiklapperbos (A) / Mofalatsane (T)	436.2
<i>Euclea pseudebenus</i>	Ebony quarri	Ebbhout -ghwarrie (A)	598
<i>Ficus trichopoda</i>	Swamp fig	Moerasvy (A) / Umvubu (Z)	54
<i>Leucadendron argenteum</i>	Silver tree	Silwerboom (A)	77
<i>Lumnitzera racemosa</i> var. <i>racemosa</i>	Tonga mangrove	Tonga-wortelboom (A) / Isikhaha-esibomvu (Z)	552

<i>Lydenburgia abbotii</i>	<i>Pondo bushman's Tea</i>	<i>Pondo-boesmanstee (A)</i>	407
<i>Lydenburgia cassinoides</i>	<i>Sekhukhuni bushman's tea</i>	<i>Sekhukhuni-boesmanstee (A)</i>	406
<i>Mimusops caffra</i>	<i>Coastal red milkwood</i>	<i>Kusrooimelkhout (A) / Umthunzi (X) / Umkhakhayi (Z)</i>	583
<i>Newtonia hildebrandtii</i> var. <i>hildebrandtii</i>	<i>Lebombo wattle</i>	<i>Lebombo-wattel (A) /Umfomothi (Z)</i>	191
<i>Ocotea bullata</i>	<i>Stinkwood</i>	<i>Stinkhout (A) / Umhlungulu (X) / Umnukane (Z)</i>	118
<i>Ozoroa namaquensis</i>	<i>Gariiep resin tree</i>	<i>Gariiep-harpuisboom (A)</i>	373.2
<i>Phileoptera violacea</i>	<i>Apple-leaf</i>	<i>Appelblaar (A) / Mphata (NS) / Mohata (T) / Isihomohomo (Z)</i>	238
<i>Pittosporum viridiflorum</i>	<i>Cheesewood</i>	<i>Kasuur (A) / Kgalagangwe (NS) / Umkhwenkwe (X) / Umfusamvu (Z)</i>	139
<i>Podocarpus elongatus</i>	<i>Breede River yellowwood</i>	<i>Breederivier-geelhout (A)</i>	15
<i>Podocarpus falcatus</i> (<i>Afrocarpus falcatus</i>)	<i>Outeniqua yellowwood</i>	<i>Outniekwa-geelhout (A)/ Mogôbagôba (NS)/ Umkhoba (X)/ Umsonti (Z)</i>	16
<i>Podocarpus henkelii</i>	<i>Henkel's yellowwood</i>	<i>Henkel-se-geelhout (A) / Umsonti (X) / Umsonti (Z)</i>	17
<i>Podocarpus latifolius</i>	<i>Real yellowwood</i>	<i>Opregte-geelhout (A) / Mogôbagôba (NS)/ Umcheya (X) / Umkhoba (Z)</i>	18
<i>Protea comptonii</i>	<i>Saddleback sugarbush</i>	<i>Barberton-suikerbos (A)</i>	88
<i>Protea curvata</i>	<i>Serpentine sugarbush</i>	<i>Serpentynsuikerbos (A)</i>	88.1
<i>Prunus africana</i>	<i>Red stinkwood</i>	<i>Rooi-stinkhout (A) / Umkhakhase (X) / Umdumezulu (Z)</i>	147
<i>Pterocarpus angolensis</i>	<i>Wild teak</i>	<i>Kiaat (A) / Morôto (NS) / Mokwa (T) / Mutondo (V) / Umvangazi (Z)</i>	236
<i>Rhizophora mucronata</i>	<i>Red mangrove</i>	<i>Rooi-wortelboom (A) / Isikhangathi (X)/ Umhlume (Z)</i>	526
<i>Sclerocarya birrea</i> subsp. <i>caffra</i>	<i>Marula</i>	<i>Maroela (A) / Morula (NS) / Morula (T) / Umganu (Z)</i>	360
<i>Securidaca longepedunculata</i>	<i>Violet tree</i>	<i>Krinkhout (A) / Mmaba (T)</i>	303
<i>Sideroxylon inerme</i> subsp. <i>inerme</i>	<i>White milkwood</i>	<i>Wit-melkhout (A) / Ximafana (X) / Umakhwelafingqane (Z)</i>	579
<i>Tephrosia pondoensis</i>	<i>Pondo poison pea</i>	<i>Pondo-qifertjie (A)</i>	226.1
<i>Warburgia salutaris</i>	<i>Pepper-bark tree</i>	<i>Peperbasboom (A)/ Molaka (NS)/ Mulanga (V)/ Isibaha (Z)</i>	488
<i>Widdringtonia cedarbergensis</i>	<i>Clanwilliam cedar</i>	<i>Clanwilliam-seder (A)</i>	19
<i>Widdringtonia schwarzii</i>	<i>Willowmore cedar</i>	<i>Baviaanskloof-seder (A)</i>	21

Source: Daff, 2011

ANNEXURE C: LIST OF TREESPECIES IN THE TOKAI ARBORETUM

ANNEXURE D: FOREST NATURE RESERVES

NAME	MANAGEMENT AUTHORITY	MUNICIPALITY	AREA (HA)	LEGAL CLASSIFICATION
Beggars Bush Nature Reserve	Eastern Cape Parks and Tourism Agency	Makana(Eastern Cape)	276	Forest Nature Reserve
Kwa Yili Nature Reserve	Ezemvelo KZN Wildlife	Ingwe Municipality(KwaZulu-Natal)	677	Forest Nature Reserve
Mussina Nature Reserve	Department of Economic development Tourism and Environment	Musina(Limpopo)	5284	Forest Nature Reserve
Waters Meeting Nature Reserve	Eastern Cape Parks and Tourism Agency	Ndlambe(Eastern Cape)	4247	Forest Nature Reserve
Ingelabantwana Nature Reserve	Ezemvelo KZN Wildlife	Ingwe Municipality(KwaZulu-Natal)	338	Forest Nature Reserve
Nkandla Forest Reserve	Ezemvelo KZN Wildlife	Nkandla Municipality(KwaZulu-Natal)	2216	Forest Nature Reserve
Nelshoogte Nature Reserve	Department of Agriculture, Forestry and Fisheries	Umjindi(Mpumalanga)	278.4161	
Wonderkloof Nature Reserve	Department of Agriculture, Forestry and Fisheries	Mbombela(Mpumalanga)	824.7715	
Flora Nature Reserve	Department of Agriculture, Forestry and Fisheries	Mbombela(Mpumalanga)	63.7026	
Indhloveni Nature Reserve	Ezemvelo KZN Wildlife	Ingwe Municipality(KwaZulu-Natal)	30	Forest Nature Reserve
Dr Hamilton Nature Reserve	Department of Agriculture, Forestry and Fisheries	Umjindi(Mpumalanga)	17.0401	
Makubalaan Nature Reserve	Department of Agriculture, Forestry and Fisheries	Mbombela(Mpumalanga)	1082.0625	
Loeriebos Nature Reserve	Department of Agriculture, Forestry and Fisheries	Kouga(Eastern Cape)	8.80	
Sunshine Coast Nature Reserve	Eastern Cape Parks and Tourism Agency	Makana(Eastern Cape)	692	Forest Nature Reserve
Brandvlei Nature Reserve	Cape Nature, Western Cape	Breede Valley Municipality(Western Cape)	1232.93	Forest Nature Reserve
Dlinza Forest Nature Reserve	Ezemvelo KZN Wildlife	uMlalazi Municipality(KwaZulu-Natal)	208	Nature Reserve
Manguzi Forest Reserve	Ezemvelo KZN Wildlife	Umhlabuyalingana	237	Forest Nature Reserve

		Municipality(KwaZulu-Natal)		
Wolkberg Wilderness Area (Serala)	Department of Economic development Tourism and Environment	Lepele-Nkumpi Municipality(Limpopo)	22009	Forest Wilderness Area
Hlatikulu Nature Reserve	Ezemvelo KZN Wildlife	Jozini Municipality(KwaZulu-Natal)	1213.20	Forest Nature Reserve
Xotsheyake Nature Reserve	Ezemvelo KZN Wildlife	Ingwe Municipality(KwaZulu-Natal)	98	Forest Nature Reserve
Fort Fordyce Nature Reserve	Eastern Cape Parks and Tourism Agency	Nkonkobe(Eastern Cape)	2154.80	Forest Nature Reserve
Marwaqa Nature Reserve	Ezemvelo KZN Wildlife	Ingwe Municipality(KwaZulu-Natal)	365	Forest Nature Reserve
Qudeni Forest	Ezemvelo KZN Wildlife	Nkandla Municipality(KwaZulu-Natal)	2356	Forest Nature Reserve
Kap Rivier Nature Reserve	Eastern Cape Parks and Tourism Agency	Ndlambe(Eastern Cape)	286	Forest Nature Reserve
Baviaanskloof Nature Reserve Cluster	Eastern Cape Parks and Tourism Agency	Cacadu District Municipality(Eastern Cape)	288087	Forest Nature Reserve
Dengwini Forest Reserve	Ezemvelo KZN Wildlife	uMlalazi Municipality(KwaZulu-Natal)	321.50	Forest Nature Reserve
Gxalingenwa Nature Reserve	Ezemvelo KZN Wildlife	Ingwe Municipality(KwaZulu-Natal)	1500	Forest Nature Reserve
Ezigwayini Nature Reserve	Ezemvelo KZN Wildlife	uMlalazi Municipality(KwaZulu-Natal)	15.50	Forest Nature Reserve
Soada Forest Nature Reserve	Ezemvelo KZN Wildlife	Ingwe Municipality(KwaZulu-Natal)	498	Nature Reserve
Ncandu Forest Reserve	Ezemvelo KZN Wildlife	Newcastle Municipality(KwaZulu-Natal)	1875	Forest Nature Reserve
Khomazi Wilderness Area	Mpumalanga Tourism and Parks Agency	Albert Luthuli(Mpumalanga)	17641.88	Forest Wilderness Area
Loeriebos nature Reserve	Department of Agriculture, Forestry and Fisheries	Kouga(Eastern Cape)	8.80	
Marutswa Nature Reserve	Ezemvelo KZN Wildlife	Ingwe Municipality(KwaZulu-Natal)	268	Forest Nature Reserve
Ngoye Forest Reserve	Ezemvelo KZN Wildlife	uMlalazi Municipality(KwaZulu-Natal)	44	Forest Nature Reserve
Ntendeka Wilderness Area	Department of Agriculture, Forestry and Fisheries	Abaqulusi Municipality(KwaZulu-Natal)	5320	
East London Coast Nature Reserve	Eastern Cape Parks and Tourism Agency	Buffalo City(Eastern Cape)	3424	Forest Nature Reserve
Hamburg Nature Reserve	Eastern Cape Parks and Tourism Agency	Ngqushwa(Eastern Cape)	700	Forest Nature Reserve
The Island Nature Reserve	Eastern Cape Parks and Tourism Agency		484	Forest Nature Reserve

Source: Department of Environmental Affairs (DEA), Protected Areas Register, 2011

ANNEXURE E: CULTURALLY PROTECTED PLANT SPECIES (PLANT SPECIES THAT MIGHT NOT BE BROUGHT HOME)

SCIENTIFIC NAMES	ENGLISH NAMES	TSHIVENDA NAMES
<i>Adenia gumifera</i>		Bopha
<i>Androstachys johnsonii</i>	Lebombo Ironwood	Musimbiri
<i>Anthocleista grandiflora</i>	Forest fever tree	Mueneene
<i>Artabotrys brachypetalus</i>	Purple hook-berry	Mudzidzi
<i>Bersama tysoniana</i>	Common bersama	Sando
<i>Brackenridgea zanguebarica</i>	Brackenridgea	Mutavhatsindi
<i>Burkea africana</i>	Red syringa	Muvhambangoma
<i>Celtis africana</i>	White stinkwood	Luvhambo
<i>Cussonia spicata</i>	Cabbage tree	Musenzhe
<i>Diospyros mespiliformis</i>	Jackalberry	Musuma
<i>Erythrina lysistemon</i>	Common coral tree	Muvhale
<i>Gardenia amoena</i>	Spiny gardenia	Murombe
<i>Gardenia thunbergia</i>	Transvaal gardenia	Tshiralalala
<i>Halleria lucida</i>	Tree fuchsia	Murevhe
<i>Heteromorpha arborescens</i>	Parsley tree	Muhathavhanna
<i>Millettia stuhlmannii</i>		Muangaila
<i>Mundulea sericea</i>	Cork bush	Mukundandou
<i>Osyris lanceolata</i>	Transvaal somach	Tshitasi
<i>Parinari curatellifolia</i>	Mobola plum	Muvhula
<i>Peltophorum africanum</i>	Weeping wattle	Musese

<i>Pouzolzia hypoleuca</i>	Soap nettle	Muthanzwa
<i>Rauvolfia caffra</i>	Quinine tree	Munadzi
<i>Schefflera umbellifera</i>	Bastard cabbage tree	Munkho
<i>Spirostachys africana</i>	Tamboti	Muonze
<i>Synadenium cupulare</i>	Dead-man's tree	Muswoswo
<i>Syzygium cordatum</i>	Water berry	Mutu
<i>Trema orientalis</i>	Pigeonwood	Mukurukuru
<i>Vangueria infausta</i>	Wild medlar	Muzwilo
<i>Vernonia stipulacea</i>	Poison tree vernonia	Mufhuluta-vhana
<i>Ximenia caffra</i>	Large sourplum	Mutanzwa
<i>Ziziphus mucronata</i>	Buffalo-thorn	Mutshetshete

Source: Khorommbi, 2001