SOUTH AFRICAN FOREST SECTOR RESEARCH AND DEVELOPMENT:

CURRENT ACTIVITIES & FUTURE REQUIREMENTS

- FINAL DRAFT -

DEVELOPED FOR

THE DEPARTMENT OF WATER AFFAIRS AND FORESTRY

DEVELOPED BY

ZETA CONSULTING

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"If you think research is expensive – then try ignorance!"
(**Hans Olav Moen**, former Director of the Norwegian forest research institute.)

"Science is often taken to be a synonym for certainty. So, when a scientist admits to uncertainty it can often be taken as an admission that there is probably a problem. In fact, in the scientific world, ambiguity, uncertainty and the wisdom that comes with failing and changing your mind, are all essential to progress."
(**Tony Blair**, British Prime Minister, May 2005.)

"… DWAF has to prioritise capacity building and training within the forestry sector by establishing partnerships and by identifying people and institutions in South Africa and beyond … and should take lead in these initiatives …"
(**Mike Peter**, Director: DWAF Technical & Information Services –
Extract from Minister's Address to DWAF Legotla, May 2005)

EXECUTIVE SUMMARY

1. This document summarizes the current research and development (R&D) activities taking place in South Africa within the forest sector and also the expert opinions of key strategic thinkers within the forest sector on the future of forest sector R&D. The forest sector is, for the purpose of this document, defined as the production and primary processing of roundwood and other products harvested from South African **plantation forests, natural forests and woodlands**. These forest resources yield the raw materials (roundwood for commercial purposes, fuelwood and non-timber forest products (NTFP)) that support a large value chain of economic activities.

2. The work was commissioned by the Department of Water Affairs and Forestry (DWAF). It is a stakeholder driven process and it is expected that it will lead to the development of a forest sector R&D protocol and strategy, which will support and resource R&D activities.

3. This Report will show that, with the exception of a few pockets of excellence, forest sector R&D activities suffer from lack of co-ordination, under-funding and a declining skills base. This worrying situation has to be rectified in support of South Africa's national development imperatives. Our global forest sector competitors have responded to similar domestic situations with the development of targeted Forest Sector R&D policies, strategies or initiatives.

4. The imperatives for greater cooperation between government, industry and research institutions in developing and implementing targeted Forest Sector R&D policies, strategies or initiatives can be summarized as follows:

    a. The commercial forest industry ("industry") is a major rural job and wealth creator for South Africa, which is estimated to economically support nearly 2% of South Africa's population. The continued development and growth of this industry requires significant innovation and efficiency gains in future, principally to deal with increasing raw material (roundwood) scarcity in the face of limited natural resources (land, water, biodiversity). **Insufficient R&D support exists to provide this innovation.**
    b. Broad-based Black Economic Empowerment (BBBEE) within the industry faces severe implementation challenges over the next decade. **Very limited R&D support exists to deal with land reform, technology transfer, human resource development and other critically related BBBEE questions.**
    c. A significant number of informal economic activities (estimated between R3-4billion in household income annually from NTFP and fuelwood) support a large poor rural population. **R&D investment in support of these stakeholders has recently been funded mostly by**

international donor agencies, but is expected to fall away as these agencies move their activities elsewhere.

d. Forest Sector development and growth have to take place within the context of increasing environmental resource scarcity. Although significant research has been directed towards the water consumption of mostly commercial plantations, **little or no attention** has been paid to other aspects that threaten the long term productivity of the forest sector: biodiversity management, sustainable harvesting of NTFP and fuelwood, or the potential impact of climate change on forest sector productivity.
e. **Human Capital, the key resource at the core of R&D, is declining within the forest sector** due to a poor public image of the sector, a lack of tertiary education support, no strategic support of basic research activities and uncoordinated education mandates. This has lead to a crisis in forest sector tertiary education, as insufficient forest sector leaders in technology fields are produced.
f. Although there are a few excellent examples of the establishment of centres of excellence within specific areas of commercial forestry R&D; **little strategic co-ordination within the sector R&D** is done. The forest sector research community has no clear mandate from Government and industry funders on the priority of research focus areas; and funding mechanisms are mostly of an ad hoc, short-term nature, in support of applied R&D. Opportunities for international collaboration, for instance in woodland research, are not sufficiently and strategically used.
g. Total **forest sector R&D investment is low by international standards**. Non-private R&D will decline further with the imminent departure from the sector of international development agencies. R&D is overwhelmingly supported by funding from the private sector, and very little government support is provided to facilitate the development of public good knowledge.
h. Most R&D outputs are of a proprietary nature, and there is a **poor culture of sharing of R&D information**. Therefore, the limited funds available for research are not being optimized.

5. A stakeholder interview process have identified **insufficient strategic leadership** by both Government and Industry in forest sector R&D as a major factor underlying the issues discussed in 8, 9 and 10 above. Such leadership is now required to address challenges and make use of exciting new opportunities that exist within the forest sector R&D realm. This will not be a trivial matter, and will require high-level commitment from R&D Funders and Performers.

6. A number of opportunities exist upon which to grow and develop forest sector R&D activities, and these are discussed throughout this document. However, the most significant development relates to the **restructuring of scientific and technological research in South Africa** by the Department of Science and Technology (DST), in line with SA's National

R&D Strategy. This requires that Sector R&D strategies needs to be prepared to secure ongoing government support and funding. It also makes government line departments responsible for setting research goals and budgets for institutions that report to them. However, since DWAF does not have a single point of entry into forest sector R&D (such as the Water Research Commission is the point of entry for water research); a formalized strategic approach is required to direct this process.

7. This study concludes that the first step in developing and implementing targeted Forest Sector R&D policies, strategies or initiatives is for all stakeholders (government, industry and research institutions) to agree on an **R&D Protocol for the Forest Sector**. It is proposed that such a Protocol has to address the following issues:
   a. **Roles and responsibilities** of different parties with regard to R&D leadership and funding.
   b. **Areas of sector R&D investment**. The Protocol should define the mechanisms for jointly identifying, prioritising and updating research focus areas (RFA's) and presenting the business case for R&D investment within RFA's.
   c. **Funding mechanisms for R&D**. It should outline the methods of securing and leveraging the funds required for different types of R&D activities.
   d. It should address **organizational mandates** related to education, basic and applied research, public and proprietary knowledge. In parallel with this, mechanisms for **integration and collaboration** have to be designed and implemented.
   e. **Dissemination and sharing of information**. It should establish an agreement between stakeholders on procedures and mechanism for greater dissemination and sharing of R&D information.
   f. **Science-based development**. The protocol should outline what R&D stakeholders will do to support the development of human resource capacity and infrastructure required for R&D performance.
   g. Finally the Protocol also has to define the **specifications for the forest sector R&D strategy**. This would include both the content and process for developing and reviewing such a strategy.

8. This Report consists of two parts. The first Part is a 15 page section outlining the project; summarizing the current state of Forest Sector R&D in SA; summarizing the constrains, challenges, opportunities and strengths of the sector; and proposing a Roadmap for the development and implementation of a national forest sector R&D strategy. The second part consists of a set of data-intensive Appendixes that provides in-depth analysis of the various components of the Document.

9. The purpose of this document is to obtain stakeholder comment on the data, analysis and conclusions presented here. In particular, we are interested in stakeholder opinion on the content of a Protocol for Forest

Sector R&D and the process to be employed in developing such a Protocol. **We would appreciate your feedback by 29 August 2005.**

We are thankful to the large number of forest sector R&D sector stakeholders who have contributed to this document through time and other resources made available, and in particular Dr. Colin Dyer of the ICFR and Mr Louis Heyl and Mr Ralph Triebel of LHA Management Consultants.

We welcome feedback and suggestions!

Please direct all comments and questions to:

Mr Jackie Crafford
Zeta Consulting
jcrafford@telkomsa.net
011 792 6939

Ms Pumeza Tunzi
DWAF
1au@dwaf.gov.za
012 336 8054

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1. Introduction

1.1 Project Goals and Terms of Reference

The Department of Water Affairs and Forestry (DWAF) is evaluating the current state of the South African forest sector research and development (R&D), and the expert opinions of forest sector stakeholders on future research requirements. The purpose of this exercise is to better understand how to facilitate forest sector research in order to elevate research outputs for the whole forest sector value chain and subsequently stimulate an increase in research programs. *A strong forest sector must be internationally competitive and has a significant development footprint. Effective research and development is an investment in science and technology which play an important role in keeping the forest sector strong.*

DWAF has subsequently commissioned a study that could ultimately lead to the development of a research protocol and research priority framework for forest sector R&D. The envisaged research protocol will outline:

- A strategic approach to Forest Sector Research;
- A priority framework for sector research;
- Responsibilities of different stakeholders in forest sector research and funding;
- Mechanisms to co-ordinate / support research and promote collaboration among the public sector, business, research institutions, researchers and practitioners;
- Mechanisms to promote greater equity and effective skills and knowledge transfer in the forest sector research community; and
- Mechanisms that will maximise the impact of forest sector research to the benefit of those who commission research and to the long term strategic benefit of the sector and the country as a whole.

The first phase of the study involves the mapping of current forest sector R&D activities, and conducting key stakeholder interviews with the following objectives:

- **Objective 1:** Map the forest sector research field in terms of: Current research activities; Research focus areas; Institutional responsibilities; Budgets; Sources of funding; and Research outputs.
- **Objective 2:** Undertake a stakeholder analysis of: The strategic issues and challenges facing the forest sector and the implications of this for forest sector research; Sector research opportunities and constraints, priorities and responsibilities.

In a classical strategy formulation process, the points of departure are to thoroughly understand the current reality and the desired future. Objectives 1 and 2 above provide current reality and desired future information respectively, and will therefore form the basis of formalizing a strategic approach to a forest sector R&D protocol or strategy. This will be the purpose of the second phase of the study.

1.2 What is the Forest Sector?

1.2.1 Definition

The White Paper on Sustainable Forest Development and its instruments, the National Forests Act and the National Forestry Action Programme, take an inclusive policy position on the forest sector. That is, the forest sector is seen as the totality of sources of forest goods and services enjoyed by South Africans, including timber and non-timber forest products, as well as environmental, social and spiritual goods and services.

In terms of the National Forests Act (1998), forests include all natural forests, plantations and woodlands as well as the forest products produced from it. This project therefore defines the forest sector to comprise of activities relevant to these three forest types. Furthermore, for the purposes of this project, the forest sector is defined to include these three categories of forest resources, as well as the primary processing of all timber and non-timber forest products derived from them (DWAF, 2005).

Section A.1 in Appendix 1 provides a more detailed description of the South African Forest Sector.

1.3 What is R&D?

Research creates new knowledge. Two areas of research are commonly defined: *basic* and *applied* research. Basic research aims at obtaining better comprehension without considering a direct use of the new knowledge in practice. Applied research aims at obtaining results of practical use (Koch, 2004).

Development converts new knowledge into useful products or processes. These are often of commercial value and are associated with technology development.

1.4 Project Approach

- Literature surveys and extensive stakeholder surveys were conducted to assess future forest sector R&D research opportunities and constraints, priorities and responsibilities. Stakeholders were classified into two broad categories: research performers and funders/strategic stakeholders.
- Based on the outputs of the above surveys, a stakeholder workshop was held on 14 July 2005, to obtain a strategic insight into Forest Sector R&D requirements.
- This report was developed out of the above process.

2. The Current State of Forest Sector R&D

2.1 In South Africa

Forest Sector research is mainly conducted in-house by forestry companies, by research institutes, science councils and universities and technikons. Table 1 was adapted from Dyer et al (2004) and identifies the major forest sector research performers in South Africa, and summarises their focus areas.

Table 3: Forest sector R&D capacity and their focus areas.

Category	Institution	Focus Area
Universities and Technikons	University of Cape Town	Forest ecology, Global change
	University of the Western Cape	Land reform
	Nelson Mandela Metropolitan University (Saasveld)	Fire Ecology, Wood Science Forest Engineering
	Rhodes University	NTFPs
	University of KwaZulu-Natal	Silviculture Forest Management Community Forestry
	University of Pretoria	Forest Biotechnology Forest Pathology & Entomology Renewable energy
	University of Stellenbosch	Forest Science, Forest Engineering Wood Science, Conservation Renewable energy
	University of Witwatersrand	Nutrient dynamics Ecology of Forests and Woodlands
Science Councils	ARC	Biological control of weeds and invasive plants
	CSIR - Environmentek	Tree Improvement Wood Quality, Water use
Forestry Research Institutes	SA National Biodiversity Institute	Forest protection Global change
	ICFR	Tree Improvement Silviculture, Forest Engineering
	Institute for Natural Resources (INR)	NTFPs, Economics, Social aspects Environmental aspects
In-house Research	Komatiland Forests	Tree Improvement Forest Management Wood Quality
	Hans Merensky Holdings	Tree improvement
	Mondi	Tree Improvement Forest Management Fiber properties Pulp & paper
	Sappi	Tree Improvement Forest Management Fiber properties Pulp & paper

The major research focus areas are presented in more detail in Table 4. It has to be highlighted that within the various research focus areas, complex fields of specialization exist, the exact nature of which is not shown in Table 4.

Table 4: South African forest sector R&D focus areas and description of their typical contents.

Research Focus Areas	Typical R&D Contents
1. Industrial Roundwood Production	
Silviculture	Tree improvement, establishment, vegetation management, forest nutrition, productivity, mensuration, growth and yield, forest protection
Forest Engineering	Harvesting, transport, fire protection, ergonomics
Forest Management	GIS and remote sensing, planning
Natural Forests	Indigenous roundwood production
2. Non-industrial Roundwood Production	
From Natural Forests	Fuelwood, building materials, community benefit
From Woodlands	
3. Industrial Roundwood Processing	
Fiber properties	Resource optimization, fibre use, productivity, energy consumption, waste utilization, new product development, etc
Pulping	
Other fiber processing	
Saw milling	
Composite products	
Other	
4. Non-timber Forest Products	Medicinal plants, Food (e.g. bee-keeping, ferns/foliages), Tourism
5. Policy & Legislation Issues	Governance, regulation, legislation, compliance
6. Economic Issues	Forest economics, taxes and subsidies, SME development, resource economics)
7. Environmental Issues	Ecosystem functioning, pollutant treatment, carbon sequestration, water use, biodiversity protection
8. Social Issues	Poverty reduction, HIV/Aids, labour matters
9. Other	

The following important aspects emerge from the survey conducted:

- Total annual forest sector R&D investment in South Africa is approximately R163 million; more than 80% of which is funded by the commercial forest industry.
- Total forest sector R&D investment in South Africa is low by international levels. The following table shows how South African R&D spend per cubic meter roundwood harvested compares to the United Kingdom, Finland and Australia (IUFRO, 2004; and various internet sources).

	Annual Harvest (million m3)	R&D Budget (R million)	R&D / cubic meter
United Kingdom	10	276	27.6
Finland	83	1370	16.5
Australia	16	1110	69.4
South Africa	18	163	9.0

- Forest Sector R&D investment on Industrial Roundwood Production and Processing is low (0.65% of turnover) by generally accepted international benchmarks (normally >1% of turnover).
- Forest Sector R&D investment in fuelwood & NTFP is especially low at 0.20% of value generated.
- Forest Sector R&D investment in basic research is concerningly low.
- The high levels of applied research done indicate towards a high degree of proprietary knowledge generated. This would prevent peer review processes and research output dissemination.
- Research activities and objectives are geared towards industry goals, which in turn would be determined by investor expectations. Government and Higher Education Institutions "play" approximately only 10% of the forest sector research sector role.

2.2 International Trends

International **trends in Forest Sector R&D (See Appendix 1 for full Literature Survey)**:

- A trend apparent in almost all major forestry countries is a strong move towards sustainable forest management, which has influenced education curricula and research priorities to shift in focus somewhat towards sustainability issues. This has been especially evident in the countries that rely on natural forests for industrial roundwood production.
- Forestry education and research organizations are being swallowed by larger departments with strong molecular biology or environmental science programs (these focus areas currently attract increased research support). It is reported that the traditional "Forestry Identity" associated with many universities is gradually disappearing.
- Research funding has been increasingly channeled towards "new economy" R&D such as the information technology sector.
- A declining role of the public sector in forest management is observed.
- With a few exceptions, a declining student numbers in forestry is noticed internationally.
- A declining skills base in forestry science is evident in most countries.
- There appears to be a move from basic to applied forestry science practices.
- Emergence of large multi-national corporations, especially in the pulp & paper sector has been evident. There has subsequently been a trend

where large companies are providing increasing in-service and short-course training and education to address skills shortages.
- There has been an increasing emphasis on community participation and transfer of ownership and management to local communities.
- There seems to be an increasing role of non-governmental organizations in social and environmental aspects of forestry has been observed.

2.3 Overall conclusions from this study and their implications

There is a relatively strong institutional base for forest R&D in SA, but this is mostly in the hands of traditional forestry institutions, especially the forestry corporates. On the whole, the educational system is delivering too few forest scientists.

Forest research in South Africa is overwhelmingly supported by funding from the private sector. While in developed countries the private sector is rightly the main funder of R&D, too low an investment by government means that the public good suffers in many ways, but especially where the forest sector serves development, i.e. in poverty eradication, enterprise development, and the provision of public-good services such as global change mitigation, biodiversity protection, and water catchment protection. However, underinvestment by government in the industrial roundwood segment also has undesirable costs, such as inadequate intellectual property in the public domain (which would disadvantage SMEs etc), a skewness in R&D thrusts (e.g. underinvestment in forest protection), excessive reliance among smaller enterprises on technology spillover from the corporate sector, and inadequate strategic coordination and thus weak global competitive ability. Non-private investment will decline further with the imminent departure from the sector of international development agencies, which contribute about 6% to forest sector R&D spend.

R&D in industrial roundwood production is well funded, though the contribution by government is too small (see above). In addition, the program is not balanced, with weaknesses e.g. in forest protection. Further, there is inadequate overall strategic coordination by global standards. There is an inadequate level of integration between research on production and research on product quality and innovation.

R&D in the non-industrial roundwood and non-timber forest products, as well as the social and environmental focus areas is hopelessly under-funded, given that the contribution of activities in these segments to national welfare is of the same order of magnitude as that of the industrial roundwood segment. This leads to severe under-contribution from the sector to the public good, especially poverty eradication, development, and environmental sustainability.

R&D investment in primary processing is below par from a competitive sector, resulting in excessive reliance on spillover from a few developed countries, and to the strong disadvantage of SMEs.

Basic R&D overall is very weakly funded, reflecting again government's weak role. The large R&D investment in applied research generates mostly proprietary information, which is not open to peer review and reduces dissemination of research outputs. This has diverse costly consequences, such as poor overall awareness of the sector and its issues, weak debate and idea generation, poor policy thinking, etc.

Tertiary forest sector education appears to be in a crisis with too few students, bursaries, and related R&D funding. A healthy forest sector education system underpins the development of research capacity and leadership in science and technology. The linkage between education and R&D is of crucial importance.

3. Summary of the Challenges, Constraints, Strengths and Opportunities facing the Forest Sector – Why do we need to invest in Forest Sector R&D?

3.1 Background

Forest Sector stakeholders have raised a number of significant challenges, constraints, strengths and opportunities that the future holds for the forest sector. These have been captured comprehensively in Appendix C (Sections C.1-C.4). In the following table, this information was used to develop a Future Paradigm for the Forest Sector in South Africa, that explores the changing nature of forestry. This Future Paradigm (it has to be emphasized that this is not a Scenario planning exercise, but merely a summary of stakeholder opinion) tells the story of increasing pressures on natural resources which will require much more emphasis on renewability and sustainability. Human capital and new technologies will have to be developed to adjust to this paradigm, while dealing with uniquely South African challenges related to poverty eradication, landscape management and enterprise development. The Future paradigm will not shift away from the Old and Current paradigms, but will rather incorporate both the Old and Current paradigms into a new set of goals. It is suggested that the forestry paradigm is changing and that research should be directed in support of these changes.

Conceptual categories	**Assumptions**		
	Old Paradigm (1850's – 1970's)	**Current Paradigm (1970's- present)**	**Future Paradigm (2020?)**
Key Paradigm Characteristic	Industrial revolution	Environmental conservation	Renewability and Sustainability
Key forestry objective	Maximum fiber harvest	Sustainable forest management	Sustainable bio-refinery[1]
Key constraints to achieving forestry objectives	Technology, infrastructure, capital	Natural resources	Natural resources, Human capital
Social paradigm in SA	"Old South Africa"	Transition	Poverty eradication, Landscape management, Enterprise development
Technology perspective	Industrial development	Information revolution	Technology revolution (Biotechnology, ITC, nanotechnology)

Sources: Adapted from Rebugio et al, 1998.

[1] **The Forest Bio-refinery**: ***Rationale*** - Paper especially is a commodity and producers will not be able to make significantly higher margins, we therefore have to focus on waste beneficiation. ***Opportunity*** – Use of lignin (for other uses than just energy) and extractives. Forest companies can become "Sasols".

3.2 Commercial Forestry

The commercial forest industry ("industry") is a major rural job and wealth creator for South Africa, which is estimated to economically support nearly 2% of South Africa's population. The continued development and growth of this industry requires significant innovation and efficiency gains in future, principally to deal with increasing raw material (roundwood) scarcity in the face of limited natural resources (land, water, biodiversity). The industry requires constant innovation to increase productivity and reduce costs within a globally competitive market. Full resource use (the bio-refinery concept), new technology development (especially within the fields of biotechnology, information technology and nanotechnology) and new product development form key elements of innovation. Although a number of pockets of excellence exist within this area, R&D is under-funded by international benchmarks, especially in areas of innovation such as new product and process development.

3.3 BBBEE

Broad-based Black Economic Empowerment (BBBEE) is a key feature on the development agenda of South Africa, and has thus far attracted much criticism for lack of broad-based impact. DWAF has developed forest enterprise development (FED) initiatives and is also in the process of facilitating a forest sector BBBEE charter. BBBEE and FED within the industry face severe implementation challenges over the next decade with respect to issues such as land reform, technology transfer, and human resource development. Although organisations such as FIETA and the industry (through the Contractors Productivity Initiative and the outgrower schemes) are investing in human resource development, little R&D investment into these issues is done. If this situation continues, South Africa may not be able to obtain critical information required to speedily resolve these issues.

3.4 Poverty Eradication

Poverty eradication in rural areas is major challenge. With forestry having such a large rural footprint, the impact of forestry to play a role in poverty eradication is significant. A significant number of informal economic activities (estimated between R3-4 billion in household income annually from NTFP and fuelwood) support a large poor rural population. R&D investment in support of these stakeholders has recently been funded mostly by international donor agencies, but is expected to fall away as these agencies move their activities elsewhere.

3.5 Environmental Sustainability

Forest Sector development and growth have to take place within the context of increasing environmental resource scarcity. Although significant research has been directed towards the water consumption of mostly commercial plantations, little or no attention has been paid to other aspects that threaten the

productivity of the forest sector. Biodiversity impact, water quality impacts, and sustainable harvesting of NTFP and fuelwood have received some research attention, but require much more R&D in support of developing management practices and technologies for sustainable sector development. In addition, the potential impact of climate change on forest sector productivity, is a major strategic field of study that is receiving little or no R&D investment.

4. A Roadmap for a Forest Sector R&D Strategy – An interpretation of Stakeholder Opinion

This section combines information sourced from extensive stakeholder feedback received, international lessons and literature into a Roadmap for a Forest Sector R&D Strategy (hereafter referred to as "the Roadmap"). The basic structure, including Vision and Goals, for the Roadmap was designed during a Stakeholder workshop held on 14 July 2005 in Irene, Pretoria; and was further developed by the project team. The method and outputs of this Workshop, survey and Workshop participants are described in Appendix D. The purpose of the Roadmap is to summarise the wide range of stakeholder opinions received into a descriptive picture.

4.1 Vision

"An adequately resourced R&D infrastructure, wherein strategically planned RFA's are addressed; supports a healthy forest sector."

4.2 Intermediate Objectives

Figure 1 presents the Roadmap for a Forest Sector R&D Strategy. The Roadmap consists of 14 Intermediate Objectives (IO's), which, if successfully achieved, will allow the Forest Sector to reach the above-stated Vision.

IO 1: Leadership & Support for Forest Sector R&D within Government and Industry exists

This is the most crucial aspect of the Roadmap. Without visionary, strong and committed situational leadership, a Forest Sector R&D Strategy is doomed to become yet another document on a shelf. Role definition and commitment to responsibilities has to be obtained for developing and implementing a forest sector R&D strategy. Generally speaking, Government is the custodian of public social, environmental and economic welfare and Industry is required by to their shareholders to responsibly invest in forest sector development. It is proposed that leadership and support roles and responsibilities be formalized in the form of a Protocol for forest sector R&D.

IO 2: There is an agreed-upon R&D Strategy

One of the first outputs to follow from the Protocol, will be a strategy document and implementation plan for forest sector R&D. This will be a living document, developed and owned by the people and organizations that are responsible for its implementation. Some of the elements of the Roadmap presented here may serve as components of such a strategy.

IO 3: Research Focus Areas are well-designed

An important and implicit part of the Vision and Roadmap is to have comprehensive and well-designed Research Focus Areas (RFA's). It is envisaged that a mechanism for developing RFA Map will be developed and implemented. Such a RFA Map could, ***indicatively***, consist of three tiers. The **first tier** is envisaged to consist of a relatively small number of broadly-defined priority research fields which comprise the challenges, constraints, strengths and opportunities of the Forest Sector. The **second tier** is envisaged to broaden the first tier priority research fields into research problem areas. The **third tier** could consist of detailed and very specific research focus areas. Such an RFA Map could provide structure to the technical research agenda; and would provide insight into capacity requirements in basic and applied research, and technology development. It is based on well-established methods of R&D program design[2].

IO 4: An agreed-upon Business Case for R&D exists

A common understanding between R&D Funders and R&D Performers of the importance and relevance of R&D programs is required. Business cases for education, basic research, applied research and technology development are therefore required and may vary across the RFA Map. This Intermediate Objective is of extreme importance as it is here that the financial value of the R&D activity is determined.

IO 5: Adequate Funding & Funding Mechanisms exist

If the business case for Forest Sector R&D in various RFA's have been agreed upon, adequate funding is required to commission Forest Sector R&D. This Intermediate Objective is of extreme importance as it is here that the "R&D sale" is made. This IO also has a "dotted line" linkage to IO 9 ("A World Class R&D Capacity Exists"), as the ability of the R&D Performer is at least as important as the R&D Business Case in making the funding decision. Appropriate funding mechanisms have to be considered. These may vary depending on the business case, whether basic or applied R&D is conducted or may vary according to the organisational nature of particular R&D performers. Appropriately designed funding mechanisms may also be used to manage R&D performance.

[2] Holz als Roh und Werkstoff, Vol 39; pp 33-39.

IO 6: Systems are in place to support R&D activities

Efficient systems form the backbone of successful organizations. Efficient systems ensure discipline, provide information, and reduce transaction costs. The implementation of a well-networked, collaborative national Forest Sector R&D Strategy will require smart, tailor-made systems. This **could** include for instance:

- A Knowledge management system.
- An inter-institution ICT platform for knowledge sharing and/or low-cost communication (perhaps Voice-Over IP).
- Regular Performance and/or R&D Output Reporting through appropriate media.
- International peer review processes to ensure quality and to retain objectivity.

IO 7: R&D efforts are integrated & co-ordinated

One of the most important requirements by more than 90% of stakeholders was higher levels of integration and co-ordination between R&D Funders and Performers. It is proposed that a network of "Centres of Excellence" may facilitate integration and co-ordination. Although the existing Centre of Excellence funding model of the NRF would only be applicable to Higher Education Institutions, it is envisaged that other mechanisms or models may be applicable elsewhere. A Precedent for this already exists within the NRF. The advantages of a network of Centres of Excellence are amongst others that it: provides flexibility for innovation (i.e. the development of new Centres); attracts good people; facilitates human resource development, basic and applied research; and that it provides the capacity for good R&D (and therefore also attracts funding)[3]. It is also envisaged that Excellence Networks can be built with institutions outside of the current/traditional forestry value chain (e.g. biotechnology, nanotechnology, ICT, social sciences, aeronautical engineering, financial engineering, etc). Within this network; roles, responsibilities and performance criteria have to be developed to ensure network performance.

IO 8: An appropriate World Class Education System exists

Stakeholders generally have expressed the desire for the forest sector to pro-actively identify the human resource capacity (numbers and skills) required on an average annual basis, and then to equip students with World Class skills require both within the R&D context, and within a general technical and management context.

[3] South Africa's National Research & Development Strategy, August 2002, Department of Science & Technology.

IO 9: An appropriate World Class R&D Capacity exists

If IO's 5, 6, 7 and 8 are in place, South Africa would have a World Class Forest Sector R&D Capacity.

IO 10: R&D Performance is exceptional

If IO's 6, 7 and 9 are in place, South Africa would produce exceptional Forest Sector R&D performance. Exceptional performance will in turn also feed higher levels of investment into R&D.

IO 11: Support is provided to the Forest Sector

Finally, the R&D outputs have to be effectively disseminated to corporate forestry companies, SME's, relevant poor people and society. Such support has to be measurable.

4.3 Assumptions

Forest sector R&D stakeholders have identified a number of key factors which underpin some of the Intermediate Objectives described above. These factors are external to a forest sector R&D strategy, and are therefore treated as assumptions in the Roadmap.

A 1: The commercial forest industry is viable and understands its impact on society

Stakeholders have indicated that, as a point of departure, it is assumed that a viable forest sector exists, which has significant growth prospects, and which broadly understands its importance to and impact on society.

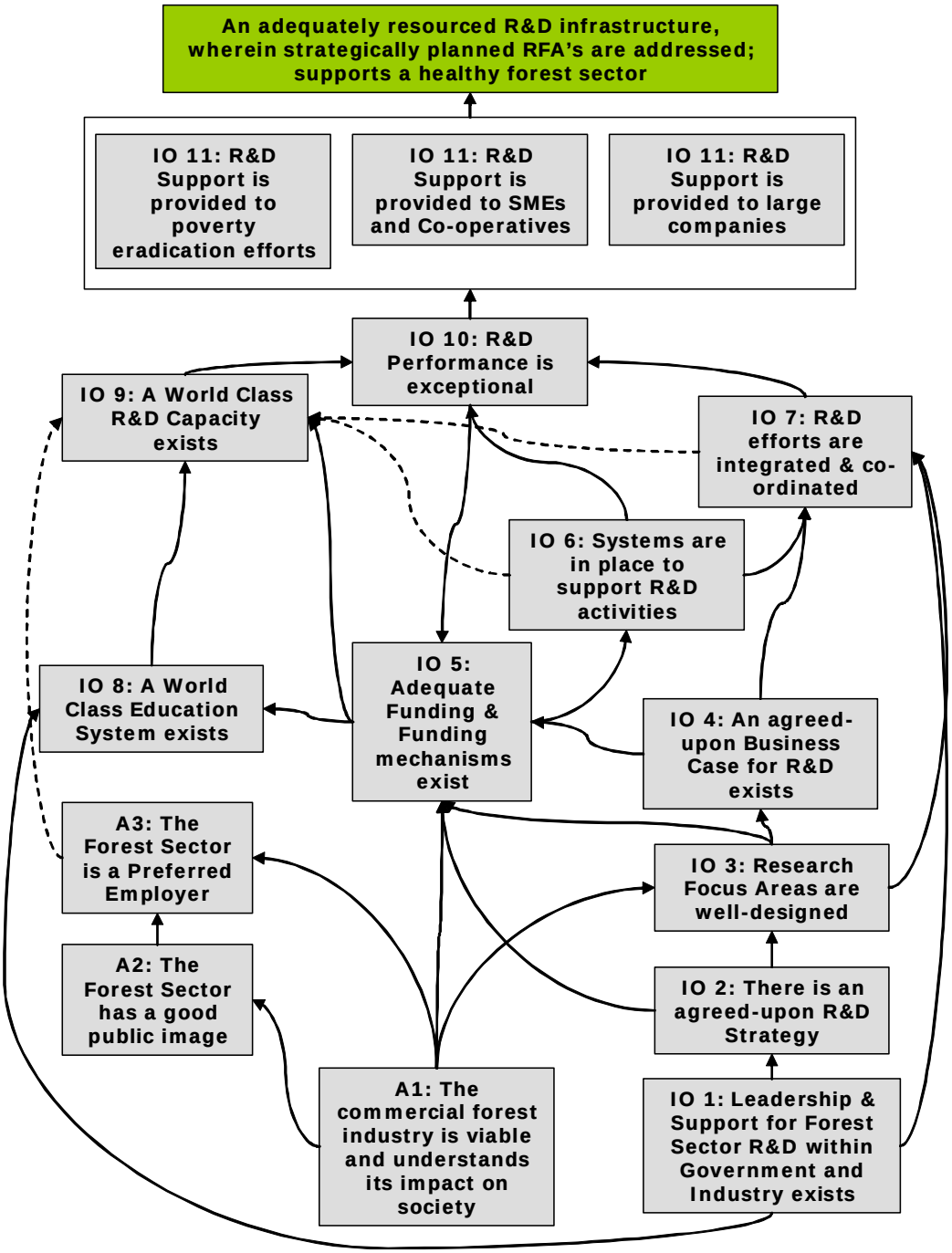
A 2: The Forest Sector has a good public image

Forest Sector R&D stakeholders have expressed strong concerns about the apparent poor public image of the Sector. Success in any venture thrives on the talent of individuals, and therefore the Sector has to attract talented individuals.

A 3: The Forest Sector is a Preferred Employer

In the last decade financial institutions have dominated the list of preferred employers in South Africa. The Forest Sector need not necessarily compete with other sector as a preferred employer, but targeted approach is required to identify, attract and keep top R&D talent.

Figure 1: A Road Map for a Forest Sector R&D Strategy

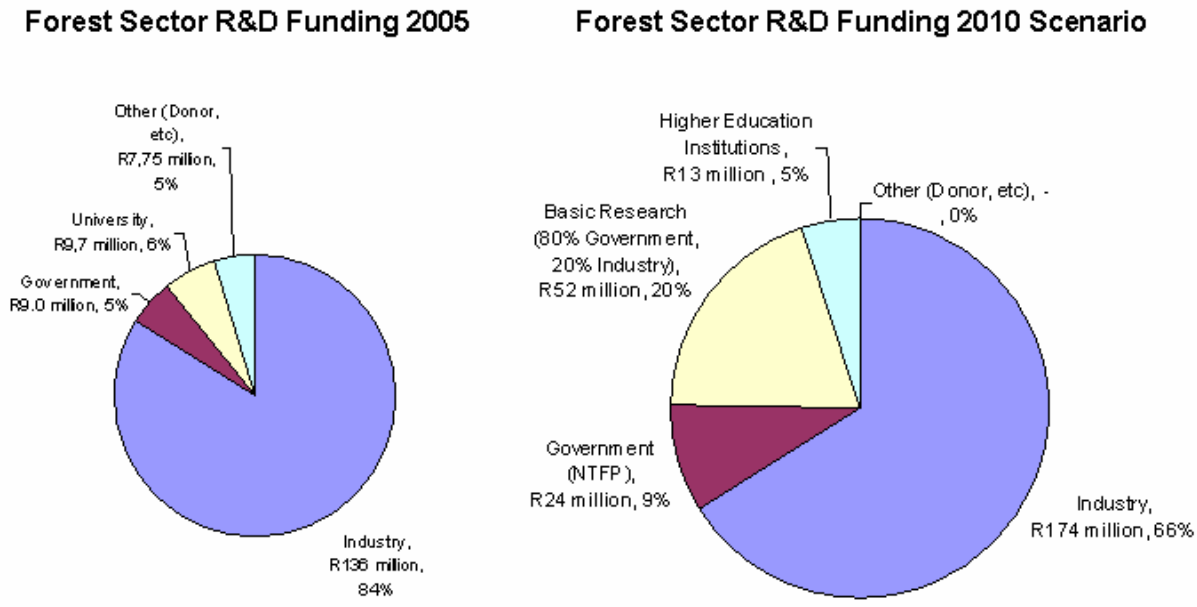


4.4 Future Funding Considerations

Figure 2 demonstrates a challenging scenario of Forest Sector R&D Funding that may be required to be achieved as part of the proposed Forest Sector R&D Roadmap. The current sources of funding (2005) is shown in the left-hand pie-chart. A 2010 Scenario is presented in the right-hand pie-chart. The following assumptions have been made for the 2010 Scenario:

- The Forest Industry maintains an R&D investment of ~0.65% of total forest sector revenue produced but grows at 5% per year (=R174 million);
- Government makes an R&D investment of ~0.60% in the fuelwood and non-timber forest products, a R4 billion "second economy" (=R24 million);
- Government and Industry supports Basic Research to the tune of 20% of the total Forest Sector R&D portfolio (=R52 million);
- Higher Education Institutions maintain their current R&D investment but grows at 5% per year (=R13 million);
- Donor funding is assumed to reduce to zero as donor agendas steadily focus away from South Africa.

The 2010 scenario shown below therefore amounts to approximately R260 million of R&D investment; or ~0.8% of total forest sector revenue generated - with the major growth originating from the Government segment. The assumptions made may not be realistic and may be debated, yet it is targets such as these that have to be committed to as part of the forest sector R&D startegy.



5. Towards a Protocol for Forest Sector R&D

5.1 Rationale

Strong rationale exists for developing a forest sector R&D protocol.

Of prime and most significant importance is the restructuring of scientific and technological research in South Africa by the Department of Science and Technology (DST), in line with SA's National R&D Strategy. This requires that Sector R&D strategies needs to be prepared to secure ongoing government support and funding. This will entail that DWAF will once again become directly responsible for setting the public forest sector R&D agenda and funding it. However, since DWAF does not have a single point of entry into forest sector R&D (such as the Water Research Commission which is the point of entry for water research); a formalized strategic approach is required to direct this process. The DST will therefore require a Protocol and Strategy as the basis for approving a Government R&D budget for the forest sector.

Furthermore, a strong desire has been expressed by Forest Sector R&D stakeholders for formalising collaboration within and between education and R&D activities to a greater extent. This desire is based upon the need to address the challenges and constraints discussed in section 3 above. There is already a strong institutional base, infrastructure, track record and momentum for forest sector R&D in SA. Within the commercial forest sector SA has two multi-national forestry companies which supports Forest Sector R&D, and has a good economic infrastructure and modern fiber processing equipment which forms an excellent basis for innovation. Within the NTFP and fuelwood sectors, a number of South African and international study programs and NGO activities have been supported by donor and other funding. These initiatives may serve as the basis for further work. South Africa also has a strong academic system, with a wide range of scientific expertise. Exciting science and technology opportunities therefore exist which have to be explored to address the challenges faced by the Forest Sector.

5.2 Content

The first step to addressing the constraints and challenges to forest sector R&D identified in this Report, is the development of a joint agreement between Government and Industry leadership and other relevant stakeholders in the sector R&D community on the way forward. It is envisaged that the Protocol will be a legal document where-in signatories will commit to specific responsibilities. Such an agreement, or Protocol, should address a number of important elements:

a) It should **identify roles and responsibilities** associated specifically with leadership requirements of sector R&D. These role-players will be the signatories of the Protocol and will commit themselves to co-operation

and to various responsibilities within the development and implementation of forest sector R&D.

b) It should define the elements required to identify **areas of sector R&D investment**. This would include mechanisms for identifying, prioritising and updating research focus areas (RFA's) and business case rationale for motivating R&D investment within RFA's. A common understanding between R&D Funders and R&D Performers of the importance and relevance of R&D programs is required. Business cases for education, basic research, applied research and technology development are therefore required.
c) It should consider methods of sourcing **funding and other resources** required for R&D performance. Government and Industry are the main sources of these funding. This would include also funding mechanisms that supports sustainable R&D activities. These may vary depending on the business case, whether basic or applied R&D is conducted or may vary according to the organisational nature of particular R&D performers.
d) It should address **organizational mandates** related to education, basic and applied research, public and proprietary knowledge. In parallel with this, mechanisms for **integration and collaboration** between various organizations need to be designed and implemented.
e) It should establish an agreement between stakeholders on procedures and mechanism for **greater dissemination and sharing of R&D information**.
f) It should address the development of **science and technology capacity**. The forest sector education system builds capacity in human capital and other R&D infrastructure. This forms the long term backbone of R&D and its dissemination. Stakeholders generally have expressed the desire for the forest sector to pro-actively identify the human resource capacity (numbers and skills) required on an average annual basis, and then to equip students with World Class skills require both within the R&D context, and within a general technical and management context.
g) Finally the Protocol also has to define the **specifications for the forest sector R&D strategy**: how it should be developed, implemented and updated.

REFERENCES

Blignaut, J.; Hassan, R.M. (2004): **Natural Resource Accounts and their application in South Africa.** In: Sustainable Options – Development lessons from applied environmental economics, J Blignaut & M de Wit (Ed). UCT Press.

Clarke, J; Foy, T; (1997): **The role of the forest industry in rural development and land reform in South Africa.** Commonwealth Forestry Review 76(3): 175-178.

Department of Science & Technology (August 2002): **South Africa's National Research & Development Strategy**, www.gov.za

DWAF (2005): **Terms of Reference: forest sector Research Map & Stakeholder Analysis Project**. Department of Water Affairs and Forestry, March 2005.

DWAF 2005a: **Draft Key Issue Paper on Forestry and Poverty is South Africa.** Department of Water Affairs and Forestry, March 2005.

DWAF 2005b: **Key Issues Paper on Fuelwood Energy.** Department of Water Affairs and Forestry, March 2005.

DWAF 2005c: **Key Issues Paper on Forestry Enterprise Development.** Department of Water Affairs and Forestry, January 2005.

Dyer, C.; Wingfield, M.J. (2004): **Challenges and Strategies facing Forest Research and Education for the 21st Century: A Case Study from South Africa?** In: Proceedings - Forest Research and Education for the 21st Century, IUFRO.

Hoeflich, V.A. (2004): **Forest Research and Education System in Brazil: a preliminary overview.** In: Proceedings - Forest Research and Education for the 21st Century, IUFRO.

Holz als Roh und Werkstoff, Vol 39; pp 33-39.

IUFRO (2004): **Proceedings of International Symposium on "Forest Research and Education for the 21st Century"**. October 12, 2004 / Seoul Education & Culture Center, Seoul, Korea.

Moneyweb (2004): **Cashbuild benefits from property market buoyancy.** www.moneyweb.co.za/news/industrials/383722.htm (25 Aug 2004).

Koch, N.E. (2004): **How can Forest Management and Society get more out of Forest Research and Education? – The Danish Example.** In: Proceedings - Forest Research and Education for the 21st Century, IUFRO.

Pelkonen, P. (2004): **Challenges and strategies for forest education and research in Finland.** In: Proceedings - Forest Research and Education for the 21st Century, IUFRO.

Rebugio, L.L. (1998): **Paradigm Shift: The key to sustainable forestry and environmental resources management.** Asian Journal of Sustainable Agriculture. Vol. 1 No. 1.

Shougong, Z. (2004): **Challenges and strategies for forest research and education in China.** In: Proceedings - Forest Research and Education for the 21st Century, IUFRO.

Van der Zel, DW; Brink, AJ; 1980: **Die geskiedenis van bosbou in Suid-Afrika, Deel II - Plantasiebosbou**; SA Forestry Journal no 114, 115 September 1980

Vander Zel, DW; 1989: **Strategic Forestry Development Plan for South Africa**, Department of Environment Affairs (Forestry is now resorting under DWAF); South Africa.

WFSP Forestry Programme (2004): **Roundwood Supply and Demand for 2030.** Prepared by LHA Management Consultants.

APPENDIX A: Literature Survey

This section sets the context within which priorities for forest sector R&D have to be developed. It describes international trends in forest sector R&D, summarises the history of forestry and forest sector R&D in South Africa and introduces the economic, developmental (social) and environmental aspects relevant to the forestry sector.

A.1 Description of the Forest Sector in SA

Table 1 describes the nature and extent of forests in South Africa. The roundwood produced in industrial plantations is the main source of fiber and timber for the value chain. Industrial roundwood production and the primary processing activities using this roundwood generate more than 90% of the revenue in the value chain, though it represents only about 60% of roundwood consumption in the country. Use of roundwood for fuel, construction and other purposes in rural livelihoods accounts for the additional volume consumption.

Timber for this purpose as well as and non-timber forest products are largely non-traded or traded within an informal market system, and these are therefore not easily valued.

For these reasons, in this report we distinguish between roundwood segment of the sector on the one hand, and the non-industrial roundwood segment on the other, as well as providing for the segments that include non-timber forest goods and services.

Table 1: The nature and extent of forests in South Africa.

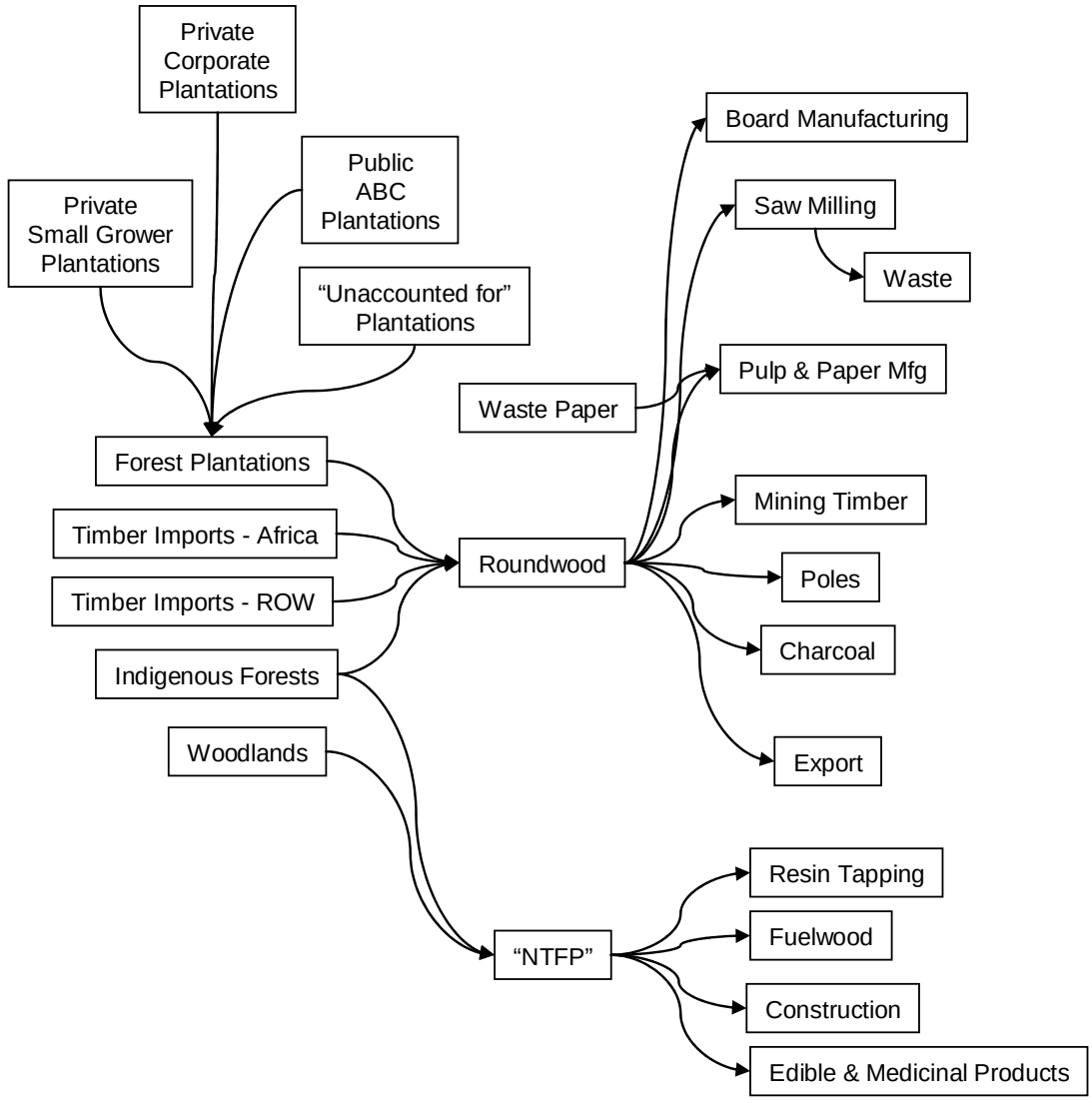
Forest Type	Structural Description	Extent (ha)
Natural Forests	Closed canopy with two or more tree layers; many species and age classes; typically 5-20m tall; fires penetrate only rarely.	534,000
Plantations	Single species (usually pine, eucalypt or wattle), single age class, regular spacing.	1,372,000
Woodlands	5 to 99% canopy cover; usually a tree and/or shrub layer and grass layer; regular fires.	29,000,000

Source: Dyer et al, 2004

Forestry and forest products in the industrial roundwood segment contribute significantly to the South African economy. Figure 1 summarises the South African value chain. Plantation forestry and its products contribute 1.2% to GDP, earn R4.8billion in foreign exchange, and directly and indirectly employ in excess of 500,000 people (Dyer et al, 2004) (see Table 2 for more information). Furthermore, it is largely a rurally based activity which plays a significant part in the rural economy.

The net economic contribution of fuelwood and non-timber forest products was estimated at R2,8 billion per annum by Blignaut and Hassan (2004).

Figure 1: The South African Forest Sector value chain showing forest products and primary processing production activities.



The revenue generated in the value chain has been quantified as follows for 2004:

Table 2: Revenue generated in the South African Forest Sector value chain in 2004.

Activity	Annual Revenue Generated (R million)
Industrial Roundwood Production*	4,000
Roundwood & Chip Exports*	500
Board Manufacturing*	2,000
Saw Milling*	2,000
Pulp and Paper Production*	12,000
Mining Timber*	800
Charcoal Production*	800
Pole Manufacturing*	2,000
Fuelwood & Non-Timber Forest Products**	2,800
Total	26,900

Sources: *WFSP, 2004; **Blignaut & Hassan, 2004

A.1.1 International Trends in Forest Sector R&D

In October 2004, the International Union of Forest Research Organisations (IUFRO) held a conference titled "Forest Research and Education in the 21st Century" (IUFRO, 2004). The conference highlighted a general declining state of professional forest sector education. This decline was closely linked to declining research activities, and decreasing employment opportunities in the forest sector. Out of the eighteen countries that presented papers on the state of their respective national forest sector research and education activities, only China and the Central and Eastern European Counties (CEEC) reported significant increases in forest sector education and research activities.

The conference highlighted a number of important (apparently international) **trends**:

- A trend apparent in almost all major forestry countries is a strong move towards sustainable forest management, which has influenced education curricula and research priorities to shift in focus somewhat towards sustainability issues. This has been especially evident in the countries that rely on natural forests for industrial roundwood production.
- Forest Sector education and research organizations are being swallowed by larger departments with strong molecular biology or environmental science programs (these focus areas currently attract increased research support). It is reported that the traditional "Forestry Identity" associated with many universities is gradually disappearing.
- Research funding has been increasingly channeled towards "new economy" R&D such as the information technology sector.

- A declining role of the public sector in forest management is observed.
- Declining student numbers in forestry is noticed internationally.
- A declining skills base in forestry science is evident in most countries.
- There appears to be a move from basic to applied forestry science practices.
- Emergence of large multi-national corporations, especially in the pulp & paper sector has been evident.
- Industrial companies are providing increasing in-service and short-course training and education to address skills shortages.
- There has been an increasing emphasis on community participation and transfer of ownership and management to local communities.
- There seems to be an increasing role of non-governmental organizations in social and environmental aspects of forestry has been observed.

The conference emphasized the following **priorities** for forestry R&D:

- The importance of a solid academic and scientific base to ensure long term development of theoretical and methodological knowledge.
- A close association is required between education, research and practice to ensure continuous relevance of education and research activities.
- The importance of integrating environmental issues into the forestry education and research syllabus.
- Internationalisation (globalisation) of education and research are important for individual countries to stay abreast of new trends and developments.
- A need for higher levels of national integration of forestry education and research (e.g. prioritization of research topics) exists.
- Technical research priorities (defined per research focus area) differed according to different country strategies.

The declining trends in international forest sector R&D need not necessarily be a cause of concern for the forest sector R&D community, as long as it is comfortable that research priorities are clearly defined and that human, financial, infrastructural and institutional capacity are in place to conduct the research.

A.1.2 A Short History of the Forest Sector in South Africa

A.1.2.1 Plantation Roundwood Production

Southern Africa is poorly endowed with natural timber resources (natural forests occupy approximately 0,1% of the surface area, with a growth rate of less than 5 m^3/ha/a). Despite this small area of predominantly subtropical mountain forests, these forests played an important role in the early development of the country (Van der Zel; 1989). Nevertheless, the production could not nearly support demand, leading to the early development of plantation forestry.

The development of plantation forestry in South Africa can be subdivided into seven time-periods. The first six of these (Van der Zel, Brink, 1980) preceded the political transformation of South Africa in 1994, with the seventh being the post 1994 period.

The period preceding the year 1876: Afforestation began in earnest during this period but plantation forestry activities were small, scattered and uncoordinated, and there was a relatively small demand for forest products.

The period 1876-1902: Plantation forestry with exotic species began in earnest during this period. A number of small plantings were undertaken in scattered areas in the former Cape Colony. These plantings were aimed at meeting local requirements for building and firewood. The discovery of diamonds in the late 1860's gold in the early 1880's, and other infrastructure requirements, such as railways and fencing, contributed to this demand, placing unsustainable pressures on both natural forests and woodlands. By 1895, 100,000m^3 of pine was already imported into South Africa annually (Van der Zel, 1989; Van der Zel, Brink, 1980).

The period 1902-1914: After the Anglo-Boer War, afforestation in the then four colonies (now comprising South Africa) and Southern Rhodesia (now Zimbabwe) was undertaken on a more intensive scale so that by 1910, the afforested area was about 100,000ha. However, the quality of this timber, yielded from unimproved, first-generation plantations, was poor in comparison to the imported softwood from the natural forests of Europe and North America. Plantation forestry was therefore regarded with skepticism by both Government and the private industry (Van der Zel; 1989). During this period, timber imports increased to 440,000m^3 per year (Van der Zel, Brink, 1980).

The period 1914-1945: The timber "famine" that ensued during the First World War (1914-1918) and the economic depression of the post-war period, served as strong motivations for the government of the time to establish forestry plantations. Attaining self-sufficiency in forest products was clearly important as the country was left vulnerable with timber imports decreasing from 440,000m^3 in 1914 to 160,000m^3 in 1918. The plantation timber resources established during this period fully proved their value at the outbreak of the Second World War when Southern Africa had softwood plantations of 125,000ha, eucalypt plantations of 238,000ha and wattle plantations of 261,000ha. Although the majority of plantations were less than 15 years old, timber production increased 10-fold during the war (from 230,000m^3 in 1938 to 2,230,000m^3 in 1944) (Van der Zel; 1989).

The period 1945-1969: During this period of global industrialization, private industry started to play an ever-increasing role in primary forest products processing. A larger demand for forest products made the forest products industries extremely profitable. Plantation area increased from roughly 600,000ha to 1,030,000ha, with annual plantings peaking in the 1950's. During the 1960's, however, annual plantings dropped rapidly. This was

probably caused by the new harvests from maturing plantations flooding the market, with a resultant reduction in projected forest products profitability (Van der Zel, Brink, 1980).

The period 1970-1993: The periods up to 1970 can be regarded as adolescence years, while the period leading up to 1994, can be seen as the maturation age, especially in its primary and secondary processing value adding activities. A number of significant events during this time were the insurance of all plantations; the realization of the pressure of plantations on water resources, which led to the establishment of the forestry permit system; and the large scale employment that occurred within the forest products value chain. As plantations and plantation management knowledge matured, risks to private investors lessened to such an extent that government moved towards commercializing its timber holdings by establishing the SA Forestry Company (Safcol) in 1992. Yet, throughout this period, government remained a guardian for the industry through its price-protecting subsidies.

The period following 1994: The political transformation of South Africa in the early 1990's brought an opening-up of the economy and associated new markets but also the entry of foreign competitors. Protective pricing policies were phased out, and State-owned plantations were put on the road towards privatization. After more than a 100 years of government subsidy assistance, the forest industry was now left to its own devices. New labor and small business development policies brought an increasing amount of small farmers and contractors; conflicts over land ownership came to the fore (Clarke, Foy; 1997); some forestry companies were forced to consolidate and merge, others thrived in the "new" global marketplace. This was also the period of the Rio Earth Summit, which saw increasing environmental pressures, also on plantation forestry.

A.1.2.2 Fuelwood, other Non-Timber Forest Products and Conservation

South Africa is well known worldwide for its biodiversity and natural vegetation with forests and woodlands offering a range of resources for both subsistence and commercial purposes particularly for rural communities. Historically, State forests were demarcated both to protect and sustain timber production, as well as to protect and manage biodiversity, water catchment resources, and social forest goods and services.

Forest products, particularly non-timber forest products offer a range of resources to the rural areas of South Africa. These resources range from fuelwood, fruit, wild herbs and medicinal plants and play a significant role in the livelihoods of many rural communities in South Africa.

Most rural areas have high levels of poverty, which is exacerbated by the prevalence of HIV/AIDS. This situation presents enormous pressure on the

natural resources around them. The timber and non-timber forest products form their basic source of earning a livelihood. Other livelihood diversifying strategies are required to ensure that the resources are given time to recover from the intense harvesting. Thus more research is required on the ecology and productivity of the resource.

With most of the rural and peri-urban communities reliant on fuelwood for energy source for both cooking and heating purposes, there is some concern about its sustainable use and future availability for generations to come. Although there are communities that have been provided with electricity (pre-paid card systems), it is apparent that most communities with access to electricity utilise it for lighting and sound for entertainment and heavily utilise fuelwood (a free resource) for cooking and heating.

A.1.2.3 A Short History of Forest Sector R&D in South Africa

Most forest research is conducted in support of commercial forests and wood processing. This includes research focused on timber production, processing, and environmental sustainability (especially water use). There has however also been a long history of research on the ecology, use and management of natural forests and woodlands. Research on conservation of biodiversity and water catchment services was conducted by the State in conjunction with research on industrial roundwood production, from the start until around 1994. Research on social forestry has been sporadic, but has been showing an increasing trend (Dyer, et al; 2004).

Scientific forestry research began in earnest after the Second World War. Early research focused on the biology of forest species, their traditional African use, timber properties and the management of natural forests. Experimental trials with introduced species (Pinus, Eucalypts, Acacias) also started during this period. The research was initially conducted by Government and universities. Private sector research started with the establishment of the Wattle Research Institute in 1947 (which became the Institute for Commercial Forestry Research (ICFR) in 1984) and developed further in parallel to the development of the commercial forestry industry (Dyer, et al; 2004).

Government remained a major sponsor of research on industrial roundwood production through the South African Forestry Research Institute (SAFRI). SAFRI was merged into the CSIR in the late 1980's, but long-term government funding of forestry research was terminated in the mid-1990's.

Most of the fuelwood and NTFP research conducted focuses on the use and socio-economic value of timber and non-timber forest products by the rural and peri-urban communities for both subsistence and commercial purposes. In recent years, there has been a slight change in the research trend to also focus on understanding the ecology and productivity of the resource as opposed to its utilisation only; i.e. towards a sustainable extraction of the resource by rural communities. The research conducted has also awakened the need to

understand the growing potential of these non-timber forest products, particularly their economic value. This growing interest has also triggered a number of changes in policy and strategies for integrated and sustainable management. Whilst the timber and non-timber forest products are well-known for their common resources of fuelwood, shade and fruit trees, there is more research conducted into their less known uses such as medicinal for HIV/AIDS, foods and handcrafts.

A.1.3 SA Forest Sector in a Globally Competitive Environment

The commercial plantation resource in South Africa comprises 1,37 million hectares and has the capacity to annually supply 22,0 million m³ of roundwood (WFSP, 2004) but supplies only about 17 million m³. Although this is currently more or less in balance with demand, a serious roundwood shortage is facing the industry. A recent demand forecast by LHA Management Consultants (WFSP, 2004) estimated an annual demand for roundwood of 37,9 million m³ by 2030. The study recommended that serious consideration be given to the expansion of the plantation resource in South Africa and in surrounding countries, as this would maximise economic development, job creation and wealth generation.

A.1.3.1 Solid Wood Products

In the solid wood products (mostly structural timber) market over the last three years, the construction industry has grown at exceptional rates. With the eminent 2010 Soccer World Cup due, and relatively low interest rates expected to be maintained over the next five years, construction industry growth is set to continue.

A large JSE listed building materials company such as Cashbuild, lists timber inflation as the second largest contributor to building industry inflation after steel (Moneyweb, 2004). This points towards a relative under-supply of structural timber. From the supply-side, SA's largest saw millers confirm this: their average rotation age has dropped from about 35 years to 28 years of the last 8-10 years – which is effectively unsustainable harvesting. Younger trees also produce lower yields and lower quality timber.

The charcoal manufacturing industry and wood treatment industry to a lesser extent, faces similar resources scarcity issues.

Within each of these sectors, there are also various technical and other challenges that have to be addressed.

A.1.3.2 Pulp & Paper Industry

The pulp and paper industry is largely a price taker in a globalized industry characterized by rapidly increasing economies of scale. For the industry to remain competitive, it therefore has to constantly increase its processing capacity, resulting in an increasing demand for roundwood.

A.1.4 Forest Sector and Development

The DWAF Draft Key Issue Paper on Forestry and Poverty in South Africa (DWAF, 2005a) summarises the context, opportunities and constraints related to forestry-based poverty reduction in South Africa. It also recommends actions to be taken to assist in poverty reduction.

A.1.4.1 Context

Since the political transition of South Africa, Government has accepted an increasing obligation to address the enormous need for poverty reduction and rural development requirements in South Africa. Forests offer the poor:

- **Subsistence for the very poorest**. This includes products to supply their basic needs (fuel[4], building materials, medicine, food); substitution for cash expenses; and a safety-net in times of disaster.
- **Business Opportunities**. These opportunities include mostly informal trade activities such as wood carving and NTFP collection and trade. Small scale timber growing is a larger-scale, more formal business opportunity, also included in this category.
- **Employment**. The industrial forest sector (plantation forestry and its associated primary processing) is rurally based, and has a large poverty-reduction footprint. Based on a national accounts rule of thumb, forestry and forest products employment can be expected to account for 30% of total forest sector output (revenue generated). Applying this rule to the South African forest sector total revenue of approximately R24 billion per annum (see Table 2), it can be expected that the industry directly generates R7.2 billion in salaries and wages. It is not known what percentage of this amount accrues to employees from poor areas, but it would be reasonable to expect that it would be as least as much as the estimated value of NTFP's of R2,8 billion (see section 1.1.2 above). In addition, formal employment brings additional benefits such as infrastructure (housing, commercial infrastructure, roads, health), education and insurance (life, health, unemployment, pension).
- **Environmental values**. It is expected that rural communities carry a disproportionate amount of risk to environmental disasters and degradation.

[4] It is estimated that 13,5 million people (30% of the population) depends on fuelwood as a primary source of energy, and use. The volume of timber used for this purpose is unknown (DWAF, 2005b).

A.1.4.2 Constraints

Four sets of constraints to poverty alleviation within forestry have been identified:

- A history of conflict.
- Scientific and technology constraints, related to more afforestation and forest products value addition.
- Economic constraints, related to various entry barriers to establish forest and forest products business enterprises.
- Governance constraints. These relate to:
    - Uncertainty over land ownership (an estimated 60% of state managed forest resources are subject to land claims);
    - Poorly understood traditional processes and structures;
    - Excessively bureaucratic and overly constraining regulations and legal requirements affecting forestry;
    - No active participation of the poor in policy development;
    - A poorly trained and managed forestry-contracting sector;
    - Inadequate information distribution to poor communities.

A.1.4.3 Opportunities & Recommendations

Three sets of opportunities and recommendations are put forward by the DWAF Draft Key Issue Paper on Forestry and Poverty in South Africa:

- **Protect the poorest** through e.g. active participation in policy development, speedy resolution of land claims, addressing capacity constraints in local government, producing guidelines for the roles and responsibilities of traditional leaders, development of extension support systems related to woodlands, and development of a long term fuelwood strategy.
- **Support equitable business development** e.g. through the implementation of a forest enterprise development strategy, easing the regulatory environment for SME development, facilitation of various partnerships and joint ventures on timber growing and beneficiation and urgent research on the sustainable harvestable yields of a variety of natural plants.
- **Encourage economic growth (and employment)** through new afforestation projects (especially in the Eastern Cape); streamlining the regulatory system that applies to forestry (e.g. afforestation licenses, tax incentives, loans, grant schemes, payment for environmental services; strengthening the provision of certain technical services by DWAF; and increased interdepartmental co-operation to encourage the multi-purpose use of forests.

A.1.4.4 Forest Enterprise Development

The DWAF Key Issues Paper on Forestry Enterprise Development (DWAF, 2005c) identifies four categories for forest enterprise development:

- Timber production enterprises;
- Contracting enterprises;
- Timber processing, value adding, and marketing enterprises.
- Non-timber forest products, including agro-forestry.

Within each of these categories various scientific, technology, governance and economic challenges and constraints have to be addressed to ensure sustainability.

A.1.5 Environmental Pressures

Towards the end of the 20th century, forestry has received increasing pressure from globalization of trade and environmental standards. Forests are widely seen as a common, global resource, producing environmental and ecosystem services through ecological processes like carbon and water cycles and the maintenance of biodiversity. Plantation forests too yield values and benefits exceeding their environmental and social costs and are important contributors to the national accounts of South Africa.

A.2 What is our competition up to?

The importance of a national forest sector research strategy for South Africa is emphasized by the actions of our national competitors:

A.2.1 Finland

In **Finland**, forestry R&D forms part of the Finnish Science Policy (published in 2004), which identifies 6 key priorities related to R&D (Pelkonen, 2004):

- To effect a substantial increase in research funding to ensure global leadership in R&D.
- To increase the development of centres of excellence.
- To promote national and international networking in research.
- To support research fields relevant to knowledge intensive industries and services (e.g. information and biotechnology).
- To intensify co-operation between users of the research system in order to promote diffusion of research findings and increase commercialization activities.
- To evaluate the impact of the performance of the research system.

Finnish forestry researchers particularly identified the need to “move from a self-centred to an extrovert area of science”.

A.2.2 Brazil

In **Brazil**, the national System of Education and Forest Research have identified 11 key priorities specifically for forestry R&D (Hoeflich, 2004):

- Conservation and genetic improvement of genes of strategic national forest species.
- Development of systems for sustainable management of ecosystems.
- Develop production systems for sustainable wood (fiber) harvesting.
- Development of management and silvicultural processes that optimize site-species growth conditions.

- Development of sustainable agro-forestry production systems.
- Development of systems for forest protection.
- Development of techniques for optimum value extraction from wood (fiber).
- Development of an Information and Forestry Policy Formulation System.
- Actions related to transfer forestry and forest products information, knowledge and technologies within the Brazilian forestry industry.

A.2.3 Australia

In Australia, one of the risks associated with a higher level of applied research identified, is that there has been an increase in relatively short term funding, which prevents research institutions to build long term R&D capacity. As a result, the Australian forest research system is currently demonstrating some of the following characteristics:

- A loss of synergy that results from teams of diverse scientists working to solve large-scale and long-term problems.
- Knowledge, that has been gained through negative results or experiments and usually not yet published, being lost through cut-backs or retirements.
- Foregoing of long-range benchmark projects, such as hydrological projects.
- Incapacity to address difficult emerging problems.
- Inability to identify and understand the cumulative long-term effects of increasing demands for multiple use of forests.

In response to these challenges, the Australian CSIRO's Forestry and Forest Products unit and New Zealand Forest Research have entered into a Joint Venture agreement to sustain critical mass. This critical mass is directed towards 8 research focus areas:

- Bushfire;
- Catchment hydrology;
- Greenhouse accounting;
- Plant-based management of dryland salinity;
- Sustainable production forestry;
- Tropical rainforest ecology and Management;
- Tropical savanna management;
- Wood innovation.

A.2.4 China

In China, a strategic plan for forestry education and research has been developed to achieve the Chinese vision for forestry: to ensuring the prospering of forestry through the application science and technology; increased development of forestry industries, strengthening the forestry discipline through education and promotion of sustainable development in forestry. The so-called "363" strategy for forestry education (this excludes primary processing) has the following priority framework (Shougong, 2004):

- **Three** sets of strategic role players in China, namely private sector, government and administrative organizations (understood to include academia and other non-government organizations); will, through an inter-institutional system of innovation, build capacity in forest science. The goal of this is to "develop ability, moral integrity, outstanding performance, public recognition, and passion for forestry development … and leaders at different levels…"
- **Six** technical programs have been designed including:
  - Ecological development and security;
  - Forestry biotechnology and superior seed production;
  - Conservation and utilization of germ plasm resources;
  - Biological industry development;
  - Digital forestry;
  - Forestry Innovation.
- **Three** tiers of education have been identified:
  - Forestry training (short courses);
  - Vocational education;
  - Higher education.

A.2.5 Korea

In Korea, a strategic and scientific priority determination process was developed after extensive consultation with forestry stakeholders. Four strategic priorities have been identified to pursue between 2004 and 2013 (Shin et al, 2004):

- Development of fundamental technologies for strengthening the economic competitiveness of the Korean forestry sector.
- Promotion of the environmental contributions of forests to improvements in the quality of life.
- Application of advanced technologies to the utilization of forest and wood products.
- Systemisation of forest-related scientific knowledge and development policies for sustainable forest management.

A.2.6 Critical Mass in forest sector Education and R&D

The table below presents scattered data which indicates the critical mass of education and R&D capacity within the forestry sectors of various countries (IUFRO, 2004). These figures are not directly comparable as the data sources and definitions may vary from country to country, but are useful for broad comparative analysis, especially in relation to the current situation in South Africa. Stakeholder interviews have revealed that only a small number of forest sector scientist graduate annually in South Africa (+-10); and that there is a under-supply of foresters in the industry.

Country	Under-Graduate	M.Sc.	Ph.D.	Active tertiary graduated foresters			
				In Industry	In R&D	M.Sc	PH.D
Finland		+- 90	+- 18				
UK	100						
Sweden				850	350		
Slovakia	625		+-120		90		
Canada	1500	670					
Brasil				7,700 (incl MSc and PhD)		1,374	286
Russia	12,000-16,000						
China (2002)	110,000	4,226					

APPENDIX B: Forest Sector R&D in South Africa in 2005

B.1 Background

Forest sector research is mainly conducted in-house by forestry companies, by research institutes, science councils and universities and technikons. Table B1 was adapted from Dyer et al (2004) and identifies the major forest sector research performers in South Africa, and summarises their focus areas.

Table B1: Forest sector R&D capacity and their focus areas.

Category	Institution	Focus Area
Universities and Technikons	University of Cape Town	Forest ecology, Global change
	University of the Western Cape	Land reform
	Nelson Mandela Metropolitan University (Saasveld)	Fire Ecology, Wood Science Forest Engineering
	Rhodes University	NTFPs
	University of KwaZulu-Natal	Silviculture Forest Management Community Forestry
	University of Pretoria	Forest Biotechnology Forest Pathology & Entomology Renewable energy
	University of Stellenbosch	Forest Science, Forest Engineering Wood Science, Conservation Renewable energy
	University of Witwatersrand	Nutrient dynamics Ecology of Forests and Woodlands
Science Councils	ARC	Biological control of weeds and invasive plants
	CSIR - Environmentek	Tree Improvement Wood Quality, Water use
Forestry Research Institutes	SA National Biodiversity Institute	Forest protection Global change
	ICFR	Tree Improvement Silviculture, Forest Engineering
	Institute for Natural Resources (INR)	NTFPs, Economics, Social aspects Environmental aspects
In-house Research	Komatiland Forests	Tree Improvement Forest Management Wood Quality
	Hans Merensky Holdings	Tree improvement
	Mondi	Tree Improvement Forest Management Fiber properties Pulp & paper
	Sappi	Tree Improvement Forest Management Fiber properties Pulp & paper

B.1.1 Research Focus Areas

In order to ensure conformity of data acquisition and analysis during the mapping of current research activities, a generic research focus area description was developed (Table B2). The rationale followed the structure of the forest sector value chain defined in Figure 1. This would allow comparative analysis of the R&D conducted per segment within the value chain.

It has to be highlighted that within the various research focus areas, complex fields of specialization exist, the contents of which is not captured in Table B2.

Table B2: South African forest sector R&D focus areas and description of their typical contents.

Research Focus Areas	Typical R&D Contents
1. Industrial Roundwood Production	
Silviculture	Tree improvement, establishment, vegetation management, forest nutrition, productivity, mensuration, growth and yield, forest protection
Forest Engineering	Harvesting, transport, fire protection, ergonomics
Forest Management	GIS and remote sensing, planning
Natural Forests	Indigenous roundwood production
2. Non-industrial Roundwood Production	
From Natural Forests	Fuelwood, building materials, community benefit
From Woodlands	
3. Industrial Roundwood Processing	
Fiber properties	Resource optimization, fibre use, productivity, energy consumption, waste utilization, new product development, etc
Pulping	
Other fiber processing	
Saw milling	
Composite products	
Other	
4. Non-timber Forest Products	Medicinal plants, Food (e.g. bee-keeping, ferns/foliages), Tourism
5. Policy & Legislation Issues	Governance, regulation, legislation, compliance
6. Economic Issues	Forest economics, taxes and subsidies, SME development, resource economics)
7. Environmental Issues	Ecosystem functioning, pollutant treatment, carbon sequestration, water use, biodiversity protection
8. Social Issues	Poverty reduction, HIV/Aids, labour matters
9. Other	Agroforestry

B.1.2 Types of Research and Development

The types of R&D were defined as specified in section 1.3 above:

Basic Research aims at obtaining better comprehension without considering a direct use of the new knowledge in practice. It therefore generally refers to the research of scientific questions not dictated by clients.

Applied research aims at obtaining results of practical use. It therefore refers to the research of scientific questions posed by clients or the nature of the business.

Development converts new knowledge into useful products or processes. These are often of commercial value and are associated with technology development, commercialisation and technology transfer.

B.1.3 Stakeholder Classification

In order to ensure confidentiality of information provided by stakeholders (research performers, funders and other strategic stakeholders), the following stakeholder classifications were used for research performers and sources of funding:

Research Performers
In-house Research (Performed by industry)
Higher Education Institutes
Science Councils
Research Institutes

Sources of Funding
Industry (Received from private companies or their representatives; professional associations, etc)
SA Government and SA Government Agencies (National, Provincial and Local Departments and other Agencies such as the WRC, NRF etc)
Universities
Non-profit organisations (e.g. Donor Funding)
Other

B.2 Current Research Activities

B.2.1 Research Focus Areas

Table B3 summarises the R&D performed per research focus area and by type of research conducted. More than 40% of the research conducted is focused on Industrial Roundwood Production, and approximately 40% of research is focused on Industrial Roundwood Processing (Figure B1). Economic research also seems to enjoy some priority, with 13% of research performed in that area. Research in Non-industrial Roundwood Production, Non-Timber Forest Products, Policy and legislation, and Environmental and Social Issues are all less that 3% of R&D performed respectively.

Within the Industrial Roundwood Production focus area, Siliviculture alone comprises nearly a third of all research done.

B.2.2 Research Outputs

For the purpose of this study, research outputs are evaluated according to Types of Research conducted. Basic research outputs are often published. Applied Research results are published to a limited extent, and some of the outputs may be client confidential. Technology development produces technologies or processes.

Figure B2 shows that nearly 60% of the R&D done falls within the Applied Research field. In most instances, very little basic research is done.

Table B3: The current state of forest sector research performed per research focus area and by type of research.

Research Focus Areas	R&D per Across Focus Area	Split Across Types of Research		
		Basic Research	Applied Research	Tech. Development
1. Industrial Roundwood Production				
· **Silviculture**	32.4%	27%	66%	7%
· **Forest Engineering**	3.3%	6%	68%	26%
· **Planning**	4.8%	5%	92%	3%
· **Natural forests**	0.0%	0%	0%	0%
2. Non-industrial Roundwood Production				
· **Natural forests**	0.3%	33%	55%	12%
· **Woodlands**	0.1%	40%	60%	0%
3. Industrial Roundwood Processing				
· **Fiber Properties**	13.4%	9%	79%	12%
· **Pulping**	6.0%	11%	79%	10%
· **Other Fibre Proccesing**	20.9%	7%	41%	51%
· **Saw Milling**	1.5%	14%	62%	24%
4. Non-timber Forest Products	2.6%	36%	60%	4%
5. Policy & Legislation Issues	0.6%	3%	5%	92%
6. Economic Issues	11.0%	3%	23%	74%
7. Environmental Issues	1.7%	28%	36%	35%
8. Social Issues	0.9%	25%	70%	5%
9. Agroforestry	0.4%	49%	51%	0%
10. Other	0.1%	33%	33%	33%
TOTAL	**100%**	**15%**	**59%**	**26%**

Figure B1: forest sector research performed per research focus area in 2005.

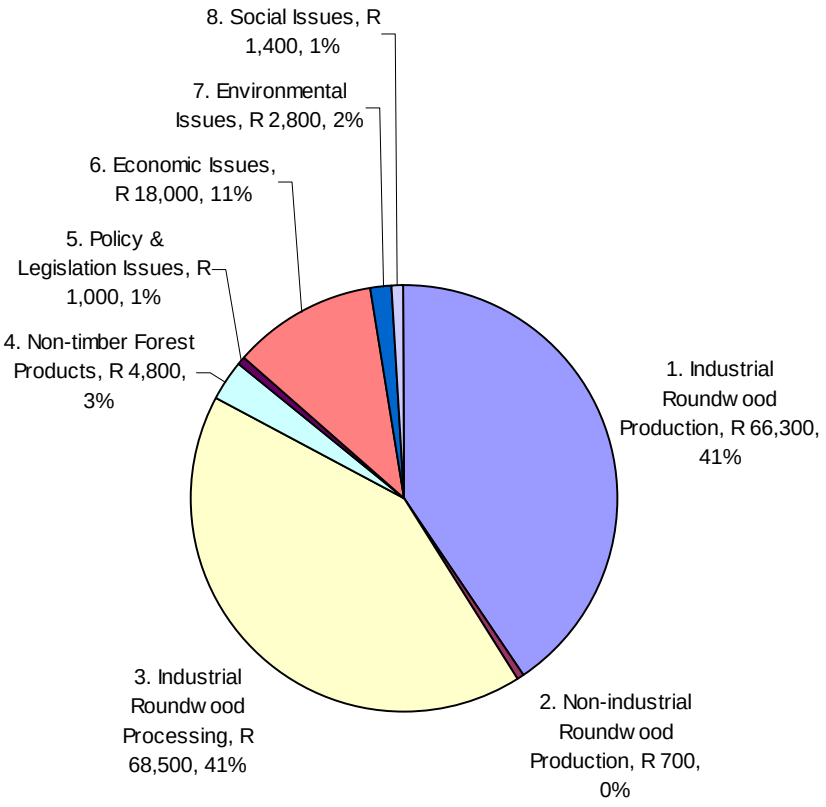
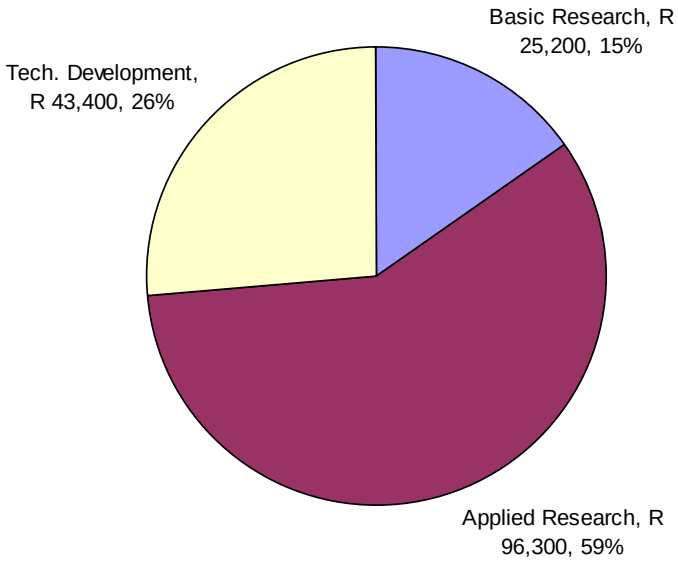


Figure B2: Type of forest sector research performed in 2005.



B.3 Institutional Responsibilities

The current research focus areas of various institutions are analysed in this section. The data presented here does not necessarily reflect an ideal situation but rather the current reality of where different institutions (Industry, Higher Education Institutions, Science Councils and Research Institutes) focus their research.

Figures B3-B6 shows that in all instances R&D performed in the two focus areas Industrial Roundwood Production and Processing are in excess of 75%. These ratios reflect high degree of investment available from industry to all institutions for R&D in these focus areas. All organizations conduct some degree of economic, social and environmental research. Higher Education institutions perform a relatively higher degree of NTFP research than other research performers (Figure B4).

Figure B3: Industry performs more than 80% of their In-house R&D in Industrial Roundwood Production and Processing focus areas.

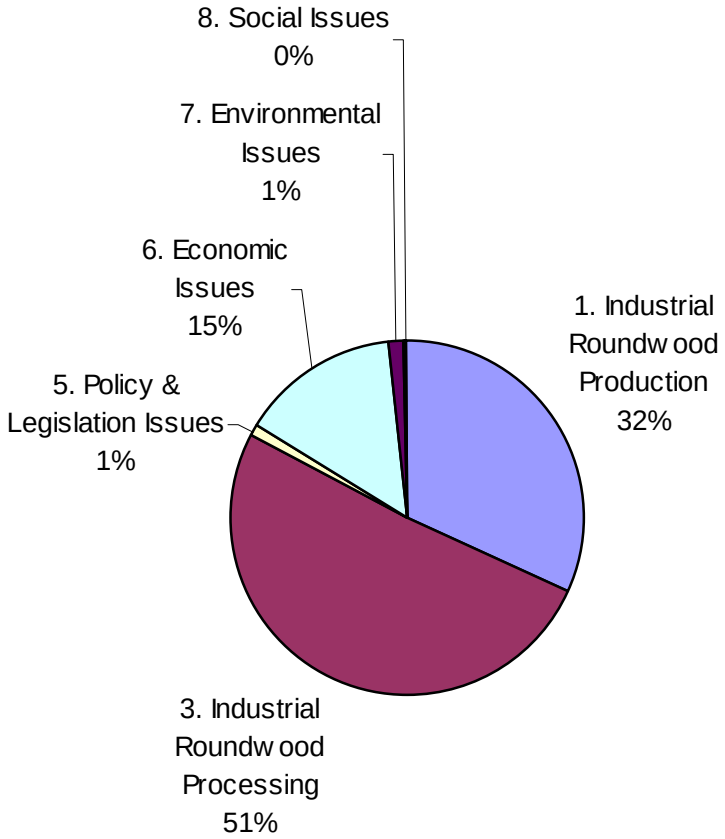


Figure B4: Higher Education Institutions perform 74% of R&D in Industrial Roundwood Production and Processing focus areas.

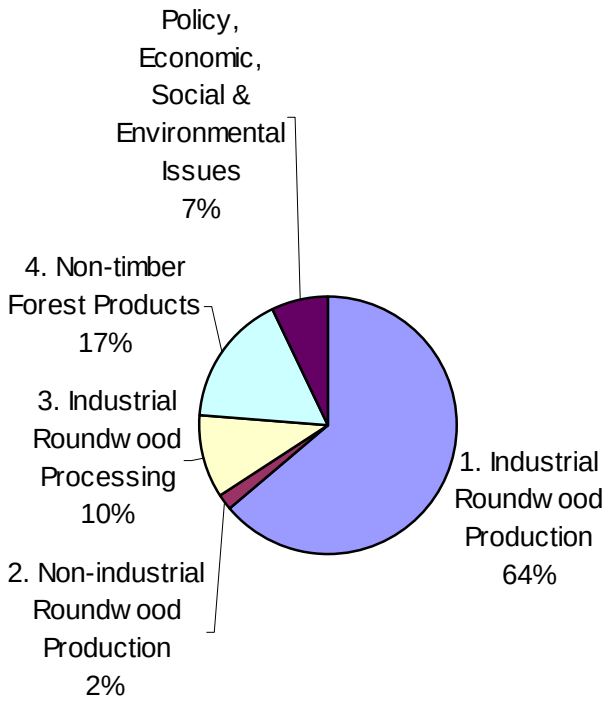


Figure B5: Science Councils perform 90% of R&D in Industrial Roundwood Production and Processing focus areas.

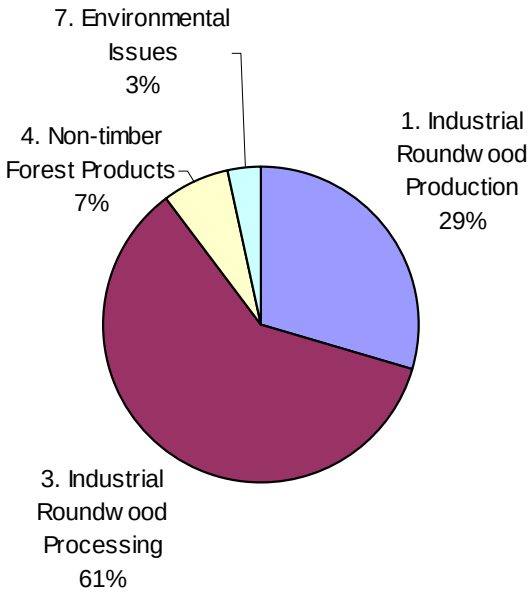
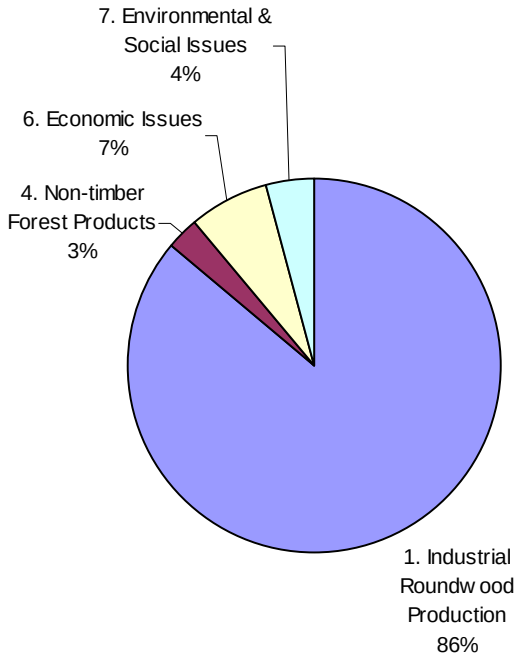


Figure B6: Research Institutions perform nearly 86% of R&D in Industrial Roundwood Production and Processing focus areas.



B.4 Forest Sector R&D expenditure

The total estimated expenditure for forest sector R&D in South Africa in 2005 is approximately R163 million. The largest components of this budget are invested in the Industrial Roundwood Production focus area (R66.3 million; and in the Industrial Roundwood Processing focus area (R68.5 million) (Figure B1). The historical (since 2000) levels of investment have in most cases been reported to be fairly stable. Research capacity and infrastructure is developed over many years, and therefore, in most cases, R&D budgets follow capacity. In three institution-specific cases, significant growth (>30%) has been reported over the last three years.

Table B4 compares adjusted forest sector R&D budgets[5] to revenue generated in the value chain:

- Total forest sector R&D investment is less than 1% (0.61%) of forest sector revenue generated.
- Industrial Roundwood Production & Processing R&D investment is less than 1% (0.65%) of forest sector revenue generated. There is however a

[5] Adjusted research budgets were calculated by assuming that the budgets of cross-cutting R&D focus areas (Policy, Economic, Environmental and Social) are conducted on a pro-rata basis across the other focus areas.

weighting factor that has to be considered here. A great many of the benefits of Industrial Roundwood Production R&D (especially related to wood quality) is focused on Industrial Roundwood Processing. There is also a reliance within the roundwood processing industry on turn-key technology.

- The extremely low R&D investment in Fuelwood and NTF products is a reflection of its non-commercial nature, and an associated reliance on sporadic non-profit (donor) R&D funding.

Table B4: Analysis of forest sector R&D budget as a ratio of forest sector revenue produced.

	Revenue Generated (R million)	Adjusted Research Budget (R million)	R&D / Revenue Ratio
Industrial Roundwood Production & Processing	24,100	157	0.65%
Fuelwood & Non-Timber Forest Products	2,800	6	0.20%
Total	**26,900**	**163**	**0.61%**

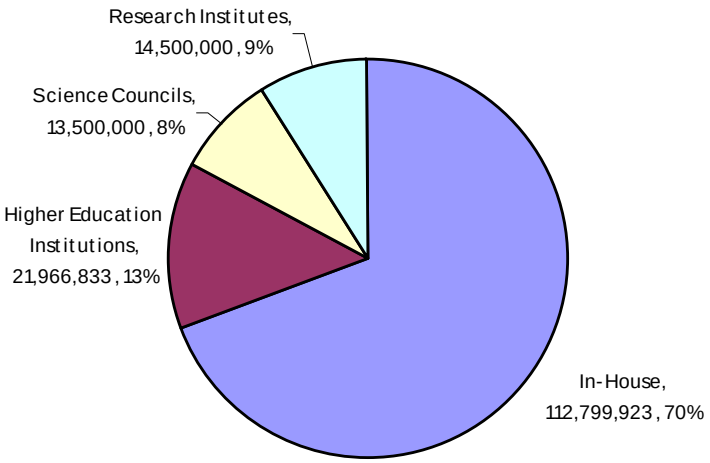
Table B5 shows the relative investment in basic and applied research and technology development. It is concerning that only 15% of the R&D budget is invested in basic research, as it is this type of research where a strong scientific basis for applied research and technology development are laid, and where human resource capacity is built. In addition, the investment in development, i.e. the uptake of research findings, is relatively low.

Table B5: Analysis of forest sector R&D budget (R'000) by Type of Research performed.

	R&D Budget	% Split
Basic Research	R 25,200	15%
Applied Research	R 96,300	59%
Tech. Development	R 43,400	27%

Figure B7 shows the forest sector R&D budget broken down per research performing institution. In-house Industry R&D is allocated 70% of the R&D budget (~R113 million); with Higher Education Institutes allocated 13% of the total budget and Research Institutes and Science Councils just less than 10% each.

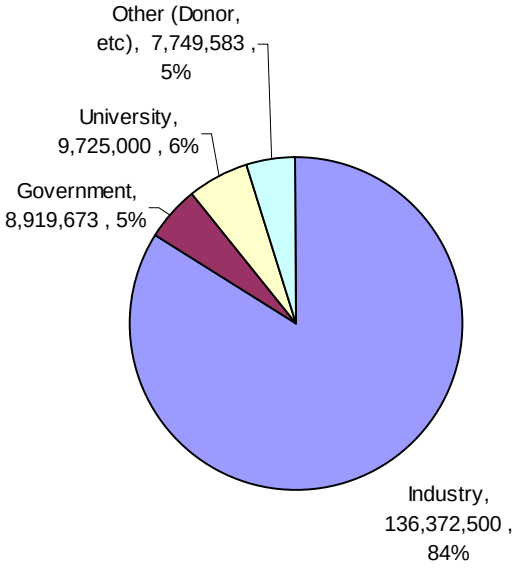
Figure B7: R&D budgets in the forest sector broken down per research performing institution.



B.5 Sources of Funding

Industry contributes more than 80% of the forest sector R&D budget, with Universities, Government and Non-profit organizations each contributing between 5%-6% respectively. These data reflects the fairly large bias in current research programs towards applied industrial production and processing of roundwood research; and the large role of In-house research capacity.

Figure B8: Sources of forest sector R&D funding.



B.6 Conclusions from this Section

The following important aspects emerge from this section:

- Total forest sector R&D investment in South Africa is low by international levels. The following table shows how South African R&D spend per cubic meter roundwood harvested compares to the United Kingdom, Finland and Australia (IUFRO, 2004; and various internet sources).

	Annual Harvest (million m3)	R&D Budget (R million)	R&D / cubic meter
United Kingdom	10	276	27.6
Finland	83	1370	16.5
Australia	16	1110	69.4
South Africa	18	163	9.0

- Forest Sector R&D investment on Industrial Roundwood Processing and fuelwood & NTFP is especially low.
- Forest Sector R&D investment in basic research is concerningly low.
- The high levels of applied research done indicate towards a high degree of proprietary knowledge generated. This would prevent peer review processes and research output dissemination.
- Research activities and objectives are geared towards industry goals, which in turn would be determined by investor expectations. Government and Higher Education Institutions "play" approximately only 10% of the forest sector research role.

APPENDIX C: The Future of the South African FOREST SECTOR – Stakeholder Views

This section summarises the **views of the stakeholders** interviewed to date, in no particular order. The interview process had not been completed at the time of writing, but will be fully available in the final report. The analysis provided here is mostly qualitative, with a quantitative summary provided in section 5.6.

C.1 The Challenges Facing the Forest Sector

- A new National Forestry Program, that supports sector growth and development has to be agreed on and disseminated.
- Increasing fiber (roundwood) production with limited land and water resources, and growing need to protect biodiversity.
- Increasing waste paper recycling to approach 55% level.
- Dealing with impending changes in land ownership.
- Infrastructure development for new Eastern Cape afforestation.
- Exchange rate, general consent appear to be that a stable exchange rate of R7/US$ creates an ideal balance between cost of capital and export revenue earned.
- Solid wood product price instability.
- Negative perception re water use and air pollution of pulp&paper mills.
- A lack of R&D capacity in fiber processing.
- Constant innovation in terms of new product development – this requires focused R&D investment.
- Constant reduction of cost of production (increasing economies of scale, etc).
- Remain competitive with Brazil, Chile and the USA – constantly reduce unit cost of production.
- Integration of “second economy” into “first economy” within the forestry context.
- Social development and economic empowerment of poor communities.
- Environmental sustainability:
    - Whole landscape management,
    - Water conservation,
    - Biodiversity maintenance.
- No clear procedures for implementing criteria and indicators for forestry.
- New pulp and paper processing capacity in Brazil, China etc causing world-wide over-supply.
- Implementation of BEE measures.
- Becoming a desirable/preferred employer.
- Preventing pests and diseases to significantly damage plantation forests.
- An increasing emphasis on wood quality is required.
- A structured and responsible approach is required to deal with contractors (they are generally under-paid, poorly trained and appointed on short contracts.)

- Plantation forestry have traditionally been regarded as the poor cousin of agriculture, allocated only marginal land, after agriculture requirements has been satisfied. In an increasingly resource-scarce economy, where sustainable investment decisions are becoming more important, this mindset may have to be challenged.
- An increasing requirement for multi-skilled people in the forest sector.
- Dealing with land reform.
- Unsustainable harvesting of fuel wood (leading to desertification).

C.2 The Strengths of the Forest Sector

- An excellent infrastructure and momentum for forestry R&D.
- Two multi-national forestry companies.
- Large Tree Improvement capacity and fast growing trees.
- Forests are a large renewable resource.
- SA is a low cost producer of fiber (roundwood) compared to most countries, although southern hemisphere competitors have the same strengths.
- A good economic infrastructure and modern fiber processing equipment.
- Control of the value chain through vertical integration reduces risk.
- Low energy prices.
- High level of technical skills among established forestry practitioners.
- A long track record of forestry R&D.
- Entrepreneurial tendency of South Africans.
- Diverse species, processing infrastructure and markets reduce economic risk.
- FSC certification of whole industry – this led to SGS basing its international FSC operations in South Africa.
- Long history of environmental awareness of forestry industry – and proactive actions.
- We understand our resource.
- Well-managed plantations.

C.3 The Constraints Facing the Forest Sector

- A general erosion of intellectual capacity in the forest sector.
- Scarcity of water prohibiting new plantation establishment.
- Global warming may reduce water availability in critical areas.
- Energy shortages due to fossil fuel limits and limited generation capacity.
- Complex, un-coordinated and prohibitive government regulations.
- Perception among forestry industry that government is opposed to forestry.
- Expensive transport.
- High level of indirect taxes.
- High cost of capital compared to international competitors.
- HIV/Aids impact - absenteeism.
- Vulnerability to international commodity dumping.
- Poor education and research performance.
- A relatively low science and technology skills level within industry (measured for instance in terms of PH.D.'s.). Lack of technical guru's.

- SME's do not have the capacity to adapt to technology changes.
- Reduced loyalty of employees.
- Poor education and training among emerging farmers.
- A generally poor contractor industry.
- Few financing options for small growers.
- Insufficient tree improvement support for small growers.
- Poor or no extension services for small growers.
- Inefficient and outdated harvesting systems.
- We are losing sight of technology advancement.
- Insufficient capacity in local government.

C.4 The Opportunities for increasing International Competitiveness and achieving National Development Imperatives

- Industrial forests becoming bio-refineries rather than structural timber and cellulose sources.
- Significant small timber grower opportunities for BBBEE and rural development.
- FED opportunities and technology transfer.
- Design of government support programs/processes for forest sector development.
- Waste paper collection (500,000 tons) from business, office and domestic sources.
- Doubling of per capita paper consumption (from current 45kg/person to 100 kg/person).
- Local value addition to timber exports.
- Increasing pulp & paper industry outputs:
    - Pulp making capacity by 52%
    - Paper making capacity by 144%
    - Recycled fiber utilization by 225%
- SA can become a technology destination.
- Investigate how other countries forge public-private partnerships to optimize development-industry collaboration for benefit of the industry and country.
- Selected national branding of forest products.
- Bio-energy.
- African fuel wood shortages.
- DWAF has pro-actively identified areas for new afforestation.
- Higher value products.
- Increased exports.

C.5 The Future of forest sector R&D in South Africa

C.5.1 Current Research Objectives

- Best utilisation of resources, matched to final product quality.
- Recycled fiber optimization.

- Increased yield (fiber and solid wood).
- New product development
- Improved solid wood processing efficiency.
- Long term (sustainable) supply of fibre.
- Improved productivity per hectare.
- Sustainability of NTFP and fuelwood harvesting.
- Protection and enhancement (e.g. yellow wood plantings).
- Understanding of the interactions between poverty alleviation, development and land use change.

C.5.2 Future Research Objectives

- Continued focus on current research objectives.
- Nutrients and water use efficiency in plantations.
- Development of the forest-based bio-refinery
- Development of alternative products from alien invasive plant species.
- Environmentally friendly processing plants:
    - Energy efficiency
    - Closed water systems
- Biotechnology
- Biocontrol technologies for alien invasive species.
- Nanotechnology
- Process refining
- Product development & beneficiation
- More “social footprint” research required.
- Identification and development of alternative species to be used in commercial plantations.
- SME / FED development and support.
- Agro-forestry integrated into land-care management philosophy, linked to multiple land use.
- Integration of community forestry into commercial foresty.
- A co-operative R&D program for small growers in Industrial Roundwood Production focus area.
- Fuelwood crises in Africa.
- Valuation of natural forests and woodlands.
- Breeding strategies to adapt to climate change.
- Increased support to small growers – but who will pay for this?
- Trees in people’s lives. Understanding and addressing constraints of greening and planting of multiple use trees in communities.
- Sustainable yields of NTFP’s.
- Developing monitoring and evaluation systems for adaptive management.
- Decentralisation of forest management to local people.
- Increased international collaboration.
- HR training and development to support R&D activities.
- Integrative approach to forest risk management (e.g. fire prevention, diseases, pests, HIV/Aids).
- Effective monitoring and management of sustainable annual harvest.
- Dealing with natural resource allocation.

C.5.3 Constraints facing the forest sector R&D

- The fragmentation of forest holdings AND of the research fraternity is a huge problem – results in poor integration and co-operation.
- There is no clear mandate among higher education institutions.
- We lack science and technology leadership.
- Lack of co-ordination between government departments responsible for resource management (DWAF, DEAT, SANPARKS).
- Poor communication between industry/communities and higher education institutions.
- Flaw in the education system – often short term research funding such as NRF is relatively easy to obtain, but it is difficult to find students to do research.
- General under-performance of higher education institutions.
- Poor perception among talented students of forestry industry – not a desirable employer.
- We need to understand what our annual demand for forest sector professionals (in industry and in R&D) is, both in numbers and qualifications. We then need to ensure that we align our education system to produce these people.
- Medium- to long-term funding commitments are required by research performers to enable development of research capacity. This is difficult in the modern environment of competitive R&D funding (such as the Innovation Fund).
- The "competitive", applied research paradigm that is currently prevailing in SA prevents sharing of information, as new knowledge is often of a proprietary nature. It also prohibits peer review, which is to the detriment of developing scientific leadership.
- Forest Sector R&D has stagnated in the last 10 years – no new science, we are no longer pioneers.
- Industry have not been able to "pick up the slack" left by the removal of Government education and research support since early 1990's.
- Science is perceived as not "sexy".
- Move towards forestry contracting has reduced employment opportunities for foresters, resulting less student numbers and therefore less capacity for R&D.
- Little or no bursaries available for forest education.
- Skewed funding of forest sector Research Focus Areas, e.g. too small investment in forest engineering.
- Explore models for Community-Based Forestry and public-private partnerships using an action research approach.
- Dissemination of R&D findings and other information is insufficient.

C.5.4 Challenges facing the forest sector R&D

- Integration and joint development of a forest sector EDUCATION and R&D strategy.
- Making the most effective use of the current R&D infrastructure.
- Improving the current R&D infrastructure.
- Ensuring a strong capacity in R&D.

- Developing dynamic and strong leadership in R&D.
- Increasing excellent publications.
- Development of smart international alliances in education and research.
- Development of a portfolio of R&D investment:
    - Industry funding to support socially and environmentally responsible development and implementation, measured in terms of investment returns (increased production, reduced cost and risk);
    - Government funding to support basic research; Blue Sky research and public good social and environmental research.
    - Innovative funding mechanisms to encourage desirable R&D performance.
    - A strong education system to form the basis of the R&D investment.
- SA needs to adopt an international peer review process to ensure quality but also to remain objective.
- Find and nurture good people.

C.5.5 Responsibilities

- Resource owners (land, water, knowledge, enterprise) are responsible to ensure the optimal sustainable use of their resources. Industry (large and small), higher education institutions, research institutes, science councils and Government therefore have joint responsibility to develop and implement a forestry R&D strategy.
- Industry primary responsibility to shareholders (to a large extent pension funds) in terms of returns on investment but also social and environmental sustainability. This also drives industry investment philosophy: applied research.
- Ensure that we plan to do the rights things before we target large R&D budgets (i.e. establish a research priority framework).
- Government's role is important and need to be better understood and defined, especially with respect to education, basic research and non-industrial research focus areas.
- Higher education institutions need to play an increasing role in education and basic research.

APPENDIX D: Towards a National Forest Sector R&D Strategy – Outputs of Stakeholder Workshop

The Stakeholder Workshop held on 14 July 2005, gathered data from participants during three parallel breakaway sessions. The three breakaway groups were comprised as follows (in no particular order):

- Commercial Industry Representatives
- Government, NGO and Other
- Higher Education Institutes, Research Institutes, Science Councils.

During each session, participants were asked to list the constraints to achieving the Vision for Forest Sector R&D as defined in Section 4 of this document. These constraints were clustered by the participants. Thereafter the project team converted these clusters of constraints to so-called "intermediate objectives", and arranged them into three Roadmaps (as demonstrated below). The results of the three group's outputs were remarkably similar.

D.1 Industry feedback

Adequate R&D Capacity exists:

- There is a lack of qualified people in sector to provide leadership and R&D capacity.
- We do not manage to build a knowledge base for the future.
- There is inadequate research capacity.

Education:

- Tertiary curricula are misaligned with industry requirements.
- We have a low science & managerial skills due to poor education and lack of mentorship.

Forest Sector a Preferred Employer:

- There is insufficient attraction for students to further studies / remain in industry / stay in country.
- Unattractive employment opportunities in sector.
- There is a poor public image of forest sector.

R&D efforts are integrated & co-ordinated:

- There is no critical mass of research efforts (researchers and research efforts un-coordinated).
- Forest Sector R&D is not sufficiently integrated into other disciplines (agric + others).
- R&D capacity is not evenly spread across RFAs.
- Lack of co-ordinated R&D capacity (eg "new" SAFRI).
- Mis-alignment of competencies, capacities, interest with strategic requirements.
- Lack of R&D alignment to national goals.
- Personal competition and infighting prohibits integration.

- R&D efforts are poorly integrated across the value chain.

R&D Support is provided to SMEs and Co-operatives:

- Small growers and -industries lack R&D support.
- Increasing industry fragmentation prevents R&D co-ordination.
- Fragmentation makes it very difficult to coordinate an sustain R&D funding.

The commercial forest industry is viable and understands its impact on society:

- The industry is not viable enough to sustain significant R&D.
- Industry does not fully understand its societal benefits and costs.
- The industry does not make a meaningful / balanced contribution to rural development.

R&D Performance is exceptional:

- Poor R&D outputs discourage investment.
- R&D efforts are not innovative.
- We do not manage identify new risks to forest sector sustainability early.
- Loss of IP to overseas due to outsourcing.

An agreed-upon Business Case for R&D exists:

- No clear understanding of the hurdle rate of R&D (Sasol > 25%).
- No common understanding between funders and RP's of the importance and relevance of R&D programs.
- Stakeholders not in agreement on what is urgent, important and economically beneficial.

Adequate Funding exists:

- Poor financial support by government.
- Imbalance in funding support to RFA's.

Leadership & Support for Forest Sector R&D within Government and Industry is required:

- Forest industry not supported by government
- Forest industry has negative attitude towards government
- Gov do not provide leadership in the Forest Sector
- No clear direction from industry is frustrating the viability of tertiary educational systems
- Lack of understanding by "Captains of Forest Sector" of Forest Sector R&D requirements
- Distrust and diverging biases between government & industry

RFA Considerations:

Demand factors

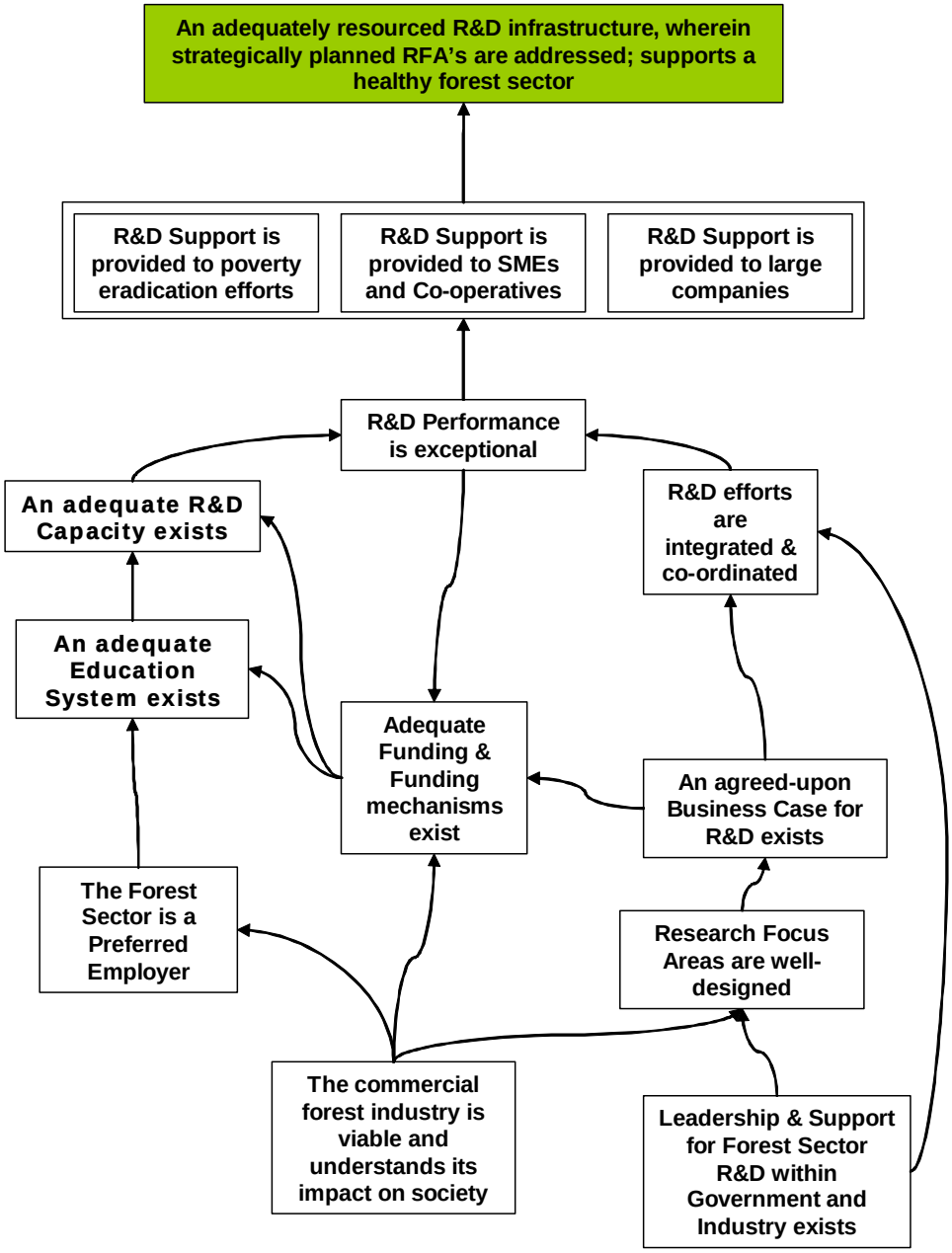
- We are unable to respond to change in global markets or market requirements

- Demand driver – wood substitution for fossil fuels, domestic market (paper and construction)

Supply factors:

- Raw material scarcity due to environmental constraints.
- Industry unable to control production costs
- Unsustainable supply of forest products at rural households (esp fuelwood)
- We do not manage to beneficiate waste products / recycle efficiently

Industry Intermediate Objectives



D.2 Government & NGO feedback

1. Forest sector role players are in agreement on objectives:

- Misalignment of RFA potential and funding
- The sector role players are polarised.
- There is no forum for discussion between forest sector role players.

2. Adequate R&D Capacity exists:

- Lack of R&D capacity (ito qualifications and experience)
- Lack of Human Capital Development.
- Lack of Human Capital Development within previously disadvantaged communities.
- Lack of continuity in R&D capacity
- No sector training and accreditation for forestry. FIETA moribund.
- Insufficient investment is done in education.
- Research done is not innovative enough.

3. There is sufficient, co-ordinated funding for R&D:

- Insufficient funding and lack of commitment for R&D investment.
- A lack of funding co-ordination causes duplication of R&D.

4. Lack of Government Leadership:

- Other agendas given priority over forestry R&D.
- Snr level management in Government not in agreement over priorities, and not lending support.
- Government does not engage effectively with research community.
- R&D does not feature high on government agenda.
- There is no clear government priority for education and research.

5. R&D efforts are integrated & co-ordinated:

- There is a lack of research co-ordination between institutions.
- No public-private partnerships are formed between Government & Industry.
- There is no inclusive R&D strategy.
- There is a lack of collaboration between government departments.
- No co-ordinating R&D efforts are conducted.
- There is poor co-operation between government & industry.

6. The forest sector has a good public image:

- There is a poor public image of forestry.
- The forest sector is not well branded.

7. There is an agreed upon R&D strategy:

- There is no rural development forestry strategy.
- There is no agreed upon strategy indicating research focus areas, roles, and funding arrangements.
- The forest sector cannot convey its concerns and expectations to government in a concise and unified way.

- There is no shared vision on forestry R&D.
- There is no clarity on R&D roles and responsibilities.
- There is a lack of research direction.

8. The Business Case for R&D is clear:

- There is a lack of funding, borne out of unqualified needs.
- The value of Forestry and of R&D is not recognised.

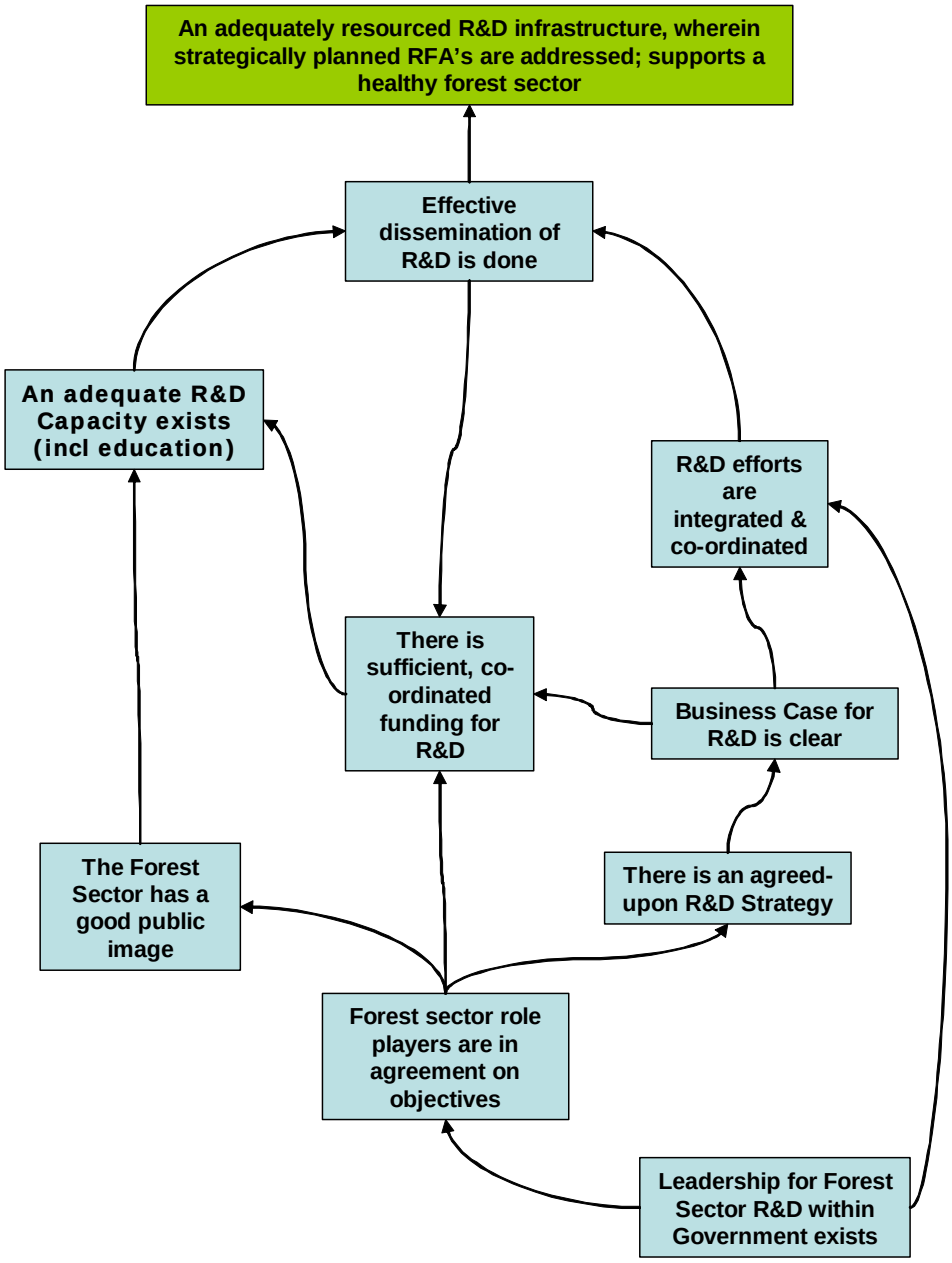
9. Effective dissemination of R&D outcomes is done:

- Hoarding of data in institutions due to competitive advantage or inefficiencies.
- Applied research outcomes are of proprietary nature.
- Emerging and small business does not benefit from R&D.

RFA Considerations:

- Agroforestry
- Rural Forest Development
- Improved cost effectiveness
- New product development
- New species & paradigms
- Community forestry
- Forest Resource Ownership transformation
- BBBEE / SMME entry barriers
- Pulpwood production for emerging growers
- Financing for forest enterprise development
- Social Impacts
- Appropriate technology for rural based activities
- Indigenous timber production and beneficiation
- Forestry's second economy
- The emerging grower base
- Environmental constraints
- Indigenous knowledge systems

Government & NGO Intermediate Objectives



D.3 Education, Research Institute & Science Council feedback

1. Funding is appropriate

- There is a lack of short-term and secure long-term funding
- Mechanisms for acquiring funding is cumbersome
- There is a lack of funding for capital equipment
- There is a lack of sustainable funding for applied & basic research

2. HR Capacity is appropriate

- There is not enough researchers & technologists
- SA has an ageing research community
- R&D capacity is highly fragmented
- The R&D community is poorly remunerated by industry standards
- HIV/Aids issues
- Transformation

3. There is strong leadership for Forest Sector R&D

- Lack of strategy
- Lack of vision
- Processes & mechanisms are lacking

4. The Forest Sector has a positive image

- The Forest Sector has an iinadequate profile
- Not perceived as preferred profession
- NO PASSION

5. Government plays a leadership role in Forest Sector R&D

- Lack of communication between & within Departments
- R & D is not a priority
- Forestry not a priority (within DWAF)

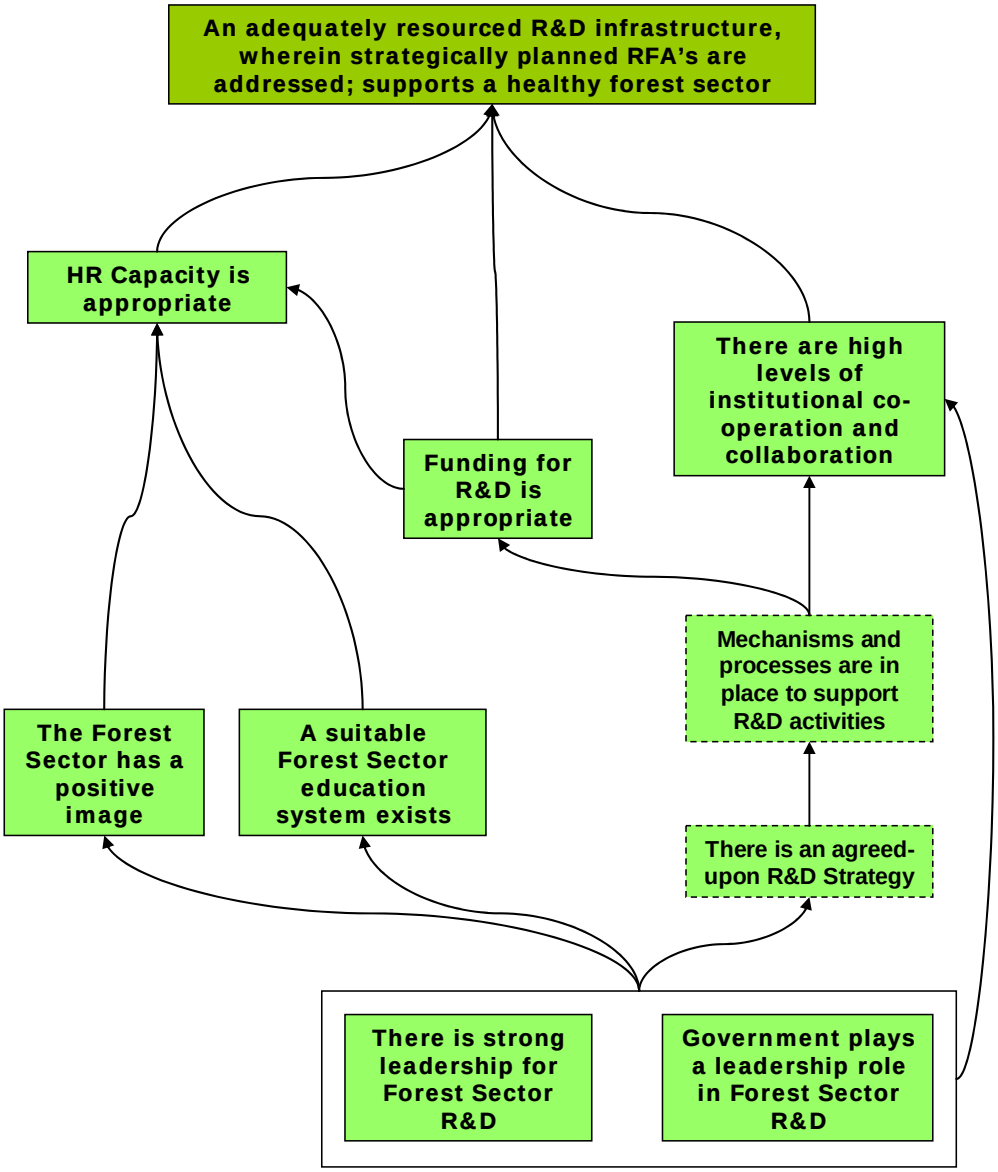
6. A suitable Forest Sector education system exists

- Lack of career path
- Lack of tertiary education strategy
- There is not enough bursaries to attract good students
- Lack of support
- Lack of maths & science emphasis at secondary level

7. There are high levels of institutional co-operation and collaboration

- Poor exchange of info
- Lack of culture of collaboration
- Preoccupation with competition
- Lack of communication

Education, Research Institute and Science Council Intermediate Objectives



APPENDIX E: Summary of forest sector Stakeholders were identified for the purpose of this Project

During the course of the interview process, additional stakeholders within these institutions were identified and interviewed. The final list of interviewees will be presented in the Final Report.

Workshop Attendees:

	Name & Surname	Organisation
1	Flic Blakeway	CSIR
2	Linda Manyuchi	DST
3	Nkuli Shinga	DST
4	Johan Bester	DWAF
5	Dirk Versfeld	DWAF
6	Mike Warren	DWAF
7	Mike Peter	DWAF
8	Represented by Prof Colin Dyer	FSA
9	Mphedzisheni Makhesha	Global Forest Products
10	Botha Maree	Hans Merensky
11	Colin Dyer	ICFR
12	Sally Upfold	ICFR
13	Frans Hansen	Kimberly Clark
14	Jan van Der Sijde	Komatiland Forests
15	Rory Mack	LIMA
16	Marius du Plessis	Mondi
17	Russel Morkel	Mondi
18	Jimmy Khanyile	NRF
19	Fred Kruger	Project Team
20	Jackie Crafford	Project Team
21	Ronel Kruger	Project Team
22	Anton Ferreira	Project Team (Unisa)
23	Andrew Morris	Sappi
24	Stefan Strydom	Sasol Wax
25	Chris Govendor	Sasol Wax
26	Angus Currie	SAWPA
27	Sue Schmidt	SAWPA
28	Dirk Laengin	Univeristy of Stellenbosch
29	Paxie Chirwa	Univeristy of Stellenbosch
30	Pierre Ackerman	Univeristy of Stellenbosch
31	Tim Rypstra	Univeristy of Stellenbosch
32	Gerrit van Wyk	Univeristy of Stellenbosch
33	Brenda Wingfield	University of Pretoria
34	Mary Scholes	University of Witwatersrand
35	Anele Moyo	WFSP
36	Erik Buiten	WFSP
37	Gerard Backenberg	WRC
38	Andrew Sanewe	WRC
39	Danie Gous	Yorkcor

Workshop Apologies:

	Name & Surname	Organisation
40	Thabiso Mudau	ARC
41	Pat Manders	CSIR
42	Patrick Matsau	DEAT
43	Wynand Fourie	DEAT
44	Jeff Sebape	DLA
45	Marcus Phago	DME
46	Masizaki Zimela	DTI
47	Temba Simelane	DWAF
48	Jeunesse Park	Food and Trees for Africa
49	Jaap Steenkamp	Forest Constractors Association
50	Mike Edwards	FSA (Represented by Dr Colin Dyer (ICFR))
51	Lorraine MaNamara	Global Forest Products
52	Udesh Pillay	HSRC
53	Jaco Schotlz	IDC
54	Jenny Mander	Institute for Natural Resources
55	Mike Slater	Masonite
56	Bernard Janse	Mondi
57	Jacques Haarhoff	Nampak
58	At van Coller	NDA
59	Iain Kerr	Pamsa
60	Brian Huntley	SA National Biodiversity Institue
61	Arlene Bayley	Sappi
62	Michal Brink	SGS
63	Alex Kuhl	Silicon Smelters
64	William Bond	University of Cape Town
65	Kevin Bennet	University of Cape Town
66	Prof Jan Raats	University of Fort Hare
67	Mike Underwood	University of KwaZulu-Natal
68	Mike Wingfield	University of Pretoria
69	Philip Wenzel	University of Witwatersrand
70	Wayne Twine	University of Witwatersrand
71	Jos Louw	University: Nelson Mandela Metropolitan (Saasveld)
72	Christo Fabricius	University: Rhodes
73	Christo Marais	Working for Water

Other Stakeholders:

74	John Rance	Amatola Forestry
75	Bruce McKenzie	Botanical Society
76	Rein Franz	CTC
77	Dave Crickmay	Dave Crickmay Associates
78	Derek Weston	FIETA
79	Johannes Baumgart	GTZ
80	Louis Heyl	LHA Management Consultants
81	Ralph Triebel	LHA Management Consultants
82	Roy Esterhuysen	Mondi-Silvacell
83	Petro Terblanche	MRC
84	Deon Malherbe	MTO
85	Craig Norris	NCT
86	John Wray	NTE
87	John Hunt	Pamsa
88	Andreas Stephanou	PG Bison
89	Stuart Christie	Sappi
90	Jack Mason	SAWGU
91	Wally Luyt	Shincell
92	Doggy Kewly	Siyaqhubeka
93	Dave Reeves	Southern Cape Sawmills
94	Jed Krige	Steinhoff
95	Siggie von Fintel	TWK
96	Charlie Shackleton	University: Rhodes