Research Plan 2012/2013

Plantation resource development, characterisation and deployment for rapidly changing environments

Initiating adaptation strategies for the South African plantation forestry sector

# Introduction

Forests are sensitive to climate change and as they have long life spans, they are more likely to be subjected to changing environmental conditions. Changes in climate that are likely to have an impact on natural and plantation forests include changes in air and soil temperatures, the amount and distribution of precipitation, the concentration in atmospheric CO2, changes in climatic variability as well as changes in the frequency and severity of extreme events such as severe droughts and high winds. In addition the frequency and intensity of fires are expected to increase as well as outbreaks of insects and pathogens as current boundaries of insect and pathogen populations are.

In South Africa plantation forestry is an important component of the economy, covering approximately 1.27 million ha of land, and supporting the pulp, paper, construction, energy and other industries. Whereas forest is widely recognized as having a potential role to play in mitigation, little research has been done on adaptation strategies in general and for South Africa in particular. This project aims to assist in improving the ability of the South African plantation forestry sector to ensure sustained growth and productivity of plantations in conditions of changed climatic conditions.

# Objectives

Objectives for the period are to

1. Understand what the climatic scenarios for the future are and what implications they will have for the forestry sector
2. To make recommendations on germplasm options for commercial plantation species based on regional climate change predictions/models
3. To make recommendations to the plantation forestry sector and government regarding adaptation strategies to ensure the resilience of the plantation forestry sector.

# Approach

## Task 1: Modelling climate change impacts on plantation species and hybrids

In South Africa the potential impact as well as mitigation and adaptation strategies for the forestry sector have received very limited attention. Some predictions of changes in the suitability of the three main plantation species (*E. grandis, P. patula* and *A. mearnsii*) have been published (Schulze, 2010) as well as some lesser species (*E. dunnii, E. nitens, E. smithii, E. grandis* x E*. urophylla, P. elliottii, P. taeda* and *P. elliottii* x *P. caribaea*) (Warburton and Schulze, 2008). Early modelling did, however, have some limitations including the use of relatively simple models based on gross climatic variables and it was suggested that these could be improved by using more sophisticated forest growth models, undertaking threshold analysis, consideration of site-species criteria, and consideration of pest and disease thresholds (Schulze, 2007).

### Description of task 1

This task will involve the use of current trial data to establish current climate predictors for plantation productivity/suitability and combining this information with future climatic models to develop suitability maps for specific hybrids and species to guide plantation establishment under changed climatic conditions in future. Similar work is currently being done by the ICFR and the aim of this task is therefore to collaborate with the ICFR and to develop a complementary set of maps (i.e. for species and hybrids where the ICFR lacks information) (as illustrated in Figure 1).



Figure Schematic outline of modelling the impact of climate change on plantation species and hybrids. People responsible for task and deadlines are indicated in yellow boxes.

|  |  |  |
| --- | --- | --- |
| Activity | Date of completion | Activity team |
| Data preparation (filling TreeBase gaps) | 10/7/2012 | Karen Eatwell  Thamsanqa Mzinyane  Nuveshen Naidoo |
| Spatial modelling (making spatial layers in combination with ICFR’s databases) | 30/08/2012 | Thamsanqa Mzinyane  Ilaria Germishuizen |
| Bringing in the ACCESS climate change anomaly grids | 14/09/2012 | Thamsanqa Mzinyane  Ilaria Germishuizen  Emma Archer-van Garderen |
| Publication and a Handbook  write-up – first draft | 16/11/2012 | Thamsanqa Mzinyane  Ilaria Germishuizen  Emma Archer-van Garderen  Oscar Mokotedi |

### Deliverables of task 1

Maps for species and hybrids showing the potential impact of climate change on growth and productivity.

The information will be presented as a publication and handbook write-up.

The information will be available on the SA Risk and Vulnerability Atlas website ([www.sarva.org.za](http://www.sarva.org.za)); as well as through South Africa’s Long Term Adaptation Strategy (LTAS) process.

### Task leader and team of task 1

|  |  |
| --- | --- |
| Team members | CA |
| Thamsanqa Mzinyane\* | **S & ET** |
| Emma Archer-van Garderen | Earth Systems |
| Nuveshen Naidoo | S & ET |
| Karen Eatwell | S & ET |

\* task leader

### Stakeholders and relevance to stakeholders of task 1

The maps will be available to the forestry sector but will be of particular relevance to plantation growers. It will assist them in deciding what species/hybrids to plant where under future climatic condition thereby reducing the risk of crop failure.

## Task 2: Germplasm options for adaptation to larger scale changes

The expected impact of climate change of forest productivity will require changes in forest management practices and in the choice of germplasm. Regarding germplasm one key requirement is variability. Variability needs to be maintained (conserved) to be able to respond to climatic variability and variability also needs to be considered when new plantations are established. Small changes in temperature and precipitation will not need large scale adaptation interventions but larger scale changes may need some more drastic measures such as selection of alternative provenances (or more imports from successful provenances) or in cases of severe changes even new species.

### Description of task 2

Under conditions of larger scale changes (e.g. in temperature, precipitation, disease and pest loads), the tolerance limits of the current plantation genetic resources may be exceeded. Under such conditions it may be necessary to introduce new provenances or species or produce new hybrids that will be able to thrive under such conditions. As importation and evaluation of such material requires many years, the acquirement of appropriate genetic material needs to be a pro-active rather than reactive measure. This activity will investigate possible sources (species, provenances, hybrids) of appropriate genetic material (e.g. disease resistant material from regions that experience high disease prevalence), i.e. predictive provenancing, as well as identifying material from marginal areas within South Africa that may be of increasing importance under future climatic conditions. Recommendations will be made regarding sources of genetic material that needs to be conserved and suggestions for conservation on a national level will be made. Further recommendations will be made regarding the deployment of the genetic material to ensure increased variability on a plantation level to reduce the risk of loss. The activities are illustrated in Figure 2.



Figure Activities and outputs for task 2 with deadlines and team members.

|  |  |  |
| --- | --- | --- |
| Activity | Date of completion | Activity team |
| Descriptors of germplasm requirements | 15/6/2012 | Marianne Hettasch  Amith Sivlal |
| Identification of suitable germplasm for larger scale changes | 17/8/2012 | Karen Eatwell  Chris Komakech  Marianne Hettasch  Brian Pierce  Amith Sivlal |
| Deployment options for increased variability | 14/9/2012 | Karen Eatwell  Chris Komakech  Marianne Hettasch  Brian Pierce |
| Draft position paper | 12/10/2012 | Karen Eatwell  Chris Komakech  Marianne Hettasch  Amith Sivlal  Nuveshen Naidoo |

### Deliverables of task 2

The deliverable of this task will be a position paper outlining adaptation strategies for the South African plantation sector.

### Task leader and team of task 2

|  |  |
| --- | --- |
| Team members | CA |
| Marianne Hettasch | **S & ET** |
| Karen Eatwell | S & ET |
| Nuveshen Naidoo | S & ET |
| Chris Komakech | S & ET |
| Brian Pierce | S & ET |

\* task leader

### Stakeholders and relevance to stakeholders of task 2

The deliverable of this task will be relevant to the forest growers and plantation owners. It will assist in making recommendations regarding adaptation strategies to climate-proof the South African plantations but in particular regarding conservation of a broad germplasm base. It will allow for pro-active measures to ensure that sufficient variability is maintained for sustained productivity of plantations.

## Task 3: Development of a briefing note to inform stakeholders and Government

Currently no long-term adaptation strategy for the plantation forestry sector in South Africa has been developed. This task will contribute to informing relevant stakeholders including the Government of possible adaptation measures; as well as contributing to South Africa’s LTAS process.

### Description of task 3

This task will involve the preparation of a briefing note to institutions including DEA, DAFF, and SADC regarding potential adaptation strategies for the plantation forestry sector. The draft will be developed by the CSIR but will then be submitted to the steering committee for forestry and climate change for further development and submission. It will also involve an information session (and members of the steering committee) to ensure participation of relevant stakeholders in the process.



Figure Activities relating to task 3 together with deadlines and team members.

|  |  |  |
| --- | --- | --- |
| Activity | Date of completion | Activity team |
| Information session | by 17/08/2012 | Oscar Mokotedi |
| Draft briefing note | 26/09/2012 | Oscar Mokotedi  Karen Eatwell  Thamsanqa Mzinyane  Marianne Hettasch  Emma Archer van Garderen |
| Briefing note | 26/10/2012 | Oscar Mokotedi |

### Deliverables of task 3

The deliverable for this task is a briefing note recommending adaptation strategies and research priorities for the South African plantation sector.

### Task leader and team of task 3

|  |  |
| --- | --- |
| Team members | CA |
| Oscar Mokotedi | **S & ET** |
| Marianne Hettasch | S & ET |
| Emma Archer-van Garderen | Earth Systems |
| Thamsanqa Mzinyane | S & ET |
| Karen Eatwell | S & ET |
| Steering committee | various organizations |

\* task leader

### Stakeholders and relevance to stakeholders of task 3

The briefing note will be developed in collaboration with the steering committee on climate change and forestry and is to government departments including DEA and DAFF as well as SADC; and the LTAS team.

# Relationship of tasks



Figure The relationship of tasks and interdependencies.

# Internal project meetings

|  |  |
| --- | --- |
| Date | Purpose |
| 22/05/2012 | Finalising research plan |
| 4/06/2012 | Project initiation, define tasks, discuss potential overlap and dependencies |
| 2/07/2012 | Project progress |
| 6/08/2012 | Project progress |
| 3/09/2012 | Presentation of results of task 1 to all project team members (TM) |
| 8/10/2012 | Project progress |
| 22/10/2012 | Presentation of results of task 2 to all project team members (MH) |
| 5/11/2012 | Presentation of results of task 3 to all project team members (OM) |
| 3/12/2012 | Discussion of project deliverables and results to all team members (MH) |

# References

Schulze, R.E. 2007. Plantation forestry: a perspective from southern Africa. Presentation for IIASA.

Schulze, R.E. 2010. Atlas of climate change and the South African Agricultural Sector: A 2010 perspective. Department of Agriculture, Forestry and Fisheries, Pretoria.

Warburton, M.L. and Schulze, R.E. 2008. Potential impacts of climate change on the climatically suitable growth of *Pinus* and *Eucalyptus:* results from a sensitivity study in South Africa. Southern Forests 70 (1): 27-36.