**ICFR & Mpumalanga Regional Interest Group Field Day**

**Date:** Wednesday 13th October 2004  
**Venue:** Sabie Country Club, Sabie  
**Time:** 08.30 - 13.30

### IN-HOUSE PRESENTATIONS

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00</td>
<td>TEA/COFFEE</td>
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<tr>
<td>08:30</td>
<td><strong>Fire management</strong></td>
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<td></td>
<td>Fuel load management as a tool in fire protection.</td>
<td>Tim Netterville, Sappi</td>
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<tr>
<td>09:00</td>
<td>Characterising <em>P. patula</em> slash loads for use in fire models and nutritional studies.</td>
<td>Tim Ross, ICFR</td>
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<tr>
<td>09:30</td>
<td>Practical plantation disease management.</td>
<td>Jolanda Roux, TPCP</td>
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<tr>
<td>10:00</td>
<td>Fire protection plans – crossing the boundaries.</td>
<td>Kyle &amp; Kirsten Mahood,</td>
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<td>Environmental &amp; Forestry Consultants cc</td>
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<tr>
<td>10.30</td>
<td>TEA/COFFEE</td>
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<td>11.00</td>
<td><strong>Silviculture</strong></td>
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<td>11.30</td>
<td>Accessing information from the ICFR.</td>
<td>Sally Upfold, ICFR</td>
</tr>
<tr>
<td>11.30</td>
<td>Pine regeneration research – results from two pilot trials investigating the effects of planting treatments and micro-environment on survival and growth of <em>P. patula</em>.</td>
<td>Carol Rolando, ICFR</td>
</tr>
<tr>
<td>12.00</td>
<td>Responses of <em>P. patula</em> to fertilisation applied at 2nd thinning.</td>
<td>Janine Campion, ICFR</td>
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<td>12.20</td>
<td>Post-establishment weed control in eucalypts and pines.</td>
<td>Keith Little, ICFR</td>
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<tr>
<td>12.45</td>
<td><strong>LUNCH sponsored by GFP</strong></td>
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</table>
Fuel load management as a tool in fire protection.

Ben Potgieter and Tim Netterville*
*(tim.netterville@sappi.com)
Sappi Forests, PO Box 7, Kwambonambi 3915

Introduction:
Fire suppression has always been the focus point of all fire protection efforts. In the USA the large amounts spent on fire suppression has over years led to the exclusion of fire from the environment which in turn has led to very high fuel loads this is one of the contributing factors for their large catastrophic fires. Emphasis is now changing to managing of fuel loads and it is acceptance that fire is an important part of the environment.

The characteristics of forest fuels determine how they burn. The quantity and arrangement of the fuel are important characteristics to consider. Lighter fuels require less heat to ignite them and are responsible for the rapid spread of fire. Other characteristics such as moisture content slope wind speed effect fire behaviour. Of these characteristics the arrangement and quantity can be managed by Foresters to have an impact on fire behaviour.

Options to consider when managing fuel loads are:
1. Burning of harvest residues.
2. Good weed control till canopy closure.
3. Control of noxious weeds.
4. Selecting less flammable species in fire prone areas.
5. Planned harvesting to break up areas of high fuel load.
6. Prescribed burning.

The burning of brush wood needs to be well controlled to prevent soil damage and the threat of planned burns getting out of control. Strict adherence to prescribed weather conditions is essential. The burning permit system should be used to control burning operations.

<table>
<thead>
<tr>
<th>BURNING CRITERIA</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Yes</th>
<th>No</th>
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<tr>
<td>Factor</td>
<td>Minimum</td>
<td>Maximum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rainfall</td>
<td>10mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of days since last rain</td>
<td></td>
<td>3 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum initial rainfall</td>
<td>70mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td>30°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind speed</td>
<td></td>
<td>15 km/hr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RH</td>
<td></td>
<td>30%</td>
<td></td>
<td></td>
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<tr>
<td>Difference between Burning Index (BI) and FDI</td>
<td></td>
<td>10 points</td>
<td></td>
<td></td>
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<tr>
<td>FDI forecast for the 3 days after the burn</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>■ 1st day</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>■ 2nd and 3rd day</td>
<td>55</td>
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</table>
When planning fuel load reduction you should begin with a risk assessment of your plantation and concentrate your efforts in areas of highest risk. For this purpose in Sappi an estimated maximum loss calculation is done for each plantation. The EML begins with fuel load classification of each compartment into one of five fuel load ratings.

The history of previous fires and current local risks is used in conjunction with the fuel load to estimate the area burnt should a fire occur on a high FDI day. The value of timber lost would be the EML more than one scenario can be run to determine the largest potential lost.

This EML is then used as a basis for planning your fuel load reduction exercise. The aim is to reduce the value of area lost by managing fuel loads and planning fire suppression around the high risk areas thus making the plantations safer.

### FUEL LOAD HAZARD RATINGS

<table>
<thead>
<tr>
<th>DANGER RATING</th>
<th>COLOUR CODES</th>
<th>DESCRIPTION OF FUEL LOADS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>✔️</td>
<td>1. Compartments and open areas burned during the past year. Compartments kept weed free.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Heavily grazed grasslands.</td>
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<tr>
<td></td>
<td></td>
<td>3. Well managed wattle compartments older than 3 years.</td>
</tr>
<tr>
<td>2</td>
<td>🔴</td>
<td>1. Canopied compartments with a standard litter layer that have received good weeding.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Pre-canopied compartments that have had good weeding and have very little grass.</td>
</tr>
<tr>
<td>3</td>
<td>🔵</td>
<td>1. Pre-canopied compartments, good weeding and some grass cover.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Two to three year old wattle compartments.</td>
</tr>
<tr>
<td>4</td>
<td>🔴</td>
<td>1. Pre-canopied compartments, poor weeding and grass cover.</td>
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<tr>
<td></td>
<td></td>
<td>2. Older compartments, very poor weeding that seriously limits access.</td>
</tr>
<tr>
<td>5</td>
<td>🔴</td>
<td>1. Compartments with slash not broken down, coppice slash and pruning slash(0-2 years)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Two years and older grasslands.</td>
</tr>
</tbody>
</table>
Management of *P. patula* fuel loads in South Africa.

Timothy I. Ross

(student@icfr.unp.ac.za)

*Institute for Commercial Forestry Research, PO Box 100281, Scottsville 3209*

Introduction:
Past research has shown that forest floor loads accumulate at high altitudes, resulting in the immobilisation of nutrients, re-establishment problems and wildfires. The presence of harvest residue following clearfelling is also problematic for a variety of management operations, most notably in re-establishment, and has been found to influence the survival of *P. patula* and increase the damage and loss caused by wildfires. Wildfires have the potential to destroy large areas of standing timber and have a large detrimental effect on the nutrient pools, passing the damage caused by the fire onto successive rotations.

Relatively little work has been done on characterising the forest floor and harvest residue fuel in terms of fuel load and nutrient properties for fire behaviour prediction. Currently there are no means available for estimating or accurately predicting the harvest residue load by fuel class on a large scale. Fuel models are required for the prediction of fire behaviour and risk for fuel management. This study focused on *P. patula* and sites were selected to cover the planted range of this species in terms of age at clearfelling, altitude, temperature, rainfall, parent material and management regimes as comprehensively as possible.

The main purpose of this project was to:

- predict the forest floor loads based on a number of site and stand factors and characterise these in terms of nutrient pools and fuel load properties across a range of sites;
- quantify the harvest residue by individual fuel classes using the line intercept sampling method and characterise them in terms of nutrient pools and fuel load properties across a range of sites;
- develop fuel models for *P. patula* in South Africa for fuel load management and lay the foundation for the development of a photo series to provide a practical guide for managers.

Site Description:
Study sites were located throughout the summer rainfall region. Stand ages of the selected compartments ranged from 11 to 37 years and covered an altitude range from 960 m above sea level (a.s.l.) to 1703 m a.s.l. Study sites covered a latitudinal range from 24° to 30° S. Mean annual precipitation (MAP) for the sites ranged from 732 to 1350 mm and mean annual temperatures (MAT) from 13.7 to 18.6 °C.

Sampling Methods:
The forest floor was destructively sampled at each site and a number of random depth measurements were also collected. Harvest residue was characterised and quantified using the line intersect sampling methodology. Other requirements for the calculation of fuel load were determined through destructive sampling of the harvest residue. Both the forest floor and harvest residue were analysed for macronutrients and sodium. Photographs were taken at each site for inclusion into a photo series.
Results:

Figure 1. Relationship between FF depth and ash-free mass for a combination of ST and PLP stands in SA. FH mass only shows the relationship between the mass of the F + H (duff) layer and the depth of the destructive sample.

Figure 2. Average mass (t ha\(^{-1}\)) of the individual fuel classes for each product. The mass of the 1-hr fuel class does not include the mass of the needles retained on the branches.
Take Home Points:

- Forest floor loads are not as thick as those reported previously in the literature;
- The forest floor, and particularly the F and H layers, accumulate in high altitude sawtimber stands;
- A single model can be used to predict ash-free forest floor mass to within 10 t ha⁻¹ sawtimber and pulpwood sites;
- Ash-free mass can also be predicted accurately using site and stand variables such as age, altitude and MAP;
- Harvest residue loads obtained using the line intersect sampling technique are comparable to loads obtained in other South African harvest residue studies where the harvest residue was destructively sampled;
- The fuel models provide a means of quantifying possible prescribed burn scenarios and determining the expected fire behaviour and risk;
- Fuel models can be used when assessing the potential fire risk to a site and different fuel management options;
- Nutrients accumulate in the forest floor and become much larger than the available nutrients in the topsoil as the litter accumulates;
- The greatest proportion of all nutrients is contained in the F layer of the FF followed by the H and L layers respectively;
- The forest floor accounts for the largest proportion of the nutrients contained in the fuel load and proper management of this fuel is essential to ensure the sustainability of plantation.

Figure 3. The mean concentration of nitrogen held in each of the FF layers of ST and PLP sites.
Plantation Health Management: Some Practical Guidelines

Jolanda Roux
Tree Protection Co-operative Programme (TPCP)
Jolanda.roux@fabi.up.ac.za (082 9093202)

Death of plantation trees can be caused by a number of different factors, broadly classified into those caused by biotic (living) and those caused by abiotic (non-living) factors. Biotic factors include agents such as fungi, bacteria, viruses and insects. Abiotic factors include drought, hail, nutrient deficiencies, frost and other non-living agents.

Diseases caused by fungi and bacteria result not only in tree death, but also affect the quality of the end product and impact greatly on management costs. These include costs of replanting, such as after mortality experienced due to Fusarium circinatum or Rhizina undulata. Other losses include loss in diameter and height growth, loss in wood quality and yield loss.

Many of the plantation tree diseases in South Africa are closely associated with stress conditions, such as those caused by drought, hail, frost, wounds, insects, planting and other plantation operations. Basic plantation management practices play a large part in disease development. Farmers and foresters can minimise the incidence of disease by paying careful attention to planting practices, species/clone selection and basic silvicultural practices.

A summary of important points to remember for farmers and foresters are given below. Paying attention to these factors will greatly reduce the incidence and impact of diseases.

1. Planting time
2. Planting technique – Jrooting?
3. Seedling quality – plug bound?
4. Wounding
5. Site matching
6. Movement of infected material
7. Fire regimes
8. Communication with researchers, companies, tree breeders

If farmers and foresters have any questions related to tree health, or wish to report a disease problem, please do not hesitate to contact the TPCP.

- Jolanda Roux  Extension and Field Services  082 909 3202
  jolanda.roux@fabi.up.ac.za
- Mike Wingfield  Director  012 420 3938 /9
  mike.wingfield@fabi.up.ac.za
- Teresa Coutinho  Manager: Diagnostic Clinic  012 420 3934 /8 /9
  teresa.coutinho@fabi.up.ac.za
- Brett Hurley  Entomology  082 909 3211
  brett.hurley@fabi.up.ac.za
Fire Protection Plans - Crossing the Boundaries

Kirsten Mahood and Kyle Mahood
EFC Environmental and Forestry Consultants cc
P.O. Box 12186, Nelspruit, 1200
kirsten@enviroforest.co.za

In the past fire protection plans were often hand drawn on standard plantation stock maps. These
fire protection plans were difficult to reproduce and, once developed, remained relatively static.

Today, with the advent of GIS and GPS technologies one is able to develop fire protection maps
using corrected digital ortho-images to accurately map fire protection information such as
firebreaks, hazard ratings, risk areas and water-points (to mention a few) in digital format.

In the past, spatial firebreak planning was generally done within farm or plantation boundaries, with
minimal spatial information being captured for neighbours. Where firebreaks on plantation
boundaries are burnt jointly by both land managers or where firebreaks are split between
neighbours, with sides being burnt in alternate years, correct spatial information is becoming
increasingly meaningful. Interactions between neighbours become complicated, and it becomes
important to map and plan your fire protection strategy together with your neighbour on a spatially
correct platform.
Accessing information from the ICFR.

Sally J Upfold
(sally@icfr.unp.ac.za)
Institute for Commercial Forestry Research, PO Box 100281, Scottsville 3209

Summary:
The Institute for Commercial Forestry Research publishes a range of information on its research outputs, in the form of scientific papers in peer-reviewed journals, as well as internal publications including an Annual Research Review, quarterly newsletters, bulletins and innovation documents. All of these have two main objectives:

- Give our research scientific credibility; and
- Disseminate relevant information to our members.

With the exception of the scientific papers, all of this information is proprietary and access to it is restricted to ICFR members, through user and password identification.

Members can readily obtain access to this information through a number of sources:

- Direct contact with ICFR member of staff;
- Library;
- ICFR website (www.icfnet.unp.ac.za); (available on CD)
- Regional Interest Group field days;
- Workshops;
- Steering Committee and other meetings.

In addition to housing hard copies of all ICFR publications produced since the inception of the (then) Wattle Research Institute (WRI) in 1947, the ICFR Library provides a wide range of information including:

- More than 3 500 books;
- 10 000 pamphlets;
- Subscription to 23 forestry-related journals;
- Reference handbooks;
- Electronic forestry-related databases;
- Access to publications from other institutions such as the University of KwaZulu-Natal.

In addition, Desiree Lamoral (ICFR Librarian) provides a service answering queries and conducting literature searches around a wide range of forestry-related issues.

The ICFR website (available) on CD provides the best electronic access to our publications, and includes a SEARCH facility allowing input of keywords or phrases.

<table>
<thead>
<tr>
<th>For more information or assistance with accessing information from the ICFR, members can contact:</th>
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<tbody>
<tr>
<td>Tammy Swain (ICFR Sabie office)</td>
</tr>
<tr>
<td>Sally Upfold (ICFR Editor / PRO)</td>
</tr>
<tr>
<td>Desiree Lamoral (ICFR Librarian)</td>
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</tbody>
</table>
Pine Regeneration Research: results from two pilot trials investigating the effects of planting treatments and micro-environment on survival and growth of *P. patula*.

Carol Rolando
(carol@icfr.unp.ac.za)
Institute for Commercial Forestry Research, PO Box 100281, Scottsville 3209

Introduction:
*Pinus patula* is the most widely planted softwood species in the summer rainfall region of South Africa. Of the pine species planted, it is considered the most sensitive to adverse climate, pests and diseases. Previous research has indicated that the following factors individually, or in combination, may facilitate high mortality following planting: heat and drought stress; pests and diseases; and harvest residue levels. There is a need for fundamental research to fully understand the interaction between site, macro- and micro-environment and seedling physiology. More specifically, quantification of certain components of the micro-environment (soil and air temperature, and soil water) surrounding the seedling at planting, and the physiological response of the plant to these factors is needed to fully understand the conditions and/or physiological factors that affect early survival and growth of *P. patula*.

The Pine Regeneration Research Project was initiated at the ICFR in 2002 with the intention of quantifying and understanding environmental aspects and plant quality factors that contribute to seedling stress and mortality. To meet these objectives, it was necessary to first investigate the relevance and quality of various physiological and morphological measurements as well as the data that could be collected on aspects of the micro-environment using the equipment available at the ICFR. Two pilot trials were established in November 2002 to provide a foundation for future trials.

The objectives were to:
1. Monitor survival and growth of *P. patula* on two contrasting sites using management practices to alter the local micro-environment;
2. Characterise the physiology of the planting stock in the nursery, and in the field for the first growing season after planting;
3. Collect data on the micro-environment (soil and air temperature, and soil water);
4. Investigate the practical and theoretical constraints of micro-meteorological, plant physiological and morphological measurements; and
5. Identify/monitor the effects of any major pests and diseases present at the sites.

Description of trials:

<table>
<thead>
<tr>
<th>Site History</th>
<th>Linwood</th>
<th>Driekop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planting Date</td>
<td>14/11/2002</td>
<td>28/11/2002</td>
</tr>
<tr>
<td>Site History</td>
<td><em>P. patula</em> pulpwood</td>
<td><em>P. patula</em> sawlog</td>
</tr>
<tr>
<td>MAP (mm)</td>
<td>825</td>
<td>1250</td>
</tr>
<tr>
<td>MAT (°C)</td>
<td>16.5</td>
<td>15.9</td>
</tr>
<tr>
<td>Altitude (m)</td>
<td>1100</td>
<td>1440</td>
</tr>
</tbody>
</table>

Trial design and treatments:
- 2 x 2 x 2 factorial with two additional controls arranged as a split-plot with four replications.
- The treatment factors were:
  - Slash Management (pit in slash versus the removal of slash away from pit),
  - Water Management (water at planting only versus continuous water over hot periods);
  - Pest Management (pesticide applied at planting versus no pesticide).
- The additional controls included the planting of seedlings without water in pits that either had the slash removed or not.
Measurements:
- Survival, height and groundline diameter;
- At the Linwood trial, more intensive measurements were made on seedling physiology and micro-environment (including soil water content of the pits, soil temperature in the root plug zone and air temperature at seedling height).

“Snap-shot” of Results:

![Graph 1](image1)

**Figure 1.** Percentage survival for the control (dry plant), no pesticide (water only) and pesticide (water and pesticide) treatments in the *P. patula* seedling regeneration trial at Driekop, Mpumalanga.

![Graph 2](image2)

**Figure 2.** Relative soil water content (percentage) measured with CS615 Water Content Reflectometers placed in the pit, adjacent to the pit and under the inter-row slash in the control.
Take Home Points:

- Contrasting survival responses at Linwood and Driekop highlight the importance of conditions at planting.
- Similar growth responses to pesticide application at both trials indicates that pesticides play a role in improving early tree growth, although further investigation is required to understand this role.
- Data collected on the seedling micro-environment did not indicate any effect of slash on soil or air temperature.
- One of the most valuable exercises of this trial was the familiarisation with different electronic equipment used to monitor various aspects of the micro-environment. The experience gained was invaluable and has already assisted in the planning and managing of further intensive trials at the ICFR.
Responses of *Pinus patula* to fertiliser applied at second thinning.

Janine M. Campion and Ben du Toit  
(janine@icfr.unp.ac.za; ben@icfr.unp.ac.za)  
Institute for Commercial Forestry Research, PO Box 100281, Scottsville 3209

Introduction:
Fertilisation modifies nutrient supply, while thinning may alleviate growth limitations of all resources, such as light, moisture, nutrients and space. The rationale for applying fertiliser after thinning is to supply readily available nutrients when other possible growth limitations have been reduced. This has the potential to increase the growth of the remaining trees to a level greater than that which would be obtained solely from the response to thinning.

A series of fertiliser trials was established in the Mpumalanga area between 1990 and 1992 following identification of the need for nutritional research on pine plantations in South Africa. This trial series was aimed primarily at identifying the nutrients limiting the growth of *P. patula* over a range of site types. The three main objectives were:

- To identify the sites on which there is a substantial response to fertiliser;
- To identify the nutrients responsible for a response, rather than the rates of application;
- To evaluate the variation in magnitude of response in relation to site properties.

Experimental design:
The five trial sites were grouped according to regional location and underlying parent material. The experiment was designed as a $2^5$ factorial, consisting of a single replicate of the following treatments:

- Nitrogen (N), applied as LAN (28% N), at 0 or 150 kg N ha$^{-1}$,
- Phosphorus (P), applied as MAP (11% N and 22% P), at 0 or 150 kg P ha$^{-1}$,
- Potassium (K), applied as KCl (50% K), at 0 or 150 kg K ha$^{-1}$,
- Calcium (Ca), applied as gypsum (19% Ca), at 0 or 140 kg Ca ha$^{-1}$, and
- No additional fertiliser, or a fertiliser re-application of the above elements, which coincided with the second thinning operation.

The 262 m$^2$ plot size consisted of 18 measured trees following the 1st thinning, which were reduced to 11 trees at the 2nd thinning operation.

Results:
The responses of *P. patula* to fertiliser applied at first thinning are documented by Carlson and Soko (2000); those at second thinning are presented here (Figure 1).

<table>
<thead>
<tr>
<th>Take Home Points:</th>
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<tbody>
<tr>
<td>The application of 150 kg ha$^{-1}$ of the following elements at second thinning yielded an economic response:</td>
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<tr>
<td>- K applied to Lowveld granitic sites,</td>
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<td>- N added to sites with shale parent materials, either as a sole application at second thinning, or in combination with NPK at first thinning, and</td>
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<tr>
<td>- Single applications of N or K at second thinning to Highveld granitic sites.</td>
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<td>Additional experimentation could optimise fertiliser quantities to refine recommendations.</td>
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</tbody>
</table>

References:
Figure 1. A diagrammatic representation of the main effects that increased basal area increment (BAI), either consistently (clear diamonds), or significantly (black diamonds). The size of the diamond represents the magnitude of the response, where 1 cm (height or width) = 0.80 m$^2$ ha$^{-1}$ increment. A = Lowveld granites, B = Escarpment shale, C = Highveld quartzite and D = Highveld granite. The BAI was calculated as the basal area for each treatment minus the initial basal area at the time fertiliser was applied at second thinning.
Post-establishment weed control in eucalypts and pines.

Keith M. Little  
(keith@icfr.unp.ac.za)  
Institute for Commercial Forestry Research, PO Box 100281, Scottsville 3209

Introduction:
Previous research has focussed mainly on the competitive effects of vegetation on tree growth during the establishment phase. In most plantations, shading at canopy closure reduces growth of competing vegetation and the need for further management. Sometimes full canopy closure is delayed or not achieved, and competitive vegetation may develop. This may occur due to one or a combination of the following factors:
- a small leaf surface area;
- a wide planting espacement;
- thinning and pruning;
- stress induced leaf senescence;
- occurrence of shade tolerant vegetation; or
- poor stocking.

Two pine and two eucalypt trials were initiated to determine the competitive effect of post-establishment vegetation on tree growth, and at what stage this vegetation should be controlled (if competitive).

Trial Descriptions:

<table>
<thead>
<tr>
<th>Species</th>
<th>Location</th>
<th>Age of trees when treatments initiated</th>
<th>Age of trees when last measured</th>
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<td></td>
<td></td>
<td>4.4 years</td>
<td>11.4 years (ht = 15 m)</td>
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<td></td>
<td>3 years</td>
<td>10.7 years (ht = 19 m)</td>
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<td>4 years</td>
<td>9 years</td>
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<td>2 years</td>
<td>7 years</td>
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<td>11.4 years (ht = 15 m)</td>
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<td>10.7 years (ht = 19 m)</td>
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<td>2 years</td>
<td>7 years</td>
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</table>

Trial Design and Treatments:
The trials were imposed on stands of trees that had been maintained in a weedfree state until the treatments were initiated. For the pines this was timed to coincide with the first pruning operation, and in the eucalypts with canopy closure.

Pine Treatments:

<table>
<thead>
<tr>
<th>Treat. No.</th>
<th>Treatment</th>
<th>Weeds removed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Weedfree</td>
<td>All</td>
</tr>
<tr>
<td>2</td>
<td>Herbaceous weeds</td>
<td>Woody weeds removed</td>
</tr>
<tr>
<td>3</td>
<td>Woody weeds</td>
<td>Herbaceous weeds removed</td>
</tr>
<tr>
<td>4</td>
<td>Operational weeding</td>
<td>Woody weeds removed prior to pruning and thinning</td>
</tr>
<tr>
<td>5</td>
<td>Weedy</td>
<td>None</td>
</tr>
</tbody>
</table>

Eucalypt Treatments:

<table>
<thead>
<tr>
<th>Treat. No.</th>
<th>Year treatments imposed</th>
<th>Age when treatment imposed (yrs)</th>
<th>Years kept weedfree</th>
<th>Years in a weedy state before weeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>December 1998</td>
<td>4</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>December 1999</td>
<td>5</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>December 2000</td>
<td>6</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>December 2001</td>
<td>7</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>December 2002</td>
<td>8</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>December 2003</td>
<td>9</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Results:
Results obtained for both the pine and eucalypt trials were similar and as such only one set of data is used to illustrate tree growth responses.

![Graph showing basal area development](image)

Figure 1. *E. grandis* x *E. camaldulensis* basal area development at Zenith Estate, KZN-Zululand.

![Graph showing basal area development](image)

Figure 2. *P. patula* basal area development at Dargle Plantation, KZN-Midlands.

Take Home Points:

- From a tree growth perspective, the results indicate that the impact of vegetation on post-establishment performance of trees is minimal.
- While this is an encouraging result for foresters, it must be acknowledged that on other sites and with other eucalypts/pines, where the vegetation spectrum may be different, competition may occur.
- It is recommended that selective control of woody and invasive plants is carried out where competitive vegetation persists throughout stand development.
- Control of invasive aliens is required by legislation and therefore must be carried out, and this, together with the control of other woody plants, will help to:
  1. reduce under-canopy fuel loads and risks of uncontrolled fires,
  2. reduce the seed bank of unwanted vegetation, and prevent their re-establishment, and
  3. improve access for silvicultural operations.