



Demonstration and Development of Fast Growing Irrigated Eucalypt Plantations

**A report for the
RIRDC/L& W Australia/FWPRDC
Joint Venture Agroforestry Program**

**by M. J. Duncan, T. G. Baker, D. J. Stackpole,
G. D. Bandara, J. D. Morris, J. J. Collopy and
R. C. Stokes**

**W03/002
DAV-131A
January 2003**

© 2003 Rural Industries Research and Development Corporation.
All rights reserved.

"Demonstration and Development of Fast Growing Irrigated Eucalypt Plantations"
Publication no W03/002
Project no. DAV-131A
CFTT Report No.: 2000/030

The views expressed and the conclusions reached in this publication are those of the author and not necessarily those of persons consulted. RIRDC shall not be responsible in any way whatsoever to any person who relies in whole or in part on the contents of this report.

This research report is available in the interests of making the data available to others. The project had some methodological issues which were not fully resolved, and the data and conclusions require careful interpretation.

This publication is copyright. However, RIRDC encourages wide dissemination of its research, providing the Corporation is clearly acknowledged. For any other enquiries concerning reproduction, contact the Communications Manager on phone 02 6272 3186.

Researcher Contact Details

Dr Michael Duncan or Dr Tom Baker
Centre For Forest Tree Technology
PO Box 137
HEIDELBERG Victoria 3084

Phone: 03 9450 8666
Fax: 03 9450 8644
Email: michael.duncan@nre.vic.gov.au
tom.baker@nre.vic.gov.au
Website: <http://www.cfft.vic.gov.au>

In submitting this report, the researcher has agreed to RIRDC publishing this material in its edited form.

RIRDC Contact Details

Rural Industries Research and Development Corporation
Level 1, AMA House
42 Macquarie Street
BARTON ACT 2600
PO Box 4776
KINGSTON ACT 2604

Phone: 02 6272 4539
Fax: 02 6272 5877
Email: rirdc@rirdc.gov.au
Website: <http://www.rirdc.gov.au>

Executive Summary *

This report presents analyses of groundwater, irrigation water, foliage, surface soil and tree growth to age 3, 6 or 8 years from irrigated eucalypt trials in northern Victoria. The trials were established in 1990 (Undera), 1992 (Mangalore), 1993 (Cobram, Nathalia, Shepparton, Tatura and Timmering), and 1996 (Appin South and Yarrawalla South). Four species were planted at each site (*Eucalyptus camaldulensis*, *E. globulus*, *E. grandis* and *E. saligna*).

The trial sites vary little in altitude (80-140 m), and have an annual rainfall between 370 and 595 mm, while pan evaporation varies between 1365 and 1625 mm. Average daily maximum and minimum temperatures range from 28-31 and 13-15°C in January, and 12-14 and 2-4°C in July. The soils typically have texture-contrast profiles with hard-setting A horizons and medium to heavy B horizons. Piezometric pressure at each site varied between 50 and 400 cm below ground level, and on average tended to lower throughout the period of the study. The sites are flood irrigated, and represent a range of water sources and qualities available in northern Victoria (low salinity channel water to high salinity groundwater to nutrient-rich municipal effluent).

This study has shown a correlation between the salinity level in irrigation water and the salinity and sodicity of the soil. At Tatura and Timmering (groundwater), where the irrigation water was highly saline (4.0 to 6.9 dS/m respectively), salt accumulation has occurred in the surface soil (0-10 and 10-20 cm), and throughout the soil profile. Salt accumulation is not a serious problem at sites irrigated with low salinity water (Cobram, Mangalore or Undera). However, the increasing trend in salinity at Shepparton suggests that it may be a problem in the future. The increase in soil salinity and sodicity at these sites has also correlated with an increase in Cl concentrations in the foliage of *E. globulus*, *E. grandis* and *E. saligna*. Similarly, there was a negative trend between the salinity of irrigation water and the growth rates of these species. It appears that growth is reduced at the most saline sites (Timmering (groundwater) and Tatura).

Irrigation with high sodium municipal effluent at Shepparton has led to increased soil salinity and sodicity, as well as increased foliar Cl concentrations. However, if these changes are having a negative impact on tree growth, it is being masked by the beneficial effects of the additional nutrients in the effluent. Growth rates at Shepparton to age 6 years are amongst the greatest recorded in southern Australia.

Soil salinity, and Cl concentrations in the foliage of *E. globulus*, *E. grandis* and *E. saligna* were initially quite high at Appin South and Yarrawalla South, but have declined following irrigation with low salinity water. However, it is possible that the high chloride concentration has caused growth losses at Appin South. Irrigation with channel water appears to have been an effective method to 'flush' salts from the soil profile at these sites.

The negative impacts of irrigating eucalypt plantations with saline groundwater, compared with non-saline channel water, are demonstrated at the Timmering site. Six years of irrigation

with saline groundwater has resulted in the soil becoming highly sodic, significant chloride accumulation in tree foliage, and poor growth rates, while at the same site, irrigation with channel water has resulted in only a slight increase in soil sodicity and higher growth rates. The trend of increasing soil salinity and sodicity at a number of TFP Pilot Sites is potentially a very serious problem if adequate leaching of salts through the soil cannot be maintained. It brings into question the long-term sustainability of irrigated eucalypt plantations using low quality water.

This report is available on request.

Please contact either:

- **Dr Roslyn Prinsley** **02 6272 4033** or
- **Dr Rosemary Lott** **02 6271 6671** or
- **Charlotte Keller** **02 6272 3736**

to obtain a copy.

* This research report is available in the interests of making the data available to others. The project had some methodological issues which were not fully resolved, and the data and conclusions require careful interpretation.