

# **Silviculture Research to Assist Large Scale Commercial Farm Forestry in Queensland**

## ***A report for the Joint Venture Agroforestry Program and the Natural Heritage Trust - Summary of full report***

### **Executive summary**

This project was conducted with close collaboration from the four main commercial plantation growers in Queensland; East Coast Tree Farms, Great Southern Plantations, Integrated Tree Cropping and DPI&F-Forestry, and through funding support from NHT, JVAP, the Queensland government (Private Plantation Initiative and Hardwoods Queensland) and from Canterwood, the primary woodchip processor operating in Queensland. Through these strong linkages, an extensive experimental program was conducted, which involved the establishment and/or management of 19 taxa evaluation trials and 24 silviculture techniques trials, across a geographic expanse from the Queensland/NSW border to Yeppoon in central Queensland. Trials were planted February 1998 to April 2001 and the research was completed in March 2002.

The 19 taxa evaluation trials were located on a broad range of representative soil and site types and investigated a wide range of hardwood species suitable for both pulpwood and pulpwood/sawlog regimes. Three acacia taxa, 42 eucalypt taxa and 13 eucalypt hybrids were tested in this study. The 19 individual trials varied widely, with different taxa treatments and experimental designs utilised at each location as dictated by site and operational constraints. Early results indicate that *Eucalyptus grandis* and *E. dunnii* are the taxa with the greatest adaptability and reliability for the immediate establishment of productive pulpwood plantations in this region. Promising results were also observed with hybrids including *E. grandis* ? *E. camaldulensis*, *E. grandis* ? *E. urophylla* and *E. urophylla* ? *E. pellita*, however there is a higher risk associated with these until more detailed testing can be made over a longer time period. Early results also indicate *Acacia glaucocarpa* may also have good potential for certain sites. *Corymbia citriodora* subsp. *variegata* (CCV) has high potential in this region for application in integrated regimes, whereby both pulpwood and sawlog products are produced.

In these subtropical and tropical environments, plantation sites need to be carefully chosen as it appears that only the better quality soils and site types have the potential to realise productivities (mean annual increment) of at least 20 m<sup>3</sup>/ha/year. Unfortunately, many of the sites available for forestry expansion are generally degraded, have shallow soils, and include sodic, strongly-duplex soil types. These sites are unsuitable for pulpwood plantations, with many examples of productivities <10m<sup>3</sup>/ha/year measured for even the best performing species on that site type.

A range of silvicultural techniques (spacing, site preparation, fertiliser and weed control) were investigated for the key hardwood species; primarily *E. grandis*, *E. dunnii*, selected *E. grandis* hybrids and CCV. As many of the results collected in this study are from trials ?? two years of age, accurate

long-term and site-specific silvicultural recommendations are not yet possible, however these results do provide a useful preliminary guide for a range of operational techniques.

Initial tree stockings of 1000–1250 trees/ha appear the most suitable for high productivity sites, but may need to be reduced to levels as low as 625 trees/ha on low productivity sites. Site preparation techniques involving high mounding have consistently proven to increase plantation growth across a wide range of soil types. Deep ripping is generally unnecessary, although is still an important technique on heavily compacted sites. Fertiliser responses are complicated by interactions between species, site and soil type, however there generally appears to be little advantage in applying large quantities of fertiliser on the most productive sites. Growth responses to increased fertiliser application on low productivity sites can be substantial, although may still be uneconomical. For those tree species which develop dense crowns at a young tree age (*E. grandis*), there may be little benefit of extending weed control beyond 9–12 months duration. For species with narrow, open crowns (CCV), it is expected that there will be substantial growth benefits of extending weed control to 15 months. Currently, Simazine + Roundup remains the most effective formulation for achieving optimum weed control on most site types, however emerging selective herbicides now offer plantation managers more flexibility. A range of new pre-emergent herbicide products have potential for greatly extending the effectiveness of a single pre-emergent herbicide application, however will need to undergo further testing before they can be more widely used.

Over the duration of this project, the early results from these trials were regularly communicated to the main industry collaborators (ECTF, ITC, GSP, Canterwood) and other interested stakeholders through various means including regular hard copy project milestone reports, short internal reports, experimental summary sheets, a number of conference and journal publications, individual field visits, large industry bus tours (40–60 attendees) and through the addition of research information to the DPI & F Hardwoods Queensland web site ([www.dpi.qld.gov.au/hardwoods\\_qld/](http://www.dpi.qld.gov.au/hardwoods_qld/)).

