TITLE DRAWING LESSONS FOR CLIMATE CHANGE ADAPTATION FROM RECURRENT DROUGHTS IN AUSTRALIAN PLANTATION FORESTS

Theme Water and Landscapes  
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Australia has 2 million ha of predominantly Pinus and Eucalyptus plantations, with these producing sawlogs or pulpwood. Many of these plantations are in areas with >700 mm annual rainfall in southern Australia and were developed in two phases. Softwood plantations expanded between 1950 and 1980 and eucalypt plantations between 1990 and 2005. There has been some recent plantation expansion into drier areas for new industries such as carbon sequestration and biodiversity conservation.

It is predicted that the climate of southern Australia will become drier as a result of climate change and consequently forest managers will need to adapt management systems to accommodate a drier climate. Australia’s plantations have been subject to both regional reductions in rainfall and recurrent droughts. The droughts in particular have affected both tree growth and survival, with total stand collapse in extreme circumstances.

In this paper we test the concept that the knowledge developed in response to both extended dry periods and recurrent droughts by Australia’s forest managers will provide insights for future climate change adaptation. We draw on specific examples from plantations across southern Australia, and in particular examine the response of managers, and the role of ongoing research and development in enabling adaptation.

Adaptation to recurrent droughts has occurred both as a result of research into specific issues or through adaptive management particularly during phases of rapid plantation expansion into new growing environments. The main adaptive responses have included:

(a) Modification of site selection procedures. While it has been recognised that climate provides the overall limitation to plantation potential certain soils, and particularly those with poor overall water holding capacity are inappropriate for plantations.

(b) Species selection. Different species have different optimum distributions and there are examples of species with a greater capacity to tolerate water stress being substituted. Attempts have been made to select drought tolerance in various species, with different degrees of success.

(c) Restricting tree water use. This is achieved by reducing leaf area through reducing initial stocking and subsequently thinning and pruning plantations, limiting leaf growth by reducing fertilizer inputs. In drier areas strips of trees have been promoted, with these drawing on water from the adjacent farmland.

The approach of using previous droughts as an analogue of future change may have some limitations. Climate change may result in new interactions (e.g. between rising CO₂ concentrations and water use efficiency) or in the emergence of new pests and diseases. Nonetheless, we suggest that previous periods of drought in Australian plantations may provide some lessons for future climate change adaptation for the plantation industry.