Plantation establishment under the Intensive Forest Management Program 1991–96

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Abstract

From 1991 to 1996, 7142 ha of eucalypt and blackwood plantations, and 248 ha of radiata pine were established under the Intensive Forest Management Program. These plantations are being managed to produce sawlog and veneer using pruning and thinning regimes.

Introduction

In 1991, planting of eucalypts (*Eucalyptus nitens* and *E. globulus*), blackwood (*Acacia melanoxylon*) and, subsequently, small areas of pine (*Pinus radiata*) commenced under the Intensive Forest Management (IFM) Program.

The main aim of the Program was to establish eucalypt plantations for production of sawlog/veneer to offset the resource included in World Heritage Area following the Helsham Enquiry. Similarly, blackwood plantations were established to provide for the maintenance and future expansion of the blackwood sawmilling and veneer industry. Establishment of these eucalypt and blackwood plantations was supported by several research and development projects, including:

- Development of cost effective establishment techniques;
- Development of regimes for spacing, thinning, pruning and fertilising for sawlog/veneer;
- Investigation of control procedures for browsing animals;
- Development of an integrated pest management system for leaf beetles; and
- Description and mapping of soils to assist site selection for plantations.

This paper provides details of the plantations established and discusses some research and operational experience gained during the project.

Plantation establishment targets

The IFM Program targets were to:

- Establish up to 8000 ha of eucalypt plantation;
- Establish up to 600 ha of blackwood plantation; and
- Keep the direct costs of eucalypt plantation establishment below $1500/ha.

In 1991, a schedule was developed to achieve the eucalypt plantation establishment rates shown in Table 1.

Table 1. Targets for eucalypt plantation establishment.

Year	Target (ha)
1991	370
1992	1500
1993	1500
1994	1500
1995	1500
1996	1000
	7370

The parameters for plantation establishment are given in Table 2.

Regimes for managing eucalypt plantations

Growing high quality eucalypt sawlogs and/or veneer in plantations requires thinning and pruning treatments if solid wood of suitable quality is to be produced at an age to be financially attractive.

The plantations were initially established at 1330 stems/ha; this was subsequently reduced to 1000 stems/ha, taking into account silvicultural advice and cost implications. The aim is to have sufficient trees to enable selection of 250 stems/ha of high quality and vigorous final-crop trees.

Some trees will be removed in a non-commercial thinning around age 5 to minimise competition with the pruned trees. A commercial thinning will be carried out at 10–12 years. This will provide revenue and improve the financial viability of the plantation. The final-crop trees will be grown on to 50–60 cm diameter. This is expected to occur when the trees are from 30 to 40 years old, depending on the site.

Fast grown eucalypts generally have persistent branches that are the most common cause of degrade in sawlogs. Pruning is required to remove these branches from the lower 6.4 m of the tree to produce a log which will yield knot-free or 'clear' wood. Pruning aims to contain the knots to a central core of 15 cm diameter.

The guidelines for thinning and pruning in eucalypt plantations were developed in 1995. These prescriptions will be reviewed as more information becomes available, particularly in the areas of:

(a) Minimising the risk of decay;

(b) Minimising the risk of kino defect; and

(c) Using equipment that minimises damage to trees during pruning.

Table 3 gives an outline of the management regime for IFM eucalypt plantations.

Photo 1. A plantation of Eucalyptus nitens *at Smiths Plains in the Mersey District.*

Table 2. Parameters for plantation establishment.

Species	*Eucalyptus nitens* was the main species planted. *Eucalyptus globulus* was recommended for frost-free sites (i.e. generally sites less than 300 m altitude), and small areas of this species were established.
Site quality	Sites capable of sustaining 'good growth rates' only (i.e. those capable of a mean annual increment of 20 m^3/ha/yr or better) were to be planted.
Soils	Rooting depth greater than 800 mm. Well drained. Good nutrient availability and retention. Good trafficability and workability. Low erosion potential and landslide hazard.
Moisture	Rainfall greater than 1000 mm/year.
Altitude	Below 800 m, with sheltered aspects and limited frosts.
Slope	Generally less than 14° but slopes up to 17° could be considered if other factors were suitable.
Location	Preference given to sites within 100 km of major processing facilities/ports, with consideration of sites up to 150 km if other factors were suitable.
Area	Minimum individual areas of at least 20 ha were considered in conjunction with proximity to other plantations and access roads.

Table 3. An outline of the recommended management regime for eucalypt plantations.

Age (years)	Stand conditions	Operation*
3 or 4	Greater than 300 prunable trees/ha. DBH of prunable trees 8–10 cm. Height of dominants > 7 m.	Select and low prune best 300 stems/ha to 2.7 m (as high as can be reached from the ground, prune to a minimum of 2.5 m) using double-action pruning shears or other approved methods (not saws). Using chainsaws or chemical injection, selectively waste thin trees competing with the final-crop trees, aiming to leave at least 750 stems/ha total, including 300 pruned.
4 or 5	DBH of pruned trees 10–12 cm. Height of dominants > 9.5 m.	Prune 300 stems/ha to 4.5 m, using ladders and bow saws or other approved methods.
5 or 6	DBH of pruned trees 11–13 cm. Height of dominants > 12 m.	High prune to 6.4 m using 4.5 m 'safe-tree' ladders and bow saws.
10 to 12	Volumes to be thinned 70–100 m^3/ha. Average tree size to be removed 0.2 m^3.	Commercial thin to reduce stocking from 750 to 250 trees/ha. Essential to minimise damage to final crop trees.
30 to 40	Average DBH from 50 to 60 cm for sawlogs.	Clearfell.

* Pruning must be done on time. If branches are generally greater than 30 mm diameter at the time of second and third pruning, then the higher lift pruning should not be carried out.

Regimes for managing blackwood plantations

The regimes currently recommended for growing blackwood are with either a *P. radiata* nurse crop, managed for clearwood production, or a eucalypt nurse crop managed for pulpwood. With a *P. radiata* nurse crop, the pine is planted at 5 m row spacing, with blackwood interplanted between each second row.

A commercial harvest of the nurse crop will assist the financial performance of the blackwood plantations. However, priority must be given to protection of the blackwood final-crop trees. Directional falling of *P. radiata* into the spaces between the blackwood rows (10 m) will minimise potential damage to the final-crop trees. Stocking is in the order of 800 *P. radiata* and 500 blackwood trees/ha.

Where eucalypts are used as nurse crops, the planting recommended is alternate rows of blackwood and eucalypt. Stocking is in the order of 500 stems/ha for each species.

As with eucalypts in plantations, plantation-grown blackwood requires pruning to ensure good form and produce high quality sawlogs.

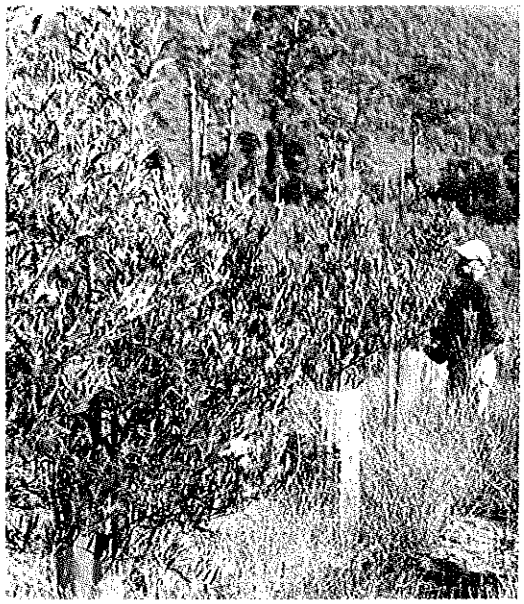

Photo 2. Plantation-grown blackwood, with a Pinus radiata *nurse crop. (Age: 20 months)*

Table 4. Pruning regime for blackwood.

Age (years)	Mean dominant height (m)	Pruning
5	5	Form prune to 2.7 m.
7	7	First prune to 2.7 m and form prune to 4.6 m.
9	9	Second prune to 4.6 m and form prune to 6.4 m.
11	11	Third prune to 6.4 m.

With a *P. radiata* nurse crop being managed for clearwood production, first form pruning and first and second lift pruning of the blackwood should correspond with first, second and third pruning of the *P. radiata* respectively. The pruning regime for blackwood is shown in Table 4.

Results

The plantation area established is shown in Tables 5–8 on a District basis and for a range of given parameters such as previous site conditions and species. The target area was, in general, achieved.

From a financial perspective, the results indicate that the target of $1500/ha for establishment costs was achieved. Costs ranged from a low of $609/ha up to $2434/ha, reflecting a range in sites and techniques. The weighted mean cost fell from some $1570/ha in 1992/93 to $1230/ha in 1993/94. This decrease in costs is a function of site specific details and improvements in operational efficiency and effectiveness.

In achieving the targets set for plantation area and costs, there were a number of outcomes including:

- The development of a plantation estate being managed for sawlog/veneer production on State forest, dispersed across several Forest Districts;
- The development of a range of skills and expertise throughout the Districts in plantation establishment;

Table 5. Area planted (ha). (All species by District.)

District	1991	1992	1993	1994	1995	1996	Total
Bass	70	371	735	446	459	0	2081
Circular Head	0	0	112	162	174	0	448
Derwent	0	0	0	8	0	0	8
Eastern Tiers	0	211	331	224	456	93	1315
Huon	74	110	279	343	147	53	1006
Mersey	242	401	606	82	273	0	1604
Murchison	26	81	166	129	0	0	402
Joint venture		0	0	0	268	10	278
Total	412	1174	2229	1394	1777	156	7142

Table 6. Area planted by species (ha).

Species	1991	1992	1993	1994	1995	1996	Total
Eucalypt	367	1057	1724	1346	1451	156	6101
Pine	0	0	248	0	0	0	248
Blackwood	45	117	257	48	326	0	793
Total	412	1174	2229	1394	1777	156	7142

Table 7. Site quality (ha).

Site quality	1991	1992	1993	1994	1995	1996	Total
High	294	899	1894	1163	1757	156	6163
Medium	118	103	87	106	0	0	414
Low	0	172	248	125	20	0	565
Total	412	1174	2229	1394	1777	156	7142

Table 8. Previous site condition (ha).

Previous condition	1991	1992	1993	1994	1995	1996	Total
Native forest	330	977	1774	1148	1214	146	5589
Pasture	66	151	330	102	50	10	709
Pine	16	46	125	144	513	0	844
Total	412	1174	2229	1394	1777	156	7142

- Lack of public acceptance of the use of some chemicals for weed control, despite scientific evidence supporting their use. It should be noted that Forestry Tasmania ceased using atrazine for weed control in 1994. Research into alternative weed management strategies has been a priority since then.

During the course of the Program, changes developed and implemented in plantation establishment techniques include:

- Different nursery stock utilising better containers and techniques for producing bare-rooted seedlings;
- Intensive planning and monitoring of chemical applications;
- Development of soils maps; and
- Improvement of site selection criteria and implementation of better site preparation techniques.

Conclusion

Forestry Tasmania now has a significant plantation estate established to produce high quality sawlogs and veneer from both eucalypts and blackwood. This represents the first large-scale programme in Australia to produce sawlogs and veneer from eucalypt and blackwood plantations. There are risks involved but these will be ameliorated to some extent by continuing research.

The IFM plantation estate is being treated in accordance with the regimes outlined. The regimes will be modified as new information comes to hand.

Further work is required to:

- Ensure that establishment costs are competitive;
- Reduce the potential for losses due to decay by applying research findings;
- Develop better and less contentious methods of weed and pest control; and
- Research and develop markets for the solid wood products that will be produced from the IFM plantations.

Acknowledgements

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Photo 3. Eucalypt seedlings at the Forest Nursery–Perth, being grown for plantations.