OPPORTUNITY COST OF WEED CONTROL IN *PINUS RADIATA* PLANTATIONS

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Conifer plantations are currently being established throughout Australia at a rate of ca. 70,000 acres per annum. An estimated $1,500,000 is spent each year on plantation weed control. How necessary is this weed control, and how effective are its economics? This paper attempts to establish a basis for investment in weed control.

A comparison between management alternatives in growing pines can be made using the criterion of discounted revenue. The difference in discounted revenue between two management policies is the opportunity cost of foregoing certain action - in this case weed control. The opportunity cost indicates the maximum allowable cost that may be spent in effective weed control. The discount rate used in this paper is 7%. Costs other than weed control are regarded as constant and are not included.

Recent studies of the effects of weeds common to plantations in north eastern Victoria throws some light on their effects on the production of *Pinus radiata* timber.

The native forest cover on these areas is principally dry sclerophyll eucalypt forest. This is felled by bulldozers and burnt shortly before planting the softwood seedlings.

HERBACEOUS WEEDS

The studies showed that in new plantings, herbaceous weeds such as *Poa australis* R.Br., *Holcus lanatus* L., *Anagallis avenus* L. and *Danthonia pallida* R.Br. can frequently cause mortalities of up to 40% and the loss of up to two years growth. Mortalities of up to 70% and loss of up to four years growth have occurred, though these are rare.

WOODY WEEDS

Acacia and *Eucalyptus* species compete with *Pinus radiata* throughout the whole or a large part of the crop rotation. This competition can result in up to 80% of the potential merchantable volume being lost.

The economic evaluation of the effects of herbaceous and woody weeds where sawlogs are the main object of production indicates that 50% mortality in a plantation planted on an 8' x 8' grid occasions virtually no allowable cost of weed control.

The maximum allowable costs of herbaceous weed control increase with the number of years of pine growth lost and the higher site qualities planted (Table 1). Dense herbaceous weed growth can commonly occasion maximum allowable weed control costs of $9 per acre on SQ III sites and up to $37 per acre in unusually severe conditions.

TABLE 1

Maximum Allowable Cost of Herbaceous Weed Control in *Pinus radiata* Plantations For a Range of Growth Loss Situations

Site Quality	Maximum Allowable Cost ($ per acre) for growth loss of :-			
	1 year	2 year	3 year	4 year
III	9	18	28	37
IV	8	16	25	33
V	6	12	19	26
VI	3	8	12	17

The maximum allowable cost of woody weed control is directly related to the density of woody weeds in the plantation, (Table 2). Where *Eucalyptus obliqua*, a competitor of medium severity, is present at high densities in SQ IV *Pinus radiata* plantations, maximum allowable costs of weed control of $142 per acre are possible. At more common densities of woody weeds alowable costs of $50 per acre are likely. Higher site qualities and more severe weed competitors will occasion higher maximum allowable costs of weed control than those reported here.

It is possible to predict the occurrence of weeds and thus the maximum allowable cost of weed control. When areas with positive allowable costs of weed control are identified the actual investment and the control technique should be selected by benefit-cost ratio or similar criteria.

It is clear therefore that in the determination of the opportunity cost, the maximum allowable cost of weed control does provide a first step to sound investment in weed control.

TABLE 2

Maximum Allowable Costs of Woody Weed (*Eucalyptus obliqua*) Control in SQ IV *Pinus radiata* Plantations with Varying Densities of Woody Weeds

Weed Density (Percent)	Max. allowable cost ($ per acre)
10	28
20	55
40	98
60	130
80	148