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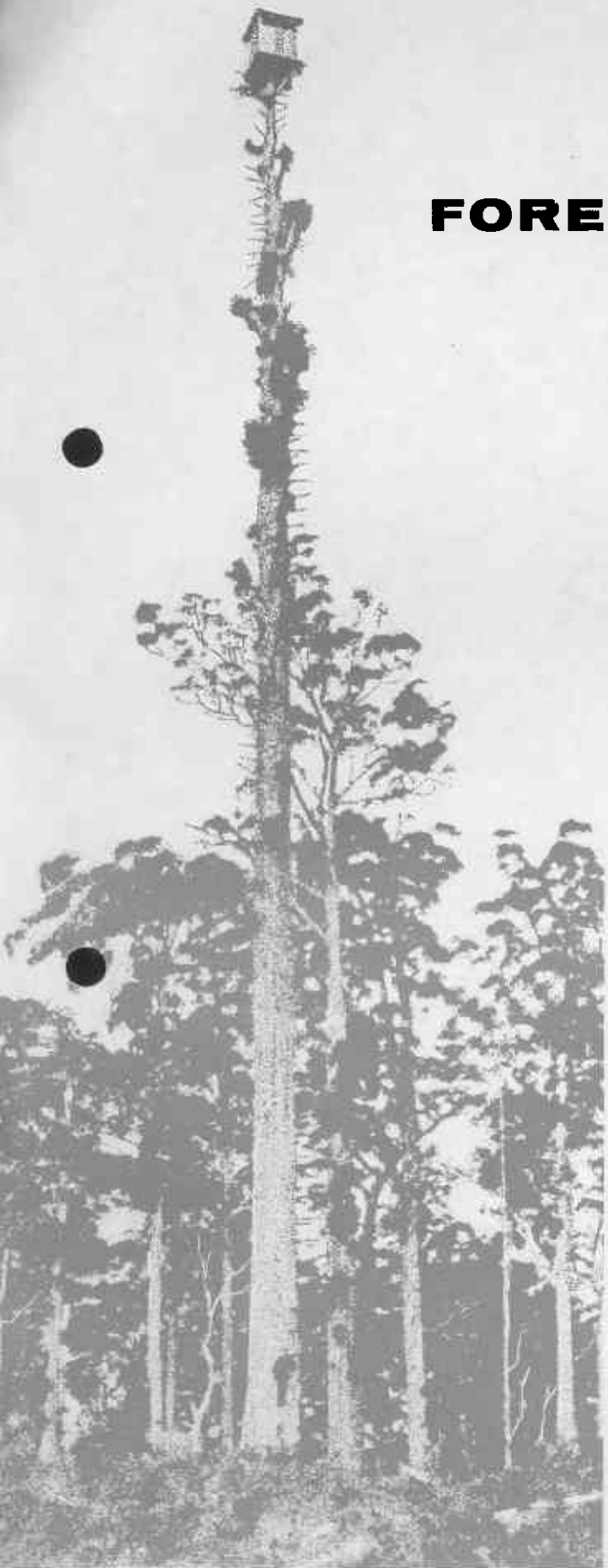

COMMERCIAL THINNING IN RADIATA PINE

by

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SUMMARY

This research note is a progress report on the Mungalup early thinning experiment, detailing establishment procedures, early yields and increment trends up to stand age 12.6 years.

INTRODUCTION

The experiment was established in July 1965, to compare the volume yield and profitability of *Pinus radiata* on a high quality site under three management regimes, namely, no thinning, moderate thinning and heavy thinning. A subsidiary aim was to determine at which stages in the rotation, thinning can be used to procure worthwhile improvements in stem diameter. All thinnings were to be commercial.

Twenty-four plots were laid out on a very high quality site in the 1957 planting at Mungalup plantation, near Collie. This was former pasture, and the growth rate of the pines was such that predominant heights in July 1965 were of the order of 60 feet, or at about that level at which first thinning is usually recommended for this species. Initial spacing of the pines was 9 feet x 9 feet, or a nominal 540 per acre, but there had been some losses due to grass competition and rabbits.

Three treatments were prescribed at this stage—unthinned, thin to 300 stems per acre (spa) and thin to 200 spa. There were eight replicates of each treatment and the area of each plot was about 0.2 acre, with two-row surrounds receiving the same treatment. The plots were enumerated and then ranked in descending order of basal area overbark. Treatments were allocated randomly to each successive group of three plots down the list. This procedure ensured comparable average initial stand parameters between the treatments (Table 1).

Table 1

Average Initial Stand Parameters for Each Treatment

Treatment	Unthinned	300 spa	200 spa
Stocking	448	425	443
Mean DBHOB (inches)	7.51	7.64	7.53
Mean volume/ac. (cu. ft. U.B. to a $2\frac{1}{2}$-inch top)	2759	2727	2821

The experimental design was thus a randomized complete block at this stage.

Late in 1969, half the replicates of each treatment were thinned to 50 per cent of their former average stocking, the other four replicates remaining unthinned. Allocation of treatments were made using the original list of basal areas and groups of six, rather than three plots. It is of interest to note that an examination of the variability growth in between replicates in 1968 showed that four replicates gave results almost as precise as eight.

At the installation of the experiment in 1965, the volume of the felled stems was measured by the sectional method. Standing tree volumes were determined from a tree volume table (Ann. Rep. W.A. For. Dept. 1969). Subsequent full-volume measurements were made in 1967 and 1969. In the intervening years only basal area over bark was measured.

PROGRESS OF THE EXPERIMENT

In the first thinning only less vigorous and poorly-formed stems were removed. Yields from the first thinning and the condition of the stands are summarized in Table 2.

Table 2

Average Volumes Removed and Basal Areas, 1965 (Volumes in cu. ft. U.B. per acre and basal areas in square feet per acre)

	Treatment	
	300 spa	200 spa
Stems Removed	125	243
Volume Removed to 4-inch top	416	1055
Volume Removed to $2\frac{1}{2}$-inch top	513	1229
Basal Area O.B. Before Thinning	139	140
Basal Area O.B. After Thinning	108	74

It should be noted that the volume figures quoted in Table 2 refer to total volume removed. The merchantable volumes were very much less than these. For example, only 65 per cent of the volume to a four-inch top was acceptable as mill logs (270 and 700 cu. ft. per acre for the 300 spa and 200 spa treatments respectively). It is evident that the presence of a particle board or pulp plant capable of utilising a smaller and lower standard of log is a considerable aid to the full utilisation of young plantations on good sites.

In terms of total volume production, there was little difference between the treatments up till 1969, but there was a strong trend for increased production in the larger mill log class (greater than nine inches top) in both thinning treatments (Fig. 1).

There is a steep log size: price gradient in Western Australia. Therefore, the thinned stands will be more profitable than the unthinned in direct proportion to these changes in log size distribution.

A far better picture of the influence of the thinning regime on profitability is obtained by an examination of the data for the select final crop trees only (100 stems per acre) given in Table 3.

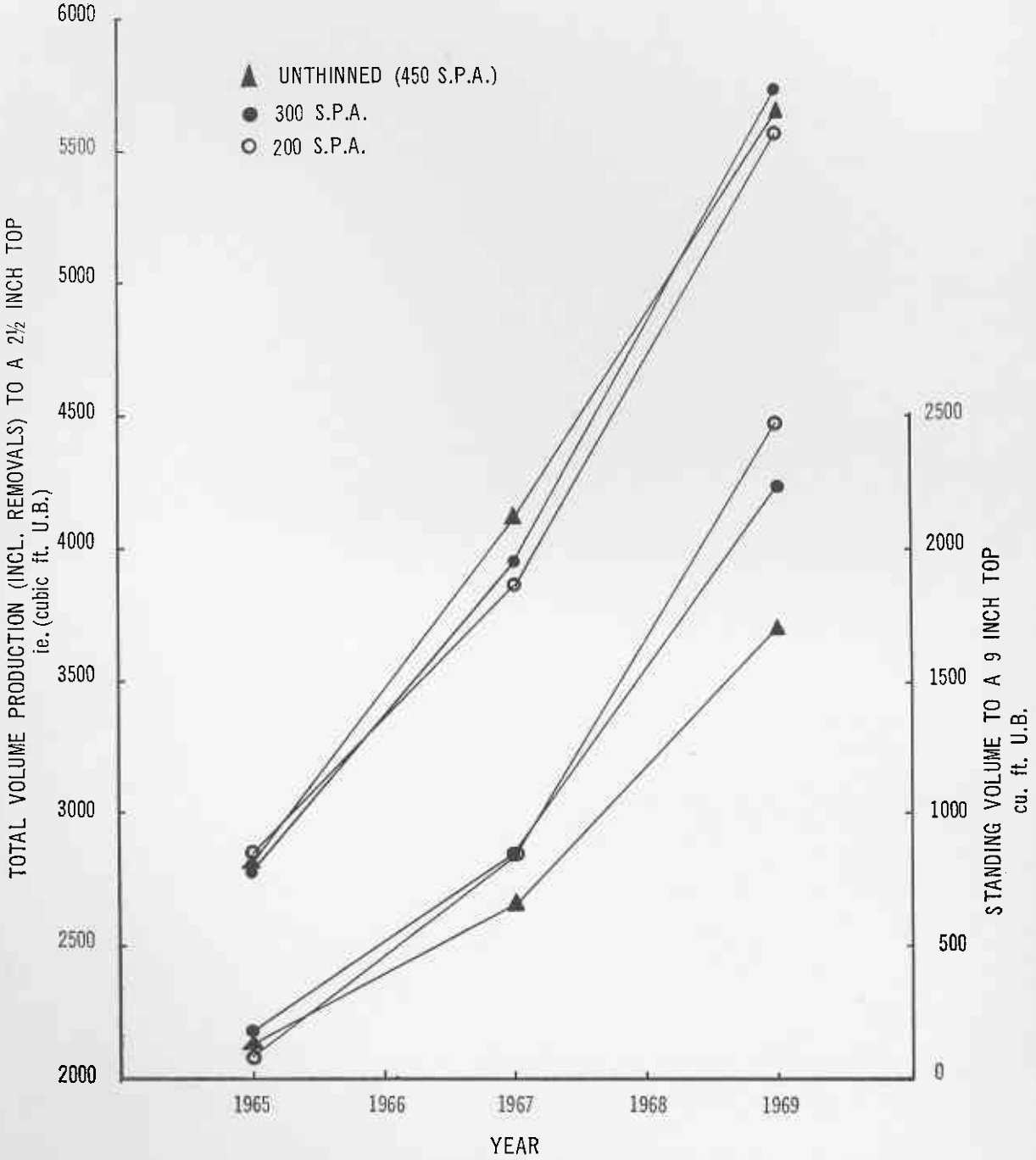

FIGURE 1: *Volume increment with thinning treatment.*

Table 3

Select Final Crop Tree Average Data 1969
(Volume in cu. ft. U.B. per acre)

	Treatment		
	Unthinned	300 spa	200 spa
Mean DBHOB (inches)	10.79	11.33	12.21
Volume to $2\frac{1}{2}$-inch top	1909	2153	2497
Volume to 9-inch top	911	1198	1655

Relative to the selects for an unthinned stand, the moderate thinning regime has produced a small (0.54 inches) increase in mean D.B.H.O.B., whereas the heavy regime has produced a more significant increase (1.42 inches). These increases may not seem vast improvements, but when considered with an increase in volume to a $2\frac{1}{2}$-inch top of 244 and 588 cu. ft. per acre respectively, in only four years, they represent very worthwhile gains. The potential financial benefit is even more marked when the volumes to a 9-inch top are examined. Moderate thinning produced an additional 287 cu. ft. per acre (up 32 per cent), but heavy thinning produced an additional 744 cu. ft. per acre (up 81 per cent). The trends in increment at this stage are such that these differences are likely to become marked with the passage of time.

One of the more valuable features of *P. radiata* is the rapidity with which it responds to cultural treatments, at least in early life. This is illustrated by the yield data for the plots second-thinned in 1969 (at predominant height 90 feet). Although total volume removed to a $2\frac{1}{2}$-inch top was very similar for all treatments, there was a much greater proportion in the larger log sizes from the thinned plots (Table 4).

Table 4

Average Yields from the 1969 Thinning
(Volumes in cu. ft. U.B. per acre)

	Treatment		
	Unthinned	300 spa	200 spa
Stems removed per acre	220	150	100
Volume to $2\frac{1}{2}$-inch top	1719	1896	1619
Volume to 9-inch top	108	422	616

An added benefit from the heavy early thinning at this point is the lower logging costs in the second thinning, since fewer stems were required for the same volume.

At this stage of the experiment, it would appear that first commercial thinnings should be heavy, rather than light or moderate, as they are more profitable in at least three ways:—

(1) higher early income to offset interest charges;
(2) the final crop gains an early size and value advantage;
(3) unit logging costs are likely to be lower.

It is of interest to note that previous Forests Department policy for *P. radiata* plantations was for the first commercial thinning to leave a residual basal area (O.B.) of 90 square feet per acre, which is mid-way between the residual basal areas of these two thinning treatments.

FUTURE DEVELOPMENT

It is planned to continue the experiment at least to stand age 40 years. Full volume measurements will be at three-year intervals henceforth as the former two-year cycle was impossible to maintain with existing staff. The final thinning is intended to take place in 1977, at stand age 20, reducing the original 300 spa and 200 spa plots to either 100 or 50 spa.