THE POSSIBILITIES OF THINNING IN THE JARRAH FOREST

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Introduction

"Dense and uniform stands of jarrah regrowth are known to experience several periods of stagnation in the course of their development. These periods of stagnation can be anticipated and loss of vigour avoided by thinning." (From Wallace and Podger, "Thinning in cut-over jarrah stands", 1959).

At the time that paper was written, early thinning could not be carried out in jarrah regrowth stands because of the intense coppice development which resulted. Many new (coppice) stems developed where there had been one before, and these quickly grew up to compete with the stems which it was intended to free by the thinning operation. The result was the opposite to the one intended and the growth of the stand was spread over more, and not less, stems. Thus, at that time, the first effective thinning which could be carried out in a Jarrah regrowth stand was when the co-dominant height of the stems was about 50' - 60'. Coppice does develop from such a thinning, but is "too far behind" to grow up and compete with the crowns of the stems remaining.

In the last few years the silvicultural problem of coppice development following early thinning has been solved by the use of the hormone 2.4.5.T. Early thinning is now possible and the decisions about when to thin and how much to remove can be approached by considering costs and growth rates only.

Thinning Response Needed for Break-even

To make a thinning operation worthwhile, the cost of the operation must be offset by the gain in marketable volume of the thinned stand compared to a similar unthinned stand.

The cost of thinning by falling at Dwellingup is currently about £12 per acre for falling trees and poisoning stumps with 2.4.5.T. Any sale of thinned material would, of course, reduce this cost. In a first thinning, however, we must expect the trees removed to be too small to be marketable.

To break-even with this cost of £12 per acre, the thinned stand must produce £12 per acre worth of marketable wood more than an unthinned stand in the time to the next thinning. To illustrate a method of calculating the response to thinning, let the time between thinnings be 30 years.

Then: £12. per acre = 12 loads/acre at £1./load royalty.

12 loads/acre in 30 years = 20 cu.ft./acre/year.

For a 20' log length this is 1 sq.ft. B.A./ac/year

For a 100 sq.ft. B.A. stand this is 1% B.A. increment.

The following table applies: TABLE 1.

Time Between Thinnings	Cost/Ac. of Thinning	Royalty Rate	Conditions for Break Even
30 years	£12.	£1./load	Thinned stand must have B.A.inct. 1% > unthinned stand
30 years	£12.	£2./load	Thinned stand must have B.A.inct. 0.5% > unthinned stand
30 years	£6.	£1./load	Thinned stand must have B.A.inct. 0.5% > unthinned stand
30 years	£6.	£2./load	Thinned stand must have B.A.inct. 0.25% > unthinned stand

A 1% B.A. increment is reasonable in a jarrah stand. The Karnet plan, (pp 30, 31) gives the B.A. increment % of elite trees 2' - 3' g.b.h. (a likely first thinning size) as 3.5% and of the "whole stand trees" as 2.4%. The difference between these two B.A. increment per cents is 1.1%, approximately the figure needed.

Further proof that this order of thinning response is possible for a 30 year period between thinnings is given by the following figures from p5 of Wallace and Podger's paper "Thinning in cut-over Jarrah stands."

TABLE 2.

	Age when measured in 1956	Mean Co-dom. Ht.	Total U.B. Vol. (Cu.ft.)	B.A.U.B. (Sq.ft.)	Vol.U.B. > 54" (Cu.ft.)	Vol.U.B. > 72" (Cu.ft.)	Bole Ht.	No. Stems Per Acre
Thinned 1928	81 yrs.	91'	2,700	105.2	2,250	1,030	44'	77
Unthinned	81 yrs.	91'	3,050	132.7	1,150	430	48'	188

i.e. 28 years after thinning, the thinned stand has produced 1,030 less 430 cu.ft. = 600 cu.ft. = 12 loads more timber over 72" g.b.h. than the unthinned stand.

Scope of the problem

Both Wallace and Podger in the paper already referred to and F.J. Campbell in his thinning prescription for the operation alongside the Marradong road, have indicated that the thinning of prime even aged jarrah regrowth stands is a worthwhile and practical operation.

The problem of thinning uneven aged jarrah - marri stands is not so easy to grasp. My approach is to decide on an "ideal" stem distribution and use all falling operations (viz. salvage cut, trade cut, cull felling, thinning) as a means of achieving the ideal stem distribution in marketable jarrah stems as soon as possible.

The stem distribution of c/o JM bush at Nyamup and my suggested ideal stem distribution are given below. (I welcome suggestions for accurately determining what the ideal stem distribution for the jarrah bush should be).

TABLE 3.

C/O JM BUSH NYAMUP

		Girth Class					Total
		12"-24"	24"-36"	36"-60"	60"-90"	90"+	
C/O JM STAND NYAMUP BUSH							
Marketable J	Stems/ac.	6	11	10	9	2	38 stems
	BA/ac.	1.06	5.4	12.3	28.1	12.9	59.8 sq.ft.
U/M J	Stems/ac.	9	8	2	1	2	22 stems
	BA/ac.	1.6	3.9	2.5	3.1	12.9	24.0 sq.ft.
Total J	Stems/ac.	15	19	12	10	4	60 stems
	BA/ac.	2.6	9.3	14.8	31.2	25.8	83.8 sq.ft.
Total M	Stems/ac.	13	11	5	3	2	34 stems
	BA/ac.	2.3	5.4	6.2	9.4	12.9	36.2 sq.ft.
Total Stand	Stems/ac.	28	30	17	13	6	94
	BA/ac.	5.0	14.7	21.0	40.6	38.7	120.0 sq.ft.

IDEAL STAND - BASED ON DI LIOCOURT

TABLE 4.

	Girth Class						Total
	12"-24"	24"-36"	36"-60"	60"-90"	90"-108"	108"+	
IDEAL NO. OF STEMS - BASED ON DI LIOCOURT							
Start of CC Stems/ac.	32	20	20	7	2	1	82
BA/ac.	5.7	9.8	24.6	21.8	10.6	8.0	80.5sq.ft
End of CC Stems/ac.	40	27	30	16	2	2	117
BA/ac.	7.1	13.3	36.9	50.0	10.6	16	134sq.ft
Stems to be removed to maintain ideal Stem Distribution	8	7	10	9	-	1	
	U/Mkt or Pulp			Marketable = 11 loads			

If we accept for the moment that thinning to 80 sq.ft. of B.A./acre is a suitable amount to reduce the stand to, and that 134 sq.ft. of B.A. is a suitable stage to cut the stand, then a comparison of the existing stem distribution of c/o bush at Nyamup with the ideal stem distribution above gives the following figures:

STEMS/ACRE

TABLE 5.

	12-24	24-36	36-60	60-90	90-108	108+
Nyamup bush now	28	30	17	13	6	-
Ideal stem distribution at start of CC = 84 sq.ft. B.A.	32	20	20	7	2	1
Trees to be removed from Nyamup to bring it to the ideal	-	10	-	6	4	-

From Table 3, the stems to be removed from Nyamup bush to bring it to the ideal are distributed as follows:

STEMS/ACRE

TABLE 6.

	12-24	24-36	36-60	60-90	90-108	108+
Marketable J				2	2	
U/M J				1		
Marri		(Pulp, Poles or Waste) 10		3	2	
Total to be removed		10		6	4	

The stem distribution at Nyamup after "thinning" as in Table 6. would then be:

STEMS/ACRE TABLE 7.

	12-24	24-36	36-60	60-90	90-108	108+	Total
Marketable J	6	11	10	7	-	-	
U/M J	9	8	2	-	2	-	
Marri	13	1	5	-	-	-	
Total	28	20	17	7	2	-	74

Removing the stems in this manner has yielded 4 marketable logs (6 loads approximately) and has reduced the number of marri stems over 24" from 34 to 19. There are no marri trees over 60" to act as a seed source.

The length of time between thinnings for Nyamup bush could be determined by ingrowth and outgrowth calculations on the stem distribution in Table 3.

It is all very well to prescribe for the removal of 6 trees in the 60" - 90" class so that 7 marketable jarrah trees are left in this size class. In the stand itself, however, these 7 trees may be closely spaced (to each other or to other trees to be retained) and it may not be possible to achieve the ideal stem distribution in one thinning operation.

I suggest that the order of points to consider when marking for thinning should be:

Dominance

J favoured over M (except where J is poor form and M is saleable)

Spacing (use 15' x 15' for trees under 36" g.b.h.) as a guide,
" 20' x 20' " " over " ") as prescribed by F.J. Campbell.

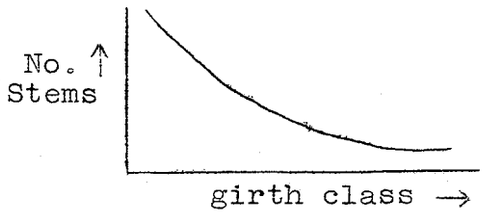
Stems of poor form, which are not taking up useful growing space need not be removed.

I suggest the order of treatment of the jarrah forest be:

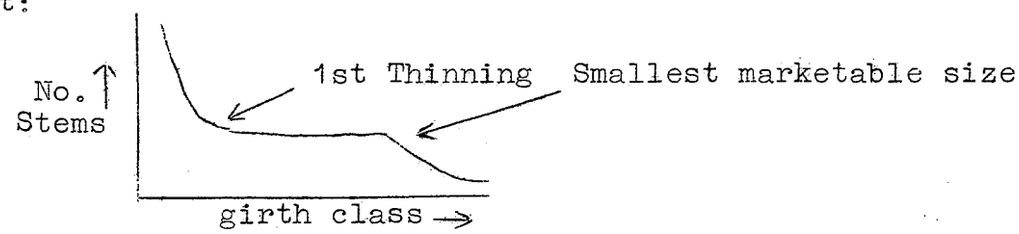
1. Salvage cut to remove dying trees (due to fire damage, dieback or other cause).
2. Trade cut.
3. Cull falling at top disposal time.
4. Thinning 10 years (or thereabouts) after the trade cut, when the stems freed by the trade cut will have had time to express dominance.

Points for discussion

1. If small sizes are not marketable, why should the ideal stem distribution be:



Why not:



2. What should the smallest unit be in which to achieve an ideal stem distribution? 1 acre? 10 acres? 100 acres?

3. Have we enough figures on response to thinning to confidently write a thinning prescription?

4. Do we know (i) the period between thinning operations?

(ii) what B.A./acre to reduce the stand to?

(iii) the B.A. at which thinning is best carried out?

5. What area can be marked for thinning each day?

Who should do this marking - o/s, F/G, A/F, A.D.F.O.?

6. What area can be thinned each day?

7. How much supervision of the operation is necessary? By whom?

8. Should the entire jarrah forest be thinned after the trade cut?

Should only our best stands be thinned? Where do we draw the line?