THE ECONOMICS OF THINNING JARRAH POLE STANDS.

by P.C. Kimber

The decision to thin or not to thin young stands of trees when the produce of the thinning is unsaleable is a difficult one. Silviculture may dictate an unsaleable thinning but the deciding factor is always one of cost; is it economically sound in the long run, or would an early unsaleable thinning be a waste of money? A considerable outlay has been made in thinning to waste in Jarrah pole stands. As a matter of interest the economics of Jarrah management under regimes of both thinning to waste and delaying thinning until some saleable produce is available have been worked out with present available information. The details and methods of working are described below. The growth rates and stockings shown are applicable to only prime Jarrah forest and it is not suggested that such economics should be assumed for any but the A height quality sites.

1. An uneconomic first thinning at age 40 years.

For the purpose of estimating future yields and the economics of thinning the following assumptions are made: -

(i). The crop is a pure pole stand.

(ii). The first thinning, which produces no saleable produce, is made at age 40 years when the stocking per acre is likely to be between 130 and 180 square feet basal area/acre.

(iii). The mean annual basal area increment from age 40 to the end of the rotation is 3 square feet/acre.

The anticipated management and growth rate of the crop, expressed in figures per acre is as follows: -

Age 40 years.

The crop is thinned to 110 stems/acre and a basal area of 60 square feet/acre. The size of the mean tree after thinning is therefore (60/110) square feet or 0.5454 square feet basal area, 31½" G.B.H.

The M.A.I. (basal area) is 3 square feet per acre so the M.A.I. (b.a.) per tree is 3/110 = 0.0273 sq. ft.

It is assumed that the next thinning will take place when all produce from the thinning will be saleable. The minimum size of stem to produce a saleable log is taken as 50" G.B.H., basal area 1.3815 square feet. The period between the first and second thinnings will therefore be (1.3815 - 0.5454) years or 31 years. ?

c/s? Only mean tree - would those sh 0.0273 to be thinned be up to 50" GBH

Age 71 years.

The total basal area of the crop will be (1.3815 x 110), or 152 sq.ft./acre. A thinning will probably reduce it to around 70 sq.ft./acre, and the amount to be removed in thinning is (152 - 70), 80 square feet, requiring the removal of

$\frac{(80)}{1.3815}$, 59 stems and leaving a basal area of 70.5 sq.ft./acre on 51 stems.

Each of the 59 stems removed will yield a 10' log with a mid girth of 49" and a volume of 12 cubic feet. The total saleable cut is therefore (12 x 59), 708 cubic feet.

As a 30 year cutting cycle is at present practised, a 30 year thinning cycle is assumed in crops below rotation age but of saleable size.

Age 101 years.

30 years have elapsed since the last thinning and the basal area of the crop has increased by 90 sq.ft./acre giving a total basal area of 160.5 sq.ft./acre. Each of the remaining 51 stems will have a basal area of 3.1470 sq.ft. and a G.B.H. of $75\frac{1}{2}$".

If the crop is again reduced to approximately 70 sq.ft./acre by thinning, 90.5 square feet will be removed, or a total of 28 stems. The actual basal area remaining is 72.4 sq.ft./acre.

Each of the 28 stems removed, of G.B.H. $75\frac{1}{2}$", is assumed to have a bole length of 40 feet and an individual volume of 65.5 cu.ft. giving a total saleable product of 1834 cubic feet.

The remaining 23 stems (basal area 72.4 sq.ft. G.B.H. $75\frac{1}{2}$") are to be felled when they reach a size of 108" G.B.H., basal area 7.0695 sq.ft. At this stage the stocking of the stand will be (7.0695 x 23) or 162.6 sq.ft./acre. The time taken to reach this size will be $\frac{(162.6 - 72.4)}{0.0273}$ or 30 years.

Age 131 years.

A final yield of 23 stems of 108" G.B.H. and bole length of 50' is now realized. The volume yield (from F.D. volume tables) is 3,910 cu.ft./acre.

Summary of expenditure and yields over rotation.

The following assumptions are made:-

(i). Value of land is 30/- an acre.
(ii). Timber is sold at 40/- a load.
(iii). Rotation period is rounded off to 130 years.

(a). Annual expenditure = $\frac{\text{Dept. budget (less pine planting grants)}}{\text{Area of State hardwood forest}}$

= (1963 figures) £0.215.

(b). Year 40:- Cost of marking thinning (per acre) £0.6
Cost of thinning £5.0

(c). Year 70:- Cost of marking £0.5
Value of timber from thinning £28

(d). Year 100:- Cost of marking £0.5
Value of timber from thinning £73

(e). Year 130:- Final yield value £156.8

BALANCE SHEET FOR EXPECTED PROFIT AT PRESENT DAY PRICES.

(All items are compounded at 4% per annum).

DR	£	CR	£
(i). Land Value:- $£1.5 \times 1.04^{130}$	= 245.7	(i). Land at cost	1.5
(ii). Cost of thinning at year 40 - $£5.6 \times 1.04^{90}$	= 191.1	(ii). Value of thinning at age 70 - $£28 \times 1.04^{60}$	294.6
(iii). Cost of marking at year 70 - $£0.5 \times 1.04^{60}$	= 5.3	(iii). Value of thinning at age 100 - $£73 \times 1.04^{30}$	236.7
(iv). Cost of marking at year 100 - $£0.5 \times 1.04^{30}$	= 1.6	(iv). Value of final yield	156.8
(v). Annual charges:- $£0.215 \times \frac{1.04^{130} - 1}{1.04}$	= 33.7		
BALANCE	£212.2		
TOTAL	£689.6	TOTAL	£689.6

Thus under the thinning regime and assumed growth rates described above all invested money is both earning 4% C.I. and showing a profit of £212.2 per acre over a rotation of 130 years.

11. A first thinning at age 80 to break even.

Girth class distribution figures for an 80 year old unthinned pole stand are available from a series of thinning trials at Mundlimup. Analysis of these figures indicated that if a few of the larger stems of saleable size were sacrificed, a thinning would be possible in which the cost of thinning out saleable stems would be covered by the value of the larger stems removed. For the purposes of the present argument this is assumed to have been done. Thinning under these circumstances to a basal area of around 70 sq.ft./acre would leave 48 stems of a mean size of $51\frac{1}{2}$" G.B.H.

A 30 year thinning cycle is again assumed giving a basal area increment of

90 square feet in this period and a total basal area per acre of 160.5 sq.ft. at age 110 years.

At this age the mean tree will be of a size of $\frac{(160.5)}{48}$ or 3.3438 sq.ft. basal area; 77¾" G.B.H.

A further thinning reducing the crop to around 70 square feet/acre would necessitate the removal of $\frac{(\ 90\ )}{3.3438}$ or 27 stems, but as a final crop of 23 stems is required for fair comparison with the previous example the removal of only 25 stems is assumed, leaving 77 sq.ft./acre carried on 23 stems.

Each of the 25 stems removed will have a G.B.H. of 77¾" and an estimated bole length of 40'. The total volume removed (from F.D. volume tables) will therefore be 1825 cu.ft. at age 110 years.

The remaining 23 stems are to be left until they reach 108" G.B.H., giving a total basal area stocking of 162.6 sq.ft./acre. The period required to reach this size is $\frac{(162.6 - 77)}{3}$ or 29 years. The total rotation is thus, rounded off, 140 years.

The final yield, as in the previous example, is 3910 cu.ft./acre.

BALANCE SHEET FOR EXPECTED PROFIT AT PRESENT DAY PRICES.

(All items are compounded at 4% per annum).

DR.	£	CR.	£
1. Land Value £1.5 x 1.04^{140}	363.7	1. Land at cost	1.5
2. Cost of marking at age 110 - £0.5 x 1.04^{30}	1.6	2. Value of thinning at age 110 - £73 x 1.04^{30}	236.7
3. Annual charges: £0.215 x $\frac{1.04^{140} - 1}{1.04}$	49.2	3. Value of final crop	156.8
		Balance	19.5
Total	£ 414.5		£ 414.5

Money invested is therefore working at less than 4% compound interest under this thinning regime (c.f. 4% C.I. plus a profit of £212.2 under the previous example).

It may well be argued that land being a national asset under State forest, its value should be ignored in financial calculations. Excluding land costs and values the relative finances of the two thinning regimes are as follows (in addition to earning 4% C.I.) :-

1 - 1st thinning uneconomic at age 40 - Profit £478.6 in 130 years.
11 - 1st thinning breaks even at age 80 - Profit £342.6 in 140 years.

In either case, including or excluding land values, it would appear that a thinning to waste at age 40 is a sounder financial operation than leaving a Jarrah pole crop unthinned until enough trees of a saleable size are available to cover the cost of a thinning operation.

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THAT TREE AGAIN!!!

by R.J. Underwood

The March 1962 issue of "Forest Notes" contained two sets of measurements of the KING JARRAH at Nanga Brook, by F.G. Quicke (1958) and J. Williamson (1960). These figures revealed the disturbing fact that this tree had decreased in bole height by 5 feet and thus in volume by 1.2 loads, in the two years between measurements.

Those foresters who were mildly alarmed by this apparent decrement in a prime specimen of our major species may however, be reassured to hear of another set of measurements which were recently exhumed.

In the 1954 issue of "Australian Forestry" in an article entitled "Giants of the Forest" by B.H. Bednall and I.M. Hawkins, the measurements of this same tree were quoted. A comparison shows:

Measurers	Date	Total ht.	Bole ht.	GBHOB	Volume
Bednall-Hawkins	1945	182'	94'	20'4½"	40.0 lds.
Quicke	1958	not given	95'	22'1"	43.8 lds.
Williamson	1960	160'	90'	22'3"	42.6 lds.

While the increase in girth of 2 feet and in volume of approximately 3 loads over the 15 year period may not be cause for wild rejoicing, it is, INDISPUTABLY, growth in the right direction.

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