Measurement of a Teak Plantation

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There is a small 12-year-old plantation of Teak (*Tectona grandis*) on a farm near Darwin. Teak is a deciduous tropical hardwood that is native to India and South East Asia and widely planted in plantations in these areas. In Northern Thailand alone there are more than 100,000ha of Teak plantation. The highly regarded durable timber is used for everything from general construction to fine joinery. Imported Teak is most commonly seen in Australia as outdoor furniture.

Although the English established teak in plantations in southern India and Burma over 100 years ago, it is only recently that the species is being considered seriously as a plantation species for tropical Australia. Apparently established in the wet season of 1988/9, this small uniform monoculture plantation is one of the oldest pruned plantations of its type in Australia. The Darwin Master TreeGrower (MTG) group measured the diameters of all trees in 2 plots, cut samples from individual trees to inspect the growth rings and marked the plantation for thinning using plastic tape.

Darwin Master TreeGrowers prepare to measure a 12-year-old Teak plantation to determine management options.

Two rectangular plots (20m x 15m) of 0.03ha were established in the plantation. The DBH of each tree was measured using the MTG Tape and then the height of the 3 fattest trees in each plot was estimated. The data was put into a simple computer based spreadsheet.

The results of the measurements are shown in Table 1.

TABLE 1. MEASUREMENTS OF A 12-YEAR-OLD PLANTATION OF TEAK

Variable	Plot 1	Plot 2	Average
Number of trees in the plot	31	28	29.5
Stems per hectare (st/ha)	1033	1014	1023
Mean Diameter (cm)	14.0	12.8	13.4
Mean Height (m)	12.0	13.1	12.5
Basal Area (m^2/ha)	16.35	13.55	14.9
Volume (m^3/ha)	65.4	59.2	62.3
Mean Annual Increment (m^3/ha/yr)	5.45	4.94	5.19

Two of the larger trees were cut open to reveal timber colour and growth rings.

Growth rings tell the story

Two of the larger trees were cut to allow inspection of the growth rings. Because Teak is deciduous, losing it leaves in the dry season, each growth ring represents one wet season's growth. This not only allows the age of the plantation to be determined it also tells us the history of diameter growth. Figure 1 shows the incremental growth of one tree as read from the growth rings. Although the width of the growth rings may reflect the length of the wet season it clearly is competition between the trees that reduces growth rates in the later years.

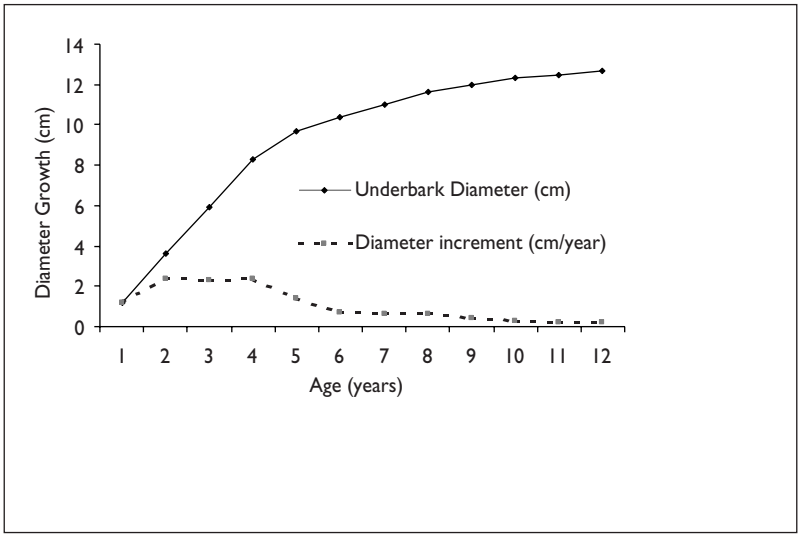


FIG 1.
Measurements of the annual growth rings shows how diameter increment has slowed as the trees began to fully occupy the site.

What the results tell us

The results from each plot are similar. The tree stocking was over 1000 stems per hectare and it was clear from the growth of the edge trees and the growth ring study that competition between the trees had begun to seriously reduce diameter growth. Because the plantation is a fully stocked uniform monoculture, we are also able to assess the relative site quality by comparing the volume production achieved to date with results from research in India and Thailand.

Figure 2 shows the mean tree diameter for a number of teak plantations in India and SE Asia collated from data in references about teak. The mean diameter of the trees in the Darwin plantation at age 12 years was approximately 13cm with a stocking rate of over 1000 stems/ha suggesting it is about middle of the range.

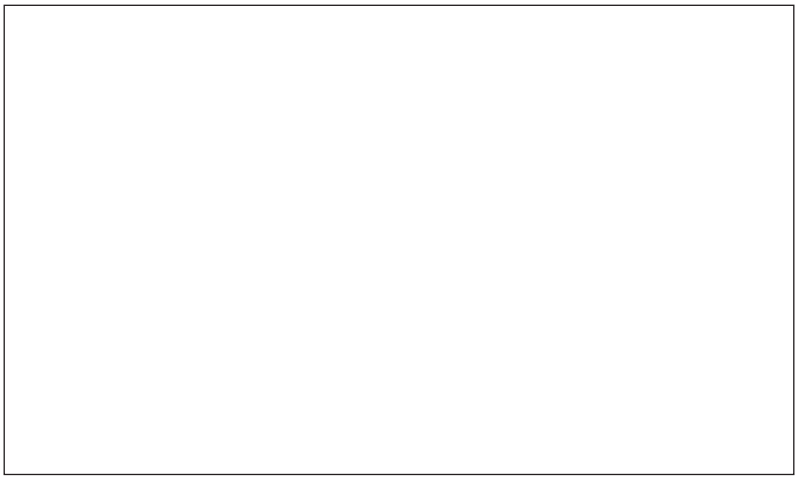


FIG 2.
Diameter growth ofTeak plantations in India and SE Asia

Although there are plantations of over 1000 st/ha in which the mean diameter of the trees has reached 20cm the growth ring study suggest that this is unlikely on this site and that growth has dramatically slowed already. Fig 2 indicates that for the production of sawlogs the stocking rate will need to be reduced to less than 500 st/ha.

Like our own eucalypts, Teak is a crown shy, light demanding species that needs to be well spaced in order to grow to its potential. Based on the measurements and data from plantations overseas the Darwin MTG group set about marking the stand for thinning confident that it would increase diameter growth rates.

Research in Thailand shows that thinning Teak plantations can promote diameter growth without compromising timber colour. Comparison of logs from a 63 year old unthinned plantation and a 25 year old thinned plantation.

Marking for thinning

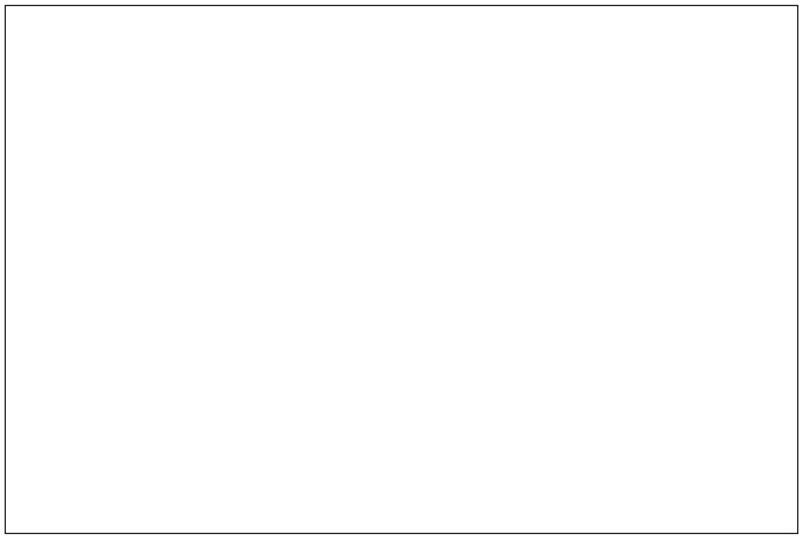
The aim of this first thinning was the removal of any tree of poor form that suggested that it would never grow into a straight sawlog. There is a risk with Teak that heavy thinning would stimulate epicormic shoots (from buds on the pruned stem) therefore a number of light thinnings to reduce competition slowly is preferable to a single heavy thinning. In any event is is likely that the owner will need to nip off any epicormics with a pole saw until the trees have develop strong canopies.

After marking the poorer quality trees a larger plot was measured to look at the effect the proposed thinning would have on the plantation characteristics. Table 2 presents the data for a 0.08ha block containing 77 trees after marking for thinning. The removal of the poorer formed trees reduces the stocking to less than 600 st/ha, increases the average diameter and removes about a third of the volume. The removal of smaller, malformed trees would therefore have an immediate impact on the quality of the forest and allow new growth to be concentrated on the better trees.

The thinned trees may have some value for craftwood although it is unlikely that a commercial market would be found for such small diameter trees. Note that the heartwood area is much less than the diameter of the stem and it is only the heartwood that has the attractive wood properties.

TABLE 2. ANALYSIS OF THE EFFECT OF THINNING ON FOREST PARAMETERS

Variable	As standing	If thinned
Stems per hectare (st/ha)	927	556
Mean Diameter (cm)	14.1	15.4
Mean Height (m)	11.0	
Basal Area (m^2/ha)	15.77	10.45
Volume (m^3/ha)	57.8	38.3



Darwin Master TreeGrowers begin thinning to promote the diameter growth of the best trees.