



Farm Forestry in the Adelaide Hills/Fleurieu Peninsula

WOODLOTS AND WIDESPACED AGROFORESTRY FOR THE ADELAIDE HILLS AND FLEURIEU PENINSULA

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This Farm Forestry Note provides a guide to growing timber on farms in the Adelaide Hills and Fleurieu Peninsula for the two most common commercial tree growing layouts:

- woodlots
- wide-spaced agroforests

It looks at a number of management aspects you will need to consider, including:

- thinning practices
- pruning requirements
- establishment costs
- stock and pasture management
- likely returns
- the relative advantages and disadvantages of each regime.



Woodlots or plantations are the conventional means for growing timber. The land is fully devoted to trees, maximising the volume of timber produced but allowing only limited opportunistic grazing.

Trees are planted closely (at a high “stocking”) to ensure competition, which will reduce branch development and encourage the trees to grow straight.

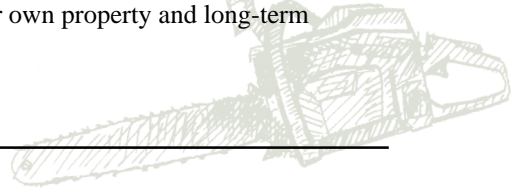
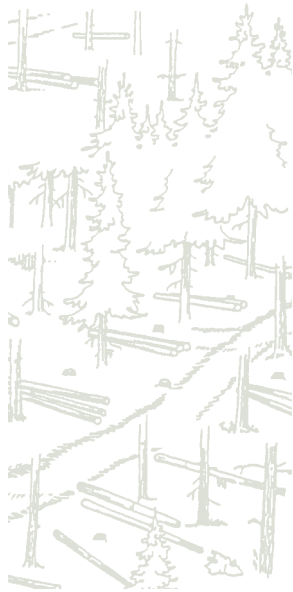
Regular thinning to remove the less vigorous and poorly formed trees is required for the forest (or “stand”) to progress and reach its full commercial potential. Left unthinned the stand would eventually become stagnant, unproductive, and susceptible to disease and insect attack. As the thinned trees are harvested you will have some cashflow during the rotation although the bulk of your financial return will not be received until the stand is clearfelled at maturity.

Pruning is not required in this type of regime.

In wide-spaced agroforests the trees are planted at lower stockings. This allows individual trees to grow rapidly, reducing the wait for financial return as each tree reaches a commercial size at an earlier age. The wider spacing allows stock to be grazed under the trees. Pruning of the lower branches is essential but this yields high quality “clearwood” logs for the top end of the market..



By studying this Farm Forestry Note in conjunction with others in the series you can decide which form of forestry is suitable for your own property and long-term intentions.



Woodlots

A farm woodlot is characterised by high initial stocking rates commonly in the order of 1100 trees/ha (3 m x 3 m spacing) to 1600 trees/ha (2.5 m x 2.5 m).

More trees are established than are expected to be commercially harvested. The extra trees provide shelter and allow selection of a final crop of trees that are tall, straight and vigorous. High tree stocking rates are maintained and the resultant early competition between trees restricts branch growth (producing small knots) and for some species encourages self pruning. A woodlot therefore does not require pruning.

Thinning is essential

As a rule, the more trees on a site the slower the growth of individual trees due to competition for moisture and nutrients. Excessively high stockings will result in slow growth rates and long rotations.

Periodically thinning a plantation is essential to produce valuable sawlogs. As the trees grow a thinning program removes the less vigorous and deformed trees, allowing more room for the better trees to continue to grow on. This increases their rate of growth, size and hence value. The first thinning can be a commercial operation removing small log, for marketing as firewood, fence posts, rails or low value sawlog depending on tree size and species.

A conventional management regime for a radiata pine plantation may rely on up to four commercial thinnings in the life of the plantation to keep trees vigorous and healthy and the log diameter increasing.

Ideally, a softwood plantation is first thinned when about 12–14 years old and then thinned about every seven years until clear felling at about 35 years.

However, there are limited markets for first-thinning products (posts, poles and small-diameter sawlog) and no market for pulpwood or woodchips in this region. Because of the relatively high logging costs for the low volume produced and the low value of small sized log you may well have to undertake “pre-commercial” thinning to waste. This means that trees are felled and left to rot, returning nutrients to the soil.

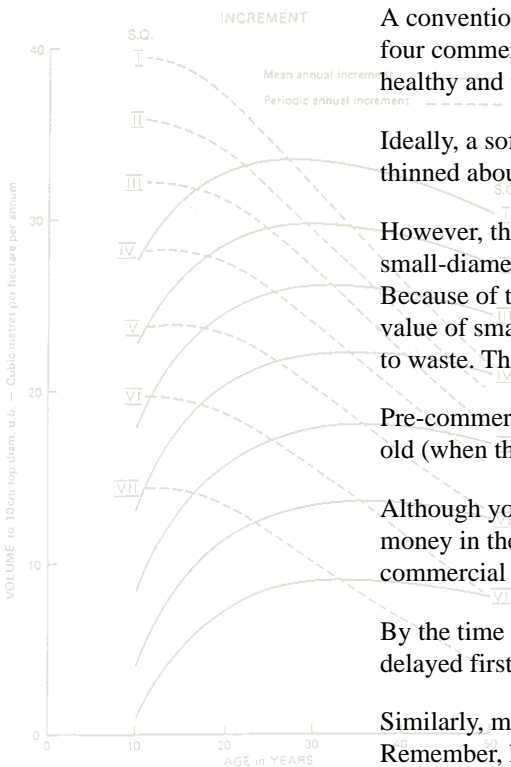
Pre-commercial thinning to waste is best undertaken when the trees are about 8 years old (when the lower branches start dying).

Although you may be reluctant to let your trees go to waste, you will make more money in the long run by non-commercial thinning rather than holding out for a commercial first thinning that may never eventuate.

By the time the remaining trees grow another 7–8 years, all trees removed in a delayed first thinning should be saleable as sawlog.

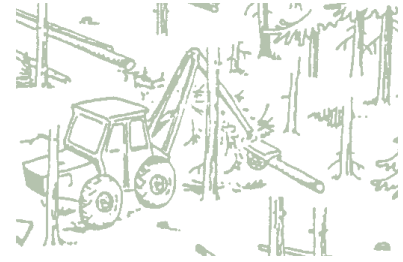
Similarly, many owners of eucalypt plantations are reluctant to cut trees down. Remember, however, that your trees are a crop, grown to be harvested! If you do not thin your stands you will induce stress from excessive site competition and may increase the risk of insect attack.

YIELD TABLE FOR PINUS RADIATA IN S.A.



The penalties for either not thinning or thinning too late are:

- a much longer time to final harvest (rotation length)
- smaller-diameter ,less valuable logs
- stress due to excessive site competition increasing susceptibility to disease or insect attack
- a high risk of wind damage after a late thinning.



You should plan your woodlot so it is large enough to warrant using logging machinery (at least a total of four hectares within a few hundred metres) and not too steep for machinery (less than 18° slope).

Indicative establishment costs for a woodlot are:		
Site preparation	Ripping or mounding	\$150/ha
Pre-planting weed control	Knockdown	\$40-80/ha
Plant stock	Depends on species	\$250-\$550/ha
Planting	Depends on site conditions, area, quality of site preparation	Do-it-yourself or \$120-\$300/ha
Post-plant weed control	Soil residual sterilant	\$40-80/ha

Typical pine woodlot regime

Typical eucalypt woodlot regime

Age years	Operation		Cost/return	Age/years	Operation		Cost/Return
7-8 years	Pre-commercial thinning	1600 trees/ha to 900 trees/ha	– \$250	3-4 years	Pre-commercial thin	1100 to 900 trees/ha	–\$100
12-14 years	Commercial first thinning	Thin to stocking of 600 trees/ha	+ \$1 750	10 years	Thin for firewood	Thin to 300 trees/ha	+ \$1 600
19-21 years	Commercial thinning	Thin to stocking of 300 trees/ha	+ \$2 400	22 years	Commercial thin	Thin to 150 trees/ha	+ \$ 2 000
26-28 years	Commercial thinning	Thin to stocking of 150 trees/ha	+ \$ 2 800	35 years	Clearfall		+ \$15 750
35 years	Clearfall		+ \$ 22 000				



Typical silviculture and returns for woodlots

Species	Trees/ha (stocking)	Typical spacing (metres)	Rotation (Years)	Number of commercial harvests	Average growth rate (m ³ /ha)	Average returns (\$/ha)	Returns* (\$/ha)	Annuity* (\$/ha/yr)
Radiata pine	1600	3x 2.5	35	4	15-30	35	21000-38000	600-1100
Eucalypts	1100	3 X 3	35	3	10-20	35	12500-25000	350-700
Cypress pine	1100	3 x 3	45-50	4	10-20	50	25000-50000	500-1000
Blackwood	1600	2.5 x 2.5	50-60	2	4	100	20000	400
River oak	1100	3 x 3	40-50	2	8-12	40	10800-18000	240-400

* Returns are indicative only and are subject to full site interpretation and assessment. Historically timber prices have reflected changes in CPI thus the projected returns above have not been discounted to net present values. Current Australian log prices have been used as a basis for estimating future returns (they would increase two to three-fold if based on current New Zealand log prices). The minor species are listed as a guide to their silviculture, their slower growth rates are not necessarily compensated for in returns.

Wide-spaced agroforests

Wide-spaced agroforests produce high-quality sawlog of appearance grade or “peeler log”. The advantages are that you:

- don’t have to wait as long for the major returns
- can reduce your reliance on markets for low-value thinnings
- can maintain farm income rather than locking your land up with trees — for example, by cutting hay until the trees are established and grazing stock under the trees
- can have as little as one hectare and still be economically viable by producing high-quality high-value sawlogs for the top end of the market
- could plant an entire paddock and not need any additional fencing.

Wide-spaced agroforests can either be:

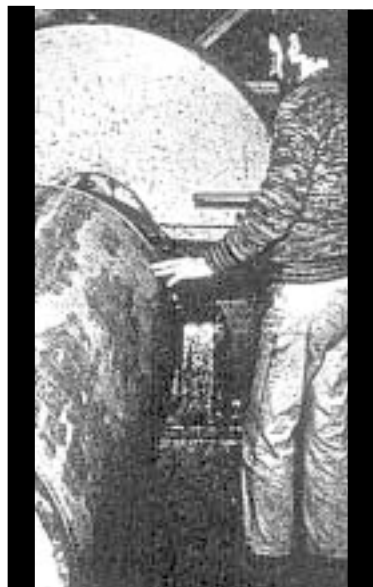
- evenly-spaced individual rows across a paddock
- an alley system with rows grouped in belts separated by alleys of agricultural land.

Pruning is essential

Wide spacing promotes maximum individual tree growth, but without pruning will result in a liability rather than an asset. Heavy branch development produces non-saleable timber.

The timing of pruning is important: too late and benefits are largely lost; too early and tree growth will be unnecessarily checked. Timely pruning is therefore a necessity with any wide-spaced system.

Your aim should be to concentrate management efforts and growth on the final crop trees. You must identify these trees as soon as possible to minimise labour and



reduce competition for limited site resources. Poor trees or trees not worth retaining as a final crop tree should be thinned out (to waste) as soon as they become apparent.

An indicative total pruning cost would be \$1100–\$1500 or 2–3 days a year per hectare for up to six years, depending on species, site conditions and stocking rate.

Plant spacing

Save time and money by only establishing as many trees as you will need to ensure an even distribution of sufficient final crop trees. Invest in the best planting stock available.

Initial stocking using standard planting stock typically ranges from 600–850 trees per hectare. Where high quality genetic planting material is available (for example, physiologically-aged radiata pine cuttings) as few as 500–600 trees per hectare can be planted and still give you 200–300 final crop trees.

For native species of unproven genetic quality, you should establish higher initial stockings of around 800 trees per hectare. This will allow for adequate selection and yet ensure sufficient evenly spaced final crop trees of good form.



Indicative establishment costs for a Wide-Spaced Agroforest are:		
Site preparation	Ripping or mounding	\$80/ha
Pre-planting weed control	Knockdown	\$30-40/ha
Plant stock	Depends on species	\$180-\$400/ha
Planting	Depends on site conditions, area, quality of site preparation	Do-it-yourself or \$80-\$250/ha
Post-plant weed control	Soil residual sterilant	\$30-40/ha

Typical regimes for pines and eucalypts may be as follows:

Age or tree height	Operation	Pine	Eucalypt
1–3 years or >1.5 m		Form prune—without removing too much leaf area Initial stocking 650	Form prune— without removing too much leaf area Initial stocking 850
4–5 years or >5 m	Prune to 2.5 m	Prune—to 2.5 m Thin to waste worst 100 trees Residual stocking 550 Stock introduced	Prune –to 2.5 m best 400 trees Thin to waste worst 150 trees Residual stocking 700 Stock introduced
6-7 years or >7 m	Prune to 3.5 m	Prune—to 3.5 m Thin to waste worst 100 trees Residual stocking 450	Prune—to 3.5 m best 350 trees Thin to waste or firewood worst 100 trees Residual stocking 450
8–9 years or >10 m	Prune to 5 m	Prune - to 6 m Thin to waste or firewood worst 100 trees Residual stocking 350	Prune– to 5 m best 300 trees Thin to waste or firewood worst 150 trees Residual stocking 450
10 years or >12 m	Prune to 6 m	Prune to 6 m Thin to waste or firewood worst 100 trees Residual stocking 250	Prune to 6 m best 150 trees Thin to waste or firewood worst 300 trees Residual stocking 150
12–14 years		Large tree crowns reduce pasture & hence grazing value	Degree of canopy closure occurs reducing grazing value
20–30 years	Clearfell	Replant	Replant

Stock management

Until your trees are sufficiently well established keep stock out. During this stock exclusion period you can cut silage or hay from between the rows of trees, keeping the area in farm production..

There are no set rules on when stock can be re-introduced. You need to consider the growth rates achieved and the behaviour/conditioning of the animals.

For pines, sheep need to be kept out for about three years while cattle can be grazed after about four years. Eucalypts often grow more vigorously in the early stages so you can often introduce stock a year earlier.

Crash grazing areas for short periods is a better strategy than set stocking in the initial stages, until stock are conditioned to the trees.

It is important to remember that stock can quickly ruin young trees in a matter of hours — be vigilant!

Pasture improvement

Pastures decline without grazing. There is an opportunity for pasture improvement towards the end of the stock exclusion period. An improved pasture will increase productivity for 7–10 years until the trees take over and canopy closure begin to shade out the pasture. At this stage the trees are “fattening up” and your prospects of realising the timber returns are becoming readily apparent.

Alley systems

Alley systems have the benefit of separating the trees and pasture. Wider “alleys” of pasture are less likely to be shaded out by the trees, allowing grazing to continue possibly through the full rotation. From a tree growing perspective, alley systems require less pruning as they are more like a woodlot where the internal rows are shaded, reducing branch development. The outside rows will need pruning to prevent large limbs developing that will degrade log quality and adversely shade the adjoining pasture, reducing production.

The role for wide-spaced agroforests

Wide-spaced agroforests are ideally suited (see table on page 7) to incorporation into your property plan in any of the following instances:

- on steep land (slopes greater than 18° but less than 30°)
- where you require excellent all-of-paddock shelter for livestock
- where you wish to reduce the fire hazard (the planting reduces wind speed, grazing reduces surface fuel loads and high pruning breaks the ground-to-crown fuel link).

In a nutshell

Use the table (on page 7) to help you weigh up the advantages and disadvantages of the two main options to decide which option (or mixture) best suits your requirements.

A common impulse to is think about using those areas that are least productive for agriculture or difficult to manage, such as steep slopes. Think again! Planting on more productive land has a number of benefits:

- you can introduce stock sooner
- you can cut silage or hay before reintroducing grazing
- more productive pasture growth on better land gives you better grazing returns
- trees grow faster and yield more timber, providing quicker returns.



Typical silviculture and returns for wide-spaced agroforests

Species	Trees/ha (stocking)	Growing space/tree (m ² /tree)	Typical spacing (metres)	Rotation length (years)	Pruning requirement	Final stocking (trees/ha)	Average volume/tree (m ³ /tree)	Average \$/m ³	Total (\$/ha)	Annuity (\$/ha/year)
Radiata pine	650	15	6 x 2.5 5 x 3	25	high	250	1.5	70	22500-30000	900-1200
Spotted gum	800-830	12	6 x 2 5 x 2.5	25	moderate	100-150	1.0**	50	6000-8500	250-350
Sydney blue gum	800-830	12	6 x 2 5 x 2.5	25	moderate	100-150	1.4**	50	8000-11500	325-450
Tasmanian blue gum	800-830	12	6 x 2 5 x 2.5	20	moderate	100-150	1.4**	50	8000-11500	400-575
River oak	800	12.5	6 x 2 5 x 2.5	30	high	100	1.0**	60	6000	200*
Blackwood	1000	10	5 x 2 4 x 2.5	30	high	100	0.6**	100	6000	200*

* Plus additional grazing value ** Stand with yield small volume of firewood as well as sawlog.

Returns are indicative only and are subject to site interpretation and assessment. Projected returns have not been discounted to net present values.

Farm forestry options compared

Situation	Woodlot	Widespaced
Establishment cost	high	low
Reliance on genetically superior material	mod	high
Reliance on small-diameter low value log markets for thinnings	high	nil
Rotation length	35 yrs long	20-25 yrs moderate
Area required	larger the better	can be small
Pruning requirement	low	very high
Suited to steep land (18°-30°)	no	yes
Grazing	no	yes
Total wood volume	high	moderate
2nd, 3rd log potential	high	low-moderate
Labour inputs	low	high
Commercial thinning requirement	yes	no
Logging costs	high	low
Firewood	yes	smaller amounts
High quality sawlog	moderate	yes
Fire hazard	high until thinned	low
Paddock shelter	low	high
Fencing cost	moderate	low

For further information:

<i>FFN 1/98</i>	<i>Introduction to farm forestry in the Adelaide Hills and Fleurieu Peninsula</i>
<i>FFN 2/98</i>	<i>Farm Forestry: Frequent questions and common myths</i>
<i>FFN 3/98</i>	<i>Farm Forestry: Establishment Guidelines</i>
<i>FFN 5/98</i>	<i>Timberbelts</i>
<i>FFN 6/98</i>	<i>Pruning guidelines for farm forestry</i>
<i>FFN 7/98</i>	<i>Firewood growing in the Adelaide Hills and Fleurieu Peninsula</i>
<i>FFN 8/98</i>	<i>Farm Forestry Species for the Adelaide Hills and Fleurieu Peninsula</i>
<i>FFN 9/98</i>	<i>Protecting your forest plantation from fire</i>

Enquire as to more recent publications

Farm Forestry, Harvesting and Marketing– Guidelines for pine plantations in the Adelaide Hills and Fleurieu Peninsula, David Hanna Forestry SA 1998

Farmtree\$ for the Mount Lofty Ranges: A Regional Agroforestry Handbook by Peter Bulman, Primary Industries and Resources SA 1995.

FS Land Capability in the Mt Lofty Ranges

All available from PIRSA offices, State Tree Centre, State Flora outlets, Mount Lofty Ranges Catchment Resource Centre (Mount Barker) and community landcare resource centres.

Environmental management guidelines for plantation forestry in SA, 1997

Mt Lofty Ranges Farm Forestry Industry Plan 1997

Primary Industries and Resources SA

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