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Employment Requirements

Agroforestry generally provides more employment, for the farmer and family, than forestry or agriculture.

Agroforestry with an agricultural emphasis provides the most steady employment pattern. As with income, the most consistent level of employment is achieved if the farmer's tree establishment programme is spread over a number of years (Figure 4).

Profitability

From a comparison of all the studies undertaken, the farmer's options ranked in order of profitability are:

- (1) forestry,
- (2) agroforestry with a forestry emphasis,
- (3) agroforestry with an agricultural emphasis, and
- (4) agriculture.

For any given agroforestry option, the most profitable means of operation is that based on the farmer undertaking the more manageable work, with the Forests Department undertaking the specialized tasks. In any case, profitability would largely depend on the correct application of forest management techniques. In most instances the 25 year rotation is the most profitable.

The overall profitabilities of forestry and agroforestry are closely linked, and are approximately double the returns per hectare per year for agriculture. The similarities in their profitability results from the dual role of the farm land. The trees and the pasture complement each other rather than compete. For instance, in agroforestry with a forestry emphasis it is possible to achieve 93% of the forest potential while maintaining 42% of the pasture's potential. For the option with the agricultural emphasis 65% of the agricultural potential can be maintained while the new forest crop achieves 53% of its potential.

NOTE: It is probable that timber prices will continue to increase ahead of forest production costs and that new forms of log sale (stumpage) will be introduced to account for the larger 'farm-grown' product. Both factors would increase the profitability of agroforestry over and above this study which used prevailing costs and conditions.

Other Farm Benefits

In addition to an overall increase in profit, agroforestry allows the farmer to continue farming practice and makes a practical contribution to the farm by diversifying income and assisting farm management, through the provision of extra stock food and shelter.

Tax Concessions

Forest operations are classed by the Income Tax Assessment Act (1933-66) as a form of primary production. For the farmer already classified as a primary producer the same taxation considerations apply to planting and tending a forest crop as to most other crops. Information on this subject is available from the Commonwealth Taxation Office at 1 St George's Terrace, Perth, or from a public accountant.

Community Benefits

Conversion from agriculture to agroforestry produces an increase in farm income and regional employment, and the pine sawlogs produced will help compensate for the steady reduction in the supply of logs from the hardwood forest. Agroforestry also has a favourable effect on the environment, particularly enhancing soil fertility, controlling erosion and reducing water salinity. The combination of these benefits must help with a more efficient allocation of the State's resources.

Further information

Information Officers of the WA Forests Department will be pleased to give information on request, and to discuss any matters mentioned in this brochure. Agroforestry demonstration areas have been established at Busselton and others are planned for the Manjimup area.

Farmers are **STRONGLY** recommended to discuss their own particular agroforestry project with an Information Officer of the Forests Department or a professional Agroforestry Consultant, **BEFORE ANY WORK IS STARTED**. Expert judgement is required for the particular considerations of location, equipment, minimum areas, the suitability of soil and pest control.

Regional Forests Department offices are at

Perth (09) 367 6333
Bunbury (097) 25 4300
Manjimup (097) 71 1412

Pine trees (one year old) are available from the Forests Department Nursery at Nannup (097) 56 1101. The 1984 price \$47/1000 trees.

Compiled from a paper by Dr. G. Malajczuk (WAFD) and Dr. D. Morrison (WADA) by Ian Kay for P.J. McNamara, Acting Conservator for Forests.

Forests Department of Western Australia.
November 1984.



Introduction to Pine

The profitability of growing Radiata pines is increasing. Softwood, produced by pines, has a number of advantages over native hardwoods; it is fast growing, light, and has a high strength to weight ratio. Pine wood is also easier to work and nail, and it is cheaper to transport than hardwood.

Although subject to insect attack, and rot, the timber can easily be treated with preservatives and safely used for any building or outdoor work. Pine timber is also used in furniture and cabinet making and veneers.

Western Australia's jarrah and karri forests can no longer meet the increasing demand for sawn timber, and to conserve this resource the Forests Department is progressively reducing the hardwood cut. The short fall between this timber supply and the predicted demand must either be met by local producers or be imported. Local production is preferred.

An Alternative Farm Crop

Independent studies in the Manjimup region have shown that in the long term Radiata pine forestry is much more profitable than grazing (Treloar, D. 1984). Unlike traditional agriculture, however, forestry practice requires short widely spaced bursts of activity, with few returns until the final harvest... not often an attractive proposition for the man on the land.

The government, however, is keen to help farmers benefit from the new crop and a number of introductory approaches have been suggested:

- (1) joint farmer/government ventures, with establishment capital or an annual income for the farmer offset against the profits of the final harvest; or
- (2) the phasing in of a combination of agriculture and forestry – agroforestry – so that a portion of the farm continues to provide an annual income and employment while the trees mature.

Figure 1: – MAP OF SOUTH WEST

Showing Study Region suitable for growing pines on farms
Other areas suitable for growing Radiata Pine

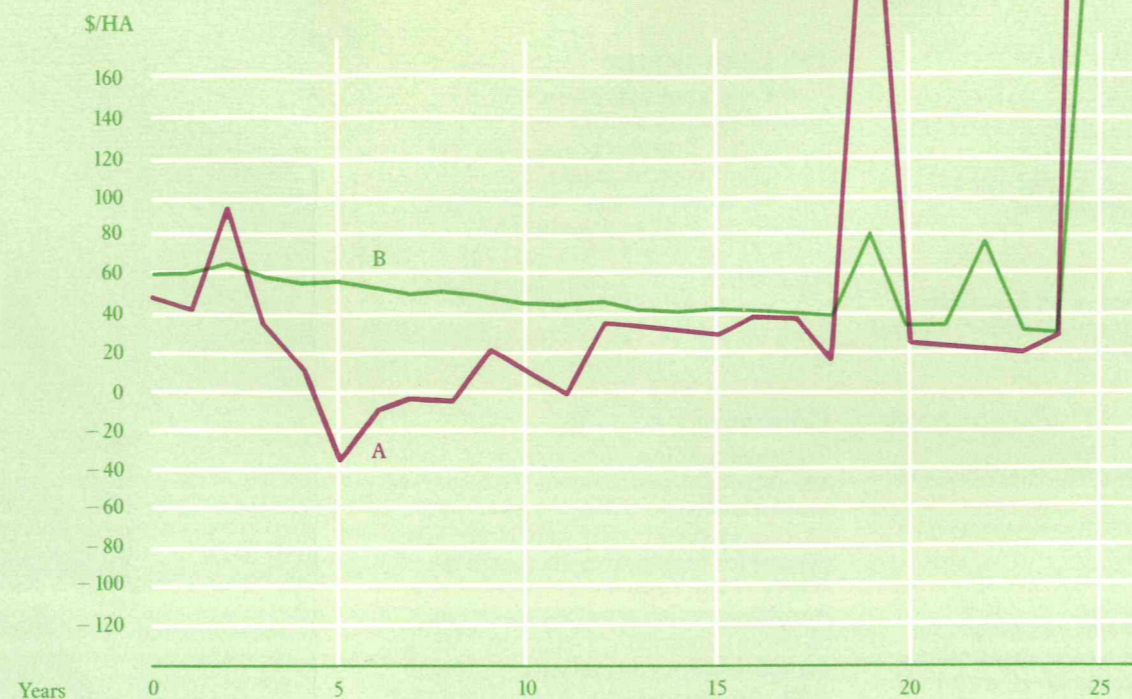
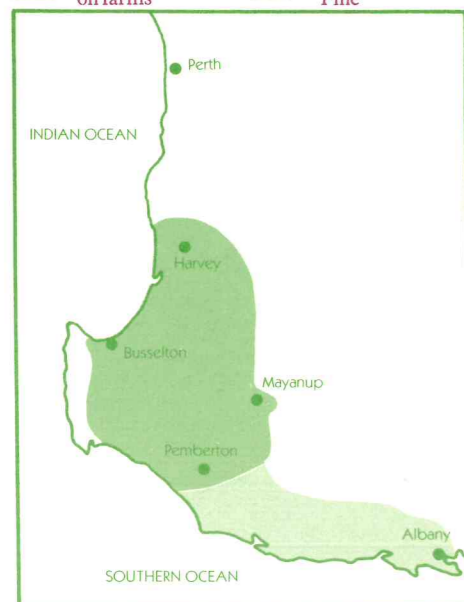


Figure 3: – Annual net returns for agroforestry for two rates of tree planting. – Agricultural Emphasis (25 year rotation).

A – Total planting in one year.

B – Conversion at 6% every 3 years.

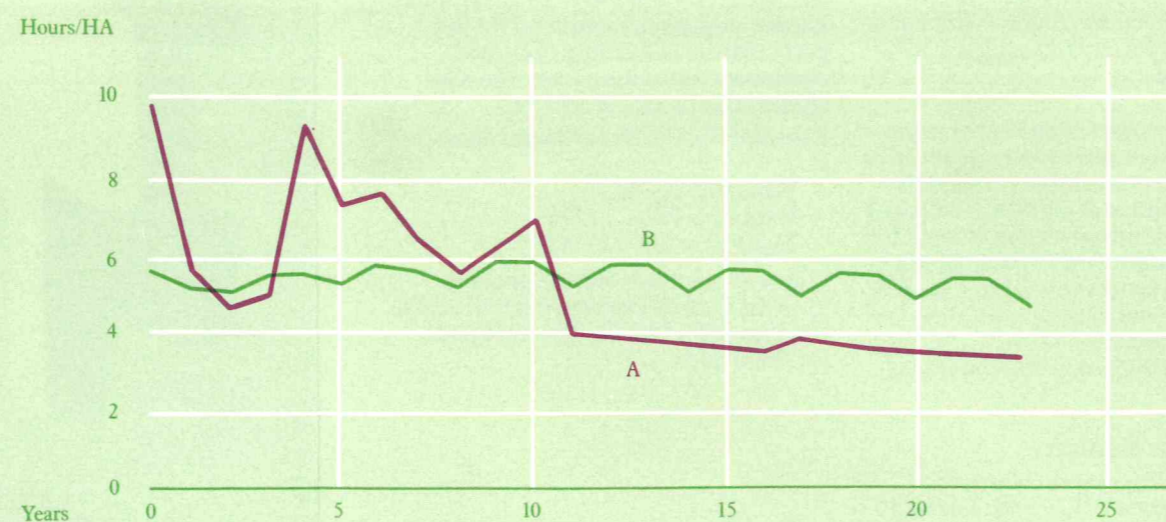


Figure 4: – Labour requirements for agroforestry for two rates of tree planting. – Agricultural Emphasis (25 year rotation).

A – Total Planting in one year.

B – Conversion at 6% every 3 years.

Agroforestry

The concept of combining forestry and farming on the same piece of land is not new. Only recently, however, has it been studied in a scientific manner. The combination of widely-spaced pine and grazing has been the subject of intense study in Western Australia for more than 10 years.

This pamphlet outlines recent studies of the economics of combining the production of Radiata pine sawlogs with the farming of hay and livestock on an average Manjimup farm (380 ha) but the general region between Harvey, Manjimup, Pemberton and Busselton has the required rainfall, soil, and market facilities. (See map of South West Figure 1).

In the study (Malajczuk, G. and Morrison, D. 1984) all possible farm costs and returns for agroforestry were considered, using 'real growth rates' between 3% and 7% per year (that is inflation was excluded). This enabled a comparison to be made with Treloar's previous study – agriculture v forestry. For the study, it was assumed that about 60% of the farm would be used for growing trees, but in practice, of course, a farmer need plant only a small area (5 hectares is regarded as an economic minimum).

Production Emphasis

There is a broad range of options available for the farmer considering agroforestry management, depending largely on the farmer's preference. Two basic examples have been considered:

- (1) one with an agricultural emphasis, requiring tree stocking to be kept relatively low and the agricultural production relatively high throughout the growth of the tree crop (rotation); and
- (2) the other with a forestry emphasis (vice versa).

Both systems produce their own mix of agricultural and sawlog products, but the general objective is to grow between 50-100 large, high quality sawlogs – while maintaining reasonable levels of grazing between the trees throughout the trees' growth.

Management of Agroforestry

The relatively high financial returns found for agroforestry depend largely upon the farmer closely following the prescribed management programme for the trees. A basic prescription for both options studied is laid out in Table 1 and illustrated (Figure 2).

Thinning is necessary (years 3-6) to remove the 'rubbish' trees. More than half the young Radiata pines develop faults, such as bends and forks, and therefore need to be removed. In agroforestry it is important to do the thinning as early as possible to minimize the amount of debris and to give the crop trees the best growing space.

Cutting off the lower branches (pruning) is essential in agroforestry for two main reasons; to produce high quality timber and to let light in for pasture growth.

Pruning aims to produce a 10 m log with a small knotty core. The timber grown outside the knotty core ('clear' timber) is highly prized quality timber. Pruning the branches starts when the diameter of the tree is about 10 cm (about age 4) and is repeated each year until there is 10 m of pruned trunk (about 10 years). NOTE: The pruned section of the trunk should not exceed 60% of the total tree height at any stage.

Tree Harvest Cycle

Although 25 and 30 year harvest cycles were considered, there is some flexibility in the timing of agroforestry logging. The decision of when to harvest trees depends upon such factors as need for income, wood and pasture, the availability of markets and taxation.

Means of Operation

For the sake of the studies, it was assumed that farmers would undertake all agricultural operations at their expense. However, there are three alternatives available for the management of the forest operations:

- (1) the Forests Department undertakes all the forestry operations at its expense, using its own equipment;
- (2) the farmer undertakes all the operations at the farmer's expense and with the farmer's own equipment; and
- (3) the Forests Department undertakes the more difficult operations (the establishment of roads and fire breaks and high pruning at years 8-11), while the farmer undertakes the more manageable tasks (weed control, fire break maintenance and low pruning).

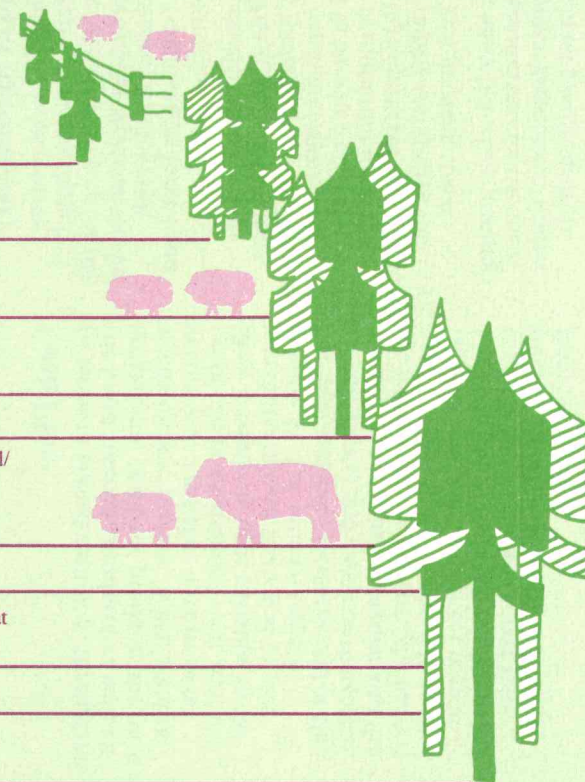
NOTE: The farmer either pays for the forest operations as they are undertaken, or the Forests Department carries the cost and offsets it against the income from the harvest (undertaken by the Forests Department). Even in operations undertaken by the Forests Department, the farmer may choose to be involved and work for wages – while developing increased forest skills.

Cash Flow

In terms of annual cash flow, throughout the forest rotation, agroforestry with an agricultural emphasis produces the most steady income pattern. When planting occurs over a number of years, a net profit can be maintained each year and there is relatively little variation in the size of the returns from year to year (Figure 3). The returns begin to fluctuate widely towards the end of the 25 year period and continue thereafter, but the fluctuations are regular and the net returns remain positive (the harvest cycle). When all the planting is undertaken in one year, annual net returns fluctuate widely from the beginning of the venture and there is a long time interval between the positive returns from harvests.

Table 1 Figure 2
Management programmes considered by the agroforestry study*

Year	Management Operation			
	Agricultural Emphasis		Forestry Emphasis	
0	Noxious weed control.		Noxious weed control.	
1	Poison rabbits if they are prevalent. Spray herbicide along rows 14m apart (spray strips 1.5m wide). Plant trees 2m apart along sprayed row (350 s.p.h.)	Fence off area if necessary. Apply 250 kg/ha Super and Potash. Cut hay. Construct roads and firebreaks.	Poison rabbits if they are prevalent. Spray herbicide along rows 10m apart (spray strips 1.5m wide). Plant trees 1.4m apart along sprayed row (700 s.p.h.).	Fence off area if necessary. Apply 250 kg/ha Super and Potash. Cut hay. Construct roads and firebreaks.
2 & 3	Apply 250 kg/ha Super and Potash. Cut hay.		Apply 250 kg/ha Super and Potash. Cut hay.	
4	Apply 150 kg/ha plain Super annually from year 3 to 30.	Commence grazing with sheep. Noxious weed control.	Apply 150 kg/ha plain Super annually from year 3 to 15.	Commence grazing with sheep. Noxious weed control.
5	Cull to 100 s.p.h. Commence low pruning.		Cull to 200 s.p.h. Commence low pruning.	
7	Cull to 50 s.p.h.		Cull to 100 s.p.h.	
8	Noxious weed control. Commence high pruning (to 10m).	Commence grazing with cattle and/or continue grazing with sheep (reduce animal stocking periodically).	Noxious weed control. Commence high pruning (to 10m).	Commence grazing with cattle and/or continue grazing with sheep (reduce animal stocking periodically).
18 or 20	Roading access for thinning.		Roading access for thinning.	
19 or 21	Thin to 35 s.p.h. – sell sawlogs. Heap debris.		Thin to 50 s.p.h. – sell sawlogs. Heap debris.	Recommence fertilizing and repeat annually until age 21 or 23.
26 or 31	Harvest 35 s.p.h. – sell sawlogs		Harvest 50 s.p.h. – sell sawlogs.	
0 to 26 or 31	Annual maintenance.		Annual maintenance.	



*These programmes (Table 1 and Figure 2) are particular to the study as an illustration of the alternatives. They should not be implemented by individual farmers without further consultation with agroforestry advisors.