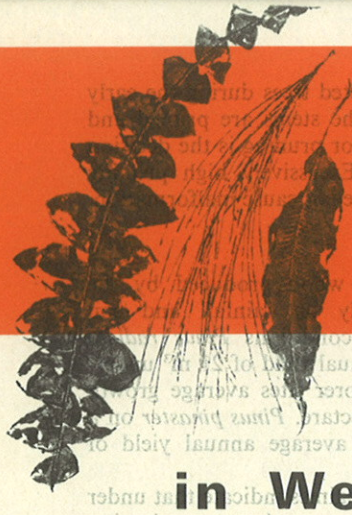

INFORMATION SHEET

FORESTS DEPARTMENT WESTERN AUSTRALIA — PRODUCTION PROTECTION CONSERVATION

PLANTING PINES in Western Australian conditions

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The need for pine plantations in W.A.

Due to our increasing population and the decreasing availability of timber imports, the demand for locally grown timber is increasing. Our indigenous forests of jarrah and karri are inadequate to meet any increase in demand for timber. Fast growing pine plantations provide the means of producing a large proportion of our future timber requirements. In fact for many purposes softwoods have several advantages over hardwood. They are lighter in weight when dry, and therefore cheaper and easier to transport. They are also easier and cheaper to work. They will more readily absorb preservatives and termite repellants. In order that Western Australia may be self sufficient in timber or even approach self sufficiency, the Forests Department has embarked on a programme of plantation establishment with a target of at least 125000 hectares by the year 2000 A.D. As at the end of 1973 approximately 34500 hectares of pines have been established by the Forests Department.

Limitations of available finance may make it difficult to achieve the target area by Government planting alone. There is, therefore, opportunity for private land owners to undertake pine planting with good prospects for the future. The following notes provide a very general guide to the various aspects of pine plantation establishment and maintenance.

The Forests Department will provide more detailed information to assist private planters in making their decisions. Direct advice and recommendations for investment can not be given, but individual proposals will be examined and pertinent elaborations of the information set out below, particularly with respect to the suitability of the proposed land for pine planting, will be provided. The Forests Department will inspect proposed planting sites in areas known to contain suitable soils and to receive adequate rainfall.

Before commencing any major plantation undertaking, it is strongly recommended that you contact the Forests Department's Como office at 121 Todd Avenue, Como, for further information (Telephone 676333).

Species

Our 34500 hectares of pine plantation and the annual planting programme of 2400 hectares have been achieved as a result of 70 years of investigation and trials. This experience has demonstrated that only two species of fast growing timber are suitable for wide scale planting in our climate and soil conditions. These are *Pinus pinaster*, from the coasts of France and Portugal, and *Pinus radiata* from California. For plantation growth both usually require an average annual rainfall of more than 760 mm. *Pinus radiata* is recommended for private planting because of its remarkable growth rate, but it is fastidious in its site requirements both in its natural occurrence and in plantation conditions.

The need for careful selection of suitable soils for pine plantations can not be over emphasised.

Selection of the plantation site

Soil and rainfall play a vital part in the performance of a pine plantation. Other factors which should be considered are distance from market and risk of fire.

Soil types. The Western Australian climate is characterised by a pronounced summer drought. These introduced species can only survive on soils capable of retaining moisture for the pine crop during our long dry summers. Shallow soils have inadequate volume to do this and very deep sands may allow too much moisture to pass from the root zone. Shallow soils therefore, or soils with a high proportion of gravel and rubble (which reduces effective storage capacity) may not support a tree crop to maturity even with fertilisers.

Because of differences in seasonal distribution of rainfall, in humidity and in soil types, overseas results of fertiliser trials are not automatically applicable in Western Australia.

Pinus radiata for maximum growth requires deep fertile loamy soils. In the high rainfall areas of the south-west of Western Australia these naturally suitable soils occur mainly in the valleys of the major rivers. They are recognisable as being red or brown in colour and of a reasonably heavy texture.

Fertiliser experiments and trials over many years have indicated that this species can also be grown on the yellow sands on the coastal plain south of Perth with liberal dressings of superphosphate, some zinc, and in some areas manganese.

The successful plantation growth of *Pinus radiata* on other sites, even with the application of artificial fertilisers, has not yet been demonstrated or proven in Western Australia.

Pinus pinaster is unlikely to justify by its financial return the purchase of lands for its growth.

It is more drought resistant than *Pinus radiata* and will grow on a lighter soil, but still requires for maximum plantation growth a 760 mm rainfall, and a moisture retaining stratum accessible during the summer months.

Solitary or widely spaced trees of any species may appear healthy on a particular site, but this does not necessarily indicate that the site can support the same species to maturity under competitive plantation conditions.

Young trees on poor sites can be misleading in that they may grow quite vigorously at plantation densities for the first five or six years, then slow down or stagnate as competition between the individuals becomes critical.

Distance from market. The location of the proposed plantation in relation to future markets or processing centres must be carefully considered. Freight costs on logs and sawn timber are considerable and have a major effect on the net return to the grower. The only real market for timber products in Western Australia now and in the foreseeable future is the Perth metropolitan area where plywood plants, particle board factories and sawmills have already been established. A major softwood processing industry is certain to be established in the South-West to utilise the production from the large plantation areas between Harvey and Nannup, but even here the major market for converted products will be Perth. Distance from market has its greatest effect on returns from the low value small sized logs from early thinnings.

Fire risk. The risk of fire cannot be overlooked in the selection of a planting site and consideration should be given to the likelihood of fire from neighbouring properties. Undeveloped land is obviously the greatest hazard. It is vital that the plantation site can be kept under close observation during the summer months for the early detection and suppression of fires.

Site preparation

It is essential to eliminate all competing vegetation. The planting site should be cleared and ploughed. Where ploughing is not feasible, scrub control may be assisted by means of weedicides. External firebreaks are essential and these must be kept clean by annual maintenance. In some areas local authorities have specific requirements for plantation firebreaks. Some road building is usually necessary to provide reasonable access for fire protection and other maintenance work. The pines are planted at a relatively close spacing to prevent excessive branch development and to provide for later selection of well formed trees. Trees of inferior form and vigour are removed progressively as thinnings. The initial spacing used by the Forests Department for *Pinus radiata* is 3 m by 2 m (1666 trees per hectare). Planting is carried out during the months of June and July when the soil is saturated.

Planting stock

For small projects, pine seedlings may be obtained from Forests Department nurseries. As it takes a year to grow the seedlings, orders should be placed 12 months in advance. Requirements in excess of 50000 plants are beyond the scope of Departmental nurseries at this stage and for large projects arrangements must be made for raising or purchasing the plants privately. Technical information on raising pine seedlings is available from the Forests Department.

Maintenance and tending

A pine plantation requires considerable attention throughout its life to maintain it in a safe, healthy condition and to promote the production of high quality timber.

Fire protection. Uncontrolled fires kill pine trees, and fire therefore poses a constant threat to pine plantations. It is vital that adequate measures be taken for the detection and suppression of fires in or close to the pine plantation. Firebreaks and roads must also be maintained.

Scrub control. Regrowth of native scrub and eucalypt coppice or grass in the plantation compete with the pines for moisture and nutrients, and if unchecked can severely impair growth rates. Control of this regrowth is usually necessary in the early years.

Pruning. Unlike eucalypts, pine trees retain their limbs and this results in knots which impair the strength and appearance of the timber. To produce timber free of knots, the limbs must be removed by pruning. This is usually carried out on selected trees during the early years. The height to which the stems are pruned and the number of trees selected for pruning is the decision of the owner or manager. Excessively high pruning can inhibit the vigour of the tree or cause malformation.

Yields and markets

The yield, or volume of wood produced by the plantation depends primarily on rainfall and soil fertility. Under favourable conditions *Pinus radiata* may maintain an average annual yield of 21 m^3 under-bark per hectare, but on poorer sites average growth may be as low as 7 m^3 per hectare. *Pinus pinaster* on a good site may maintain an average annual yield of 7 m^3 per hectare.

Trials of various thinning regimes indicate that under Western Australian conditions, volume production remains reasonably constant over a wide range of stocking, i.e. the productivity of the site can be spread over a large number of small trees or concentrated, within limits, into a lesser number of faster growing trees. Thus the best thinning regime depends on the markets available and would be decided by assessing what is the most profitable type of produce in that market situation.

There are various outlets for plantation produce ranging from fence posts and small logs for chipping to large sawlogs and peeler logs for plywood production. Generally the larger the log the greater its value per cubic foot and the lower the cost of felling and extraction.

Thinning

The intensity and frequency of thinnings and the length of the rotation adopted depend on market opportunities and the type of product required. In W.A. the opportunities for selling small logs are limited and the Forests Department's thinning regime therefore aims at producing large high value logs as quickly as possible. This is achieved by heavy early thinning reducing the number of trees to the final crop stocking early in rotation. The early thinnings and the tops of the later thinnings are expected still to produce adequate volume for chip and pulp requirements.

The anticipated rotation length for *Pinus radiata* under this system is 30 years, or possibly less depending on market opportunities.

This system produces little in the way of intermediate financial returns but it aims to maximise value production in the shortest period of time.

For *Pinus pinaster* the anticipated rotation length is 40 years, using a similar silviculture with intensive early thinning.

Alternative methods of management using lighter, more frequent thinnings will produce earlier returns provided markets are available for the logs from young trees. Due to their small size and high proportion of knots and coarse grain these thinnings are not attractive for sawmilling. Growth rates on the final crop trees will be correspondingly slowed by carrying a heavier crop in the intermediate years.

Costs and returns

The costs of establishing a plantation depend on numerous factors including the cost of land, cost of clearing and ploughing, roading and fire protection works, vermin control and planting. The estimates of costs given in the following notes are based on Department experience and refer to direct field expenditure only.

The total cost of establishment can range from as low as $75 per hectare starting with cleared land under pasture to well over $250 per hectare where heavy initial clearing and later scrub and coppice control is involved. Subsequent control of scrub, coppice and

vermin and pruning in the first ten years could cost up to $150 per hectare.

Maintenance of roads, firebreaks and other fire protection measures such as fire detection, standby time and maintenance of equipment costs up to $8 per hectare per annum.

Prices for log timber depend principally on log size and quality but the return to the grower is also affected strongly by the cost of logging and transporting the logs to market. Returns can thus vary widely and on current prices for delivered logs range from $8.10 per cubic metre for small chipwood logs to $21.20 per cubic metre for large sawlogs.

Falling and extracting costs currently could absorb $4 to $10 per cubic metre. The proportion absorbed by freight will of course vary with distance from the market, and could range between $1.70 per cubic metre for distances up to 20 km to $6.80 per cubic metre for 300 km (based on density of 900 kg/m^3, i.e. 56 lb./cu. ft.).

It is difficult to generalise, but *on present day values* a well managed plantation of *Pinus radiata,* on a good site within 80 km of the processing plant, should yield a net return (i.e. total returns minus total costs excluding tax and interest considerations) of $3000 to $4200 per hectare over a period of 30 to 40 years.

Because of its slower growth rate *Pinus pinaster* is unlikely to exceed a net return of $2500 per hectare on the best site.

Taxation

Certain State Land Tax concessions applicable to horticulture (orchards) are applicable to private forests. Details can be obtained from the State Taxation Department at 2 St. George's Terrace.

Forest operations are classed by the Income Tax Assessment Act (1933-66) as a form of primary production. For the person classified as a primary producer the same taxation considerations apply to planting and tending a forest crop as with most other crops. Such classification is not automatic and information on this subject is available from the Commonwealth Taxation Office at 1 St. George's Terrace, Perth.

Further information

This is a very general outline aiming to cover briefly all the factors involved in pine plantation management in Western Australia. More detailed information is available on request and it is strongly recommended that you contact the Forests Department at Como before commencing any major plantation undertaking.

Metric conversion

The following metric conversion factors may assist the reader.

1 hectare = 2·47 acres (34500 hectares = 85215 acres)
1 mm = 0·039 in. (760 mm = 30 in.)
1 m = 3·28 ft. (3m by 2 m = 10 ft. 6½ in.)
1 m^3 = 35·3 cu. ft. ($10/m^3 = 28 c/cu. ft.)
1 km = 0·621 miles ($6.80 per cubic metre for 300 km = 19c/180 miles)