

*Forestry*  
IN  
WESTERN AUSTRALIA



CHAPTER IX  
TREE PLANTING  
IN WESTERN AUSTRALIA  
SAND DRIFT RECLAMATION  
TANNIN TREES  
OF WESTERN AUSTRALIA

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FORESTS DEPARTMENT, WESTERN AUSTRALIA

# CHAPTER IX TREE PLANTING IN WESTERN AUSTRALIA

## SAND DRIFT RECLAMATION TANNIN TREES OF WESTERN AUSTRALIA

IN many parts of the State, particularly in the arid and semi-arid areas where much of the original vegetation has been removed for agricultural purposes, the need for more suitably placed trees to meet shade, windbreak and ornamental purposes is realised. To aid people who desire to improve such conditions on farms and other properties, the Forests Department maintains nurseries, providing plants at a reasonable cost. A seed store also operates to supply seed for those who either prefer to raise indigenous trees and shrubs by this means, or who are unable to take advantage of the nursery stock. This store plays an important part in supplying local eucalypt seed for afforestation purposes overseas.

### *Forests Department Hardwood Nurseries.*

Following the formation of the Forests Department, a nursery for the propagation of commercial timber trees for Departmental plantations was established at Guildford in 1896. However, conditions proved unsatisfactory, and in 1897 a site was selected at Hamel, a small siding on the main South-Western Railway, two miles south of Waroona. The area selected was a portion of the old de Hamel Estate and consists chiefly of rich alluvial soil through which runs the south branch of Samson's Brook.



Plate 54.

General view of the Forests Department nursery at Hamel. Pines are shown in the foreground.



Still surviving are many fine trees and shrubs planted at the time of establishment of the nursery. Among the most outstanding are Norfolk Island pines, well over 100 feet in height, camelia bushes up to 20 feet in height, and a number of plants of the New South Wales waratah. Of particular interest is a huge specimen of cork oak about 80 feet high and 11 feet in girth, from the butt of which strippings of commercial cork have been obtained. Most of the areas planted with pines at the beginning of the century have now been cut out, but one or two stands still remain, these being probably the oldest stands of commercial pines in the State.

Although the nursery was established mainly to supply commercial timber trees to Departmental plantations, a number of ornamental trees were soon being raised for supply to the Education Department for planting in school grounds, to local authorities for street and park planting, and to other public bodies and charitable institutions. This was gradually extended to include land holders who required trees for shade and shelter for stock, for ornamental and shelter planting around farm homesteads, and for farm woodlots.

Up till 1916 all trees were supplied free of charge, but the demand became so great, and the system so abused, that in 1917 it was decided to make a charge for the trees to cover the cost of raising them. At about the same time, in agreement with private nurseries in the metropolitan area, it was decided that no further shrubs would be raised at Hamel and that the trees would not be supplied to private persons resident within the metropolitan area.

Earlier figures are not available, but since 1925 the annual distribution of trees from Hamel has ranged from 30,000 in the depression years, to 314,000 in peak years, with a total distribution since that year of four-and-a-half million trees covering seventy-five different varieties.

Owing to its situation in the heavy rainfall area of the South-West, conditions at Hamel have proved unfavourable for the raising of trees suitable for planting in the low rainfall of the wheatbelt. To meet this end, the Department established another nursery at Kalgoorlie in 1947. This nursery has since been removed to Dryandra, near Narrogin, where it is best able to meet the demand for this type of stock.

The aim of the Forests Department in establishing these nurseries was to have a suitable tree for every site and every job, and there seems little need to seek outside of Australia to find most of them. Little is to be gained by even departing from our own eucalypts which exhibit such an outstanding variety of form and shades of leaf colour, while many bear blossoms of very great beauty. Furthermore, they possess that rather uncommon combination—fast initial growth and long life. Eucalypts also exhibit a great deal of adaptability enabling many to thrive over relatively great variations in climate and soil.

#### *Tree Planting.*

Growing trees is not a difficult business normally, provided time and care are given to the few necessities ensuring success—initial selection of species, initial planting, and watering and tending over the first one or two years. Once past the first two difficult years, established plants are able to continue with very little attention.



In the establishment of trees on properties, there are several points to consider:—

- (1) Purpose for which required.
- (2) Suitable species for the locality.
- (3) How planting stock may be obtained.
- (4) Method of planting.
- (5) Subsequent tending and protection.

#### 1—Purpose.

In selecting trees for any particular purpose, some knowledge of their habit of growth is necessary and may save much disappointment and trouble later on. As an example, we can consider the number of tall growing trees which have been planted under electric light lines in this State and the amount of labour which is expended annually in attempting to cut them back into forms that nature never meant them to assume. It is inadvisable to plant tall growing trees too close to a house while a row of tall trees which would make

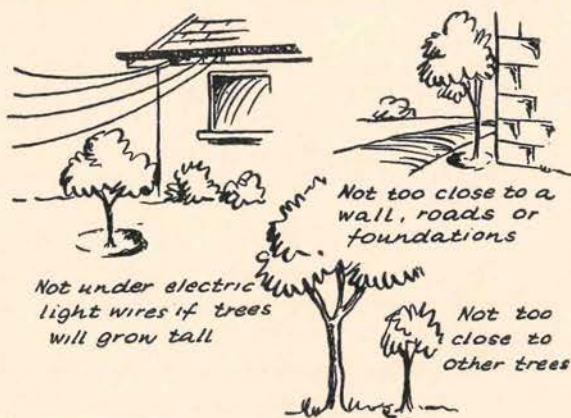


Plate 55.

Site selection is important in tree planting.

a picturesque avenue would not, unless associated with a line or two of more bushy trees, make a very effective windbreak. For clumps of shade trees in paddocks something tall is required, whereas for shade in a fowl yard something low and bushy would be preferable. The salient characters of a number of suitable trees are supplied in the accompanying table, Appendix VII.

#### 2—Species.

Trees selected should be either those that are indigenous to the locality or to some locality enjoying similar climatic conditions. This stipulation may eliminate trees for which a grower may have a strong preference, but it is one that cannot be ignored. Besides climate we have to consider the suitability of the soil type for the species. Most farmers know that different species are associated with different soil types—in fact it is not uncommon to hear a soil described by the trees it originally carried, e.g., "morrel country", "gimlet flat", and so on.

#### 3—Planting Stock.

Where a small number of trees is required, say one hundred or less, it is much less trouble to obtain them from the nursery, but where a greater number is required, consideration may be given to raising them on the farm.

#### 4—Planting Methods.

*Methods of Direct Sowing.*—While trees can be established by direct sowing (spot sowing), this method requires favourable conditions both from the point of view of soil and of climate. Moreover, plenty of seed is required. If sowing is to be attempted, the best procedure is to sow directly into pots or jam tins, thinning the seedlings which germinate from a pinch of seed, and holding the plants in the container for a year until they are of suitable size to plant out.

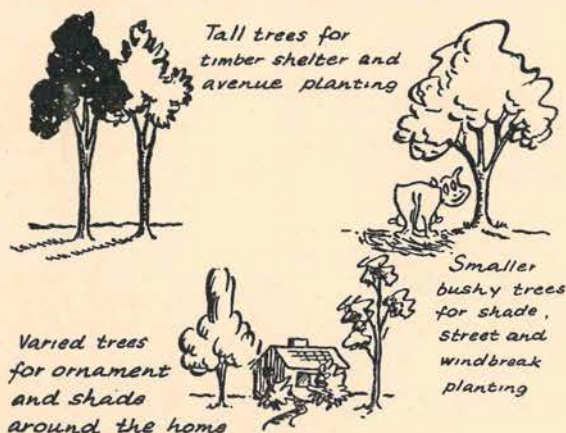


Plate 56.

Different trees for different purposes.

*Planting of Trees obtained from the Nursery.*—Two methods are recommended:—

- (a) For establishment under field conditions where cultivation by farm machinery is possible.
- (b) For establishment as isolated ornamental trees or, in such situations such as in street planting, where machine cultivation is not possible.

(a) *Establishment under field conditions.* A method practised and proved for establishing belts of trees in low rainfall areas (13 inches) is along the following lines.

- (1) The ploughing and fallowing of land for twelve months prior to planting.
- (2) Fencing to exclude stock and rabbits.
- (3) Planting during early winter.
- (4) Watering (about one gallon per tree) at the time of planting but no further watering subsequently.
- (5) Cultivation between rows shortly after planting and then at intervals during the next two years to keep the surface free of weeds.
- (6) The chipping of weeds from around the trees with a hoe wherever they cannot be reached by a cultivator.

(b) *Establishment of isolated trees, ornamental trees, street trees, etc.* These cannot be given the cultivation recommended above and periodic watering is advisable for one or more years after planting.



Planting should be done in early winter, preferably June but not later than August

Positions for the trees should be selected to provide ample room for development and to eliminate competition from adjacent trees and shrubs as far as possible. An area 3 or 4 ft. in diameter should be cleared of all debris, worked to a depth of about 24 inches and hollowed into a saucer-shaped depression about five inches deep, in the centre of which the tree is to be planted. Where the ground is rocky it is sometimes advisable to break it up with explosives.

Watering at the time of planting is advisable and thereafter at intervals as required. During the first summer, watering once per week may be necessary but after this, at less frequent intervals. Waterings must be heavy enough to ensure that the moisture soaks well down.

Frequent light waterings which just moisten the top ultimately do more harm than good.

Manure, if any, should be used sparingly, and well mixed with the soil. If of animal origin, it should be well rotted before application. The native trees grow naturally in our soils without manure and an excess, added to the planting hole, may cause damage to growth. A mulch of grass, leaves or old rotted manure around the tree checks drying out.

#### *Details of Planting Methods.*

Trees received from the nursery should be inspected immediately, and if dry, the soil surrounding the roots should be watered and kept moist up to the time of planting.

Care is necessary in removing plants from pots and in subsequent handling. The covering cone or ball of earth must not be broken as eucalypts cannot tolerate damage to the roots. If a coil of roots is found at the bottom of the pot, these can be gently uncoiled and the planting hole deepened to take them.

In planting, roots should not be cramped or distorted, but permitted to dangle straight into the hole and soil filtered through the fingers in around them.

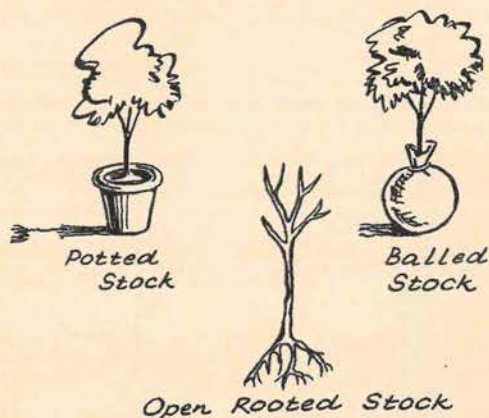


Plate 57.

Types of nursery stock.

Planting is preferable in damp soil with the surface of the root ball of earth covered to a depth of about one inch. All air pockets should be removed on filling in the planting hole by firmly pressing the soil with the hands and finally gently pressing with the side of the planter's boot. The first watering should now follow.

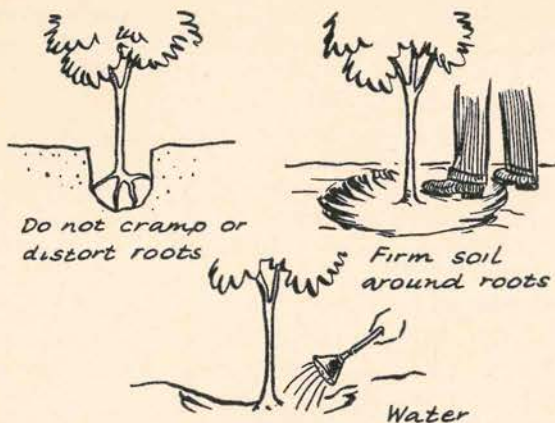


Plate 58.  
Planting a tree.

#### 5.—Spacing and Subsequent Attention.

With medium to large-sized trees, particularly those destined for shade or ornamental purposes, it is unadvisable to space closer than twenty-five feet apart. With smaller trees it is often permissible to place at closer intervals.

Adequate protection from rabbits, stock and other animals is essential. Above all, make certain the trees are protected from fire. A guard consisting of chicken wire surrounding three or four stakes is usually all that is needed for normal protection of isolated trees in their young stages. It will also permit hessian or branches to be attached if shelter from frost, wind or excessive insolation is deemed advisable. A straight stick inserted alongside the young tree and about four inches from it will serve as a support to which the plant may be loosely attached by a slack cord.

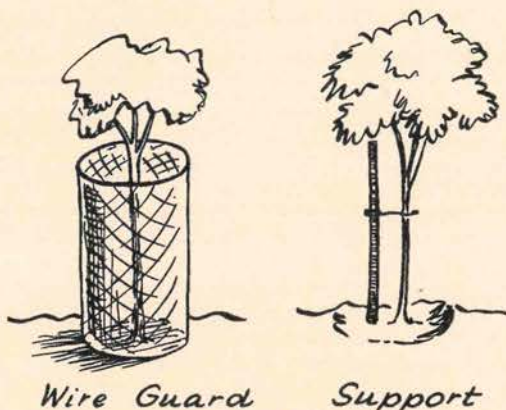


Plate 59.  
Protecting the planted trees.



The planter must make sure that weeds do not grow around the young tree. Rank weed growth is one of the most frequent causes of death to young trees.

A variation of planting method is recommended when conditions permit. This entails the holding of plants for twelve months in larger containers such as kerosene tins instead of planting direct into the soil on reception from the nursery. For street planting in built-up areas, this method has much to commend it. At the end of the second year, the trees will be four or five feet high. With careful planting and subsequent attention, losses are negligible.

In holding trees for this extra year, certain precautions should be taken.

- (1) See that the containers have ample drainage holes, preferably at the bottom of the sides.
- (2) Containers should be stood on supports a couple of inches high to prevent roots passing into the soil below.
- (3) To prevent the trees becoming too spindly, tins should be spaced about a foot apart.
- (4) Refrain from pruning except to correct a misshapen form or growth.
- (5) Water at least two or three times a week.
- (6) At time of planting the hole must be deep enough to take the large block of earth in which the tree is established.

In view of the fact that once established, a tree will be a feature of the environment for a long period, initial selection and planting procedure should be given considerable thought to ensure that the final tree fully meets the requirements which instigated the planting.

## SAND DRIFT RECLAMATION

The loose, sandy nature of the soil of our coastal belt renders it particularly susceptible to wind erosion. Stability of this sand is entirely dependent on the protective action of native vegetation, and any serious damage to such by overgrazing, fire, trampling, etc., very quickly results in the formation of large drifting sand dunes which bury everything in their path.

Numerous areas of drifting sand exist around our South and South-Western coastline. These areas vary in size from a few acres to many square miles. It is considered that these dunes have always been a feature of the coastal belt, but their formation has undoubtedly been accelerated since that country was occupied by white man.



Some of the huge dunes facing the Southern Ocean, particularly the one lying between the mouths of the Warren and Donnelly Rivers, are engulfing karri forest of 200 ft. high. Most dunes are in very inaccessible country and are not, at the present time, causing any serious economic damage. There have been several exceptions, however, and dunes at Swanbourne, Boranup, Augusta, the mouth of the Warren River, and around the Greenough River at Geraldton, have been, or are in the course of being fixed.

Dunes at Swanbourne were encroaching on valuable suburban property, those at Boranup on roads and railways, and those at the Warren River gave indications of proving a serious obstruction to stream flow. In the Geraldton District, dunes are encroaching onto valuable land, approaching the townsite, and endangering the Greenough River.

#### *History of Dune Fixation in W.A.*

It is to our credit that in a country little over 100 years old and still with a population of much less than 1 per square mile, battle has been joined and some victories already won against "sea sand."

It is interesting that, as far back as 1892, sawmillers first challenged the wind and "sea sand."

The firm of M.C. Davis & Sons of Karridale imported "Marram Grass" from South Africa and planted it on the Boranup Dunes over a hundred and fifty miles from Perth. The sand dunes were fixed and remain stable. They confirmed the knowledge of the Old World and set the target for the pioneers of our State.

Little further work was recorded in the State until in 1919 and 1920, the Cottesloe and Swanbourne local authorities carried out successful fixation of dunes in the coastline near Perth, and from 1924 to 1927 the Forests Department planted about 100 acres of University Endowment Land at Swanbourne, financed by University Funds.

In 1936 a report was received by the Forests Department that a very large shifting sand dune some 1,000 acres in extent was threatening the flow of the Warren River near Calcup Ford. Immediate steps were taken by the Forests Department to fix this dune with Marram Grass. The whole surface of the dune was planted and no further encroachment took place.

In 1937 and 1938, after an inspection to ascertain the extent and economic loss being caused by the advance of the huge Yeagerup dune North of the Warren River, a start was made to arrest the dunes which stretched for some 10 miles from the vicinity of the Warren River towards Mt. Silvertop. Marram Grass was established at a number of points on the dune to form nurseries from which large quantities of grass could be obtained at a later date to extend over the dune.

In 1938 and 1939 the movement of a number of dunes between Cowaramup and Augusta was arrested. These dunes were threatening valuable agriculture and grazing lands at Cowaramup, Ellensbrook, Groocardup, Kilcarnup, Gnara-bup, Boodjedup and Caljardup.

Further small areas of moving sand were dealt with at Rottnest Island, Garden Island and Point Peron during World War II, with funds provided by the Department of the Army.

Unfortunately success has not attended the effort to establish Marram Grass at certain Rottnest sand drifts due to the exceedingly high lime content of the sand. This sand consists almost solely of fine shell particles and analyses as 98% calcium carbonate.

The same trouble has also been experienced with similar lime dunes at Greenough River and Mahomet Flat near Geraldton. A number of different plants, both local and imported, have been tried, so far without success.

Marram Grass is the outstanding medium which has been successfully used for stabilising coastal sand dunes in this State. It is easy to establish and extremely hardy within the 20 in. isohyet, and on any sand not containing more than 60% to 70% of calcium carbonate in the form of shell particles.

#### *Method of Dune Fixation.*

Satisfactory fixation of all dunes threatening points of economic importance has been effected by the systematic planting of Marram Grass until recently. This grass, a native of South Africa, is admirably suited to the purpose. It thrives on white beach sand in close proximity to the sea, where mean annual rainfall is not less than 20 inches. Possessing the ability to grow rapidly through shifting sand, it may in the short period of a year, be responsible for a hummock 6 ft. to 8 ft. in height. This rapid growth is arrested once the sand movement ceases and stable or fixed dunes are characterised by tussocks of dead or dying grass. By this time, however, much of the indigenous flora has become sufficiently re-established to continue to hold the sand in position.

Drift sand dealt with in this State falls into two classes:—

- (1) Those commencing immediately from high water mark and spreading inland.
- (2) Areas of drifting sand separated from the coast by a belt of country on which the indigenous flora remains unharmed.

In the first case, a belt of *Spinifex hirsutus*, an indigenous plant which thrives just above the high water mark, is planted to protect the first plantings of Marram Grass. The spinifex accumulates on low dunes sheltering the grass planted immediately beyond, in rows parallel to the sea. The greater the degree of exposure, the closer is the planting spacing employed.

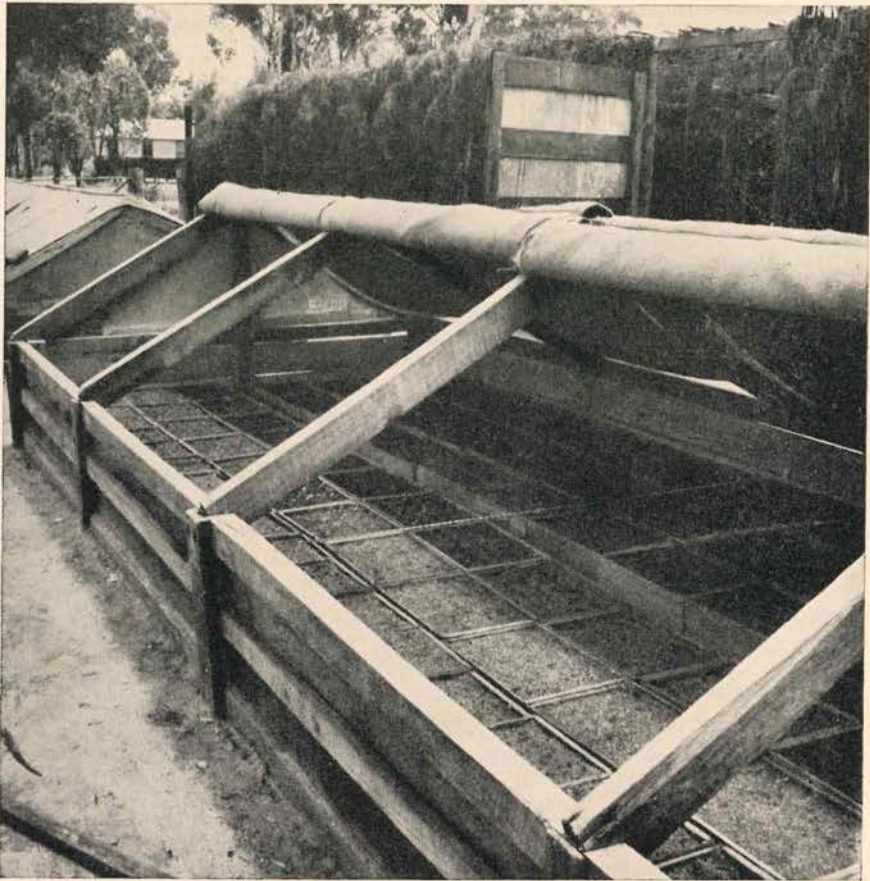


Dunes of the second type are comparatively easy to fix since they are usually not so exposed. Marram Grass is planted in rows at right angles to the direction of the most damaging winds. The espacement may vary from 12 ft. between the rows and 4 ft. between the plant sets, to 60 ft. between the rows and 5 ft. between the sets, depending on various factors concerned.

Grass cuttings are the usual planting material, these being readily obtained from established clumps. Establishment from seed may only be affected in areas well protected from exposure; conditions which do not often prevail.

For maximum benefits to be derived from any planting programme, sheep and goats must be totally excluded and the grazing of horses and cattle strictly regulated over the area.

The whole of the State's coastline from Shark Bay to Eucla is unstable, and any factors such as overgrazing or fire, which are likely to upset the balance of nature, will start the sand moving. There is no doubt that as time goes on and pressure of population requires the utmost use of our land, the State will be very concerned with the stabilisation of these areas.



**Plate 60.**

Eucalypt seedlings in trays in a shade frame at Dryandra nursery.

# TANNIN TREES OF WESTERN AUSTRALIA

TANNIN is a valuable commodity which has the ability to convert hides to leather, making them resistant to air, moisture, temperature change and bacterial attack. They are also useful as a basis of ink, as an astringent in medicine, and, in the United States, a significant portion of total tannin consumption is used as a dispersant to control the viscosity of mud in oil well drilling.

At the present time the world is suffering from a shortage of tanning materials. This shortage promises to become more acute in the future. It is therefore necessary to consider conservation of existing resources, wherever possible.

Several of the native eucalypt trees of Western Australia, namely, the mallets, wandoo and marri are at present, or could be, commercial sources of tannin of value to the State. These resources are under the control of the Forests Department and it is desirable to place them as with other forest enterprises, on a sustained yield basis to ensure permanence of supply.

The tannins of the State occur in one of the following forms:—

- (a) In the bark of the tree.
- (b) In the kino or gum of the tree.
- (c) In the wood of the tree.

## (a) *Tan Barks of Western Australia.*

The bark of brown mallet (*Euc. astringens*) is the most important tannin producer in Western Australia.

The history of the tan bark industry in this State is one of destructive exploitation. Beginning early in the present century, an export market of 138 tons in 1903 rose to 20,700 tons in 1905. A rapid decline of production followed as stocks of mature mallet trees were destroyed by stripping, by fire, or by removal during the clearing of land for agricultural purposes. The greater part of mallet bark obtained today (about 1,000 tons per annum) is from privately held land where it is collected with little attention to reproduction. The supply is sufficient to meet the local demand but leaves little for export.

When it was plentiful, the bark which contains approximately 45 per cent. tannin, was held in such high esteem that attempts were made to grow brown mallet (*Eucalyptus astringens*) in other countries. Whilst there was at least partial success in South Africa, it is known that attempts failed in the former German colonies of East Africa. Eucalypts are of proven value in afforestation of arid (under 10 inch annual rainfall) and semi-arid (10-20 inch rainfall) regions outside Australia and the potential value of the formerly important mallet bark in assisting to overcome the serious world tannin shortage is one not likely to be forgotten.





Plate 61.  
Brown mallet (*Eucalyptus astringens*) plantation at Dryandra near Narrogin.

Seven tan bark species occur in the semi-arid regions of this State. In order of importance they are:—

- Brown mallet (*Eucalyptus astringens*).
- Blue mallet (*Eucalyptus gardneri*).
- White mallet (*Eucalyptus falcata*).
- Swamp or flat-topped yate (*Eucalyptus occidentalis*).
- Swamp mallet (*Eucalyptus spathulata*).
- Dundas mahogany (*Eucalyptus brockwavi*).
- Dundas blackbutt (*Eucalyptus dundasi*).

The first three species are the only ones that have been used commercially as a source of tannin and their barks have been sold collectively under the name of Mallet Bark. It is with these three, and in particular the first, that the State is concerned as regards future supplies of tannin.

Artificial regeneration of brown mallet has been carried out for over twenty-seven years in Western Australia, and 18,000 acres of plantations have been established at Dryandra 20 miles north-west of Narrogin. Here it is proposed to grow the trees to a size which will permit the use of the wood for sawn timber, as well as producing bark as a major crop.

Experimental work with wattle planting was undertaken at Mundaring Weir by the Forests Department in the 1930's to see if such a source of tannin was economically feasible in this State, as it is in South Africa. In view of the fact that wattles required a good soil more suited to other purposes, such as pine growing, and that the timber by-product from wattles has not the value of mallet, wattles were abandoned for the more favourable eucalypt source.

(b) *Marri Kino or Gum.*

Investigation has proceeded, for over twenty years, into the suitability of marri kino as a supply of tannin materials. As yet, this kino has not been used commercially because of difficulties of insolubility and colour, but investigations have definitely established that the tannins from it are very suitable for tanning heavy leather.

(c) *Wandoo Wood Extract.*

The wood of the wandoo tree contains usable tannins in a high enough concentration to warrant commercial extraction.

Two plants are operating, one at Boddington and one at Toodyay, to supply a commercial extract for local and export markets.

The trees used as a raw material for extraction are the wandoo (*Eucalyptus redunca* var. *elata*) felled during clearing operations for the extension of agricultural lands. Normally much of this cleared timber would either be burnt or just left to rot on the area. The extraction process is a satisfactory method of utilising a forest resource which would otherwise be wasted in the process of development.