Forestry

IN

WESTERN AUSTRALIA

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CHAPTER V

PINE PLANTATIONS IN WESTERN AUSTRALIA

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FORESTS DEPARTMENT, WESTERN AUSTRALIA

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Introduction.

THE continent of Australia has no natural forests of pine. A few timbers such as hoop vine, bunya pine and cypress pine are commonly referred to as pines, but they are not true pines and not now of high importance in the economic field of providing large quantities of softwood needed by Australia.

Western Australia, particularly, is deficient in softwoods, and has, perforce, learnt to use eucalypt hardwoods for many purposes for which softwoods are used in other parts of the world. Normally about 80 per cent. of a country's requirements are softwood, but in Western Australia the position is reversed and approximately 80 per cent. of hardwoods are used.

The position with respect to future supplies has been under review for a considerable time, and, because of the demands of an ever-increasing population, has led to the formation of plantations of introduced pines which have the ability to reach maturity in a relatively short time. These plantations will provide the timber necessary to avoid large scale importation of the State's requirements in the future.

The Need for Pine Plantations.

The eucalypt forests of the State are slow growing, high quality hardwoods, and a population of 650,000 is using something over 50 cubic feet in the round per capita per annum of sawn timber, plus an estimated 8 cubic feet of imported wood products, mostly paper. Paper is unlikely to be made on a large scale from eucalypts unless a mixture can be made with softwood to provide desirable characteristics.

For a future population of one million it may be said that the State Forests are sufficient, without considering paper pulp, but the export trade would cease.

Plantation Research in Western Australia.

When sawmilling was introduced into Western Australia the hardwood forests existed as prime mature stands. Pine plantation establishment which followed later was, however, dependent upon introduced species of which very little was known concerning their suitability for this State. Without this knowledge, the well-known European methods of establishment were unsuccessful. The first problem then was a matter of experimenting to find species which were suited to Western Australian climatic conditions.

The establishment of pine plantations on a large scale is a costly undertaking, and before any ambitious plans could be formulated, this experimental work had to be carried out.

Experience showed that a pine from California, U.S.A., *Pinus radiata,* was the species most suitable for the Western Australian climate, but unfortunately the soils in which satisfactory growth could occur were limited in area, and intensive soil survey work has been carried out to determine what areas of suitable land are available. A second choice in species followed in which the slower growing Portuguese Maritime pine or *Pinus pinaster* was selected for the comparatively poor soils of the coastal areas of Western Australia.

However, before large scale planting could take place, further experimental work was necessary, for the growth of *Pinus pinaster,* especially, was unsatisfactory. Early attempts to raise young pines in the nurseries proved failures, and much work and study were given to this problem for it was a preliminary obstacle which had to be solved before plantation establishment could take place.

The results of these studies indicated that a special fungal association with the young seedlings in the nursery was essential before satisfactory growth could be expected. Further work indicated the necessity of the use of zinc and superphosphate manurial application in certain areas.

With the initial investigations completed, there was still no guarantee that large scale plantations could be established, for it was only by observing the growth of the experimental trees through to the stage where timber was produced that certainty of success could be given.

The results of this final study indicated that certain strains of *Pinus pinaster* were more suitable than others.

These strains were brought about by the geographic origin of the pines which were either from the Atlantic coast of France and Portugal, or from the Eastern Mediterranean area. In all, there have been six recognisable strains from these areas. It was found that the Portuguese strain—Leiria—possessed desirable timber and a much better rate of growth, and was accepted as the basis of future *Pinus pinaster* planting.

The Present Position in Western Australia.

The first attempts at pine planting were in the early part of the century in the Ludlow and Hamel areas. Here some failures occurred due principally to incorrect strains being used and the lack of knowledge of any satisfactory establishment technique.

From the commencement of plantations at this time, planting has increased to a present area of about 23,000 acres. Of this area, 17,500 acres are *Pinus pinaster* and 5,500 acres *Pinus radiata.* The plantations range in size from several thousand acres down to small experimental areas of little more than a few acres. The distribution of the plantations is wide and is shown in figure, Appendix VIII.

The older plantations are yielding limited supplies of logs for various uses including plywood, flooring, lining mouldings, and cases. An annual production of 800,000 cubic feet of mill logs from thinnings has been reached and this will increase as time goes on.

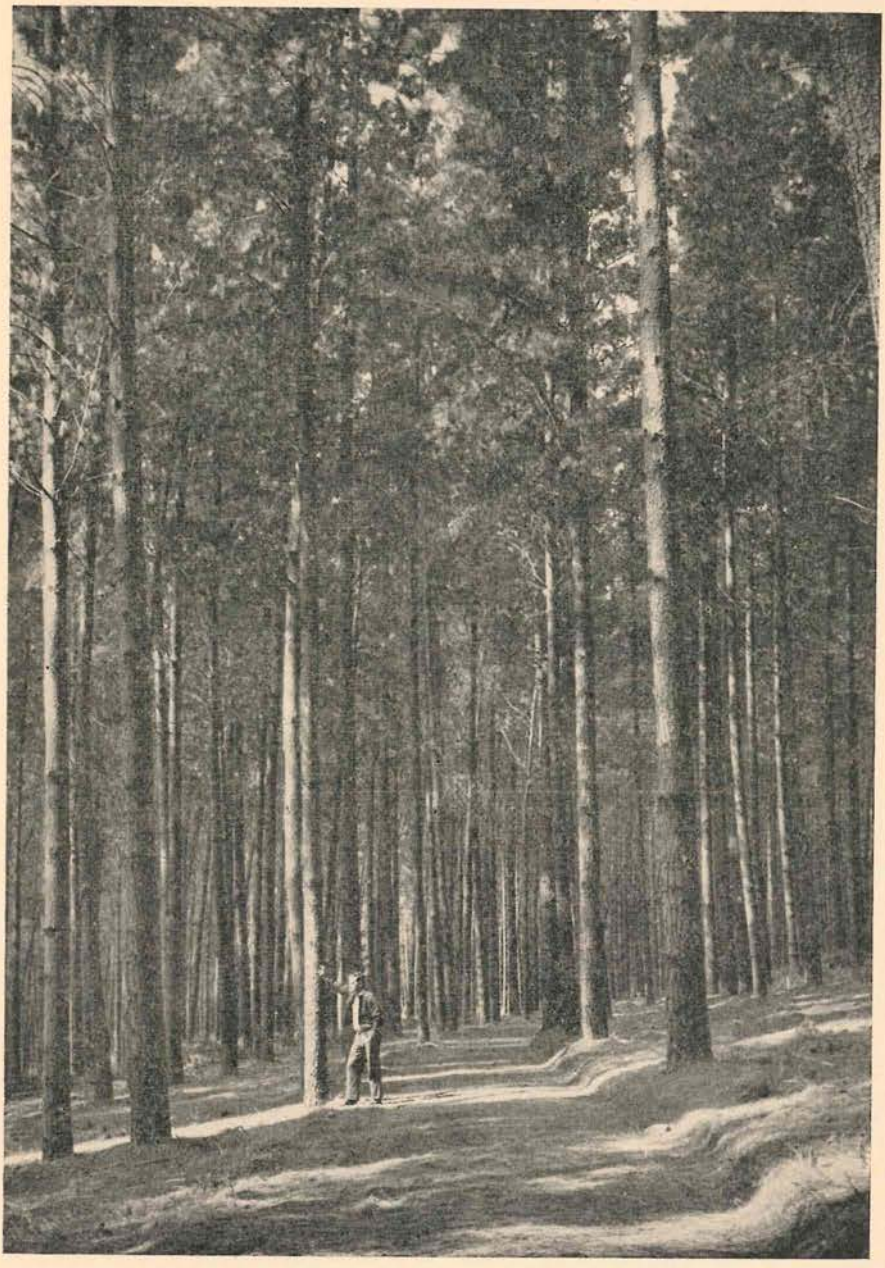

Plate 38.

Pinus radiata at Mundaring Weir plantation.

Establishment Methods in Western Australia.

Through the years of experimenting, the stage has now been reached where a standardised technique of plantation establishment can be applied, and while there are still problems to be solved, the sequence of operations is straight forward and does not present the difficulties that were met with earlier.

Seed Selection.

Because of the past lack of knowledge concerning suitable strains of *Pinus pinaster,* many of the existing plantations are now stocked with undesirable trees, the seed of which had been gathered and sown indiscriminately. It therefore is imperative that further planting of these types be avoided and until pure stands of the Leiria strain become established to provide pure seed, present supplies of seed must be imported from Portugal. Here, a certificate of purity of strain is supplied and certainty of satisfactory growth features is assured.

Pinus radiata seeds, on the other hand, are obtained from South Australia and no problems are encountered with strains of this species. The local collection of seed from trees of outstanding quality is being considered.

The Nursery.

Development of the nursery is most important, for the seedlings which are ultimately used in the plantation are all raised here and at an age of about 10 months are planted out.

In the construction of new nurseries, the necessary mycorrhizal fungus must be introduced, for it is only through this that satisfactory growth of the seedlings can occur. The method of introduction of the fungus has been to spread soil from the older established nurseries into the soil of the new nursery.

Previous to any sowing of the seed, it is necessary to carry out germination tests to determine the number of seedlings which could be expected from each lot of seeds. This is a most important consideration, for it is from the results of the germination tests that the quantity of seed to be planted is determined. If, for example, the tests show only 50 per cent. germination, then to obtain sufficient young pines, two seeds must be sown to obtain each seedling.

A further precaution which must be taken before the seed is planted is to treat it with red lead as a protection against damage by vermin. Following this, the seed is sown in rows directly into the nursery beds by use of machines. A scene of a typical nursery is shown in plate 39.

The seeds are sown in this manner to provide 18 seedlings for each foot along the row. The rows themselves are spaced 14 inches apart, so that each acre of nursery can provide approximately 600,000 seedlings. In the plantations the tree spacing is 9 feet by 9 feet for *Pinus radiata,* and 7 feet by 7 feet for *Pinus pinaster,* which represents a total of 538 and 890 trees per acre respectively. Therefore, according to the annual area of plantation to be put in and allowing for a certain amount of culls, the area of nursery and number of plants necessary can be determined.

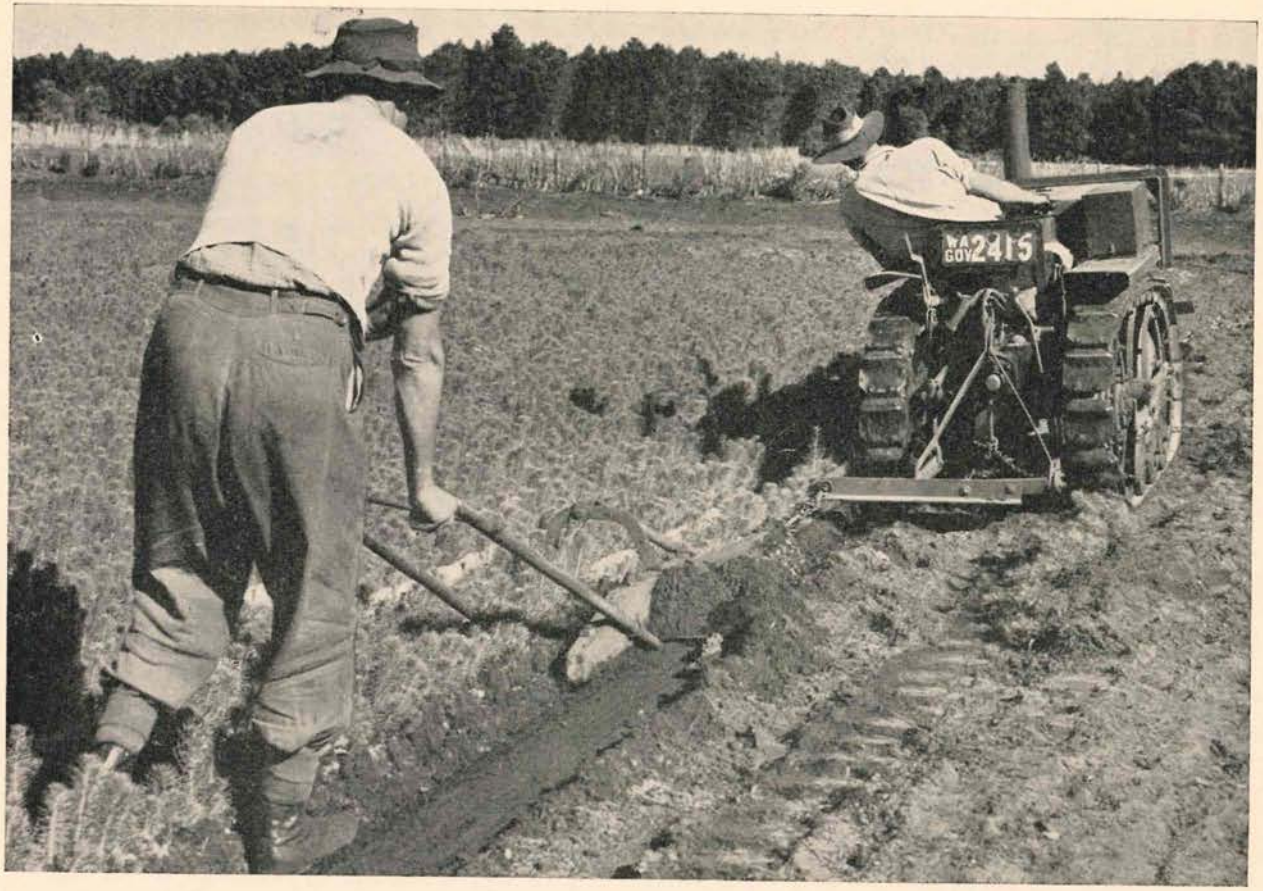

Plate 39.
Gnangara nursery—lifting one year old pine seedlings ready for planting out.

Once established, care must be taken of the young seedlings, for whereas the mycorrhizal fungus is beneficial and necessary for the young pines, there are other fungi which, if permitted to develop, can cause considerable loss in the nursery. These several fungi cause the damping off disease which occurs when conditions become damp, due to overcrowding of the seedlings and lack of soil aeration. Damping off must be carefully watched for and treated by the application of fungicides at its first appearance. Careful tending of the nursery must also be maintained and all weeds removed by means of either a blow torch, hand weeding, or the new method of spraying with mineral oil weedicides.

It has also been found advisable to work nursery soil on a three-year rotation system with pines and green crops which are ploughed in. This rotation maintains soil fertility and aids control of the harmful fungi and insects.

The Selection and Preparation of the Plantation Site.

Before any plantation area is decided upon, a soil survey of the proposed area is carried out. Only areas with suitable soils are selected for planting. For *Pinus radiata* it has been found that the required standard is high and only good red loams and sandy loams are used. *Pinus pinaster* is more tolerant of soil types, and it has been found that the better soils of the coastal sand plain near Perth produce *Pinus pinaster* stands of a quality equal to any in the State. Soil samples are collected during the survey, and analysed at the Dwellingup soil laboratory. These tests must show the soils to be of a specified standard before they are selected for planting.

As the raising of the young pine in the nursery takes place, so does the preparation of the planting site. Here, bulldozers in heavily timbered country and tractors linked by heavy cables in lighter country remove the original vegetation in preparation for the pine. The general method employed is to clear the area some years in advance of planting to enable the timber to dry out for burning. Prior to planting, the area is burned and ploughed.

The plantation area is then subdivided into compartments which, in the coastal areas, are generally rectangular in shape and approximately 25-50 acres in area. In hilly country the shape of the compartments vary, for the boundaries are carefully selected to provide a trafficable firebreak. Here the areas of the compartments are less and in the order of 20-40 acres.

Planting.

The planting of the prepared areas takes place in June and July following satisfactory rain, and is carried out either by means of special tractor-drawn planting machines in suitable country, or by hand planting in the steeper and rocky areas. Spacing of the young trees is at distances of 9 feet by 9 feet for *Pinus radiata,* or 7 feet by 7 feet for *Pinus pinaster*; 528 and 890 trees per acre respectively. The reasons for this seemingly close spacing are many, but principally they are used to assure that straight trees with small branches are formed. Also, this close growth enables the young trees to quickly form a cover over the land and eliminate competition from the natural growth of the original vegetation. A final reason is that from the original large number of trees planted, a good selection can be made for trees which are to be kept as the final crop.

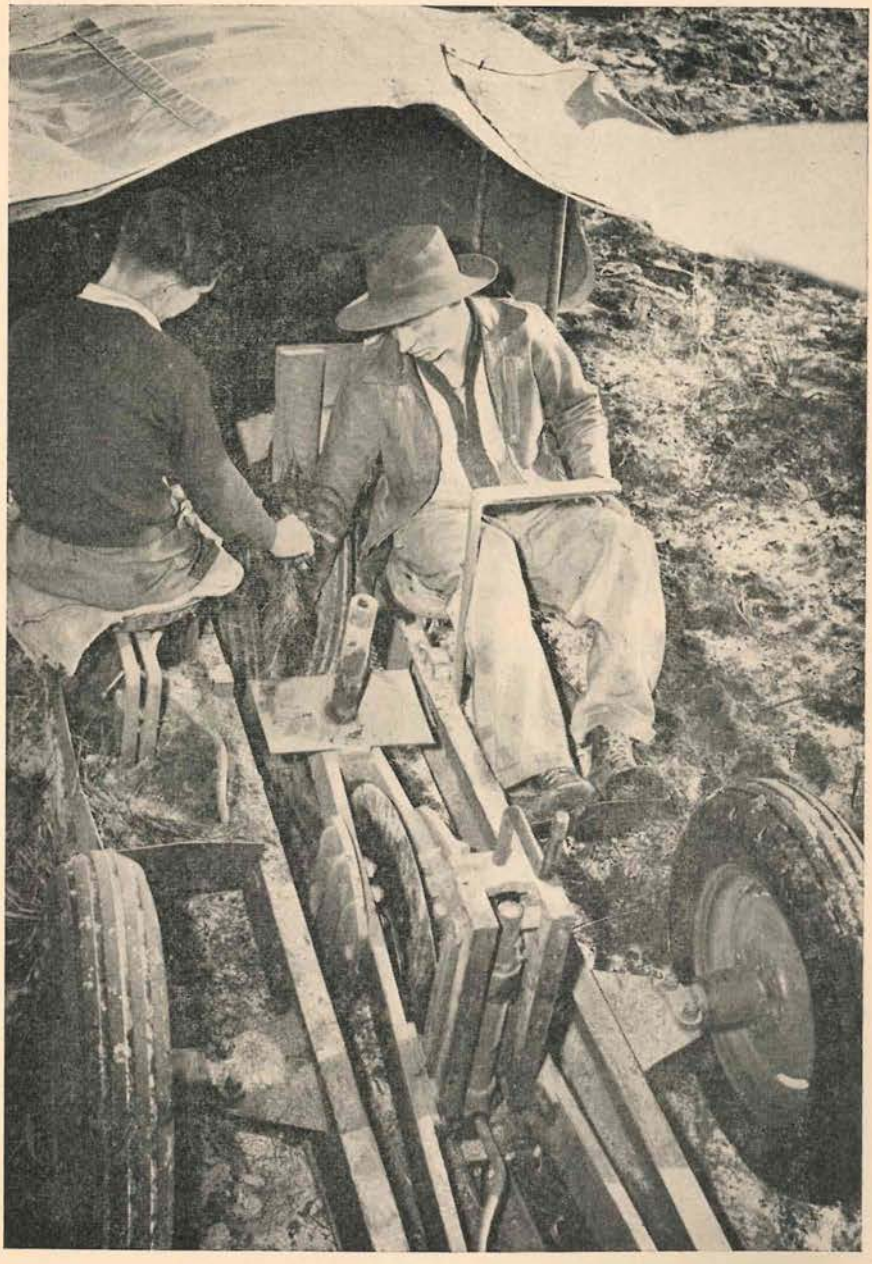

Plate 40.

Operating the "Lowther Tree Planter" on the coastal plain.

Tending the Plantation.

Planting of the young pines does not complete the operation of plantation establishment, for care or tending must take place after the initial planting. Coppice or "sucker" growth of natural plants in the early years can cause competition with the young pines and unless treated, may cause the failure of the area. The coppice is slashed at the end of the first year, and after this time the pines can generally take possession of the area and suppress any further natural vegetation that appears.

Pruning.

Pine trees, in their natural state, produce side branches which unlike the eucalypts, are persistent and do not fall off when they die. To produce clear timber the operation of pruning is carried out and these limbs are removed either by skilled axemen or by the use of a pruning saw. The tree can then increase in volume without having to enclose the dead side branch to result in knotty timber. A second important reason for pruning is to reduce the fire hazard caused by the dead limbs. Once removed from the trees and placed on the ground, these rot away within a few years.

Thinning.

As the growth of the plantation takes place, the trees increase in size until a point is reached here the growth of some becomes stagnant while that of others goes ahead. At this stage it may be said that the trees are utilizing the land to the utmost, and the stagnation or "suppression" is due to the competition for moisture, food and light—or the struggle for survival between the trees on the area. As little satisfactory growth can be expected from the suppressed trees, the operation of thinning takes place whereby all of the poorer trees are removed, together with some of the other competing trees to give the remainder living room to grow on until a further thinning is required.

As the remaining trees become older and larger, the same process occurs, and further thinning must take place. Thinning continues until a final crop of about 80-100 trees per acre remain. These too are felled when they reach maturity and a new crop of young pines is established.

The age at which final felling of the plantation takes place varies according to species, but the general age for *Pinus radiata* is from 30-40 years, while that of *Pinus pinaster* is from 50-60 years.

Fire Protection of Plantations.

The establishment of plantations represents a large capital outlay, and adequate protection of this asset from fire is essential. Accordingly, an intensive system of firebreaks is constructed and maintained by ploughing or grading each year.

Plate 41.

"Greystones" Homestead, Mundaring Weir, in 1920 prior to plantation establishment. The following photo was taken 30 years later.

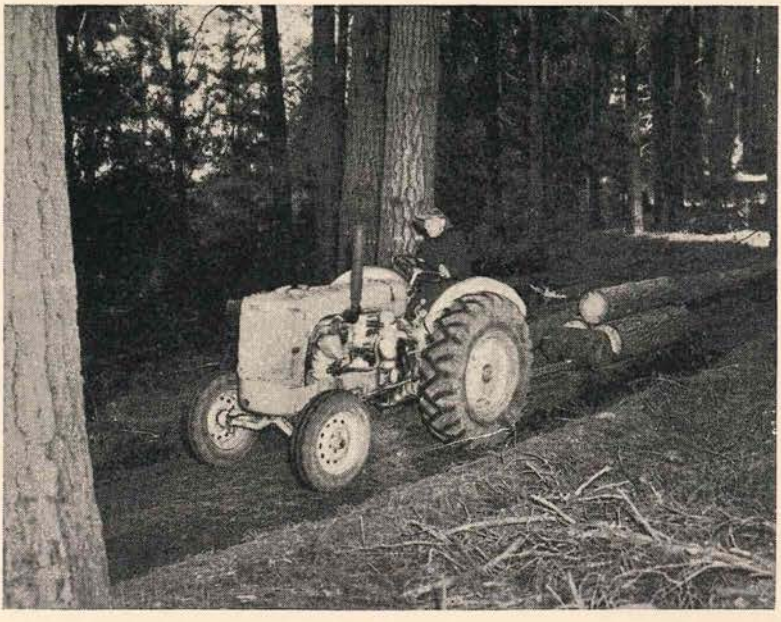

Plate 42.

Peeler logs for plywood manufacture being snigged during thinning operations. This photo was taken within a few yards of where the house stood in the previous photo.

The Management of Plantations.

Just as a Working Plan is written for the management of the natural forests, so a separate plan is prepared for pine plantations. Here a programme of annual planting for the period of the plan (usually five years) is laid down, together with the yields of timber that may be taken from already existing plantations. The plan has as its basis the results of the years of experimental work and experience, and allows for the many aspects necessary for plantation management.

The Working Plan is the authority approved by Parliament and, subject to the limitations placed on it from time to time by the availability of finance, is carefully adhered to through the whole of the period of its existence.

An Example of the Results of Management in Western Australia.

Should you have the opportunity to visit the Greystones plantation at Mundaring Weir, you would see what is possibly the best compartment of *Pinus radiata* growing in Australia (see plate 38). It was planted in 1922. It has a growth of 150 feet in height, and trees to 150 cubic feet in volume. In gross volume it has produced 9,000 cubic feet in thinnings over 33 years and also 9,000 cubic feet in the 70 trees per acre remaining in 1955.

Eighteen thousand cubic feet in 33 years or 545 cubic feet each year represents nearly one ton of timber every month for 33 years. In terms of sawn timber this would have a value of £6,000 for every one acre of the compartment described.

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