EUCALYPTS FOR THE PRODUCTION OF PULPWOOD IN NEW ZEALAND

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SUMMARY:

The wood pulp industry in New Zealand is dependent on large monocultures of Pinus radiata *D. Don. Pathologically this is undesirable and usually* Pseudotsuga taxifolia *(Poiret) Britt. is suggested as an alternative species. The author considers that broadleafed trees should be used and that poplars and eucalypts are possibilities. Hybrid poplars have been developed overseas for Northern Hemisphere conditions and experimental plantings only could be recommended at this stage. On the other hand eucalypts have been grown successfully here and much is known in Australia about their pulping qualities. The species that are used commercially are listed and from this list those suitable for pumice country have been selected. These are* Eucalyptus fastigata *Deane and Maiden,* E. gigantea *Hook f,* E. regnans *F. Muell.,* E. sieberiana *F. Muell.,* E. goniocalyx *F. Muell.,* E. nitens *Maiden,* E. viminalis *Labill,* E. lindleyana *DC, and* E. radiata *Sieb. Climatic conditions under which these species grow in Australia are compared with records of Tokoroa and Kaingaroa Forest. The need for careful selection of seed and for the correct naming of species is stressed and the advantages of having short fibred pulp to mix with long fibred* P. radiata *pulp is pointed out.*

In this country a large wood pulp industry has been successfully established, based on the large coniferous plantations in the pumice country of the Central North Island. The major parts of these forests are *Pinus radiata* D. Don. and the remainder other species of *Pinus*, or *Pseudotsuga taxifolia* (Poiret) Britt. (Douglas fir). From the pathological angle the disadvantage of having large tracts of forests of one genus has been pointed out in the De Gryse report (1955) and, on a number of occasions, the desirability of breaking up these large monocultures with blocks of other species, has been discussed. The selection of, and change over to, other species is one of the most difficult silvicultural problems facing the forestry profession. The change has to be economical to carry out and the species selected suitable for consumption in the present utilization plants. On most occasions Douglas fir has been suggested as an alternative. However attractive this change may be, it is not a very economical one because it would be necessary to destroy all *P. radiata* at present on the areas, the difference in the initial growth rates of the two species

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being so great that the Douglas fir would be badly suppressed wherever any pines survived. In many places also the competition from native shrubs would be such that release cuttings would be necessary on the Douglas fir for at least four years after planting. Furthermore, even if it were economical to convert *P. radiata* areas to Douglas fir, we would still be dependent on two very similar conifers. It would be far better to find an alternative for some of the areas that is not a conifer but a broadleaf.

There appear to be only two possibilities amongst the broadleafed trees. These are the poplars and the eucalypts. Many new hybrid poplars have been grown overseas in recent years, but in most instances, they have been carefully selected to suit local conditions in the Northern Hemisphere, and until they have been tried experimentally in this country, large scale plantings would be a risky undertaking. In addition, the genus requires a better soil than much available for forestry in this country.

On the other hand many species of eucalypts have been grown successfully in this country and offer the greatest chance of success. The requirements to be filled for our purpose are as follows:—

1. The species must be suitable for pulping. The timber must be light coloured so that bleaching is not difficult.
2. It must grow well on pumice soils.
3. It must be able to grow at least in some situations in competition with *P. radiata.*

To date no pulping of eucalypts has been done in New Zealand so we are dependent on overseas experience in this regard. Australia, South America and South Africa are all pulping eucalypts. According to Jefferies (1954) the following species of eucalypts, in order of quantity used, are pulped in Australia—*Eucalyptus regnans* F. Muell., *E. gigantea* Hook f., *E. obliqua* L'Her., *E. scabra* Dum-Cours., *E. sieberiana* F. Muell., *E. capitellata* Sm., *E. radiata* Sieb., *E. viminalis* Labill., *E. goniocalyx* F. Muell., *E. consideniana* Maiden, *E. muelleriana* Howett, *E. bridgesiana* R. T. Baker, *E. nitens* Maiden, *E. rubida* Deane and Maiden, *E. lindleyana* DC., *E. globulus* Labill. and *E. fastigata* Deane and Maiden. In other countries *E. saligna* Sm., *E. grandis* (Hill) Maiden, and *E. camuldulensis* Dehn. have been used.

These species, with the exception of the last three, all satisfy the first condition on our list, and have the great advantage that much is already known about their pulping qualities and problems. The three exceptions all have reddish timbers and are, in any case, unsuitable for the areas under consideration.

The stringy barks *E. obliqua, E. scabra, E. capitellata* and *E. muelleriana* are not suitable for pumice country although they would be worth consideration for other areas, and *E. globulus* is generally unhealthy in these conditions. *E. bridgesiana* and *E. rubida* are usually poor formed trees and can be replaced by better species as can *E. consideniana.*

This leaves us with four ash eucalypts *E. fastigata, E. gigantea, E. regnans* and *E. sieberiana;* three gums *E. goniocalyx, E. nitens* and *E. viminalis;* and two peppermints *E. lindleyana* and *E. radiata.* The temperature and rainfall of typical areas for these species in Australia are set out in Table 1. These are summarised from Forestry and Timber Bureau Leaflet No. 65 (1953). For comparison, records for Tokoroa and Kaingaroa Forests are included.

Some experience has been gained in growing all these species in New Zealand and some have been grown on pumice soils. This experience may be summarised as follows:—

E. fastigata

This species has grown well in a mixture with *P. radiata* on the Kaingaroa Plains where it has a growth rate equal to that species. Good specimens are also to be seen in Cambridge, Rotorua and around Putaruru.

E. gigantea

Good healthy specimens are to be seen at Oruanui and Taupo and it is growing satisfactorily on the Kaingaroa Plains. As this species grows in many localities colder than those experienced here care should be taken to obtain seed from warmer parts of its habitat and to plant it only in the colder sites.

E. regnans

There are no records of this species growing on pumice country but in view of the way the two preceding species thrive no difficulty should be experienced with this tree.

E. sieberiana

This tree grows well on pumice soil and regenerates freely. Seedlings can in some situations force their way through quite heavy bracken fern cover.

E. goniocalyx and *E. nitens*

Neither of these species has been tried on pumice country but both are worthy of extensive trials. *E. goniocalyx* is reputed to grow well near Okoroire.

E. viminalis

This is one of the easiest species of eucalypt to grow and to transplant. It does well on pumice soil. For pulpwood planting seed should be obtained from suitable Australian sources as most trees grown under this name in this country are hybrids many of which are of very poor form.

E. lindleyana and *E. radiata*

These two species have been planted in plantations around Putaruru where they have grown very well. Coppice growth and natural regeneration has been excellent and because of this they are attractive for pulpwood production. In Australia they are not popular for pulping because trouble has been experienced with the numerous resin pockets in the trees. These are mostly associated with old fire

scars and other damage to old trees. It is not anticipated that any similar trouble will be experienced here with young quickly grown stems. The closely related *E. robertsoni* Blakely, is worth considering along with these two. It is reputed to be a better tree and its silvicultural qualities have been described by Jolly (1928). A judicious mixture of these peppermints with the other species mentioned above will probably give the most satisfactory stand from the silvicultural angle as it would be possible to maintain a comparatively dense canopy to give adequate control of ground cover. These are the most promising eucalypts for pulpwood production. All are suitable for mechanical, chemical and semichemical pulp and trials should be initiated in forest areas to gain experience in the comparative growth of these species.

TABLE I

	Temperature				Rainfall	
	January		July		Mean Annual	Rainy Days
	Min.	Max.	Min.	Max.	Ins.	
Species						
E. fastigata	49°F	77°F	30°F	48°F	30–40	80–120
E. gigantea	47	68	32	43	40–60	100–200
E. regnans	47	71	34	48	30–65	125–200
E. sieberiana	54	74	37	53	30–40	100–150
E. goniocalyx	48	72	33	50	40–50	90–150
E. nitens	46	72	31	47	30–50	90–140
E. viminalis	52	74	37	51	25–55	80–125
E. lindleyana	54	78	36	55	25–40	100–150
E. radiata	50	77	32	49	25–50	90–110
Range	46–54	68–78	30–37	43–53	25–65	80–200
Tokoroa	49	72	34	53	46–76	129–189
Kaingoroa Forest	48	66	33	45	43–78	130–189

They are profuse seeders and no great difficulty should be experienced in obtaining sufficient quantity of seed to meet requirements. Correct nomenclature is important with eucalypts and Blakely's "Key to the Eucalypts" 2nd Edition (1955) provides the only satisfactory reference at present available. It is very important that all seed used be true to name and that it be collected from the very best form, fast growing trees of each species. It is not sufficient that it comes in a packet with a nice label. Foresters must satisfy themselves that it has been collected from carefully selected trees growing in a climate comparable with that of the districts in which it is intended to grow them. There is probably no genus of trees that offers so great a reward for careful seed selection as does this one.

No difficulty should be experienced in raising any of these species from seed and all transplant well as one year seedlings. Planting spacings of either 8' x 8' or 6' x 6' may be used. Rotations of twenty years or less will probably prove most suitable as young, quick grown timber is preferred for pulpwood. A mean annual increment of 300-400 cubic feet seems reasonable to expect under these conditions. Regrowth from coppices will be satisfactory from the gums and peppermints, but not from the ashes which will have to be replanted or naturally regenerated each rotation. Fortunately they are profuse seeders and no great difficulty is likely to be encountered in securing adequate regeneration.

There appears to be no reason why these eucalypts should not be successful in replacing *P. radiata* wherever it is necessary to break up these large monocultures. The change over must, of necessity, be a slow one so that the percentage of short fibred wood being consumed by the pulpmills will be progressively increased over a long period but unless something unforeseen happens will never provide more than a minor proportion of the wood for pulp. The short fibred pulp will be of great use in producing high quality products in which a mixture of short and long fibres is an advantage, and, at the same time, it will improve the forest complex and thus strengthen the foundations of the industries dependent on this raw material.

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