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# *Robinia pseudoacacia* for ground-durable posts?

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## Introduction

Foresters, particularly researchers, are supposed to be adept at thinking at least 20-30 years ahead, because of the long time their tree crop takes to reach maturity. It is thanks to such visionaries as Sir Francis Dillon Bell and Dr 'Winkie' Sutton that the forestry industry is in the rosy position that it currently finds itself (today's visionaries are at a distinct disadvantage, for they have to do battle first with economists who have difficulty seeing past present-day costs and returns – but that's another issue). What do today's visionaries see as newcomers to the future forestry scene? I'd like to suggest that, in a world trying to cut costs and showing more and more resistance to insecticides, fungicides and toxic chemicals generally, there should be an increasing role in the future for naturally durable timbers. Down here in the colder parts of the South Island we have some good candidates for above-ground use, particularly in the likes of Douglas fir and macrocarpa. However, it is a different story below ground, for we are generally too cold for the ground-durable eucalypts such as *Eucalyptus pilularis* and even *E. muelleriana*. One species stands out as a good candidate and that is the black locust or *Robinia pseudoacacia*. But, as this article attempts to explain, growing ground-durable *Robinia* heartwood is not likely to be easy.

*Robinia pseudoacacia* or black locust is a native of eastern North America. Since about 1600, when it was possibly the first North American tree introduced to Europe (Keresztesi, 1988), it has been widely planted elsewhere. By 1986 over three million ha of *Robinia* plantations existed outside the USA, with China and South Korea each having planted over one million ha.

## *Robinia* in New Zealand

*Robinia* has been planted in New Zealand for over 100 years. The species has not earned a good reputation because of poor form and a tendency to breakage in exposed sites. However, it retains its attraction to many tree growers because of its capability to produce durable heartwood early in life. The heartwood has been tested in New Zealand for ground durability and was initially classified as at least "durable" and probably "very durable". Of 33 hardwoods tested, *Robinia*, was one of only three species listed in the second category and was the only one that grows relatively readily in the colder parts of the South Island. However, more recent FRI assessments of *Robinia* after 26 years rate posts more likely to be "durable" (rather than "very durable") with an average service life of 20-25 years (D. Page, FRI – pers. comm.). Page also queries whether the heartwood

from young trees will be as good quality as the older material used in the FRI tests.

## Improved Hungarian clones

In 1985, Otto Krijgsman of the Forest Research Institute (Rangiora) visited Hungary and was impressed with the form and growth of some of these clones. Consequently, improved material in the form of seed and rooted plants from seven clones was imported in 1986. These were used to establish various trials in the Rangiora nursery in 1988.

## Demonstration planting in FRI's Rangiora nursery

The main aim of these plantings was to demonstrate management options for growing roundwood. They included seven clones and one seedlot of Hungarian origin and one seedlot of New Zealand origin, each represented by 375 trees. These were planted at three spacings – 1000 s/ha



Inside the *Robinia* management plot (4000 s/ha) year three. Close spacing and thinning to one stem per stump has promoted reasonable form in this seedlot of NZ origin.

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(2.5 x 4.0 m), 1600 s/ha (2.5 x 2.5 m), and 4000 s/ha (2.5 x 1.0 m). Each spacing treatment consisted of a central management plot containing 30-100 trees (depending on spacing) with two rows of surround trees. Within each clone/seedlot the three spacings were adjacent to each other to allow fair comparison of silvicultural treatments. Unfortunately, limited stock numbers and space did not permit replication – hence the term ‘demonstration’ rather than ‘trial’ plantings!

### Results to date

Detailed results are given in Ledgard (1993). Survival in all plantings was generally good and growth in the first year after coppicing was sometimes spectacu-

lar (over 2 m). However, after the initial impressive coppice growth, performance was mostly disappointing except on sheltered, fertile sites. It now appears that, in Canterbury, *Robinia* requires virtually horticultural conditions for adequate performance and even in these frost can be a problem, particularly with the imported clones. Shelter is not only important initially but also in later life when leafy crowns can be very susceptible to damage by wind.

In the FRI Rangiora nursery, on a very sheltered fertile site, the imported clones have performed excellently (see photo) apart from a susceptibility to wind damage when in full leaf. However, this is an “ice cream” site and nowhere else have I

seen them perform to this very acceptable standard. Elsewhere in the FRI nursery, on a more exposed site (in the demonstration plantings) the trees grown from seed collected locally (nick-named “Vulgaris”) are more vigorous than the imported clones. Although they occupy the more sheltered end of the block they probably confirm indications from Canterbury sites elsewhere that the local “Vulgaris” is a hardier breed.

Although hardier and more vigorous, the form and straightness of the New Zealand seedlot “Vulgaris” is poor, and without silvicultural tending it produces a number of stems of variable form (3.6 stems/plant compared to an average of 2.2 stems/plant for the imported Hungarian clones). Therefore, if posts are the management objective, some tending after establishment is essential.

### Ground-durable heartwood posts in 10 years?

In open ground I have grown *Robinia* to post size in as little as four years. However, roundwood cut from such trees will contain only sapwood and the four-year-old post I put in a fence line at home lasted barely three years. In the quest for durability, heartwood is essential and can be encouraged with the correct management.

The demonstration planting in FRI’s Rangiora nursery demonstrates that, in Canterbury using the “Vulgaris” material, it may be possible to grow durable heartwood posts in 10 years. After four years mean height at the close spacing was 5.7 m, compared to 4.6 and 3.8 m for an imported seedlot and clone in adjacent plots. Height growth in the wider spacings was less (5.4 m in the 1600 s/ha plot and 4.2 m in the 1000 s/ha plot). The mean dbh in the dense plots was 5.5 cm for “Vulgaris” and 4.1 cm and 3.0 cm for the imported seedlot and clone respectively. Diameter growth to date has been similar in all plots, BUT, heartwood appears to be forming earlier in the densest plot. Two trees were felled in each plot and at 1.4 m heartwood was already forming in the 4000 s/ha treatment, but not in the wider spacings. Many trees exhibit a close relationship between sapwood area and leaf surface area, so it is understandable that in the dense plot where crown development is most restricted, heartwood should be encouraged to form earliest.

The regime that appears to be emerging is to plant at a close spacing to encourage good form and to limit crown growth once the initial fast height growth phase is past. After one year, coppice back to ground level and early in the following season prune back to one stem. This stem should reach post height (2 m plus) in one



Pruning imported Hungarian *Robinia* clones aged five years in FRI’s Rangiora nursery archive. Note the good form even at wide spacings.

season and therefore no further treatment is essential, but if longer roundwood is desired then some summer tip pruning (in preference to winter pruning) to encourage straight growth will be needed (a good account of the benefits of summer pruning is given in Barton, 1993).

Some final words of caution. Firstly, success with the above regime will only be possible if prospective growers of *Robinia* pay careful attention to other important aspects such as siting and establishment procedure – see Krijgsman (1993) and Ledgard (1993). And secondly, naturally durable posts (particularly those

grown quickly) are unlikely to be as reliable as commercially treated softwoods where a trouble-free life of 30+ years is expected. However, in a world showing increasing resistance to chemically treated products there should be an expanding market niche for well-grown 'natural' *Robinia* heartwood posts in the future.

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# Priorities for research on alternative tree species for wood production in New Zealand

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## Introduction

Reviews by the Ministry of Research, Science and Technology of scientific research in New Zealand on plantation forestry (Waite, 1991) and forest products (Cope, 1992) both recommended that more attention should be paid to researching species other than radiata pine. A necessary step identified before instituting major new research initiatives on alternative species was to determine the level of government funding appropriate for research on alternative trees for industrial forestry, the species most likely to repay this investment, and the particular fields of research of highest priority.

Under a contract from the Foundation for Research, Science and Technology, I undertook to investigate what research was being done in New Zealand on alternative tree species for production forestry, and explore what our best economic options might be for growing alternative species on a fully commercial scale. In light of these findings, a research agenda would be proposed to support potential investors, growers, processors, and exporters in making a commercial success of these other species. The idea of the investigation was thus to try to pick winners, and then define what necessary new information and technologies was required to fully develop forests and markets of these alternative species.

My approach was to review the experience in New Zealand with growing, pro-

cessing, and marketing alternative species, and to identify a "short list" of candidates which seemed to have the best prospects as profitable alternatives to radiata pine. As well as their suitability for forest development, I took account of the extent to which alternative species were likely to be preferred to radiata pine in certain end uses, and of the items of imported timber and other forest products for which locally grown woods might be suitable substitutes. A further important consideration in narrowing down the list of species for attention in research programmes was the future likelihood of them generating major new export sales.

## Competition from radiata pine – the major impediment to growing other species

Whilst there is undoubtedly plenty of enthusiasm and support in some quarters for a greater research effort in other trees, there is little commitment to plant them on a significant scale. Past research, and trial-and-error experience throughout the country has already created a valuable body of knowledge on alternative species. The fact nevertheless remains that 90% of the plantation forest resource in New Zealand is radiata pine and that it continues to dominate planting programmes. Only radiata pine figures prominently in the recent spate of new personal investments in forestry, and it is clear that little or nothing else in the eyes of promoters, investors or their advisors is considered a good bet. To make things even tougher for the "alternatives", there is a concerted research

programme and promotional campaign aimed at adapting and marketing the wood of radiata pine for virtually the whole range of purposes for which alternative species could be considered. Thus, a major obstacle to the greater use of alternative tree species in New Zealand is the competition for investment finance, land, research effort, management skills, technical resources, and markets, from radiata pine.

## Likely profitable alternatives to radiata pine

Species diversification is often seen as "a good thing", but can money be made out of growing alternative species in New Zealand?

The downfall of most alternative softwoods is that slower growth rates mean longer rotations and/or lower yields, and thus higher growing costs, and a longer wait for a financial return. With the possible exception of Corsican pine (*Pinus nigra*) for poles, other pines have no wood quality advantages and few siting opportunities, other than the South Island high country, over radiata pine, and thus little possibility of higher prices to compensate for the higher growing costs.

Of the native softwoods, kauri (*Agathis australis*) and the podocarps have been well researched from most likely angles. For both technical and conservation reasons, prospects are poor for profitably managing natural forests for the sustained yield of wood. Furthermore, prohibitive establishment costs and long rotations make these slow-growing natives poor

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