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Timber production from shelterbelts — getting started

Two design and management options

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Recently when arriving a little early at a friend's farm it became obvious that I had surprised him. As he came out of the vegetable garden, innocently throwing the chainsaw behind the hedge out of my sight, I could see that I had interrupted a job he had intended to have completed well before my appearance. As we greeted each other, he must have sensed I knew what he was up to and confessed everything.

All but a few of last year's proposed shelterbelt planting programme of 10,000 radiata pine seedlings lay clearfelled. After having arrived from the nursery the previous winter they had been heeled in the vegetable garden where they had taken root permanently.

How often do we all return from a farm forestry field day all fired up over some new concept, and rush off and order a few thousand seedlings. Meanwhile, during the busy winter period, farming activities take preference to fencing and getting the area sprayed for planting. Despite the planting season giving way to early summer the seedlings are bunged in the ground anyway. Of course, from that day on we pay the price of poor background research and planning. Visiting members of the forestry and agricultural discussion groups delight in firing a barrage of questions as to why it was planted or managed in that particular way. But in being prepared for this usually critical group a list of plausible excuses is well rehearsed.

Fortunately for my friend, a project initiated in a burst of enthusiasm had not progressed further than purchasing the seedlings and had not developed into an expensive exercise, continuing on for some 25 years.

The idea of preceding the establishment of any tree planting investment with a pilot plot established one year in advance of the main planting venture has a lot of appeal. Experience gained on a small scale can be applied the following year. The application of increased management skills acquired can only result in a project giving a better return on investment, demonstrating the importance of PLANNING and good MANAGEMENT.

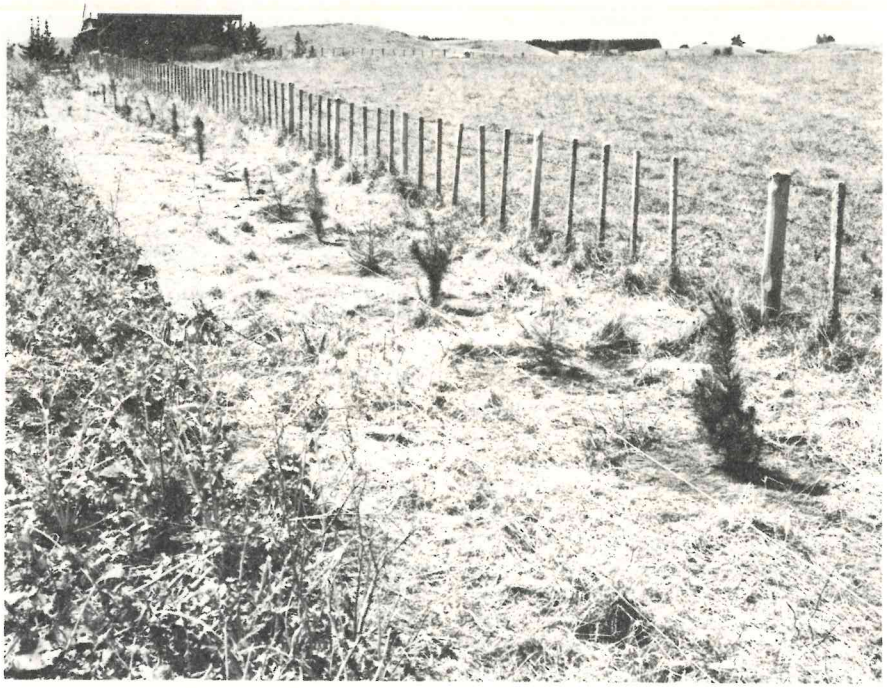
While giving my friend a hand to cut and heap the remaining seedlings he suggested that next year's effort would be more successful if I were to provide him with an outline of some design and management options aimed at producing high-quality timber and shelter benefits.

He commented that, in providing him with this outline, he only wanted the main conclusions with no unnecessary historical background or technical jargon. Here was an opportunity to give my outline.

In both the following options radiata pine is considered as the timber producing species.

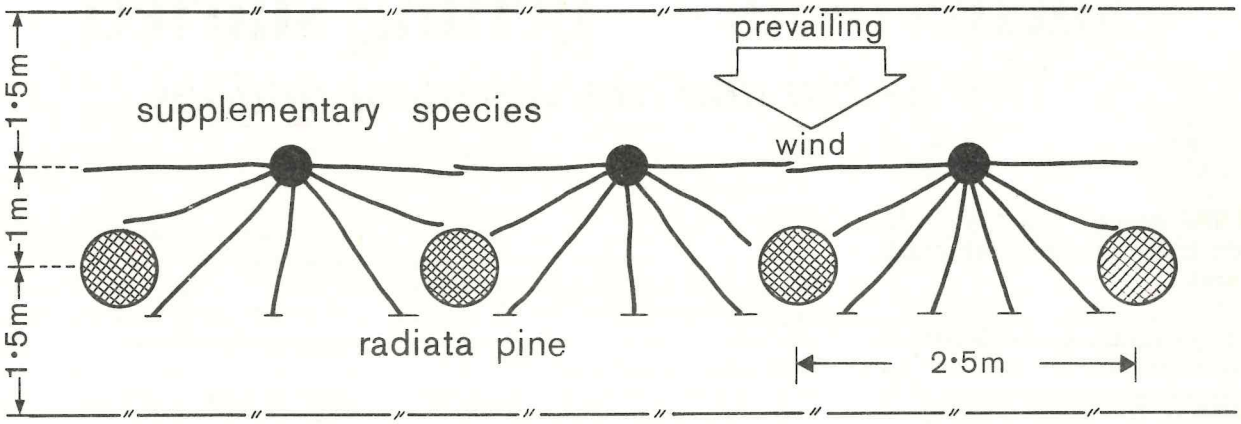
OPTION ONE

In late winter precision plant one row of radiata pine cuttings at 2.5 m to 3 m spacings. When the trees are 4 m to 5 m tall conventional pruning to half height should start. Diameter growth of trees on farms is rapid, therefore pruning on time to confine the branch stubs to a minimum defect core is important. One method of achieving this is to leave 3 m of crown on each tree. Pruning is carried out annually until all trees have been pruned to a height of 6 m. On a good growth site this might be around age seven. This operation will destroy the bottom shelter, so to compensate, a slower growing or supplementary species is interplanted within the row of radiata pine or planted in a row of its own just offset from the radiata pine. The supplementary species is established in the same year as the radiata pine. In providing bottom shelter in its position under the umbrella of radiata pine branches the function of the supplementary species is sacrificial. The choice is wide and may include species such as *Cryptomeria japonica; Cupressus arizonica; C. macrocarpa,* Leyland cypress; Western Red cedar; and Douglas fir — to name a few.



Single-row, wide spacing, weed control, high-quality tree stocks and electric fencing: a prerequisite for success. OPTION ONE. NZFS photo.

OPTION ONE



Management of the supplementary species is as important as for the primary species (radiata pine). This ensures a desirable permeability is maintained and that branches which spread out over the fence and later the paddock are kept in check. For this, topography permitting, a mechanical horticultural type trimmer applied to both sides is ideal, particularly if the supplemenatry species and the radiata pine are planted in the same row. Where the supplementary species is in a row offset to the row of radiata pine, fan pruning (on one side) may be considered. Fan pruning is a technique where all branches pointing towards the nearest fence are removed with pruners or jack saw, leaving only those branches pointing towards the opposite side of the shelterbelt. In later years the remaining untended side can be mechanically trimmed. Fan pruning, if carried out severely enough (see diagram), has an advantage in that it is permanent, unlike trimming which is expensive and has to be carried out regularly.

The figure shows what the OPTION ONE shelterbelt should look like.

The following is an example only of an establishment and management cost budget for Option One. It is based on the establishment of 400 radiata pine cuttings, and 400 seedlings of a supplementary species per kilometre. All costs include materials and labour.

OPTION ONE BUDGET
(example only)

	1 km
Fencing (permanent electric, one fence only)	$1500
Marking out	30
Spot spraying herbicide	80
Tree stocks (radiata pine cuttings)	60
(supplementary species)	240
Planting	80
Pruning (radiata pine)	680
(supplementary species)	200
Trimming (supplementary species, 1 side twice)	80

Pruned radiata pine, at six years, with slower growing cryptomeria. A design to yield high value timber and shelter benefits. OPTION ONE. NZFS photo.

OPTION TWO

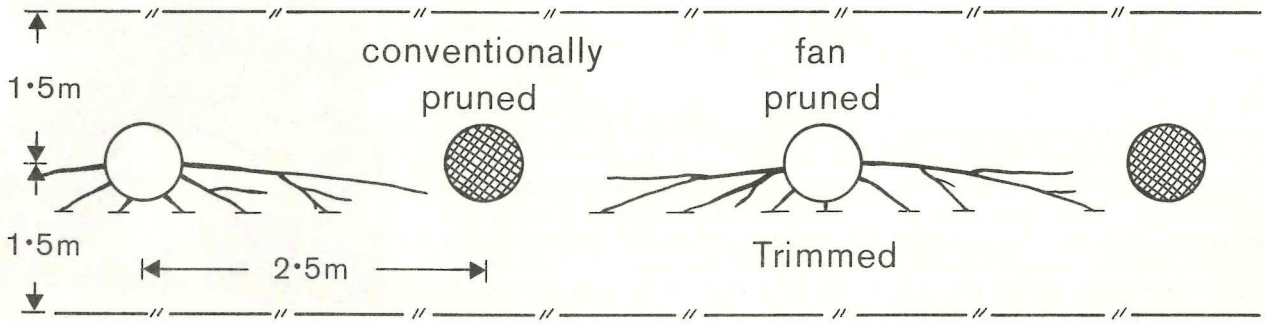
Precision plant one row of radiata pine at 2.5 m to 3 m spacings. When the trees are 4 m to 5 m tall, conventionally prune every alternate tree. In this option the low shelter is provided by the remaining alternate trees which are managed in either of three ways:

(a) MECHANICAL TRIMMING both sides of the shelterbelt. Commencing early and applied regularly is a good method of maintaining the narrowness of the shelterbelt. This treatment depends on the availability of suitable machinery and topography.

(b) FAN PRUNING the remaining alternate trees removing a single quadrant of branches only is a new treatment currently being evaluated. Branches are removed creating a potential clearwood quadrant of 50 to 80% of the tree circumference (see diagram on next page and photo). Branch development on the opposite side of the shelterbelt is kept in check by regular mechanical trimming.

(c) INTERNODE PRUNING the remaining alternate trees might be termed an option for the far-sighted enthusiast. In this technique some whorls of branches are removed leaving single whorls at

OPTION TWO (b)



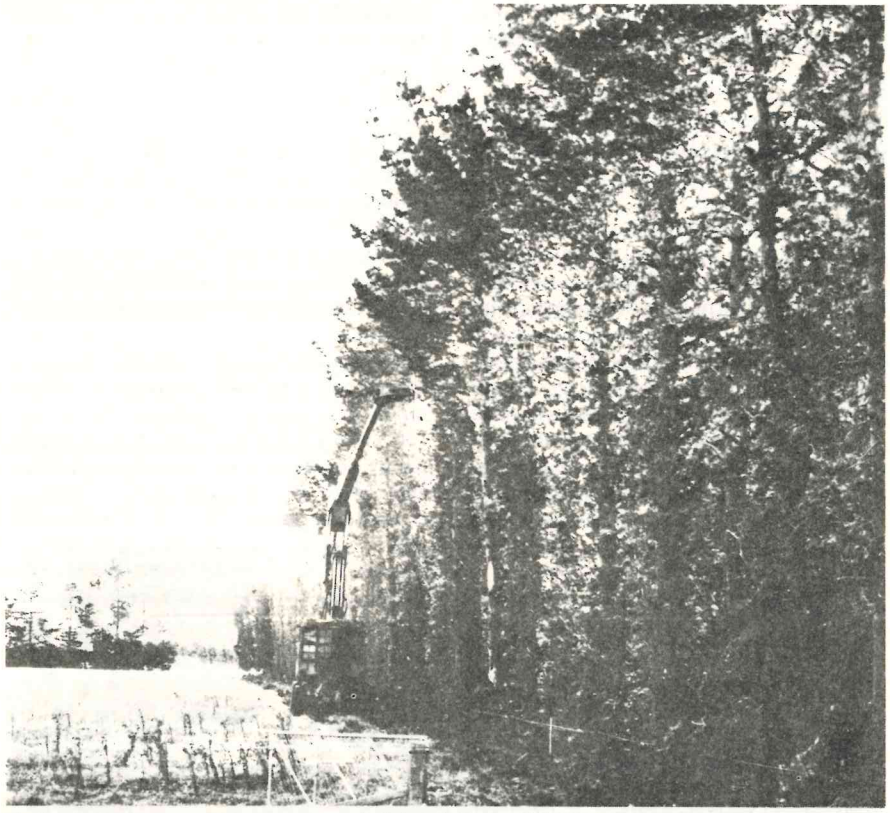
predetermined heights (see photo). The aim is to produce short clear length logs. Upgrading the value of an otherwise untended tree which would produce low-grade timber containing huge intergrown knots that in the future, chances are, no sawmiller will want. Internodes created of the right length, straight, and with defects confined to a small knotty core may be utilised as peeler bolts for the manufacture of plywood veneer. Although in theory the application of internode pruning has great potential in shelterbelts, trees treated in this way have yet to be sawn or peeled and that's another 20 years away yet!

The following is an example of an establishment and management cost budget for OPTION TWO (b).

Every alternate tree is conventionally pruned to 6 m with the remaining trees being fan pruned (60% circumference branches removed). The remaining side is periodically trimmed. It is assumed that a single row of radiata pine has been planted at 2.5 m spacings or an equivalent of 400 trees per kilometre of shelterbelt.

OPTION TWO BUDGET
(example only)

	1 km
Fencing (permanent electric, one fence only)	$1500
Marking out	15
Spot spraying	40
Tree stocks (radiata pine cuttings)	60
Planting	40
Pruning (includes fan pruning)	500
Trimming (1 side 8×)	220



Mechanical trimmers can operate to a height of 15 m. OPTION TWO (a). NZFS photo.

Some further considerations and points of clarification are necessary to ensure the success of the shelterbelt investment.

PRECISION PLANTING is best achieved by marking out the shelterbelt prior to the spraying or planting operation. Cut two lightweight sticks (bamboo) to meet the planting design dimensions. In the example of OPTION TWO one stick is cut to 2.5 m (distance between trees within row) and the other 1.5 m (distance from the shelterbelt to the fence). Using an aerosol paint marker and holding the sticks in an L-shape, marks are made indicating the tree planting position. It is possible for one person using this procedure to mark out the shelterbelt at a walking pace.

GOOD ESTABLISHMENT techniques cannot be over-emphasised. Apply a knockdown and residual herbicide by spot spraying prior to planting. This will ensure bare ground for at least the first growing season. Good planting techniques must also be used to ensure the shelterbelt doesn't topple or blow over in future gales. Planters are often quick to blame tree toppling on high fertility sites and rapid growth rate. Despite this, few trees have been shown to topple when given good ground preparation and proper planting techniques. In many South Island situations, ripping to a depth of 500 mm is essential.

Pruned radiata pine alternating with mechanically trimmed trees. OPTION TWO (a). NZFS photo.

IMPROVED GENETIC MATERIAL. With shelterbelts we are locked into a system of planting the final stocking. Large variations in growth and form of existing radiata pine seedling stock has had to be accepted. However, new developments at the Forest Research Institute have resulted in the identification of genetically superior trees which have better form and growth. Controlled pollination between such trees can be used to produce moderate quantities of seed which will be grown into one- or two-year-old seedlings, each of which can be treated to produce quantities of juvenile cutting material. These cuttings will have better stem form and growth than seedlings of lower genetic quality. The cost of these cuttings will be 2-3 times that of seedlings but the production of more uniform high-quality crop should more than offset this increase. Until these new generation cuttings from control pollinated seed become commercially available, only high-quality seed orchard planting stock should be considered.

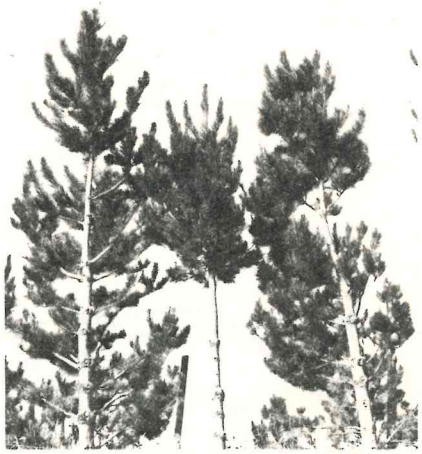
WHY RADIATA PINE? No other commercial timber producing species subjected to such a range of soil types, varying rainfall, and extremes of exposure has such a fast and uniform growth rate matching that of radiata pine. The proof of this is to fly over the Canterbury Plains where one sees little else but radiata pine. There is, of course, a place for special purpose species in shelterbelts, e.g., eucalypts, Australian blackwood, *Cupressus macrocarpa,* and *C. lusitanica.* It must be remembered that unlike radiata pine, most of the special purpose species, particularly some of the hardwoods, are site specific and that shelter itself is a primary site requirement for their growth. These species may be best suited to internal shelterbelts.

FENCES are necessary for the protection of the shelterbelt throughout the entire rotation. Profitability of the shelterbelt investment is sensitive to fencing costs. The conventional eight wire and batten fence costing around $4000 a kilometre cannot be justified financially. Cheap and effective electric fencing systems ranging from $500 to $2500 a kilometre are ideal.

Distance between trees and the fence line is important. Distances of 1.5 m for sheep and 2 m for cattle are considered acceptable, without unnecessarily increasing the area of the shelterbelt or risking damage from stock browsing.

WHY SINGLE ROWS AND WIDE SPACING? Historically those considering timber production from shelterbelts planted close-spaced, multiple-row designs (long narrow woodlots or thickets). The objective was to contain branch sizes by suppression. This was achieved on the middle rows at least, but at great expense to individual tree growth and profitability. Unfortunately, the multiple-row design has continued to remain fashionable. One reason might be that some growers have taken their lead from horticulture where wind breaks are a prerequisite to the success of many export crops. The design in terms of timber production and profitability is of no consequence.

However, except in a very few circumstances agricultural shelterbelts are not a prerequisite to farming objectives. Therefore the criteria for their evaluation is surely return on money invested or benefit realised from either the management for timber production and/or agricultural benefits, relative to the costs incurred.



A recently pruned young shelterbelt; alternate fan and conventional pruning. OPTION TWO (b).

Financial evaluation, comparing widely spaced single-row shelterbelts with closely-spaced single or double-rowed shelterbelts, indicates that each produce a similar volume of wood. But by planting all those extra trees in a multiple-row design it costs several times more to establish, prune, harvest, and saw for a similar return. In economic terms when taking into account returns from timber production, traditionally spaced multiple-row shelterbelts or closely-spaced single-row shelterbelts can be very unprofitable.

FURTHER INFORMATION on herbicides, establishment methods, supplementary species choice, application of pruning techniques, or any other matter relating to shelterbelt silviculture can be obtained from your Forest Service Advisory Officer. Their technical ability coupled with your local knowledge make a good partnership.

SUMMARY

Leaning on the top rail of the gate my friend had scribbled all the important points on pages headed NOTES in his stock and station agent's diary. Looking down at the overlay of sketches etched into the dirt it was becoming obvious that sufficient information had been discussed to enable him to choose an option and make a start.

TO CONCLUDE, it must not be overlooked that well-managed shelterbelts are a valuable timber crop in their own right. In getting started whatever option is chosen, management for shelter need not compromise timber quality and returns. This is achieved by wide tree spacing with subsequent early and regular pruning. Only then is effort rewarded with returns of up to $50,000 nett per kilometre of shelterbelt; shelter benefit could even be considered a bonus.

Alternate internode and conventional pruning. An option for the enthusiast? OPTION TWO (c). NZFS photo.

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