In our Contemporaries

NZ Journal Of Forestry Science

ADVANTAGES OF CLONAL FORESTRY FOR *PINUS RADIATA* – REAL OR IMAGINED?

Carson M.J. Vol.16(3): 403-415 (1986).
Clonal forestry shares many advantages with current control-pollinated orchard strategies, including shorter plant production times, control of pedigree, flexibility of deployment, and efficient capture of additive genetic gains. Its potential advantages in increasing uniformity and capturing non-additive genetic gains need to be quantified to justify its future use.

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GENERATION OF A SUSTAINABLE *PINUS RADIATA* CELL SUSPENSION CULTURE AND STUDIES OF CELLULAR NITROGEN NUTRITION

Teasdale, R.D. Vol. 16(3): 377-386 (1986).
Initiation of the culture involved selection of initially rare meristematic cells from the dominant mass of differentiating cells with limited mitotic capacity. The chromosomally normal culture was found to be capable of long-term culture and amenable to quantitative growth experiments using dry-weight yields of suspension-cultured cells. Responses to nitrogen nutrients provided growth contour plots illustrating the interaction between ammonium and nitrate nutrients, with optimal growth in the vicinity of 3 mM ammonium and 15 mM nitrate ions.

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CULTURE OF *PINUS RADIATA* EMBRYOS WITH REFERENCE TO ARTIFICIAL SEED PRODUCTION

Teasdale, R.D., Buxton, P.A. Vol. 16(3): 387-391 (1986).
Embryos developed with normal morphology, although not as large as those from natural seeds. All plants from artificial seeds formed roots in sterile soil. The growth of embryos placed radicle-down into the same agarified medium was inferior in that the lengths of cotyledons, hypocotyls, and roots of resulting plants were markedly reduced.

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DYNAMICS OF EVEN-AGED *NOTHOFAGUS TRUNCATA* AND *N. FUSCA* STANDS IN NORTH WESTLAND.

Smale, M.C., Van Oeveren, H., Gleason, C.D., Kimberley, M.O., Vol. 17(1): 12-28 (1987).
Untended, fully stocked, even-aged stands of *Nothofagus truncata* (Col.) Ckn. (hard beech) or *N. fusca* (Hook. f.) Oerst. (red beech) of natural and cultural origin and ranging in age from 20 to 100 years, were sampled using temporary and permanent plots on a range of sites in North Westland. Changes in stand parameters with age were quantified in order to assess growth of these stands, and thus gain some insight into their silvicultural potential.

Stands of each species followed a similar pattern of growth, with rapid early height and basal area increment. Mean top height reached a maximum of c. 27m by age 100 years. Basal area reached an equilibrium of c. 41 m^2/ha in *N. truncata* and 46m^2/ha in *N. fusca* as early as age 30 years. *Nothofagus truncata* stands had, on average, a somewhat lower mean diameter at any given age than *N. fusca* stands, and maintained higher stockings. Both species attained similar maximum volume of c. 460 m^3/ha at age 100 years.

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SELECTIVE LOGGING IN PODOCARP/TAWA FOREST AT PUREORA AND WHIRINAKI

Smale, M.C., Beveridge, A.E., Pardy, G.F., Steward, G.A., Vol. 17(1): 29-50 (1987).
In Pureora and Whirinaki Forest Parks 30-40% of total merchantable timber volume was harvested in 1961 from two unreplicated 15 ha blocks of podocarp/tawa forest; a further block remained unlogged as a control. In 19 years after logging at Pureora, the actual number of merchantable trees lost in the two logged blocks was considerably lower than in the control, although the rate of residual tree loss was similar. This suggests that logging has, in part, anticipated natural mortality and has not adversely affected stability. In 22 years after logging at Whirinaki, mortality of merchantable trees occurred at similar rates in all blocks, suggesting that logging has not adversely affected stability there either.

Logging appears to have had little impact on regeneration of canopy species. Naturally regenerated *Beilschmiedia tawa* (A. Cunn.) Kirk (tawa) seedlings are widespread in both localities, and podocarp seedlings are widespread at Pureora but scarce at Whirinaki where podocarp population structures in virgin forest are not stable.

At Pureora, gross volume increment in merchantable trees, mostly podocarps, was higher in the unlogged control and in one logged block than the other (0.5-0.6 cf. 0.3 m^3/ha/annum). Net decrement occurred in all blocks, but was much higher in the control than either logged block. Total net decrement (i.e. including non-merchantable trees) is likely to be considerably higher. Growth plots in logged and virgin forest at Pureora indicate a likely average recovery period, for 80% of equilibrium basal area, of nearly 100 years for selectively logged forest.

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ESTABLISHING KAURI IN A PINE STAND AND IN SCRUB

Bergin, D.O., Kimberley, M.O., Vol. 17(1): 3-11 (1987).
Growth and survival of kauri (*Agathis australis* (D. Don) Lindl.) planted within a young *Pinus elliottii* Engelm. stand on an exposed site on the Coromandel Peninsula was significantly better than that of kauri planted within adjacent low (1m high) and tall (3-4 m high) scrub. However, on a sheltered site no significant improvement occurred. Fertiliser application to kauri at planting within pines was not worthwhile but in tall scrub was beneficial. This indicates that pines not only provide shelter but may also include beneficial soil changes.

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PINUS RADIATA STEM VOLUME INCREMENT AND ITS RELATIONSHIP TO NEEDLE MASS, FOLIAR AND SOIL NUTRIENTS, AND FERTILISER INPUTS

Hunter, I.R., Hunter, J.A.C., Graham, J.D., Vol. 17(1): 66-75 (1987).
The hypothesis was tested that the stem volume increment in the first year after fertiliser application in a series of *Pinus radiata* D. Don fertiliser trials would be proportional to the needle mass, and the amount of nitrogen and phosphorus in foliage, soil, and applied fertiliser. Soil nitrogen and phosphorus contributed little to the relationship and the model could be simplified to: $\triangle$ Volume (m^3/ha/yr) = $-$ 0.115 + 0.269 kg N in the needle mass.

This simple relationship was then tested on a range of independent data and found to predict accurately. It can be used in simple physiological growth models and when reversed may be used to estimate the efficiency of fertiliser uptake.

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MYCORRHIZAL FUNGI OF *PINUS RADIATA* PLANTED ON FARMLAND IN NEW ZEALAND

Chu-Chou, Myra, Grace, Lynette J., Vol. 17(1): 76-82 (1987).
Mycorrhizal fungi of *Pinus radiata* D. Don were studied on agroforestry sites in the central North Island of New Zealand. *Rhizopogon rubescens* Tul., the most common mycorrhizal fungus of *P. radiata* in conventionally grown forests, was replaced by two less common mycorrhizal fungi – *Tuber* sp. and *Scleroderma* spp. The soil fertility of the agroforestry sites is high, especially in phosphorus, and this may be the major factor affecting the change of the mycorrhizal fungal species.

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INFECTION CHANGES AND VOLUME LOSS IN A 19-YEAR-OLD *PINUS RADIATA* STAND AFFECTED BY ARMILLARIA ROOT ROT

MacKenzie, M., Vol. 17(1): 100-108 (1987).
The level of infection by *Armillaria* spp. in a 19-year-old, wide-spaced *Pinus radiata* D. Don stand was re-assessed after nine years. Although the overall infection level had changed little, the individual trees infected at the end of the period were not necessarily the same ones which had been infected at the start. Thirty-one percent of the trees infected at the start were uninfected at the end of the nine-year period. Sectional measurements showed that growth trends reflected changes in infection by *Armillaria* spp. Volume loss due to lethal infections was predicted to be between 26 and 61 m^3/ha on a 28-year rotation. Over the same period of time the loss of potential volume attributable to sub-lethal infections was estimated at 5.5 to 11 m^3/ha.

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VOLUME AND TAPER OF *EUCALYPTUS REGNANS* GROWN IN THE CENTRAL NORTH ISLAND

Hayward, W.J., Vol. 17(1): 109-120 (1987).
Tree volume and compatible taper equations have been developed for plantation *Eucalyptus regnans* F. Muell. growing in a central North Island forest. Previously published non-linear and polynomial forms of compatible taper equations were estimated but found to be inadequate for describing the shape of the whole stem. An extension of the non-linear form was developed, which characterised the neiloid, paraboloid, and conoid sections of the stem satisfactorily and for which the standard error of estimate of bole diameter is $\pm$ 13mm. This development, it is claimed, goes some way to resolving the conflict between equation compatibility and prediction bias.

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PURUKI EXPERIMENTAL CATCHMENT: SITE, CLIMATE, FOREST MANAGEMENT, AND RESEARCH

Beets, P.N., Brownlie, R.K., Vol. 17(2-3): 136-60 (1987).
Multidisciplinary research has been undertaken at the Purukohukohu experimental basin, particularly in the Puruki catchment over the past 15 years. This period covers the conversion of Puruki from pasture to *Pinus radiata* D. Don, the development of the trees to canopy closure, and the effects of differential intensities of thinning on growth to the middle of the rotation. Results of investigations into tree growth, nutrient cycling, and catchment hydrology are presented in papers collected in this issue of the Journal. This paper backgrounds the site, climate, history, and management of the catchment, and the development of the trees.

Puruki is a 35 ha catchment located at the southern end of the Paeroa Range in the central North Island of New Zealand, at an elevation of 600m. The rhyolitic pumice soil, previously under rye grass/clover pasture and regularly treated with fertiliser, provides ample moisture and nutrients for *P. radiata* growth under the climatic conditions: 1500mm of evenly distributed rainfall

annually, 5 GJ/m^2 of solar irradiance annually, and average monthly temperatures of between 5° and 15°C. Puruki was uniformly planted with *P. radiata* at 2200 stems/ha in 1973 and trees in the individual subcatchments (Tahi, Rua, and Toru) were progressively pruned to 2.2m height and thinned to 160, 550, and 290 stems/ha respectively by 1985, with further thinning intended. A part of Rua was left unthinned as a control. In closed canopy stands periodic volume increment attains 52 m^3/ha/year. The removal of between half and three-quarters of the tree basal area every three to four years reduced volume increment to between 25 and 30 m^3/ha/year, but this is likely to increase when management thinning is completed and the stand leaf area can increase uninterrupted to unthinned levels.

The interrelationships between aspects of the research work covered in the accompanying papers are illustrated using a conceptual modelling framework. The data collected at Puruki have proved valuable for testing theoretically based models and calibrating empirical models of *P. radiata* growth under conditions of ample moisture and nutrient supply.

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HYDROLOGY AND SEDIMENT REGIME OF A PASTURE, NATIVE FOREST, AND PINE FOREST CATCHMENT IN THE CENTRAL NORTH ISLAND

Dons, A., Vol. 17 (2-3): 161-178 (1987).
The hydrology and sediment regime of a 0.10km^2 pasture, 0.34km^2 pine forest, and 0.28km^2 native forest catchment were compared. The highly permeable pumice soils of these catchments resulted in generally low annual stormflow yields (0.54-5.2% of gross rainfall) and consequently low annual sediment yields (4.0-27.0 t/km^2/yr). The pasture catchment had the highest average flows, highest peak flow rates, and greatest stormflow yields, but lowest evaporative losses. The pasture catchment also recorded the maximum instantaneous sediment concentrations and the maximum instantaneous sediment discharges. The pine forest catchment had the lowest annual average flows, lowest low flows, and lowest instantaneous sediment concentrations and discharges, but evaporative losses were similar to those from the native forest catchment. The native forest catchment had the lowest stormflow yields, lowest peak flows, and highest low flows. Some of the differences in hydrologic responses from the native forest catchment could be explained by drainage density rather than land use.

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What's new in Forest Research

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FRI Bulletins

No. 108 (revised)

A GUIDE TO THE USE OF HERBICIDES IN FOREST ESTABLISHMENT

Davenhill, N. (1988)
Topics covered include the naming of herbicides, types of herbicides, formulations, surfactants (wetting agents), mixing and handling, hand application, aerial application, monitoring procedures, storage, and safety. Principles of chemical weed control and selection of herbicides are emphasised but without giving specific recommendations for particular weeds.

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No. 130

WAIPAPA ECOLOGICAL AREA: A STUDY OF VEGETATION PATTERN IN A SCIENTIFIC RESERVE

Leathwick, J.R. (1987)
Vegetation pattern in the Waipapa Ecological Area, central North Island, is described and mapped as part of a programme to demonstrate methods for resource data collection in scientific reserves. Semi-quantitative plots were used to collect data in forest, scrub, and mire vegetation, which were analysed using ordination and classification techniques.

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No. 135

WORKSHOP ON GROWING RADIATA PINE FROM CUTTINGS

Menzies, M., Aimers, J.P., Whitehouse, L.J. (1988)
This bulletin contains the papers presented to a workshop held to review the use of radiata pine cuttings for plantation forestry. The papers are grouped in two sections – the field performance of cuttings, and nursery production methods and establishment operations for cuttings.

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No. 136

EXPORT PROSPECTS FOR RADIATA PINE

Bourke, I.J. (Comp), Whitehouse, L.J. (Ed.), (1988)
In this report eight studies which analyse the market prospects for forest products to the year 2000 are presented. The studies analyse market prospects for logs, wood, chips, sawn timber, plywood, reconstituted panels, pulp and paper, and minor uses of wood. Projections of likely export volumes and prices are provided.

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No. 142

A GUIDE TO HANDLING AND GRADE-SAWING PLANTATION-GROWN EUCALYPTS

Haslett, A.N. (1988)
This bulletin discusses the factors to be considered when developing young eucalypt sawing strategies, as well as describing the equipment currently used in Australian eucalypt sawmills. General sawing strategies are described with the understanding that these should be adapted to suit the individual sawmill.