

Acknowledgement

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Climate change and tree planting in Central Otago

Jolyon Manning

There is little doubt but that the climate in Central Otago has already changed significantly in our lifetime. Winters are frequently milder. It is more difficult to be precise about possible changes in precipitation. Improved irrigation practices and better weed control could offset predictable disadvantages (in the event of further climate change in the next few decades) that may arise with increased drought – especially for such horticultural crops as grapes and commercially viable herbs.

The range of tree species suitable for planting in Central Otago could be extended with the provision of well-designed shelter belts, and irrigation in suitable soils.

Widespread discussion on the topic of climate change and the 'greenhouse effect' has now directed our attention to some of the possible regional impacts. However, it is important that we consider in greater detail the critical climatic 'threshold values' and those crops now growing in what might be regarded as 'marginal climates'. The semi-arid Central Otago climate zone provides a good example where these critical physical boundaries and their impact on plant life can be closely observed.

For any crop (be it grassland or trees) there are critical climatic constraints and threshold values of which the occurrence of frost and/or persistent drought are simple examples.

These irregularities make a big demand on many introduced trees and plants.

It is the frequency with which such thresholds are crossed that provides the best index of the effect of climate on crop. This is especially important when such thresholds are exceeded in successive years. The nearer a system of land use is to the meteorological limits appropriate to such a system, the more

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susceptible it is to small fluctuations in climate (e.g. grapes and cherries in Central Otago).

This factor is of paramount importance in arid and sub-arid areas and the period of fluctuations that must be considered is no more than the lifetime of a single farmer. (*Smith, London. UNESCO Conference on Climate Change. Rome 1961*)

In areas where farming (and forestry) is of primary importance the variability of the rainfall may be critical. This is particularly so in an area of low rainfall, where variations from the mean can be of major economic significance. (*Maunder. Central Otago, 1965*).

So how dry is Central Otago? The average annual rainfall in Alexandra is about 335 millimetres. If we use this as a base index of 100 then some of the better-known forests rank as follows: Balmoral (Canterbury) 186, Naseby 188, Berwick (near Dunedin) 220, Tapanui 276, Hanmer Springs 359, Golden Downs (Nelson) 402, Whakarewarewa (Rotorua) 450, Kain-garoo Forest 466, and Mohaka (Hawkes Bay) 467.

Yet given reasonably deep soils it is surprising how well *P. radiata* does even in these exceptionally dry conditions in Central Otago.

About 80 per cent of the growth in most crops (grasses and trees) occurs in the months from September to December. In Alexandra we get on average only about four 'effective' showers in excess of 10 millimetres with total 'effective' rainfall in this period often less than 100 millimetres at a time when open pan evaporation might total about 500 millimetres.

Since systematic records have been taken in Alexandra in 1923 very dry years have included 1975/76, 1977/78, 1955/56, and 1963/64. And in 1963/64 Alexandra recorded the lowest ever 12-month rainfall yet recorded in New Zealand – 167 millimetres.

Alexandra is not a windy place by New Zealand standards. Yet a frequent summer afternoon onshore wind averages about 25/35 kilometres/hour from 2 pm to 8 pm when afternoon temperatures range from 25C to 35C. Along with a few adjacent centres in the heart of Central Otago, Alexandra records about 140 days every year when the temperature tops 21C and 40 days when it tops 27C.

Research elsewhere demonstrates that such conditions are stressful for pastoral grazing animals. So it is for trees, too – especially the introduced deciduous species with rigid leaf systems that are easily damaged through desiccation in the persistent dry winds.

Often soils in the driest parts of Central Otago are very thin overlaying the schist rock formations. They dry out very quickly indeed.

There is also an impermeable 'hard-pan' just a few inches below the surface on better soils inhibiting desirable deep tree root development. Weed control measures are critical. Recent studies in South Dakota (USA) have indicated that weed control has been the leading improvement in cultural practices.

Weeds 'rob' the crop of moisture, nutrients, and light. The loss of these essential ingredients is important every year; it is critical in drought years.

Out-of-season frosts can be very damaging indeed. For example, in May 1988 (following closely upon a mild autumn) a snowfall and subsequent very cold calm weather brought frosts sufficiently severe to cause mortal injury to *P. radiata* aged 12/15 years in the Idaburn near Otarehua and widespread damage elsewhere in Central Otago to well established eucalypts and wattle species.

The steep gradient in climate and landscape character with very short distances between quite different habitats makes Central Otago an excellent outdoor teaching laboratory for the earth and atmospheric sciences. The frequency of 'climate accidents' in this marginal climate ensures that many factors in plant life come more sharply into focus. Many of New Zealand's top environmental and earth scientists have had their single most important real life experience in this unique habitat.

Open parklands and orchard habitats are more vulnerable to climate change than closely planted commercial plantations and native bush protected in part by the closed canopy. This

factor should be considered in detail by those now creating agroforestry systems.

I have now studied very closely the climate records for Central Otago for more than 30 years (three sunspot cycles. . .). The most striking feature is undoubtedly the warming of our winters.

There may also have been some relaxation in the vigour of the westerly winds in the equinoctial seasons. Relatively dry but cold southerly outbreaks are more possible for Central Otago in these circumstances.

Useful rains that bring effective moisture for trees come from well developed frontal troughs accompanied by high vertical cloud formations not so much influenced by the rain shadow effect of the main divide. Whilst we have been having difficult dry summers of late it is worth recording that Milford Sound received a record 9120 mm of rain in 1988.

The choice of suitable tree species is now better understood. We have a wide range of trees at Jolendale (some of them introduced by FRI and others grown from seed imported from overseas). More careful consideration can now be accorded landscape values, and sustainability of trees for both shelter and production.

Detailed long-term monitoring of climate characteristics is vital and fully justified in the national interest. Without that record it is well nigh impossible to interpret climate change objectively. Our memories are quite short when it comes to accurately recalling earlier local climates.

In the meantime we can make more effective use of supplementary irrigation, give more attention to soil preparation (such as the break-up of the 'hard-pan' structures located close to the surface in dry districts) and better weed control measures. In Alexandra we believe from experience that the addition of as little as 10 per cent of the average annual rainfall (i.e. 35 millimetres) selectively applied to trees can make a significant contribution to survival and growth in a parkland habitat.

An examination of many of the features described above can be better interpreted through inspection of the Jolendale Park on Bridge Hill in Alexandra. Interested readers are most welcome to visit the 30-year plantings. Inquiries should be directed to Jolyon Manning, C/o P.O. Box 901, Dunedin CPO.

Young owner of renowned cable log skidder

Tony Gamble of Mosgiel, Dunedin, is New Zealand's youngest owner of the renowned Caterpillar model 528 cable log skidder.

Tony, just 23 years old, logs in Flagstaff near Dunedin. He skids old crop radiata and Douglas fir, supplying four local mills and export timber for the Dunedin City Council forestry company.

Seven Years in Bush

Tony has been in the bush for seven years and took over the skidding contract from his father Bill two years ago.

Last year Tony purchased a Cat 518

from New Zealand Caterpillar agent Gough, Gough & Hamer. The unit, with 8500hrs on the clock, had been completely checked over and had four new tyres. In 15 months running the 518 Tony spent only \$2500 on repairs, the bulk of this a turbo change out.

"This made a big difference with virtually no R&M costs and enabled me to get on my feet and put some dollars away for the 528," says Tony.

"I decided to go for the 528 because of larger piece size, haul distance and steeper slopes.

No Problems

"The 528 has already proved my

theory true. It is much more stable and because of the extra weight and horsepower there is a lot less winching . . . She will just pick the drag up and walk away – no problems."

Tony works with his father who has been logging for 21 years and has just ordered a Cat EL200B for log loading.