Plant & Food Research
Rangahau Ahumāra Kai

RESEARCH BRIEF 14

Wood production of 'Kawa' poplar in an Agroforestry trial

Poplar is widely planted internationally as a forestry and agroforestry species. The poplar cultivar 'Kawa' has been planted in Northland as an agroforestry tree. 'Kawa' has a higher wood density than most other poplar cultivars, with a straight stem.

This report has been compiled from data collected by Peter Davies-Colley on whose property the nelder plantation is planted. These data are the most comprehensive nelder plantation data available in New Zealand, and the most comprehensive growth data for 'Kawa' poplar.

The nelder plantation is located on flat land. The site is low lying and prone to periodic flooding and runoff from the adjoining sloping pine forest and pastoral land (Figure 1b). The nelder trial compares 13 spacings of 'Kawa' planted for an evaluation of timber production, equivalent to 70 up to 600 stems per hectare (Table 1). Planting material was 70 cm stakes.

Tree spacing (m)	3.8	4.2	4.6	5.2	5.6	6.3	6.9	7.7	8.6	9.3	10.4	11.4
Stems per hectare	630	520	421	344	285	231	189	155	129	104	84	71

Table 1. The 12 tree spacings used in the nelder with equivalent stems per hectare.

The trees are planted in rows of up to 13 trees (giving the 12 spacings in each row), and as the spacing increases the rows diverge from each other so that the final appearance of the trial is shaped like a fan. The height and diameter data are analysed for plots numbered from 1 (widest spaced) to 13.

Figure 1b. Aerial view of the nelder block (the fan shaped planting facing the bend in the road). Lighter trees are 'Kawa' poplar, darker trees are radiata pine.

Growth and Production Trends

Competition for light as indicated by relative reduced height growth at the higher tree densities (Figure 2) is evident as early as year 4, but even by year 18 is not a factor for plots 1–8 (densities of between 231 and 285 stems per hectare).

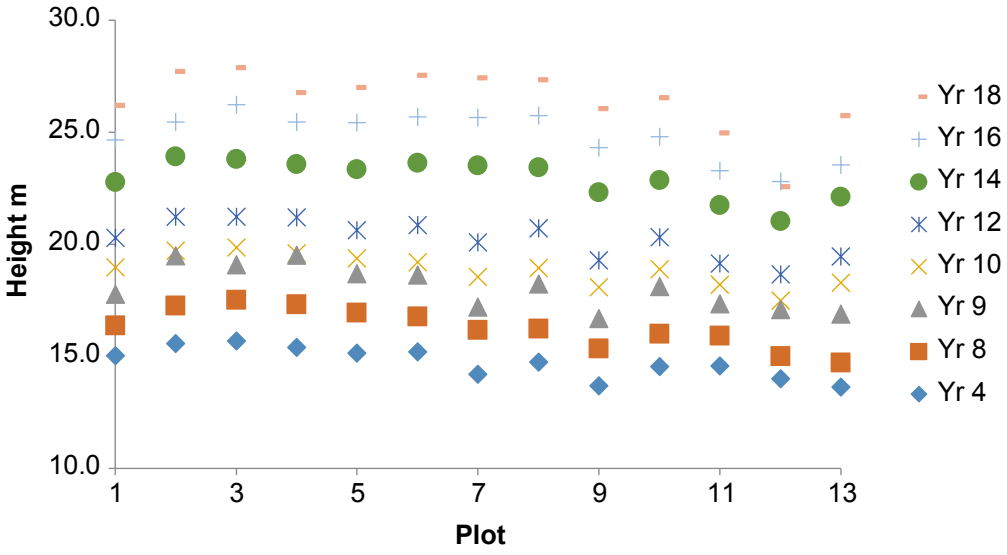

Figure 2. Changes in mean height of 'Kawa' poplar with age for the various plots (the larger the plot number the denser the tree planting) from year 4 to year 18.

However, the effect of competition on stem diameter at the different planting densities is more pronounced (Figure 3), showing a decline at densities greater than 104 stems per hectare.

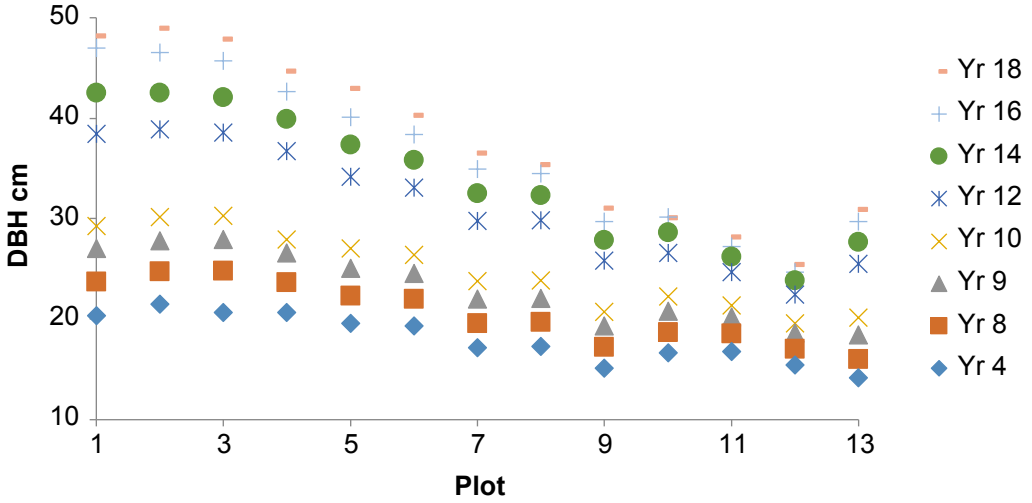

Figure 3. Changes in mean diameter at breast height (DBH) with age for the various plots from year 4 to year 18.

Wood volume per hectare (Figure 4) was calculated using the formula

Wood volume in m^3 (V) = tree height x DBH^2 x 10^{-4} and

Wood volume per ha = wood volume x tree density (stems per hectare)

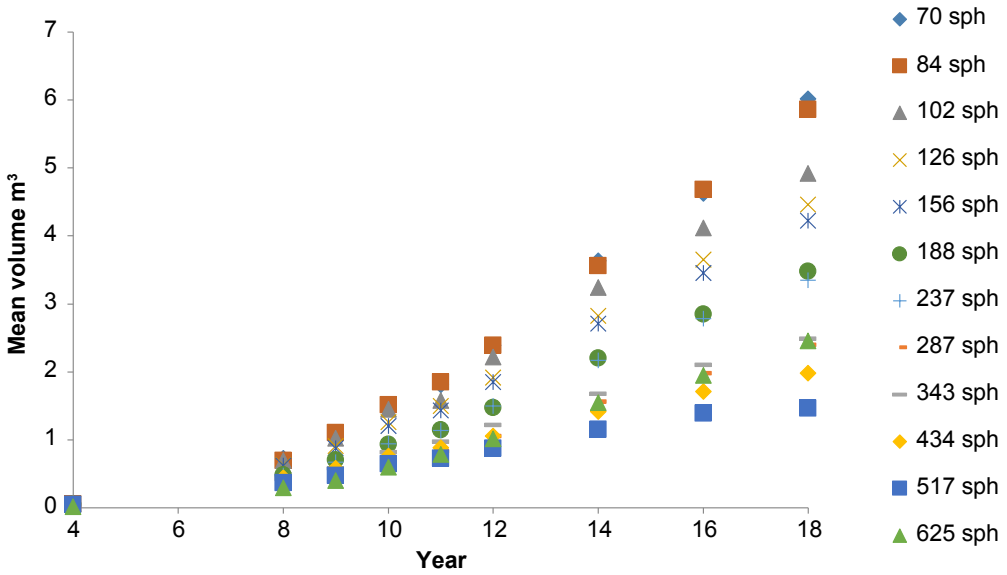

Figure 4. Change in mean wood volume (m^3) per tree with age for the different tree densities.

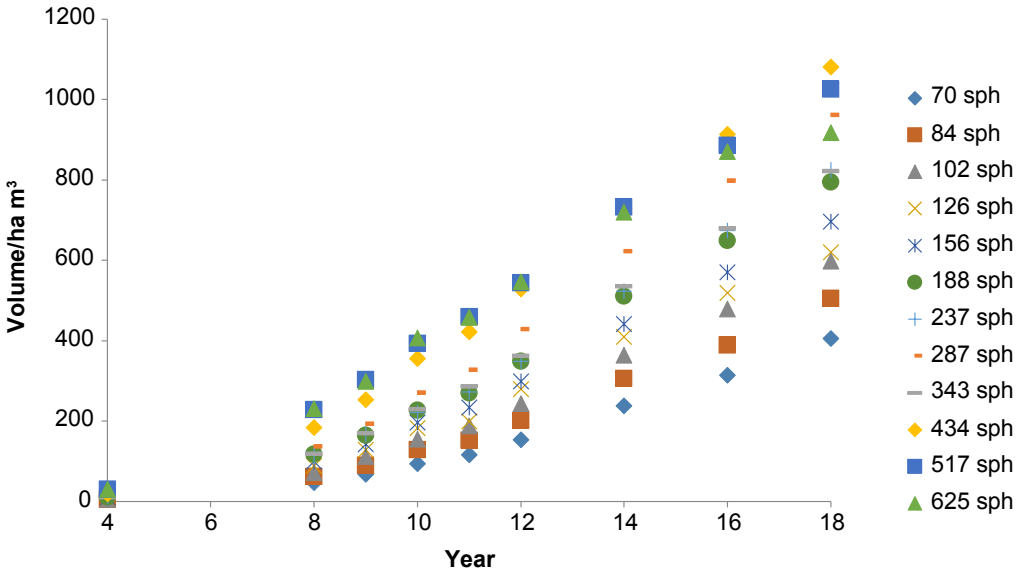

Figure 5. Change in mean wood volume (m³) per hectare with age for the different tree densities.

While wood yield per tree increases as tree density decreases (Figure 4) maximum wood yields at year 18 are dominated by the higher density plantings (Figure 5). This is significant where the agroforestry purpose is to produce biomass for energy generation, but a separate calculation is required where the purpose is for usable timber production.

For more information

This is one in a series of research briefs about Poplars and Willows that can be found at poplarandwillow.org.nz

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