

planting and pruning fewer trees in Regime B would have substantially reduced compounded costs. Timely thinning would also have improved sawlog yield and hence reduced sawing costs.

At least as important, the series of studies which have appeared in print take no account of the carrying capacity of sites. The maximum basal area of radiata pine stands in the pumice country lies between 60 and 70 m<sup>2</sup>/ha. Stands of the same species in Southland and coastal Otago can attain basal areas in excess of 90 to 100 m<sup>2</sup>/ha. This has a profound effect on the level of optimum stocking.

It serves no useful purpose to carry out such studies as that in the paper. What we need to know is the optimum stocking for various sites. Thus we need comparative studies of various final crop stockings (100, 150, 200, 250, 300, 350 stems/ha), with the optimum planting density and rotation for each. However, in all cases, pruning and thinning should be undertaken at the same crop height so as not to give a bias to the results.

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*I. D. Whiteside and W. R. J. Sutton reply:*

Sir,— We welcome the opportunity to reply to Mr Chavassee's comment on our paper but we cannot accept his claim that our figures are "rigged" or that our claims are misleading.

The object of our paper was to explain the background to the development of SILMOD and to give a summary of the main conclusions especially as they affect forestry profitability.

In the two years since we wrote that paper a great deal more work has been done. Although we can now better qualify them, the major influences we list on pages 303-5 of our paper are still as we gave them. Comparisons of the range of stockings for a wide range of silviculture treatments on a wide range of sites have consistently demonstrated that the profitability increases as final crop stocking decreases down to 200 stems/ha. Comparisons below 200 stems/ha are difficult because our currently available yield prediction models have not been adequately validated for such low stocking levels.

As we clearly state in our paper, the higher final crop regime (Regime B) was typical of many stands that have been treated in Southland Conservancy over the last 30 years, and indeed as late as 1979 (see Williams, 1982).<sup>\*</sup> Regime A, by contrast, is

<sup>\*</sup>Williams, F. J. N., 1982. Review of 1979 New Zealand radiata pine management practices. *N.Z. For. Serv., For. Res. Inst. Bull. No. 11*: 22pp,

a regime involving a lower final crop stocking and earlier pruning. Mr Chavasse claims "a very different picture would be obtained if in Regime B only 1000 stems/ha were planted". However, if only 1000 stems/ha are required for a final crop stocking of 370 (*i.e.*, a ratio of initial to final crop stocking of 2.7) then only 540 stems/ha need be planted in the 200 stems/ha regime. As there would be proportional savings in pruning and thinning costs, the differences in profitability between the two regimes would remain much the same.

Mr Chavasse claims that earlier pruning and thinning as in Regime A would have improved revenue, etc. We explored this aspect for the range of sites and rotations tested and the improvement was small. We clearly state at the bottom of page 309 that the improvement resulting from earlier pruning and thinning would have to be less than 20% of the difference between the two regimes. Over 80% of the improved profitability can be attributed to the lower final crop stocking. This finding is consistent with results obtained from a wide range of geographic localities and site qualities.

Mr Chavasse makes the claim that the Southland-Otago sites' ability to carry higher basal areas than Kaingaroa will have a profound effect on the level of optimum stocking. We have not found this to be so. As we state in the Appendix to our paper, we used, wherever possible, the appropriate Southland Conservancy growth functions — age/height, growth model, tree volume table, etc. Our comparisons show that in Southland Conservancy a given Site Index produced more basal area and volume than the same Site Index in the Central North Island (Site Index 25 m in Southland produces about the same volume as Site Index 30 m in Kaingaroa). However, these growth differences did not favour selection of a high stocking regime. Subsequent work has confirmed this.

The examples given in our paper were to demonstrate how SILMOD might be used. The general findings on pages 303-5 of our paper summarise the results of hundreds of runs done exactly as Mr Chavasse suggests. These comparisons for Southland and for all other parts of New Zealand almost always show that profitability increases as final crop stocking decreases down to 200 stems/ha. Definite recommendations on final crop stocking below 200 stems/ha must await improved growth models.