

CONSTRUCTION OF AN INDIVIDUAL TREE TOTAL VOLUME PREDICTION MODEL FOR *Pinus nigra* var. *maritima* (Ait.) Melville (CORSIKAN PINE) IN GREAT BRITAIN

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A total volume prediction model for individual trees was constructed using total height and diameter at breast height (dbh) as explanatory variables for intermediate and neutral thinning types using the data obtained from the British Forestry Commission.

The key question used was $v_i = g_i * h_i * f_i$ where v , g , h , and f represent the total volume, basal area, total height and form factor of an individual tree. Form factor is the most difficult variable to measure because, it is highly correlated with species, age, site, variations, stand density, crown growth and competition from the neighbouring trees.

Assuming basal area and total height of the particular tree will indicate the competition and age, direct functions were not constructed for competition. However, it was tested indirectly using crown parameters, stand density (N) and total basal area (G). Top height related functions were used to represent the site quality. The final equation tested was $v = f(g, h, s, G, N, \text{crown growth})$.

For each thinning type, 75% of plots were used for model construction and the remaining 25% for the validation of the constructed models. Data were divided by thinning type and then by age in order to fit the models to one year at a time.

Crown parameters, site parameters, total number of trees or total basal area were not statistically significant when fitted and the standard residual distribution indicated no improvement. Basal area and total height were the significant variables. Finally, basal area was replaced by dbh. For the final model at each age R^2 was between 0.972-0.999 and standard residuals were distributed without showing any particular pattern. Quantitative tests indicated negligible bias and very high modelling efficiency for all ages. Lack of fit test indicated the model was adequate.

There was an attempt to construct parameter prediction models with age which was not successful because the estimated parameters for all ages were distributed around 0.5. Finally an averaged value of the parameter which replaced the form factor was selected for all ages for both thinning types. The final model is given below.

$$v = 0.5040 * h * (\pi dbh^2 / 40\ 000)$$