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COMPARISON OF TreeBLOSSIM PREDICTIONS WITH BRANCH DATA FROM THE BRANCH INDEX DATABASE

J.C. GRACE
M. BUDIANTO

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EXECUTIVE SUMMARY

Data on branching stored in the branch index (BIX) database potentially offered independent data for comparing with predictions from TreeBLOSSIM.

Non-confidential data from four experiments were selected from the BIX database for an initial study. Matching these data back to the relevant permanent sample plots proved to be extremely difficult and time-consuming. Even then, there was often insufficient information in the PSP system to run TreeBLOSSIM.

TreeBLOSSIM predictions of branching were generated for three plots in the Tarawera trial, RO955, which had received the same treatment. TreeBLOSSIM generally predicted higher percentage of smaller size and higher percentage of larger size branches compared to BIX data.
This result needs to be treated with caution since it is only the result from one treatment in one experiment. Further analyses are needed to determine how TreeBLOSSIM performs across a range of sites and different silviculture treatments.

Given the difficulty in matching BIX data to the appropriate PSP and the fact that TreeBLOSSIM needs to give realistic predictions for current stands not historic stands, it was decided that further sensitivity analysis of TreeBLOSSIM should use alternative methods such as PhotoMARVL in current sample plots.

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INTRODUCTION

The branch model, BLOSSIM (Grace *et. al*, 1999), has been developed from data collected by destructively sampling a limited number of near-rotation age trees. This model has been linked with the individual tree growth model (Gordon and Shula, 1999) to form the computer model, TreeBLOSSIM.

Permanent sample plots or MARVL2 data can be used as input data to the model. From these data, TreeBLOSSIM will predict the growth of branches from age zero to the current age taking into account any silvicultural treatments. TreeBLOSSIM can then be used to grow the branches to any future age.

TreeBLOSSIM only grows and outputs branch information in integer years whereas the individual tree growth model allows the input of growth data measured part way through a growth-year. If the initial PSP measurements are part-way through a year, then the initial branch information is output at the following integer year (i.e. if the growth data was measured at 6.05 years then the branch data will be for 7.0 years).

The objective of this study was to compare predictions of branching from TreeBLOSSIM with non-confidential branch data collected in PSPs and stored in the branch index (BIX) database. Branching data include cluster height, number of stem cones and branches in a cluster, maximum branch diameter in each quadrant of a cluster. Most of these non-confidential data were used to develop the first branch index (BIX) model (Inglis and Cleland, 1982). The BIX database was considered as a good starting point for testing how well TreeBLOSSIM predicts branching.

For comparing branch data generated by TreeBLOSSIM with BIX data, it was decided that it would be sufficient to import the PSP data measured at a similar time to the BIX data. This would avoid any errors associated with growing trees in TreeBLOSSIM.

PSP PLOTS WITH NON_CONFIDENTIAL BIX DATA.

A few non-confidential datasets were selected from the branch index database for an initial study (Table 1).

Table 1. PSPs with non-confidential branch data in BIX database.

Forest, PSP plot	Year Planted	Regional Growth Model
Woodhill, CA334	1954 (CHHF)	Sands
Whangapoua, AK401	1961 (Ernslaw One)	Clays
Tarawera, RO955	1963 (FCF)	Pumice Plateau
Berwick, SD371	1959 (Wenita)	Southland

MODEL RUNS AND DATA ANALYSIS

After a long process of searching and matching the BIX database with the PSP database, it appeared that only a limited number of PSP plots could be used in this study. If PSP measurements were recorded part way through a growth year, it was necessary to extract the PSP data measured approximately 1 year previous to the BIX data (see above). For many of the plots associated with the experiments in Table1, there were either no PSP measurements or no height measurements in the year prior to the BIX measurements. Table 2 shows the summary of data that could be used in this study.

Table 2. Summary of data available for BIX-BLOSSIM comparison

PSP plot	Plots in BIX record	Plots available for study
AK401	6	2
CA334	4	0
RO955	27	9
SD371	5	0

Tarawera trial (RO955)

Tarawera was one trial where the PSP measurements were collected part-way through a growth year. While 27 plots from 9 treatments were measured for BIX in 1980, only 9 plots from 3 treatments can be used for comparison with TreeBLOSSIM as no tree height measurements were recorded in PSP in 1979 for the remaining 18 plots. These 9 plots were thinned to 379 sph in 1969.

Data from 3 plots (thinned from approximately 2000 stems/ha to 379 stems/ha in 1979) were analysed initially to determine the distribution of maximum branch diameter per cluster.

The actual and predicted distributions for maximum branch diameter in a cluster for these 3 plots are shown in Table 3, Figure 1 and Table 4, Figure 2 respectively. Figure 3 shows the comparison of percentage frequency distribution for the maximum branch diameter in a cluster between data in branch index database and TreeBLOSSIM predictions for Plots 1-3.

Table 3. Distribution of maximum branch diameter per cluster as recorded in the BIX database.

Branch size(mm)	BIX-Plot 1	BIX-Plot 2	BIX-Plot 3
<= 15	8.33	2.03	6.5
16-25	20.59	19.29	23
26-35	27.94	29.95	31.5
36-45	29.41	29.95	19.
46-55	11.76	12.69	12.5
56-65	1.96	4.06	4
66-75		2.03	2.5
76-85			0.5
>85			0.5

Figure 1. Percentage frequency of maximum diameter in a cluster as recorded in BIX database.

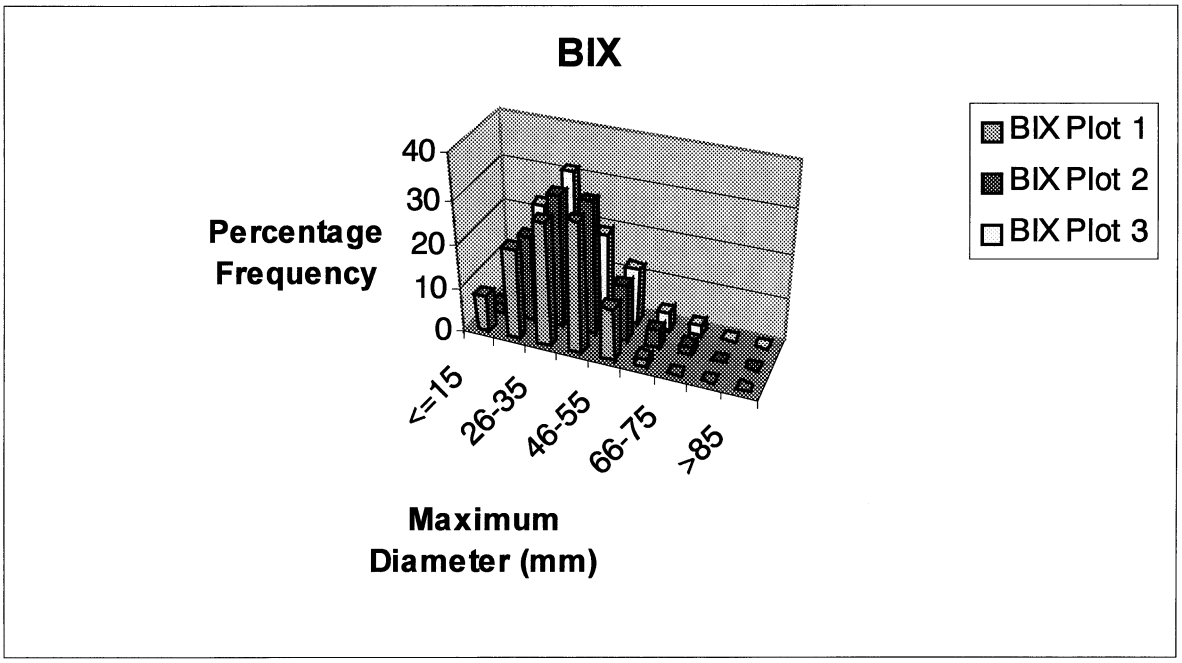


Table 4. Distribution of maximum branch diameter per cluster as estimated from Tree-BLOSSIM simulations.

Branch size(mm)	BLOSSIM-Plot 1	BLOSSIM -Plot 2	BLOSSIM -Plot 3
<= 15	14.86	11.3	16.18
16-25	18.29	15.25	18.5
26-35	21.71	22.6	24.86
36-45	20.57	24.29	15.03
46-55	14.29	12.43	14.45
56-65	9.71	6.78	7.51
66-75	0.57	5.08	3.47
76-85		2.26	
>85			

Figure 2. Percentage frequency of maximum diameter in a cluster as predicted by TreeBLOSSIM.

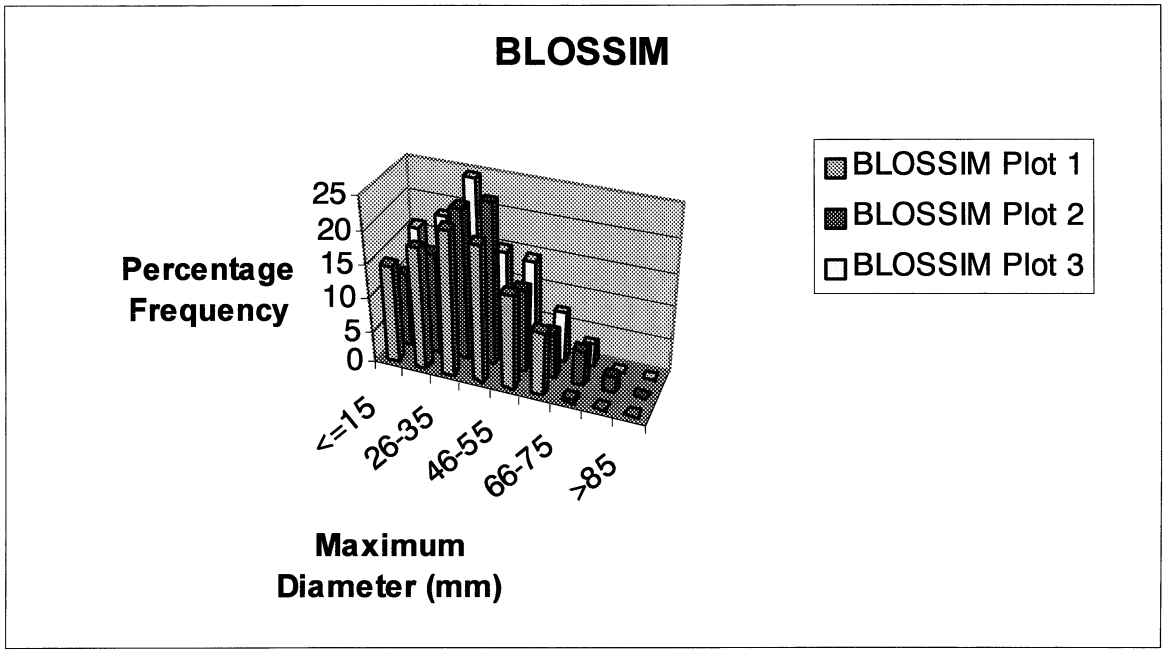
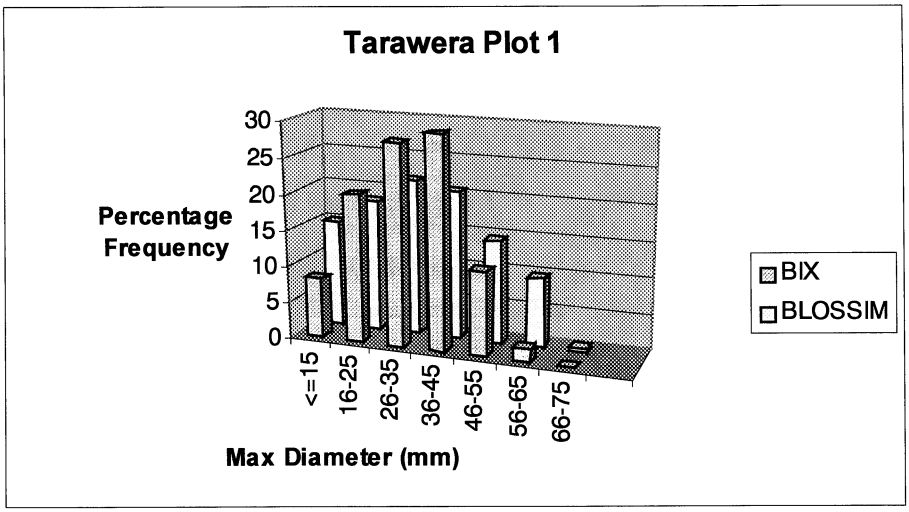
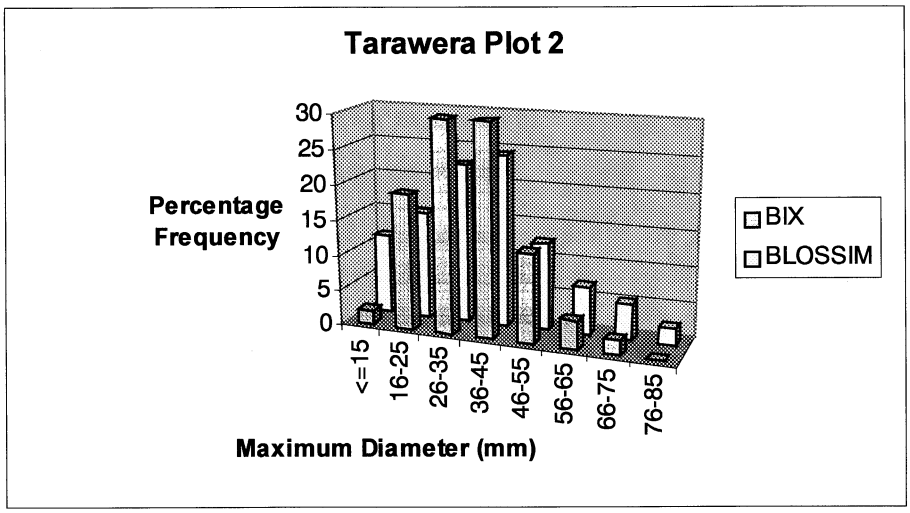
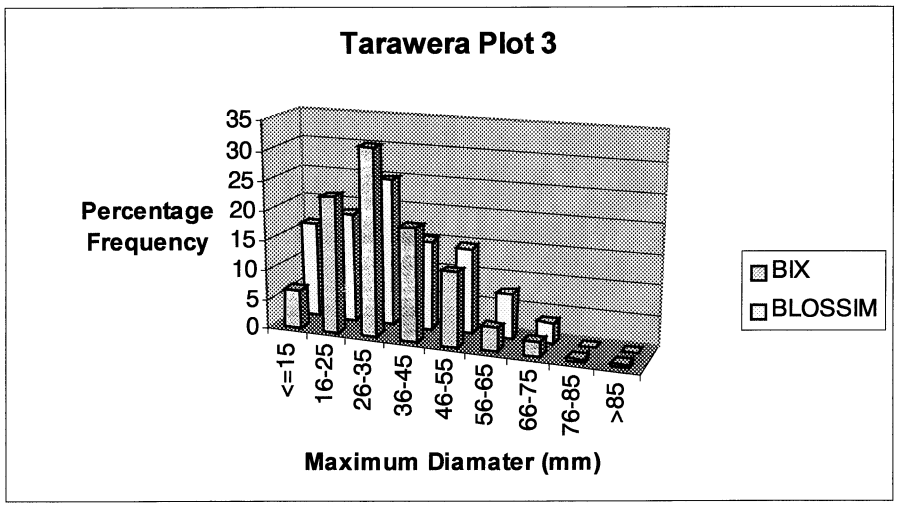


Figure 3. Comparison of percentage frequency distributions for maximum branch diameter in a cluster between data recorded in BIX database (BIX) and TreeBLOSSIM predictions (BLOSSIM).







DISCUSSION

For these three plots, TreeBLOSSIM generally predicted higher percentage of smaller size and higher percentage of larger size branches compared to BIX data (Figures 3 –5). There was little variation in either the actual or predicted distributions between these 3 plots (Figure1 and 2).

These results need to be treated with caution since they are only the result from one experiment. Further analyses are needed to determine the trends across a range of sites.

The study was abandoned after presentation to the Stand Growth Modelling Cooperative in July 2001 due to the following reasons:

1. The limited time available for this study was mainly used in matching the BIX database with the PSP database. This was particularly time-consuming because the reference to PSP plot number was poorly documented in the BIX database.
2. A number of PSP plots could not be used due to tree height data not being recorded up to 1 year-prior to the BIX data. Several of these plots could have been used if a longer time gap was allowed.
3. The non-confidential data being considered is from unimproved seedlots whereas most of the data used in developing the branch model in TreeBLOSSIM is from 850 seedlots.
4. Most of the resource is now from improved seedlots. Hence there is limited value in determining whether TreeBLOSSIM gives accurate predictions for historic seedlots.

FUTURE DIRECTION

It is considered that PhotoMARVL offers more value for sensitivity analysis of TreeBLOSSIM. It can be used in current Stand Growth Modelling Cooperative trials. As well as providing data to test TreeBLOSSIM, it will expand our knowledge of branching within these trials. Furthermore it will provide a permanent record of the trees allowing reasons for differences between model output and measurements to be determined.

Another approach is for us to run TreeBLOSSIM for selected PSP for each forest owner, and ask them to provide us with feed-back as to whether the simulated results appear realistic.

REFERENCES

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