Nationwide Yield Prediction by Adding Up Yields of Prefectures

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Until now, it was difficult to conduct the nationwide-scale yield prediction by means of adding up the yield of each prefecture because only a part of prefectures could provide reliable harvesting information. The purpose of this study is to predict the harvesting areas and volumes in all 47 prefectures based on the harvesting data in some specific prefectures.

To investigate harvesting tendencies we employed the harvesting data about final cutting areas from 1999 to 2003 in the private planted forests in 22 prefectures that seemed to provide reliable data compared with the statistics about the amount of timber traded during the corresponding period.

Employing the harvesting data in 22 prefectures we estimated the felling probability for each of the prefectures, and then the harvesting patterns (the felling probabilities from 1st to 20th age class) were classified into several groups by the decision tree method. Furthermore we classified other 25 prefectures into the preceding groups by a discriminant analysis with the socioeconomic predictor variables. For a validation, harvesting volumes were calculated from the estimated harvesting patterns and compared with the amounts of timbers traded in markets.

The results were as follows: The harvesting patterns in 22 prefectures were classified into three groups; group1 – high, 2 – moderate and 3 – low in their timber production level. The prediction accuracy was 85% in the discriminant analysis. 25 prefectures were classified into 7 group1 prefectures, 12 group2 and 6 group3 by the estimated discriminant equation. The total sum of predicted yields in 47 prefectures was 97,155 ha/5yrs that amounted to 24,277 thousand m$^3$/5yrs. The predicted timber volume for the sum of 47 prefectures was 10% higher than the observed values; above all, Iwate, Yamagata, Ibaraki and Toyama prefectures had comparatively large relative errors between 7 – 20% in their predictions, which might result from the misclassification in the discriminant analysis. On the whole, the proposed method was useful for the nationwide-scale yield prediction.