Teak growth doubles in the Lao Mountains depending on the control of stand density and topographic conditions

Teak plantations are being promoted in the mountainous areas of Lao PDR including in Luang Prabang Province. However, teak growth varies greatly depending on the conditions of the planting site. Clarification of the factors related to the growth of planted teak and establishment of a suitable land determination method will be the basis of effective land use in mountainous areas.

In this study, the growth history of teak trees was estimated from annual rings for each of the three canopy trees felled from 27 plots of teak plantations aged 20 and over in the southwestern part of Luang Prabang Province. A total of 81 teak trees were felled and cut into round slices at regular intervals to create a disk, and the annual rings were read. Based on the analysis of annual rings, we estimated the diameter growth and tree height growth process of each teak tree with the age and analyzed the relationship between tree growth and topographic conditions as well as stand density.

The diameter growth (Fig. 1, left) and tree height growth (Fig. 1, right) of planted teak differ by about twice.

The diameter growth and tree height growth of teak individuals are significantly affected by the shape and gradient of the slope to be planted (Fig. 2). For the fast growth of teak, the gradient of slope should be gentle, with the concave part considered better than the convex part and the lower part deemed better than the upper part of the slope.

In the study area, the actual stand density of planted teak was about 500 to 1,600 trees/ha at the stand age of 20 years and over. In that range, the lower the tree density, the better the diameter growth and tree height growth.

This teak suitability determination method can be disseminated to farmers by technical instructors because the index used can be obtained by simple measuring instruments or visual measurement at the site. Substituting the output of the prediction formulas for diameter growth and tree height growth into the volume estimation formula leads to the prediction of teak yield. This result is expected to be applied to areas with similar climate, meteorology, geology, and soil conditions (for example, northern Thailand) with some correction.

(A. Imaya [Forestry and Forest Products Research Institute],
S. Vongkhamho [Forestry Research Center, NAFRI, Lao PDR],
C. Takenaka [University of Nagoya], K. Yamamoto [University of Nagoya],
H. Yamamoto [University of Nagoya])

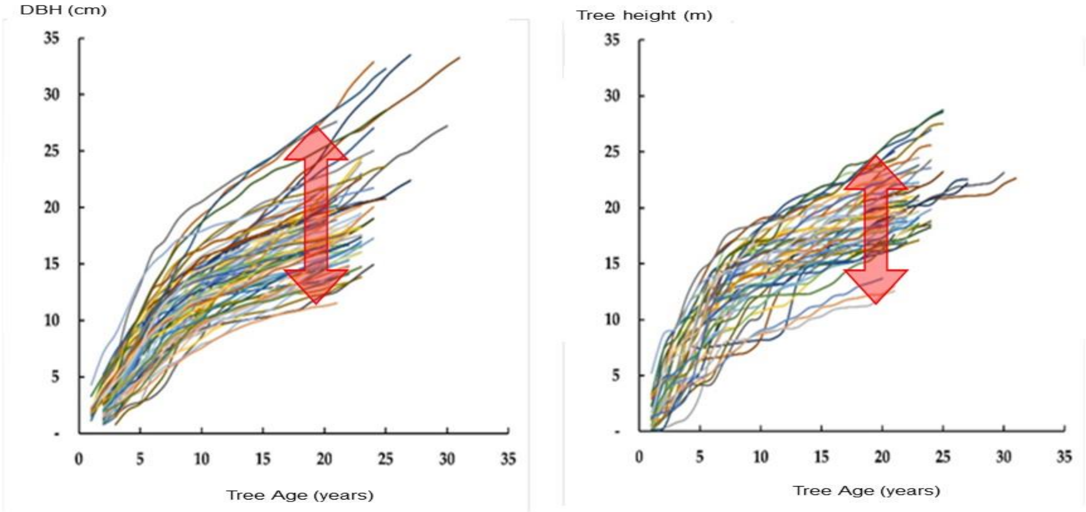

Fig. 1. Diameter growth (left) and height growth (right) of planted teak

Note: Growth history was estimated from annual rings for each of the three canopy trees felled from 27 plots of teak plantations.

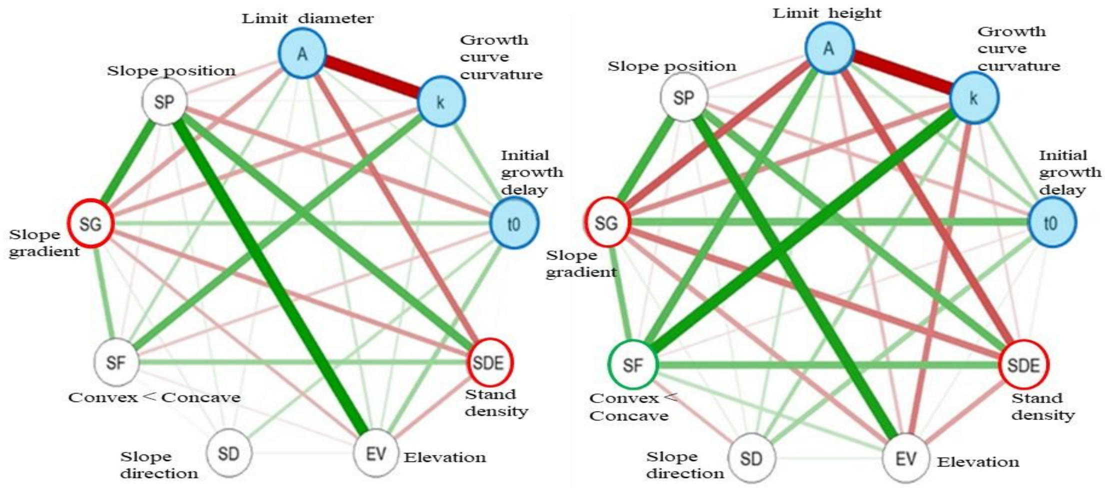

Fig. 2. Partial correlation network between DBH–age growth curve parameters and topographic conditions (left) and height–age growth curve parameters and topographic conditions (right)

Note: The green and red lines indicate positive and negative correlations, respectively. The line thickness indicates the strength of the Spearman's partial rank correlation. The letters in blue circles indicate variables of tree growth parameters A, k, t_0 in Mitscherlich growth function; $Y=A(1-\exp(-k(t_i-t_0)))$. Other circles indicate stand density (SDE) and topographic conditions such as elevation (EV), slope gradient (SG), slope direction (SD; N<E<S<W), slope form (SF; convex<concave) and slope position (SP). The factors in green circle ○ and red circle ○ have significant positive and negative relationships with growth at the 1% level.

Reference: Vongkhamho et al. (2022) *Forests* 13, 118. https://doi.org/10.3390/ f13010118

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