Development of the Decision Support System for Sustainable Forest Management Balancing Public Benefit and Economics

Tohru Nakajima (Graduate School of Agricultural and Life Sciences, The University of Tokyo)
nakajima@fr.a.u-tokyo.ac.jp

Our study aims to develop a decision support system for sustainable forest management that balances public benefit and economics. The site and stand conditions were estimated by using three-dimensional measurements derived from field surveys, airborne LiDAR, and aerial photographs. Based on the actual site and stand conditions (e.g., stand height, diameter at breast height, stand density), stand growth predictions, wind hazard risk assessment, etcetera, were conducted. The even aged plantation forests have various silvicultural practice records and initial conditions [1]. *Cryptomeria japonica*, *Chamaecyparis obtusa*, *Larix kaempferi*, and *Abies sachalinensis*, which have long-term, multitemporal field measurement records, were the main species targeted for the development and improvement of the stand growth prediction system. Japanese carbon credit guidelines allow the use of the stand growth prediction system, which simulates timber growth and carbon stock.

Using these prediction systems and analysis of government forestry subsidy systems, public benefit (e.g., carbon sequestration) and economic (e.g., forestry profitability) factors were estimated to develop a decision support system on various spatio-temporal scales [2]. The total forest management optimizations were also conducted by considering the forestry profits, labor requirements, timber production, etcetera, as objective functions and restrictions [3].

Under scenario-based simulations, depending on the intensity of silvicultural practices, a decision support system for sustainable forest management that balances public benefits and economics was developed as applicable from the stand to the national level. Approximately, 30% of the total plantation forest throughout Japan was found to be sustainable plantation forest area for producing timber economically. It is important to consider the difference in economic costs and public benefits at the local level for establishing rational sustainable forest management planning. In particular, the potential of the timber volume was found to be distributed in areas to the north of the Tohoku region.

In this study, a simulation system that enabled us to increase the output of information to optimize profitability and positive sociological output depending on various needs, such as labor requirements (related to Plan-Do-Check-Act cycles for practical forest management), has been developed.

References

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