（学位第３号様式）

学 位 論 文 要 旨

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題　目	Assessment of strategic forest management system in the subtropical forest of Okinawa Main Island (沖縄本島の亜熱帯森林における戦略的森林管理システムの評価)

The 27,161ha of the Yambaru Forest is managed by various stakeholders, which includes the Japanese government, Okinawa Prefecture, individuals and three municipalities – Kunigami, Ogimi and Higashi – with different management goals. The critical issue occurs in Yambaru is on how to improve society's perception and understand the sustainable use of forest resources for a stable and efficient forest management system. Therefore, this study was carried out to assess the potential management systems of Yambaru Forest, which is subject to diverse vegetation and land use conditions. The three main parts of the study consist of i) the dynamics of Yambaru forest, ii) elevation-based zonation for conservation forest, and iii) strategic management option for production forest.

Firstly, the vegetation structure and forest land use and land cover (LULC) attributes were assessed to explain the existing forest conditions. Vertical vegetation structure assessed within 20 sample plots showed that Shima walichii were the dominant species with mean diameter-at-breast height (dbh) and tree height of 10.3cm and 8.4m respectively. Major trees were concentrated in the middle layer (5-10m), and trees of smaller in height (<5m) significantly contribute to the high forest diversity. The forest canopy structure, as delineated from Light Detection and Ranging (LiDAR), yielded a low accuracy due to the complex vegetation and topographical conditions. In addition, the forest LULC was evaluated using high-resolution satellite image of IKONOS with different image classification methods. Pixel-based classification derived the highest accuracy of 83.7% compared to the object-based classification of 81.3% in detecting the land cover attributes of logged-over forest and the adjacent areas. The study discovered that the post-harvest activity by silvicultural treatment of replantation had a positive impact through the reduction of bare area and increased amount of vegetation cover.

Secondly, the potential forest management by zoning system was introduced based on elevation gradients. The Potential Conservation Areas (PCAs) at different elevation levels were evaluated using digital terrain data along with information concerning forest ownership, protected parks, watershed areas, vegetation and forest accessibility. The PCAs decreased with an increased of elevation. The optimum PCAs at the middle-peak level illustrated the continuous connection of forest area with fewer forest patches. From the Digital Canopy Height Model (DCHM), the mean tree height was higher at this altitude than at other levels. The result was then compared with the zoning plan by the Okinawa Prefecture. The feasible measure of elevation gradients integrated with various consideration factors provide a better understanding of site selection for PCAs in the Yambaru Forest.

Finally, strategic timber management options produced by HARVEST allocation model were examined on the different harvesting procedures. With the small clear-cutting method, the estimated volume of timber production was 12% higher compared to the selective-cutting method. Mean patch sizes and forest edges were the significant factors that interacted with harvesting practice. For a long-term forest planning, the model is indispensable to predict cost-effective, appropriate and relevant timber harvesting options to improve timber management strategy towards a sustainable yield of timber production.

The result from this study is expected to improve community perception and comprehension on sustainable resource management in a practical approach. It could also be beneficial to support decision-making process for strategic forest management in the Yambaru forest.