The Climate Niche Impacts of Critically Endangered Plant Species'Distributions of Thailand

By Matchima Laithongkham
Advisor: Asst.Prof.Dr Watit Khokthong
Environmental Science Program, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand
Contact: matchimababe@gmail.com, Advisor: Watit@gmail.com

ESRC Environmental Science Research Center, Faculty of Science, Chiang Mai University

FACULTY OF SCIENCE CHIANG MAI UNIVERSITY

ABSTRACT

Understanding species distribution and climatic niches is essential for effective conservation and restoration planning. This study applied the Maximum Entropy (MaxEnt) model in RStudio to evaluate the influence of climatic variables on the distribution of three critically endangered plant species in Thailand: Siamese rosewood (*Dalbergia cochinchinensis*), Agarwood (*Aquilaria crassna*), and Cycad (*Cycas tansachana*). Occurrence records were combined with bioclimatic variables to model habitat suitability. The model used 35 records for Siamese rosewood, 28 for Agarwood, and 15 for Cycad, with high predictive accuracy (AUC = 0.98, 0.95, and 0.86).

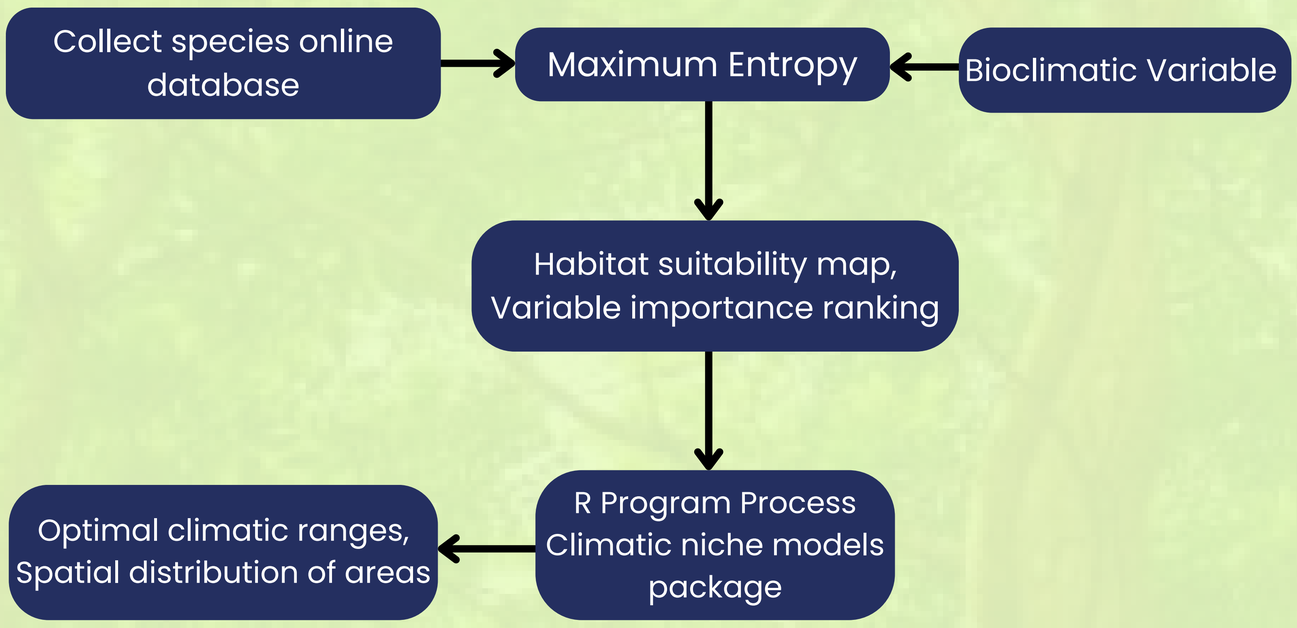
INTRODUCTION

Biodiversity loss is a major global environmental issue affecting ecosystem stability and species survival. In Southeast Asia and sub tropical Asia, critically endangered plants such as *Dalbergia cochinchinensis*, *Aquilaria crassna*, and *Cycas tansachana* have restricted distributions and are highly sensitive to environmental change. This study uses the Maximum Entropy (MaxEnt) Species Distribution Model to evaluate climatic niches and predict habitat suitability to support conservation and restoration planning.

OBJECTIVE

To identify the specific habitat suitability, and bioclimatic variable where three species are preferred based on the MaxEnt model.

METHODOLOGY



Tools

IUCN GBIF iNaturalist MaxEnt RStudio WorldClim

RESUITS



Figure1 *Dalbergia cochinchinensis*



Figure2 *Aquilaria crassna*



Figure3 *Cycas tansachana*

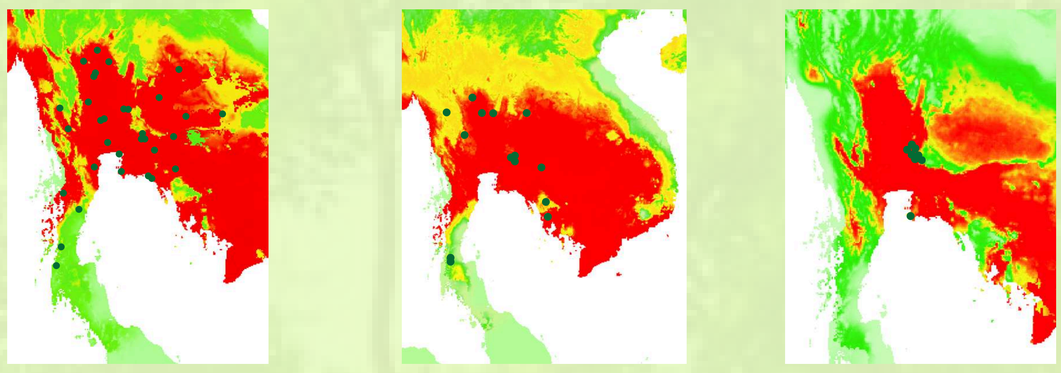
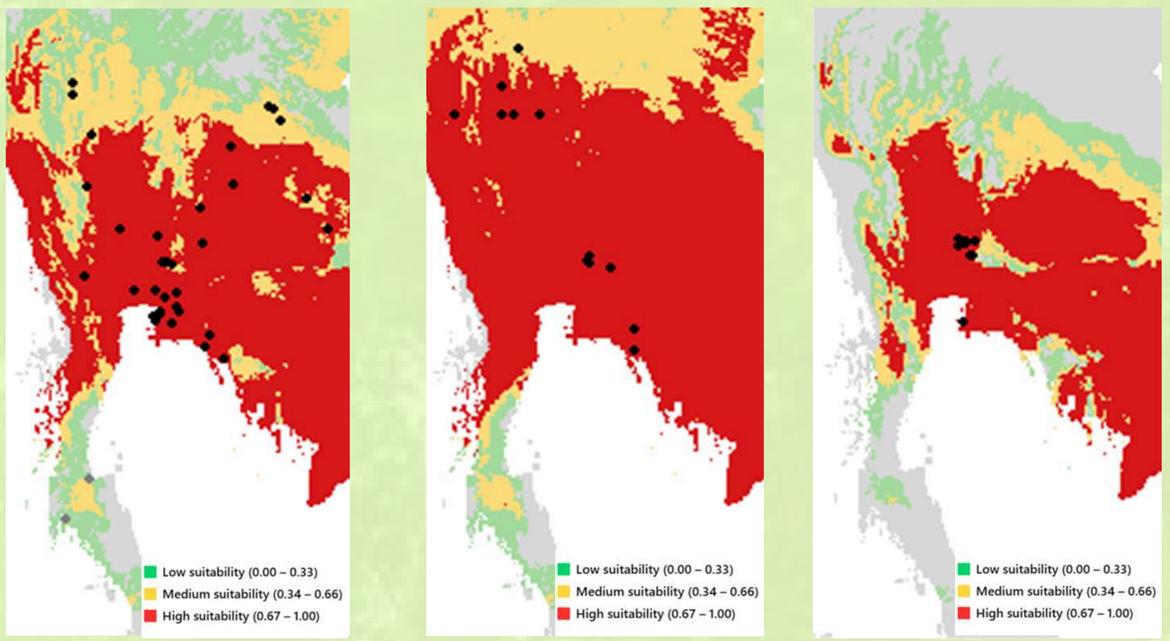


Figure4 Current habitat suitability map of three species



Dalbergia cochinchinensis *Aquilaria crassna* *Cycas tansachana*

Figure5 Future Climate Nihe 2050 (2041s & 2060s) SSP2 suitability map of three species

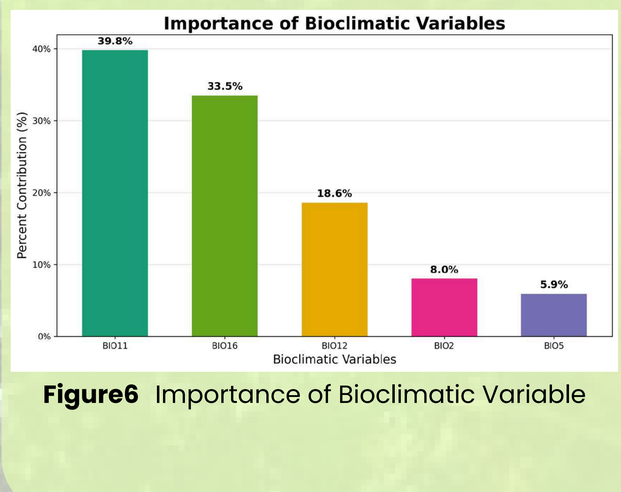


Figure6 Importance of Bioclimatic Variable

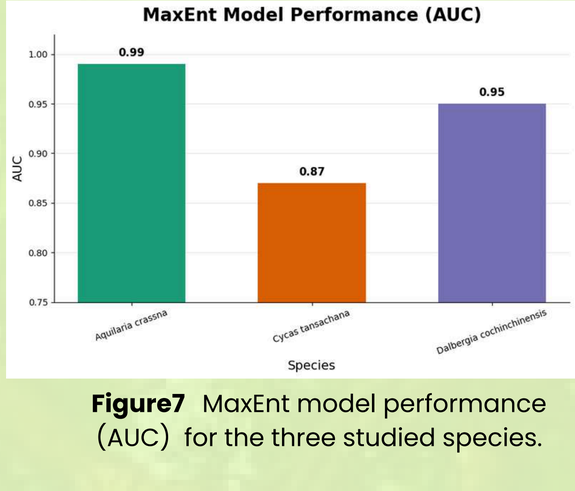


Figure7 MaxEnt model performance (AUC) for the three studied species.

CONCLUSIONS

- All three species, bio 11 (Mean Temperature of Coldest Quarter) consistently showed the highest permutation importance.
- Habitat suitability maps provide important guidance for conservation planning, restoration programs, and identification of unsuitable planting areas.
- Expanding climate-based Species Distribution Models (SDMs) to more native species can support sustainable forest restoration under climate change.

REFERENCE

1. Frontiers in Plant Science article Radbouchoom, S. (2025). Forecasting habitat suitability of tropical karst plants in a warmer world — Thailand's Begonia diversity as a key example. Frontiers in Plant Science. Advance online publication. https://doi.org/10.3389/fpls.2025.1496040
2. Plant Ecology (Springer) article Lukman, A. H., Shitara, T., Aihara, T., Fajrin Hidayat, M., Wiryono, Tang, C. Q., Kamijo, T., & Matsui, T. (2025). Climate-driven niche dynamics of endangered Castanopsis argentea and C. tungurrut in Indonesia. Plant Ecology. Advance online publication. https://doi.org/10.1007/s11258-025-01550-w