

Restoring Carbon-Rich Peat Swamp Forests: Early Outcomes of the Badas Tree Planting Project, Brunei Darussalam

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Abstract

Tropical peat swamp forests are among the world's most important terrestrial carbon stores, providing long-term carbon sequestration while supporting unique biodiversity, regulating hydrological processes, and reducing fire risk. Across Southeast Asia, however, extensive drainage, logging, and land-use change have degraded many peatlands, resulting in substantial greenhouse gas emissions and loss of ecosystem functions. Restoring degraded peat swamp forests using native tree species is increasingly recognised as a nature-based solution that contributes to climate change mitigation while enhancing ecosystem resilience.

The Badas Tree Planting Project is a long-term restoration initiative led by Universiti Brunei Darussalam in collaboration with the Forestry Department and multiple stakeholders to restore degraded peat swamp forest in Brunei Darussalam using threatened native peat-specialist dipterocarps. Across two restoration phases, a total of 535 saplings were established over 5.94 ha, comprising *Rubroshorea albida* (Vulnerable) and *Dryobalanops rappa* (Endangered). A standardised monitoring framework was implemented to assess survival, height, diameter at breast height (DBH), and leaf production through repeated field censuses.

Five-year monitoring of *Rubroshorea albida* recorded an overall survival of 21%, with 70 surviving individuals now functioning as small trees. Surviving trees continued to exhibit substantial structural development, reaching a maximum height of 7.40 m and a maximum DBH of 12.99 cm. Meanwhile, *Dryobalanops rappa* maintained an encouraging 89% survival after six months, accompanied by continued increases in height and stem diameter, demonstrating successful early establishment under degraded peat swamp conditions.

These findings demonstrate that science-based restoration using native peatland tree species can promote long-term ecosystem recovery while strengthening the climate mitigation potential of degraded tropical peatlands. Continued monitoring will enable future evaluation of biomass accumulation, carbon sequestration, and ecosystem development, providing valuable evidence to support peatland restoration and climate policy in Brunei Darussalam and across Southeast Asia.

References/ Publications

Sukri, R.S., et al. (in preparation). Long-term monitoring of threatened dipterocarps in the Badas Peat Swamp Forest restoration programme.

Access to relevant information

Badas Tree Planting Project, Institute for Biodiversity and Environmental Research (IBER), Universiti Brunei Darussalam.