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## A Comparative Study of Tree Species Responses to Enrichment CO<sub>2</sub> Over A Six-Year Period in Tekam Forest Reserve, Jerantut, Pahang

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### Structured Abstract

**Background:** Industrialization has increased greenhouse gases, particularly CO<sub>2</sub>, due to urbanization, agriculture, and industrial processes which leads to climate change. Climate change affects on Malaysian forests including physiological processes, forest distribution, and biodiversity, as these are influenced by air temperature, moisture, CO<sub>2</sub> levels, and soil nutrients. A free-air carbon dioxide enrichment (FACE) system serves experimental platforms to explain plant responses to escalating CO<sub>2</sub> concentration, offering the most realistic conditions for stimulating the effects of anticipated enrichment CO<sub>2</sub> levels. The purpose of this study is to assess and compare the response of tree species and quantify tree community structure under enrichment CO<sub>2</sub> in the FACE plot over a six-year period in Tekam Forest Reserve, Jerantut, Pahang.

**Methods:** All trees within FACE plot were measured and identified with the assistance of FRIM botanist. Specimens were classified by family, genus, and species in line with tree species composition. In this study, species diversity index was assessed to determine species richness and species evenness. Abundance parameter and biomass distribution were identified tree group structure of the study site. Comparative statistical tests were evaluated species diversity, richness, and biomass distribution over six years.

**Results:** This study shows 475 trees from 124 species, 78 genera, and 37 families were recorded in 2018 within the FACE plot at Tekam Forest Reserve. By 2023, this decreased to 281 trees, 94 species, 69 genera, and 34 families. The Margalef Index fell from 21.92 in 2018 to 11.43 in 2023, and the Shannon-Weiner Index declined from 4.26 to 3.38, indicating a drop in species diversity. The Evenness Index also decreased slightly from 0.51 to 0.43. *Xylopia ferruginea* had the largest DBH and became the dominant species with a SIV<sub>i</sub> of 9.24%. Total biomass increased from 15.40 t/ha to 17.47 t/ha.

**Conclusion:** The study found that CO<sub>2</sub> enrichment changes tree species responses. Establishing control sampling areas and investigating edaphic factors over ten years is recommended to understand species diversity. Further research on the FACE system is needed to mitigate climate change and track changes in tree species using field surveys and genetic analysis.

**Keywords:** Climate change, enrichment CO<sub>2</sub>, FACE, species composition, Tekam Forest Reserve

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