

# 疏伐作業對杉木人工林光合作用及碳吸存影響之研究

## Effects of thinning practices on the photosynthesis and carbon sequestration of *Cunninghamia lanceolata* plantations

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### 研究計畫中英文摘要：

#### (一) 計畫中文摘要

關鍵詞：碳吸存、二氧化碳剖面、杉木、土壤呼吸、光合作用

本計畫為「人工林生態系經營及生物多樣性保育研究之因應策略」之一個子計畫，研究目的在瞭解疏伐作業對杉木人工林碳吸存的影響。本計畫將從(1)單株林木光合作用CO<sub>2</sub>固定量，(2)林內垂直剖面CO<sub>2</sub>濃度動態變化，以及(3)林地土壤呼吸三方面來探討疏伐作業對杉木人工林碳吸存的影響。試驗地將在林試所蓮華池研究中心進行，選擇不疏伐對照區及疏伐度50%處理區，共兩區進行比較。將在上述兩區搭設鐵塔測定單株杉木陽葉及陰葉的光合作用率，並測定其光合作用光反應，供將來建立樹冠層光合作用碳吸存模式。林內CO<sub>2</sub>濃度垂直剖面分布將由自動取樣系統進行日變化及季節變化的監測。土壤呼吸量的測定將採購土壤CO<sub>2</sub>通量測定系統進行不同時間、不同空間的監測。由上述三種層次的監測可比較疏伐作業對杉木林CO<sub>2</sub>吸存量及CO<sub>2</sub>釋放量的差異，可提供人工林生態系經營在碳吸存方面的重要資訊。

#### (二) 計畫英文摘要

Key words: carbon sequestration, CO<sub>2</sub> profile, *Cunninghamia lanceolata*, soil respiration, photosynthesis.

This proposed study is a subproject of the integrated project entitled “strategy of ecosystem management in plantation forests and their biodiversity conservation.” The objects of this study are to understand the effects of thinning practices on carbon sequestration of *Cunninghamia lanceolata* plantations. Tree experiments will be conducted in this study. Firstly, the diurnal photosynthetic rates of both sun and shade leaves will be measured *in situ* at the upper canopy layers. We will establish two towers with platforms to reach the canopy top of *Cunninghamia* trees. Photosynthetic light responses of both sun and shade leaves will be measured in the plantation. These data could be used to construct a canopy photosynthesis model in the future. The second approach is to monitor CO<sub>2</sub> profiles within the plantations. The daily as well as seasonal variations in CO<sub>2</sub> profiles will be measured. Finally, Soil respiration will be monitored by using a commercially available soil CO<sub>2</sub> flux system, which is LI-8100 system. Soil CO<sub>2</sub> flux in both control plot and treatment plot will be monitored at various spatial and temporal resolutions. By measuring the photosynthetic CO<sub>2</sub> fixation, the CO<sub>2</sub> profiles, and the soil CO<sub>2</sub> flux, carbon sequestration between thinned and un-thinned *Cunninghamia* plantations can be compared. In addition, information obtained from this study can provide useful information regard to ecosystem management on our plantation forests.