

# **Estimation of Planted Tree Growth using Ground-based Observation and Satellite Remote Sensing Data**

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Tropical forests have extreme potentials as environmental resources. These include forest products, rich ecosystems, genetic biodiversity and countless biosphere services. However, most of the natural forests in the tropics are nowadays deeply threatened by human activities from outside. For about three decades, UNESCO has been promoting its Man and Biosphere (MAB) Programme, for sustainable use and conservation of biosphere resources by humans, who are themselves part of the global biosphere. Forests planting positively contributes to MAB activities: it provides timber or pulp searched for their great economic values, as well as invaluable biosphere services such as CO<sub>2</sub> absorption, stable soils, clean water and many other ecosystem amenities. In this research, we aim at monitoring the growth of planted trees in Indonesia, and at estimating their biomass parameters using rigorous on-site surveys, satellite remote sensing techniques (optical and microwaves) and GIS (Geographic Information Systems).

Tropical weather conditions (atmospheric water vapor and clouds) seriously affect the acquisition of high quality optical satellite data, even though optical remote sensing imageries provide us with easily comprehensible image information. Therefore, using microwave satellite data, which are less affected by atmospheric conditions, will provide a powerful source of the spatial information. In this research, GIS-based algorithms for a combined use of passive (optical) and active (microwave) satellite remote sensing data will be developed and applied in order to monitor the planted trees growth and estimate their biomass parameters for sound planning and decision making. Ultimately, the analysis results of this research will provide us with fundamental and critical information to be the base of sound decision-making for sustainable forest management in the tropics.