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Carbon Footprint of Commercial Forest Plantations (*Eucalyptus grandis*, *Pinus patula*) and Protection Forest Plantation (*Guadua angustifolia kunth*) in Colombia

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Abstract

Life cycle analysis (LCA) is a criterion to identify and quantify environmental benefits for process or products. LCA is useful to determine different environmental impact categories in the whole production chain or part of it. Carbon dioxide mitigation improves the global environmental impact of a specific product expressed as carbon footprint by the substitution of raw materials and processes to combine environmental and economic benefits. In this work, LCA was performed to determine the carbon footprint for two commercial forest plantations (*Eucalyptus grandis*, *Pinus patula*) and one protection forest (*Guadua angustifolia kunth*) in Colombia. Forestry operations were divided into three categories: seedlings production, planting and soil preparation, and maintenance and control. The felling process was not considered. The amount of plants per hectare was established for each species. The OpenLCA® software was used to evaluate emissions in global warming potential, and the Ecoinvent v3.2 database for the inputs of life cycle inventory data for different secondary processes. The inputs that feed the forestry processes were obtained from the management and commercial forestry plans for the evaluated species. Results showed that the variations depend on species planted and their maintenance, which includes different levels of fertilization, as well as different intensity of forestry operations. The maintenance and control stage have the highest contribution to total emissions of CO₂, being a considerable result that counteracts the CO₂ captured by the plantations.

Keywords: carbon footprint, life cycling analysis, OpenLCA