Investigating Combustion Characteristics of Three Native Timbers: *Araucaria cunninghamii, Intsia bijuga* and *Pometia pinnata* for Bioenergy Source

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Abstract

Global population growth, socio-economic boom and industrialisation exert enormous pressure on the use of non-renewable fossil fuel products as a source of energy over the past decades. The consequential impact on the environment as a result of burning fossil fuels is the emission of toxic gases (carbon) and global warming. The focus now is to find an alternative energy (green energy) from renewable, sustainable and environmentally benign sources (e.g. hydro, solar, wind, geothermal and organic biomasses) to substitute the use of fossil fuels. Green energy (bio-energy) can be ideally derived from biomass due to its wider/ready availability and ease of conversion. Biomass such as agroforestry wastes/residues can be converted to produce bio-energy via combustion, gasification and pyrolysis processes. For instance, wood is a good source of energy when converted through above processes and has been practiced by ancient civilisation. Since then the process of converting wood for bioenergy was adopted on industrial scale in modern times. The benefits are that wood is a renewable resource and carbon released through combustion is said to be **"carbon neutral"** as carbon is absorbed by plants and recycled in nature.

This case study investigated combustion characteristics of three native commercial timbers (*Araucaria cunninghamii, Intsia bijuga* and *Pometia pinnata*) specifically to measure and analyse their energy (heat calorific value) outputs, compare heat calorific values produced from solid wood cubes and sawdust pellets within and between species and analyse ash contents. The results indicated that the hardwoods *(P. pinnata* and *I. bijuga)* were potential fuelwood species for bio-energy with low ash remains. On the other

hand, *A. cunninghamii* (softwood) generated high heat energy from the sawdust pellets but the ash remains was high and thus, this indicated low potential as fuelwood.