

Modelling sustainability of primary forest residues-based bioenergy system

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Abstract

Lack of access to modern energy limits socio-economic development in developing countries, particularly in rural communities. Primary forest residues are potential bioresources for producing modern forms of energy, which can be supplied to the rural communities. However, variations in production of primary forest residues over time exacerbate sustainability challenges for developing sustainable bioenergy systems based on the residues supply chains. A model is presented showing dynamics of primary forest residues, as bioenergy feedstocks, stemming from forest plantations management, harvesting systems, and stakeholder influence and interest along the bioenergy production value chain. Using a case study of the Viphya forest plantations established for timber production in Malawi, management and harvesting systems, sawmilling technologies, residues production and post harvesting management were assessed and key sustainability challenges along the residues supply chain have been identified. The decrease in stocks of mature stand over time results from over-exploitation of mature stand for timber production, delayed replanting, high death rate of replanted trees and underinvestment in

plantations management. An integrated framework for forest management and bioenergy production can promote sustainable harvesting of mature stand for timber and primary forest residues production which in turn can promote availability and reliability of forest residue-based bioenergy systems.

Key words: Systems approach, primary forest residues, sustainable bioenergy production, forest plantations, Malawi