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### ENGINEERING DEVELOPMENTS FOR SMALL-SCALE HARVEST, STORAGE AND COMBUSTION OF WOODY CROPS IN CANADA

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**ABSTRACT** Woody crops have been used for thousands of years by man as the primary source of energy for heating and cooking. They remain an important source of energy in less developed countries but have been largely replaced by fossil fuels, nuclear energy and hydroelectric power in developed countries. The role of woody crops for energy has been revitalized in developed countries with the need to diversify sources of energy. The current research program on woody crops at Agriculture and Agri-Food Canada includes the recent development of a woody crop harvester to collect small size trees (< 75 mm diameter) in plantations and in natural growth. The harvested package is a round bale, typically 1.2 m wide by 1.5 m in diameter; it allows natural drying from about 50% moisture at harvest down to 30% outside and 20% under shelter after four to six months of storage. The combustion value of woody crops averaged 19.4 GJ/t on a dry matter basis with little variation (standard deviation of 0.48 GJ/t DM). The woody crops can be pulverized into fine particles (< 3 mm), artificially dried to 10% moisture and processed into pellets for combustion. However, in a practical trial, more than 7.5 MJ/t DM were required to produce pellets (2.0 MJ/t DM for mechanical process and 5.0 MJ/t DM for drying) without providing more energy than coarse wood chips (< 50 mm). Several rural application (heating community and farm buildings, drying crops) can use locally grown woody crops (willow) or forest residues (branches, bark) in the form of chips to replace current fossil energy sources such as oil, propane or natural gas. The use of woody crops is intended in areas where abundant land is available for forest or new plantations. Sustainable land management can reduce the use of fossil fuel while generating increased value to otherwise neglected woody biomass. The presentation describes such potential applications in Canada.

**Keywords:** Woody, bale, biomass, drying