ABSTRACT The bio-baler is an alternate approach to harvest woody crops as round bales, typically 1.2 m wide by 1.5 m diameter (4’ x 5’). Originally developed for short-rotation willow in plantations, the bio-baler is now able to harvest a wide range of woody crops with a basal diameter up to 150 mm (6”). It can improve management of wild brush, forest understory vegetation, encroaching small trees on abandoned land, in addition to its original role of harvesting young planted trees. It allows easy handling, storage and transportation to sites where the biomass can be used for energy or other applications. In fall 2009, a third generation bio-baler was used on eight different sites across Minnesota (Waseca, Madelia, Faribault, Afton, Ogilvie, Hinckley, Aurora and Hibbing). A total of 160 bales were harvested at these sites. Average bale mass (green crop) was 466 kg (minimum of 403 kg; maximum of 528 kg). Bale density averaged 296 kg/m³ (min. 204 kg/m³; max. 388 kg/m³). Moisture content averaged 44.9% (min. 36.0%, max. 51.3%). Bale dry matter density averaged 163 kg DM/m³. Harvested biomass per unit area ranged from 2.49 t/ha on lightly covered land to 55.24 t/ha on densely covered land (average 14.72 t/ha). Biomass harvested (recovery) was 72.3% of original cottonwood in Madelia; 75.8% of original oak and maple shrubs in Afton; 73.5% of poplar regeneration in Hibbing. Actual harvest rate averaged 17.40 bales/h (min. 2.31 bales/h; max. 34.22 bales/h). Mass harvest rate averaged 7.78 t/h (min. 1.22 t/h; max. 14.20 t/h). Harvest rate was higher in dense vegetation. Diesel fuel consumption for harvest averaged 1.75 L/bale (min. 0.52 L/bale; max. 4.74 L/bale). Fuel consumption was lowest when harvesting dense crops. The data will be used to estimate cost of harvesting woody biomass under various environments. The bio-baler will be compared with alternate removal techniques to improve land management and biomass recovery.

Keywords: Bio-baler, harvest, woody, biomass, Minnesota