Willow harvesting using a small-scale system in Michigan

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Electricity production from renewable sources has been steadily increasing in Michigan since 2009. The large areas of pasture and hayland available in Michigan present a unique opportunity for the potential development of Short Rotation Woody Crops (SRWC). For SRWC to be competitive with fossil fuels and other forms of renewable fuels, the machinery cost and harvesting productivity of reconfigured forage harvester must be evaluated. In this project, a small-scale harvesting system, including a John Deere 7330 tractor, a Ny Vraa JF192 willow harvester, and a Komatsu CK35-1 multi terrain loader was evaluated in a 3-year-old willow plantation in Michigan. The production rate of the harvesting system was determined to be 3.94 dry tons per hour. with an estimated hourly cost of $52.18/dry ton. The stump-to-landing net energy ratio (calculated as recoverable heating value of the biomass over fossil fuel input) was calculated to be 18.43. Data envelopment analysis (DEA) is used to measure the efficiency of this small scale harvesting system and to suggest the best direction for improving the harvesting system's efficiency.

Keywords: Hybrid willow, harvesting machinery cost, harvesting productivity, reconfigured forage harvester, short rotation woody crops.

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