



RENEWABLE AND ALTERNATIVE ENERGY FACT SHEET

Willow Harvesting Equipment Considerations

What Is Willow?

Shrub willow (*Salix* spp), a fast growing short rotation woody crop, produces biomass feedstock for conversion to heat, power, and liquid transportation fuels. Willow production has attracted attention in the Northeast due to its rapid growth, high yields, and



The New Holland 130 FB Coppice Header, shown above, is a new high-capacity specialty header designed to harvest and process fast-growing, woody biomass crops, such as short-rotation coppice willow and poplar grown as a renewable fuel source. Compared to previously available methods, the 130 FB Coppice Header used with the New Holland FR9000 Forage Harvester achieves twice the harvesting capacity and can process trees of double the normal diameter into biofuel-ready wood chips of desired lengths. The harvester can cut 2 ha (5 acres) per hour, resulting in up to 120 tonnes (132 tons) of harvested wood chips per hour from trees up to 15 cm (6 in.) in diameter. No changes are needed to feed rolls or chopper drum on the base unit when using the Coppice Header. Operators can harvest one or two rows at a time, depending on the crop, and can adjust the cutting length from 6 to 66 mm (0.2 to 2.6 in.) to meet end-user specifications.

ability to thrive on lower quality soils and lands such as pasture and idle cropland. The crop is harvested every three years and requires minimal maintenance. The Northeast Woody/Warm-season Biomass Consortium, NEWBio (<http://www.newbio.psu.edu/>)—whose objective is to build robust, scalable, and sustainable value chains for biomass energy based on energy crops—is actively facilitating willow production. To date about 200 acres (80 ha) of willow are harvested annually in NY and PA, with an average yield of 20 green tons per acre. In the next few years over 400 acres (160 ha) will be harvested as newly planted stands become mature.

Equipment Information

At present, willow is harvested using a New Holland short rotation coppice (cutting) header (130FB) which is attached to their FR9000 series of forage harvesters (such as the New Holland FR9080, FR9090 or FR850). The header is specifically designed to cut and chip willow, poplar, and eucalyptus.

The harvester is intended to harvest double rows of willow with stems up to 4.75 in (120 mm) in diameter, and produces 0.4 to 1.75 in (10 to 45-mm) sized chips. Chipped material can be directly transported to a variety of end users for conversion without requiring further processing. At optimal conditions the harvester can produce 77 to 99 green (wet) tons/hour (70 to 90 Mg/hr) of willow biomass crops with standing biomass ranging from 9 to 29 green tons/acre (20 to 65 Mg/ha).

Since specialty equipment is used to plant and harvest willow, a major barrier to large-scale willow crop production is a lack of available equipment. In addition, harvesting is the single largest cost component of willow biomass production. Detailed enterprise budgets on willow production are available at the NEWBio website (<http://www.newbio.psu.edu/>). To facilitate willow production, NEWBio is making available to prospective willow growers, at subsidized costs, specialty equipment for planting and harvesting willow.



Harvest Assistance

The NEWBio project has contributed to the purchase of the specialized 130FB cutting header. Under the agreement with NEWBio, the owner of the cutting header (based in NY) will transport both the forage harvester and header to harvest sites. The grower is expected to pay transportation and operating costs. At present, due to depreciation and maintenance of the willow harvester, the owner charges \$500 per machine hour plus operator and fuel costs.

There is no charge for the NEWBio-subsidized header use. This brings up the question of transporting the header only and using a locally available forage harvester.

Having a forage harvester at the location where the willow is being harvested could potentially reduce costs, but the following considerations and adjustments are recommended and/or required to run the harvester through willow in the northeastern US.

FR Base Unit Requirements

Depending on FR model and original configuration, some or all of these features may be installed already. Consult a NH FR dealer to determine which features are on your unit.

1. Cutterhead knife configuration that will supply chips in the desired size range
2. Dual Hydraulic Drive Kit
 - Normally used for independent header and feedroll drive
 - Standard on larger FRs since 2010
3. Grain Header Hydraulic Drive Kit
4. HydroLOC Connector Shaft Kit
 - Used to mechanically connect feedroll gearbox and 130FB header drive gearbox
5. Discbine Hydraulic Drive Kit/Dual Drive Diverter
 - Diverts header drive flow to drive saw blades on 130FB
6. High Capacity Auxiliary Hydraulic Kit

Recommendations for better performance:

1. Four-wheel drive (4WD)
2. Rear auxiliary hydraulics and drawbar – required if pulling a wagon with the harvester.
3. Narrow tires
 - Preferably forestry tires, and no wider than 710mm on the front
 - Most forage harvester tires probably will not survive jagged stools
4. Fuel tank shield/guard
 - Not sold by CNH but recommendations and designs are available



Summary

NEWBio has made both specialized planting and harvesting equipment available to growers. However, growers should be aware of all of the costs associated with harvesting, especially, costs to adapt local forage harvesters to fit the willow cutting header. It is also important for growers to be cognizant of other management costs associated with planting, maintenance, and marketing prior to embarking in willow production.

For more information, visit Penn State's NEWBio website at:

<http://www.newbio.psu.edu/>



Prepared by Michael Jacobson, professor of forest resources, Penn State Department of Ecosystem Science and Management.

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