Overwintering Switchgrass in the Field in NYS

Purpose: The purpose of this publication is to evaluate harvest options for switchgrass as a combustion feedstock.

Harvest Options

As a warm-season grass, switchgrass initiates growth later in the spring than cool-season grasses, and is not mature until late summer or fall. While a two-cut management is possible for switchgrass grown as animal forage, a one-cut management is the only feasible option when harvested for biomass purposes.

Harvest of switchgrass during the growing season requires that at least a 6-inch stubble remain in the field, to minimize risk of damaging the stand. In late fall or the following spring, however, switchgrass can be mowed as low to the ground as is possible, without risk of damaging the stand.

Fig. 1. Fall harvested switchgrass in October.

Fall Baling

Switchgrass can be mowed and baled in the late fall. This will allow maximum recovery of biomass yield from the field, but carries a fall weather risk. Late fall rainfall may make it impossible to bale dry switchgrass, as there are insufficient heat units in late fall to dry either the hay or the soil in a timely fashion, once they are soaked from rainfall.

Spring Baling

Switchgrass left standing in the field over winter is subject to considerable loss of yield, with most of the inflorescence, and some of the leaf blades lost from the standing crop. Heavy snow cover may flatten the switchgrass, resulting in additional mowing losses. Standing switchgrass dries out very quickly in the spring, permitting mowing and immediate baling as soon as the soil surface is dry enough for equipment traffic.

Fig. 2. Spring harvest of switchgrass, mowed in the fall and overwintered in the field.

It is possible to mow switchgrass in late fall and leave the biomass in a windrow over winter. It may be advantageous to leave a 4-5” stubble when mowing in the fall, to try to keep the biomass away from the soil surface. This should enhance the drying process in the spring, but will result in a 2-3% yield loss per inch of stubble left in the field.

Fall-mown switchgrass will likely require raking in spring in NYS, to allow the lower surface of heavy windrows to dry out and avoid rotting of the biomass. The rake must be adjusted to the proper height to minimize soil contamination and avoid stones in the windrow.

Methods

Switchgrass was mowed and baled in the late fall, mowed in late fall and baled in spring, and mowed and baled in the spring over four growing seasons. A field of 'Nebraska' switchgrass (sown in 2006) had 5 field replicates and a field of 'Cave-in-Rock' switchgrass (sown in 2005) had 10 field replicates for each harvest treatment. Treatments were randomized and each replicate consisted of two 13' adjacent swath widths. The two swaths in each replicate were raked into one windrow for baling. All mowing was at 3-4" stubble height.

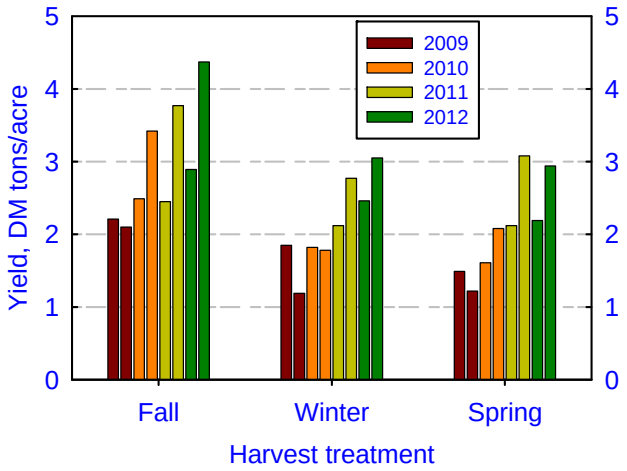

Fig. 3. Dry matter yields. The first bar is Nebraska and the second bar of the same color is Cave-in-Rock. Winter = overwintered windrow.

Results

The Cave-in-Rock field had a much more uneven soil surface compared to the Nebraska field, making biomass recovery more difficult. Yields increased over the years, with Cave-in-Rock eventually outperforming Nebraska. Spring baling was as early as March 19 and as late as May 9. In a relatively dry spring, early spring harvest greatly improved yield recovery. Overwintered windrows needed to be raked to prevent rotting on the bottom surface.

Most flowering heads and many leaves were lost from standing grass over winter. Some lodging occurred in grass left standing over winter. The relatively heavy yields for Cave-in-Rock in 2012 resulted in severe lodging by the spring of 2013. While it appeared that less leaves and flowering heads were separated from the lodged plants, yield recovery was similar for standing vs. overwinter windrowed grass in the spring.

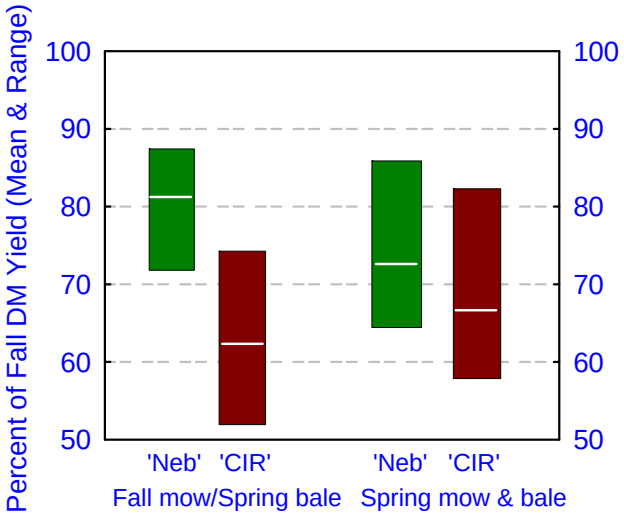

Fig. 4. Percent of fall yield recovered in spring (mean and range for 4 years). Nebraska (Neb) and Cave-in-Rock (CIR) were in separate fields.

Summary

Switchgrass mowed and baled in the late fall produced the highest DM yields. Overwintering switchgrass results in yield losses ranging from about 15-50% of fall yields. Recovery of DM yield in overwintered switchgrass is strongly influenced by spring weather conditions.

Additional Resources

Lawrence, J, J.H. Cherney, P. Barney, and Q. Ketterings. 2006. Establishment and Management of Switchgrass. Agronomy Fact Series #20. http://nmsp.cals.cornell.edu/guidelines/factsheets.html.

Samson, R. et al. 2008. ARF07 Project. Optimization of Switchgrass Management for Commercial Fuel Pellet Production. http://www.reap-canada.com/library.htm

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For more information

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