



For2-2011 - Nitrogen Rates on Established Switchgrass

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Nitrogen Rates on Established Switchgrass

Purpose:

To determine the optimum nitrogen rate on an established switchgrass stands.

Methods:

Five nitrogen rates were applied and replicated (Figure 1) in early May as the switchgrass began to green up. Yields were collected where possible for each plot in the fall after a killing frost and again in the spring prior to the initiation of new growth. Nitrogen was applied at the same rates and in the same strips in 2009, 2010 and 2011. There were two sites: 1) Ameliasburg, ON and 2) Williamsburg, ON.



Figure 1. Plot layout of the 5 Nitrogen Rates and 2 replications.



Figure 2. Nitrogen Application at Ameliasburg



Figure 3. Ameliasburg – 7 July 2009. This picture shows a lighter green strip which is the 0 pounds nitrogen per acre rate.



Figure 4: Switchgrass in September 2009 at Winchester Springs, ON



Figure 5: Collecting Fall Cut Yields in October 2009 at Ron Toonders

Results:

Fall and spring harvest yields were collected where possible to look at potential yield loss over winter.

Table 1: Dry Matter Yield (mt/ac) of Switchgrass – Ameliasburg ON

N Rate (lbs/ac)	Harvest Date			
	5-Feb-10	21-Apr-10	11-May-11	7-Nov-11
0	4.50	3.92	2.81	3.02
50	4.88	4.21	3.53	5.30
100	3.63	4.17	3.74	5.35
150	4.91	3.85	4.00	6.73
200	3.68	4.09	3.86	6.28

Table 2: Dry Matter Yield (mt/ac) of Switchgrass – Williamsburg, ON

N Rate (lbs/ac)	Harvest Date		
	10-Nov-09	26-Mar-10	08-Dec-10
0	4.07	3.69	2.2
50	4.73	3.29	2.7
100	4.43	3.24	2.7
150	4.18	3.66	2.9
200	4.06	3.34	3.3

Table 3: Spring Harvest (26March 2010) Yields of 2009 Nitrogen Rates on Switchgrass and Percent Yield Loss Over Winter at Williamsburg, ON

Nitrogen Rate	Fall (10Nov. 2009) Yield (t/ac)	Spring (26 March 2010) Yield (t/ac)	% Loss Over Winter
0	4.07	3.69	10.3%
50	4.73	3.29	43.8%
100	4.43	3.24	36.7%
150	4.18	3.66	14.2%
200	4.06	3.34	21.6%
Average	4.29	3.44	25.3%

Table 4: Spring Residue Soil Nitrogen - Ameliasburg ON

Nitrogen Rate (lbs/ac)	Soil Nitrogen (kg/ha) 15 Apr 2010	Avg. Soil Nitrogen (kg/ha) 15 Apr 2010
0	43.6	42.8
50	46.8	45.6
100	54.4	37.8
150	66.4	62.6
200	65.2	55.6
Net Return to Nitrogen - assumes \$90/mt for Switchgrass and \$0.50 per pound actual Nitrogen		

Summary:

Due to the wet fall weather and early snow, fall yields were taken at only one site in 2009 & 2010 (Williamsburg). Although there are small yield differences (Tables 1 and 2) between the different nitrogen rates, the yields are statistically not different. Although higher biomass yields were at the 100 to 150 lbs/ac rate, the higher spring biomass yields were between 50 to 100 lbs/ac rates. Based on the assumption that combustible feedstock quality is higher with spring harvested biomass and at a value of \$90.00 per tonne for the switchgrass, it would appear that the most economical nitrogen rate is between 50 to 100 pounds of nitrogen per acre based on one year. Further yield years are needed to determine the optimum nitrogen rate. Fall harvest as compared to spring harvest yields at the Williamsburg site (Table 3), there was a dry matter yield loss of 25.3%. Analysis of the residue soil nitrogen (Table 4) taken from the nitrogen strips at Kurt Vanclief's site indicate higher residue nitrogen in the 150 & 200 pound per acre nitrogen strips. This could be due to additional nitrogen was available than the switchgrass plant required.

Next Steps:

2011 was the final project year. If possible, a spring harvest for yield at the Kurt Ameliasburg will be collected.

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