



## Brown Midrib Sorghum Sudangrass Nitrogen Management

Brown Midrib Sorghum Sudangrass (BMR SxS) managed as a forage crop in a 2-cut harvest system can be a good alternative to corn silage when corn planting is delayed due to wet soil conditions. In agronomy fact sheet #14, we presented (1) potential benefits of adding BMR SxS to dairy farm cropping systems and (2) management guidelines such as seeding rates, harvest management etc. In this fact sheet, we present nitrogen (N) management guidelines for BMR SxS based on the results of six N management field trials conducted in New York in 2003 and 2004.

### New York nitrogen trials

Six field trials were conducted in New York in 2003 and 2004. One trial (Essex County) followed spring plow-down of a grass-legume sod, a second trial had 5,600 gallons/acre liquid manure applied 19 months prior to BMR SxS planting (Columbia County), and the remaining four followed BMR SxS, corn or a small grain crop (Table 1). All trials were planted in the first two weeks of June using a seeding rate of 65 lbs/acre and harvested in late July or early August (1<sup>st</sup> cut) and in September (2<sup>nd</sup> cut).

Table 1: Soil series, cropping history and planting/harvest dates for the six BMR SxS N rate studies conducted in New York. Shaded sites had a manure or sod history.

County	Soil Series	Cropping History	Planting Date	Harvest Dates
Tompkins	Volusia silt loam	SxS (2002), wheat (2001)	9 June 2003	31 July 26 Sept. 2003
Columbia	Hoosic gravelly loam	SxS (2002)	2 June 2003	29 July 28 Sept. 2003
St Lawrence	Hailesboro silt loam	SxS (2003)	6 June 2004	4 Aug. 28 Sept. 2004
Essex	Cosad loamy fine sand	Long-term grass/legume sod	7 June 2004	26 July 27 Sept. 2004
Cayuga	Lima silt loam	Wheat (2003), barley (2002)	9 June 2004	4 Aug. 20 Sept. 2004
Tompkins	Bath/Valois gravelly silt loam	Maize (2003), barley (2002)	4 June 2004	3 Aug. 20 Sept. 2004



Figure 1: Nitrogen rate study in Tompkins County in 2003.

Each trial was set up to have four replicates of six N rates (0, 50, 100, 150, 200, and 250 lbs N/acre per cut) applied as ammonium sulfate with the exception of the trial in Columbia County where 200 lbs N/acre was the maximum N rate and urea was the N source.

In addition to dry matter yield, forage samples were analyzed for total N so two N fertilizer efficiency parameters could be determined (1) Nitrogen Use Efficiency (NUE) or the increase in DM yield per lb N added; and (2) Apparent N Recovery (ANR) or the amount of N removed in harvest per lb N applied. The equations for both efficiency parameters are:

$$\text{NUE (lb DM/lb N}_{\text{applied}}) = \frac{(\text{DM at N}_{\text{applied}} - \text{DM at 0 N})}{\text{N}_{\text{applied}}}$$

$$\text{ANR (\%)} = \frac{(\text{N}_{\text{uptake at N}_{\text{applied}}} - \text{N}_{\text{uptake at 0 N}})}{(\text{N}_{\text{applied}})} * 100$$

## Results of field studies

At all sites, BMR SxS responded to fertilizer N but most economic rate of N (MERN) and yield varied. For the four sites that did not have manure applied or sod in the previous year, the MERN ranged from 122 to 171 lbs N/acre per cut with yields ranging from 3.5 to 4.3 tons DM/acre (Figure 2 and Table 2). At the other two sites, yield was higher (4.6 and 6.2 tons/acre) and less N was needed to reach these yields (<50 and 107 lbs N/acre per cut following sod and manure application, respectively). The N recovery for fertilizer at these two sites was 61-73%; much greater than the 29-43% for the other four sites.

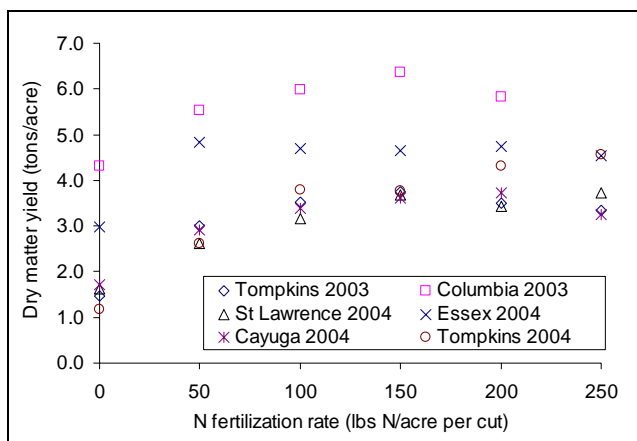


Figure 2: Effect of N fertilizer application on dry matter yield for six BMR SxS studies conducted in New York in 2003 and 2004.

Table 2: Dry matter yield, N use efficiency and apparent N recovery at the most economic rate of N for six BMR SxS N rate trials in New York.

County	Year	Most economic rate of N (MERN)	Dry matter yield at MERN	N use efficiency at MERN	Apparent N recovery at MERN
		lbs N/acre per cut	tons/acre DM total	lbs DM per lb N	%
Tompkins	2003	125	3.7	16	39
Columbia	2003	107	6.2	16	73
St Lawrence	2004	139	3.5	12	35
Essex	2004	<50	<4.6	33	61
Cayuga	2004	122	3.6	14	29
Tompkins	2004	171	4.3	16	43

Independent of site, the N use efficiency and apparent N recovery decreased with amount of N applied. Generally, second cutting made better use of the added N than first cutting. Averaged across all sites and years, N application rates greater than 130 lbs N/acre per cut decreased the N use efficiency to less than 15 lbs DM per lb N and apparent N

recovery to less than 45% showing greatly enhanced environmental loss of fertilizer N when more fertilizer N is applied.

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### BMR Sorghum Sudangrass Nitrogen Recommendations

*To meet N needs, brown midrib sorghum sudangrass should be fertilized more like an intensively managed perennial grass than a corn crop with N split-applied at planting and after the first cutting. If no manure is applied, broadcast 110-130 lbs N/acre at planting and topdress the same amount soon after each cutting for higher yield and protein content. For sites that follow sod plow-down or recent manure application, N application rates should not exceed 35-55 lbs N/acre per cut for optimum return to fertilizer investment and reduced N losses to the environment. Manure should be applied within 2 days after cutting to minimize damage to re-growth.*

### Additional resources

- o Cornell University Agronomy Fact Sheets #2 (Nitrogen cycle—the basics), #4 (Nitrogen credits from manure), and #14 (Brown midrib sorghum sudangrass) [nmsp.css.cornell.edu/publications/factsheets.asp](http://nmsp.css.cornell.edu/publications/factsheets.asp).
- o Rensselaer County Cornell Cooperative Extension site: [www.cce.cornell.edu/renselaer/agriculture](http://www.cce.cornell.edu/renselaer/agriculture).
- o Nutrient Management Spear Program BMR SxS site: [nmsp.css.cornell.edu/projects/bmr.asp](http://nmsp.css.cornell.edu/projects/bmr.asp).

For more information



Cornell University  
Cooperative Extension

Nutrient Management Spear Program  
<http://nmsp.css.cornell.edu>

Quirine Ketterings, Tom Kilcer, Jerry Cherney,  
Pete Barney, Greg Godwin, Patty Ristow

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