Forage Research Update

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SOUTH DAKOTA - Managing CRP Switchgrass for Biomass Feedstock

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CRP land on which perennial warm-season grasses are grown could be a resource for bioenergy feedstock production and carbon (C) sequestration. A four year field experiment was conducted to determine the responses of switchgrass and soil C sequestration in a silty clay loam soil to N fertility and harvest frequency on CRP land in eastern South Dakota. Ammonium nitrate and cattle manure were applied at rates of 0, 100, and 200 lb N/ac. Biomass was harvested when switchgrass was fully headed either every year or alternate years from 2001 to 2004.

Averaged across N rates, the proportion of switchgrass was greater with manure-N (65%) than with fertilizer-N (47%). Total biomass production averaged about 20% greater when harvested every year (2.2 t/ac/yr) compared to alternate years (1.8 t/ac/yr). However, by the 4th year, the proportion of switchgrass was 75% higher in plots harvested in alternate years vs. every year. In other research in South Dakota, switchgrass proportion was maintained when annual harvests were delayed until after killing frost in the fall rather than when switchgrass was fully headed.

In the current study, the concentration of structural components was greater in biomass harvested alternate years, whereas total N and ash tended to be less, when compared to annual harvests. Total N and ash concentrations in biomass were greater with fertilizer-N than manure-N. Soil C was sequestered 67% more rapidly with manure-N vs. fertilizer-N. Without N addition in some form, no C was sequestered.

Table 1. *Biomass characteristics of switchgrass-dominant CRP as influenced by nitrogen and harvest management for 4 years in eastern South Dakota.*

Management Treatment	Management Level	Total Yield	Switchgrass Yield	NDF	N	Ash	Soil Organic Carbon (0-3 ft)
	lb N/ac, form	----- T DM/ac -----		---------- % ----------			C Change, T/ac
Nitrogen Fertilizer Rate and Form	0	2.7	2.3	69	1.0	7.3	0
	100 Amm. Nitr.	4.1	2.8	68	1.3	8.3	3.4
	100 Manure	4.3	3.7	70	0.9	7.2	7.6
	200 Amm. Nitr.	4.2	2.5	67	1.5	8.0	5.0
	200 Manure	4.1	3.1	68	1.2	6.5	6.7
Harvest Frequency	Every	4.2	2.8	67	1.2	8.4	NA
	Alternate	3.5	2.9	72	1.1	6.9	NA