Minnesota - Native Perennial Grassland Species for Bioenergy: Monocultures vs. Mixtures

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Mixtures of perennial grassland species have potential for bio-energy production if they yield more than monocultures (single species); they have greater ability to withstand environmental variation, or provide more ecosystem services. This may require a highly diverse mixture of species or a strategic combination of a few species with specific contributions to productivity, nutrient cycling, and tolerance to environmental changes.

Field studies were seeded in 2006 to 1) evaluate the establishment/productivity of native warm- and cool-season grasses planted in monocultures (alone) and mixtures at four MN locations and 2) determine the botanical composition of mixtures and monocultures harvested once annually.

In 2007 (year after seeding) at all locations, switchgrass and/or Canada wild rye grown alone yielded more biomass than any mixtures. On average, a mixture of four native grasses yielded 22% more when grown without versus with legumes and forbs. Results from the first two years indicate that above ground biomass yield and relative dominance of species is influenced greatly by location.

Table 1. *Biomass yield of 2nd year stands of native perennial grassland species at four Minnesota locations in 2007*

Treatments	Lamberton	Waseca	Becker	St. Paul
	----------tons DM/ac----------			
Switchgrass	3.8	2.7	0.9	0.1
Big bluestem	1.6	0.6	0.3	0.0
Indiangrass	1.6	0.7	0.3	0.1
Canada wild rye	3.9	1.5	0.4	2.5
Grass mixture	4.0	1.7	0.9	1.4
Legume mixture	2.0	0.7	0.0	0.1
Forb mixture	2.9	1.9	0.2	1.0
Grasses + Legumes	2.1	1.8	0.9	1.7
Grasses + Forbs	2.8	1.5	0.6	1.6
Legumes + Forbs	2.2	1.6	0.3	1.0
Grasses + Legumes + Forbs	3.1	2.0	0.7	1.1
High diversity mixture	2.1	1.7	0.6	2.0