

## Minnesota - Biomass Species' Yields Vary with Landscape Position

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Understanding biomass productivity on different landscape positions is essential to 1) supply a consistent source of feedstock that meets quality specifications for the bio-energy market, while 2) increasing farm profit and providing ecosystem services.

This research determined the effect of landscape position on productivity of potential biomass crops. 'Garst 6420' alfalfa, 'DK44-92RR' corn, willow (2 'clones'), 'D-125' cottonwood, 'NM6' poplar, and 'Sunburst' switchgrass were planted on 7 different landscape positions at Waseca, MN:

1. a summit area with excellent water drainage but visible erosion;
2. a depositional area that receives water from 2 hill-slopes, with poor drainage and accumulated topsoil;
3. a flat area that is poorly drained but has retained its topsoil;
4. an East-aspect hill-slope;
5. a South-aspect hill-slope;
6. a Southwest-aspect hill-slope; and
7. a North-aspect hill slope.

**Table 1.** Crop biomass yield at Waseca, MN. Data for alfalfa, corn stover, corn grain, and switchgrass represent 2 years of growth (2006-2007). Data for willow represent growth in the 2nd-year post-coppice. Poplar and cottonwood data represent 3rd-year growth.

Landscape Position	Alfalfa	Corn Stover	Corn Grain	Willow	Cottonwood	Poplar	Switchgrass
	-----ton DM/ac-----						
Summit	13.3	7.4	10.2	8.0	16.4	15.0	7.7
Depositional	6.8	6.2	6.9	13.8	13.6	11.8	4.2
West Slope	11.9	7.7	9.4	7.6	13.0	13.3	7.4
Flat	13.6	4.3	6.2	12.2	14.8	13.7	6.7
South Slope	12.7	6.8	9.6	6.0	16.1	12.6	5.8
SW Slope	13.9	6.7	7.9	9.4	16.8	15.2	5.3
North Slope	13.6	7.4	9.7	10.9	10.7	14.4	6.3

Biomass yield data representing two years of growth are presented in Table 1. Alfalfa, corn, and switchgrass yields were least in deposition areas where water tends to collect. Conversely, willow and poplar productivity were high in these areas.

Corn-grain and stover yields were least in deposition and flat areas, and greatest on a well-drained summit. Corn-stover yield was positively related to soil N and several terrain attributes; but corn-grain yield was not related to any soil or terrain attributes tested.

Willow productivity was least on a summit. Alfalfa and poplar productivity were greatest on a relatively steep slope with potentially erosive soils. There were differences in crop productivity between hill-slope positions differing in slope and aspect.

Data were collected over two years with above-average rainfall. This study provides a first step in developing crop selection and placement on the landscape with the goal of functional optimization.