230. Agronomic, Environmental, and Economic Performance of Alternative Biomass Cropping Systems

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Abstract: The U.S. is embarking on an aggressive agenda to reduce dependency on fossil fuels. In response, the demand for biofuel feedstocks will continue to grow into the foreseeable future. While grain-derived ethanol will meet much of the initial need, cellulosic materials are expected to comprise at least a portion of biomass feedstocks and provide a more sustainable solution. We seek to develop a portfolio of cellulosic bioenergy feedstocks that together are productive, profitable, and mitigate the negative impacts of traditional bioenergy crops on the environment. We accomplish this goal through a randomized, replicated experiment comparing five cropping systems across five landscape positions. The experiment was initiated in fall 2008 and is a collaborative effort involving ecologists, agronomists, hydrologists, and economists. We are collecting data on energy and fertilizer inputs, grain crop yields, below ground processes, and standing biomass levels to evaluate economic and agronomic performance. Environmental performance is being assessed using a suite of metrics used to quantify changes in water and soil quality, greenhouse gas emissions, and carbon and nitrogen pools and fluxes. Results on biomass production and variation in soil and water quality by landscape position are forthcoming from this first year's efforts. In summer 2010 we will also measure greenhouse gas emissions and carbon and nitrogen pools and fluxes. Proper siting of these cropping systems across agricultural landscapes will allow producers to maximize agronomic and economic performance while maintaining higher levels of environmental performance compared to a single cropping system.

Keywords: Agriculture, Biomass productivity, Ecosystem Services, Targeting