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Weekly Farm Economics: Production of Bioenergy Crops in the Midwest

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The Energy Independence and Security Act of 2007 mandates that 79 billion liters of biofuels must be produced annually from non- corn starch feedstocks by 2022. Perennial grasses, switchgrass and miscanthus, could provide the needed biomass with additional benefits that they increase soil carbon, have better nitrogen fixation, provide higher biofuel yield per unit land and can be grown productively on low quality land. Switchgrass and Miscanthus are two of the more promising bioenergy crops because they are relatively higher yielding and have low input requirements. The purpose of this report is to determine the breakeven costs of producing these two energy crops in the Midwest.

There are many different varieties of switchgrass that are divided into two broad categories, the lowland varieties and the upland varieties, with lowland varieties having higher yields per hectare compared to upland varieties. Among the upland varieties, Cave-in-Rock is considered to be well suited for cultivation in the Midwest because it is cold tolerant. Its life span is about 10 years but could be longer. The variety of miscanthus being studied as a bioenergy crop is Miscanthus x giganteus which is a sterile variety with a life span of 15 to 20 years. Miscanthus is a cross between two species and has three sets of chromosomes instead of the normal two. This prevents the normal pairing of chromosomes needed to form fertile pollen and ovules and makes it sterile. It has been grown in the European Union on a very large scale for over 20 years with no evidence of becoming invasive.

The majority of switchgrass growth occurs during the warm summer months of June to August, whereas miscanthus growth usually peaks between August and October. In the fall, both grasses undergo senescence and translocate nutrients from the above-ground plant canopy to the roots. Delaying harvest until after senescence reduces need for nutrient application in the subsequent year, reduces drying time, and improves the quality of the biomass. Yet, waiting to harvest until after senescence also decreases harvestable yield by 20-40% for miscanthus and 15-20% for switchgrass. The seasonality of biomass growth also influences the timing and the quantity harvested and therefore affects the duration of storage time and the amount of biomass loss during storage. All of these factors influence the cost of harvesting and storage.

Miscanthus and switchgrass have been growing in experimental plots at the University of Illinois since

2002. Data gathered from these experimental plots have provided information on the suitability of growing these grasses in the Midwest. Miscanthus has a higher yield on average than switchgrass in the Midwest, but performs poorly in the northern regions, while switchgrass yield is not affected as significantly by cold weather. Due to the fact that there is some uncertainty about the input use for these crops a low-cost and high cost scenarios are given in the description of the agronomic procedures. The breakeven prices for profitable production of these crops are calculated from estimates of the costs of inputs, machinery, and land. The breakeven prices for both crops depend significantly on the quality of farmland being used for production. The cost of producing Miscanthus can be as low as $69-106 per ton DM in Illinois if average quality land is used and $49-$80 per ton DM if marginal quality land is used. Switchgrass can produced for as low as $72-$102 per ton DM in Iowa if marginal quality land is used while costing $117-$151 if average quality land is used. The average breakeven price for miscanthus is lower in the southern regions of the Midwest than the northern regions. The average breakeven price for switchgrass is more uniform across the Midwest, but higher on average that miscanthus. These breakeven prices are somewhat sensitive to some of the assumptions made. The breakeven prices are more sensitive to changes in corn and soybean prices, miscanthus rhizome cost, and miscanthus lifespan, than to planting and harvesting costs, input costs, and the interest rate.