Costs of producing switchgrass for biomass in southern Iowa[1]

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Switchgrass (*Panicum virgatum*) is a perennial warm-season grass native to Iowa, grown for decades on marginal lands not well suited for conventional row crops. It is now being recognized as a potential energy source and alternative cash crop for Iowans. The Chariton Valley Biomass Project is Iowa's first major switchgrass demonstration project, promoting switchgrass' potential for large-scale production. Iowa imports 98 percent of the fuels needed to generate energy in the state. Future success of a domestic energy industry in Iowa is dependent on the development of alternative energy sources, including biomass. The support and participation of biomass producers will be critical to this future.

Costs of production are a major factor determining whether or not producers will grow switchgrass. Switchgrass has been planted by some farmers under the Conservation Reserve Program (CRP) but the management techniques were essentially minimal and thus different from the ones required to make it a viable activity for producers. Since switchgrass is a relatively new commercial crop little is known about the costs to produce the crop at a commercial level. Some researchers have estimated the costs of production using data from experimental plots. The problem with using experimental data is that they may be different from the situation on farmers' fields. This work estimates switchgrass production costs using producers' data as much as possible and incorporating their actual management techniques.

Switchgrass cultural practices vary considerably among farmers in southern Iowa. This is due partially to farmer experimentation with alternative techniques and to the different soil types and existing practices. This variation results in a wide range of production costs. Overall the cultural practices in southern Iowa can be grouped into different scenarios based on the time of year for seeding, the type of seeding method and the soil used for production.

We estimated costs of production for seven different scenarios and over four different yield levels. There were two different frost seeding scenarios and five spring seeding scenarios. Additionally, we estimated costs for 1.5, 3, 4 and 6 ton yields, per acre.

There are three main cost components to switchgrass production costs. There are the establishment costs, costs for reseeding and the production costs. The establishment costs were prorated over an 11-year period. These costs included the standard components of seed, fertilizer, pesticides, and land preparation. Switchgrass will not always establish in the first year. To account for this we also estimated the costs of reseeding. The reseeding costs were prorated over 10 years and they were multiplied by the expected probability of reseeding. This produces the expected, yearly costs for reseeding. The probability for reseeding was determined based on the timing of the original seeding. The annual production costs included pesticides and fertilizers. Harvesting and fertilizer costs are a function of the yield.

The frost seeding scenarios produced the highest returns. It was assumed that the frost seeding would only need to be reseeded 25 percent of the time. The frost seeding on land that was previously grassland

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produced the lowest cost of all. The costs under this scenario ranged from $49 to $114per ton depending on the yield.

The cost of producing switchgrass is reduced by more than 50 percent when the yields go from 1.5 to 6 tons per acre. The costs of production per ton decrease at a decreasing rate as yields increase. For example, with frost seeding on cropland costs decreased 40 percent when increasing yield from 1.5 to 3 tons per acre. However, costs only decreased by 33 percent when going from 3 to 6 tons. This is similar to the frost seeding on grassland where the costs decreased by 38 percent going from 1.5 to 3 tons and by 31 percent going from 3 to 6 tons per acre.

The costs were also estimated using different land charges. The cost for land was the second most significant influence on cost differences. A $25 increase in the land charge, from $75 to $100 per acre caused a 13, 11 and 8 percent increase in the cost per ton for 1.5, 3, and 6 ton yield. Similarly, a decrease in land charges from $50 to $25 decreased costs by 14, 12, and 8 percent for the 1.5, 3, and 6 ton yields.

The yield and the land charge chosen were the two most significant influences on the costs of producing switchgrass. As the yield increases, the adverse effects of an increasing land charge are reduced. For a given land charge, doubling yields results in a 50 percent reduction in the costs per ton.

The yields are the key factor in the cost of switchgrass production. Emphasis should be put on research to improve yields. In the field now, with best management practices, some producers have reached yields of four tons per acre. As improved management practices are applied and higher yielding varieties become available the cost of production will decrease.

Switchgrass has to be profitable to be adopted. One of the key components in profitability is knowing costs of production. We have estimated the costs and shown that they will vary considerably. The biggest variation comes from alternative yield and land charge assumptions. The appropriate land charge will vary with the quality of the land. If the land had been cropland then the opportunity costs will be higher, conversely if the land was grassland the costs will be lower. As more is known about proper switchgrass management techniques and as new cultivars are developed yields will increase and the costs of production will come down.