**WORKING PAPER (UNDER REVIEW)**

# Is Growing Switchgrass Economically Feasible?

## A field-scale economic analysis of switchgrass production in the Upper Missouri River Basin

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Switchgrass has been studied extensively and praised for its high potential as feedstock to generate renewable energy with many advantages over conventional bioenergy crops. But to secure a significant supply of switchgrass feedstock, farmers across the U.S. would have to shift significant portion of their croplands to switchgrass stands—a sight we're unlikely to see unless they can make a profit growing it.

This article explores the economics of growing switchgrass in the Upper Missouri River Basin (UMRB) (Figure 1)—an important U.S. agricultural region with the potential to produce large quantities of switchgrass. By estimating crop budgets we determined the base price farmers would need to be paid to make switchgrass production economically appealing. Our estimated break-even price for switchgrass is comparable to grass hay, however, there are still many uncertainties about actual production costs and yields. Further, developing markets for switchgrass may require policy incentives such as renewable fuel subsides, tax credits, or emissions cap-and trade regulations. It would also require producers who are willing to take on the additional risk of an untried and uncertain market.

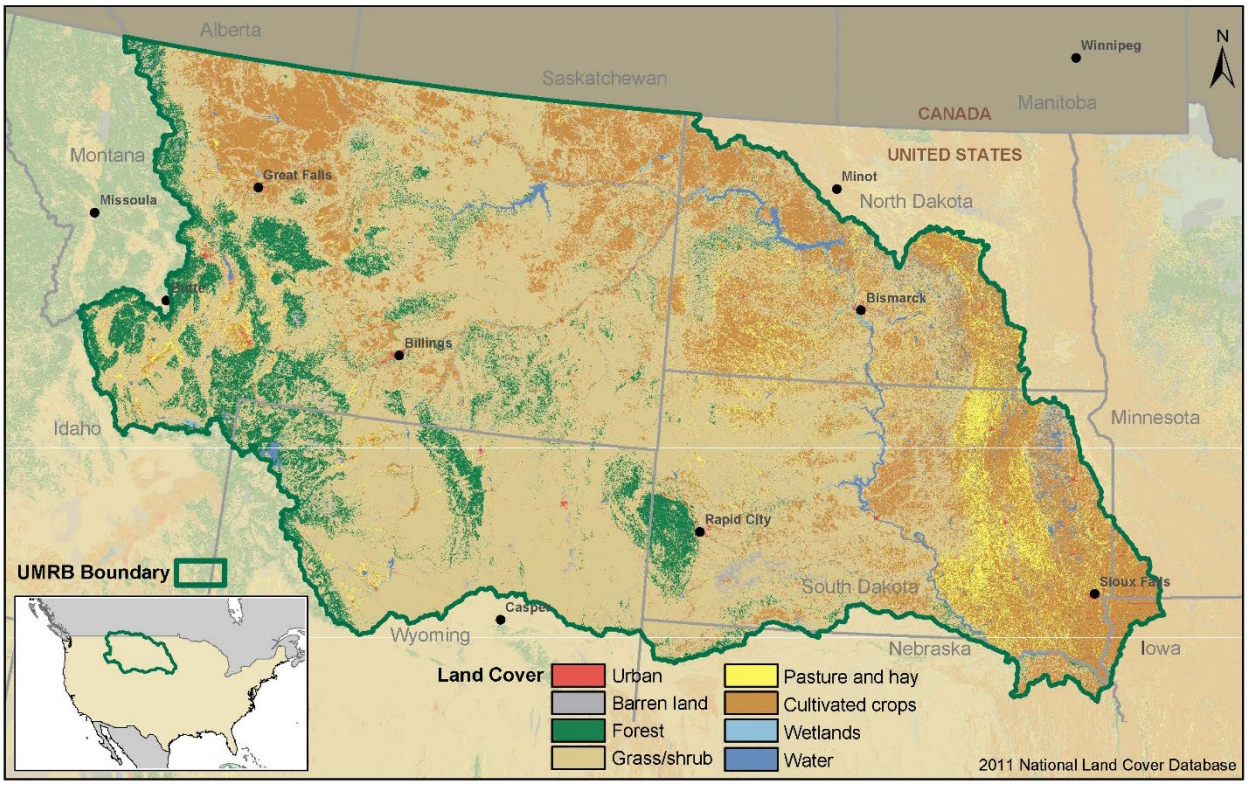


FIGURE 1: THE UPPER MISSOURI RIVER BASIN (UMRB)

## ADVANTAGES OF SWITCHGRASS

As the demand for renewable energy steadily increases in an ever more carbon-constrained world, so does the appeal of switchgrass. Not only is switchgrass a potential source of renewable feedstock that can either be burned to produce electricity or fermented to produce ethanol, it also has many advantages over conventional bioenergy crops, like corn. It's a perennial, native grass with wide-ranging adaptability across the U.S., tolerating low fertility, acidic soils, and moderately alkaline soils, meaning it could be grown in much of the U.S. and on a wide-range of marginally productive lands, avoiding competition with food crops. Switchgrass also offers many environmental benefits including

wildlife habitat, erosion control, nutrient loss avoidance, and reduced input requirements compared to annual crops.

However, despite these advantages, switchgrass is not yet grown on a commercial scale in the U.S. For switchgrass to become a widely adopted bioenergy feedstock, many factors would need to align—including that it would need to be profitable at the field-level. In this article, we report estimated costs of producing switchgrass in the UMRB and consider what price producers would need to receive to make switchgrass an economically appealing crop to consider.

## Crop Budgeting to Estimate Switchgrass Break-even Prices

We estimated a crop budget for a conventional dryland switchgrass operation in the UMRB, available in another publication. This budget focuses on variable costs of production—costs that vary with output, such per-acre costs for land, labor, operating capital, and field operations—which allows us to compare the production costs of switchgrass with those for conventional crops, such as grass hay.

Based on this budget, assuming production practices and yields consistent with previous literature and using 2017 prices, we estimate the total production cost of switchgrass would be $113 to $110 per acre, depending on soil productivity and fertilizer needs. If we assume expected yields of 2.73 tons per acre, this means switchgrass producers in the UMRB would need to receive at least $40 per ton in order to break-even and recoup their production costs.

While these results are based on current literature, it is important to remember that they are estimates. Since there is limited production of switchgrass currently in the UMRB, potential yields and production costs are not certain at this time. Experimental case studies should be conducted at various sites within the UMRB to improve our understanding of switchgrass production in this region, since results may differ depending on soil types and whether switchgrass is grown on marginal land or converted cropland. Even though switchgrass tolerates a wide variety of climate and soil conditions, the specific environment in which it is produced may affect production costs and yield and may, therefore, affect the price necessary to cover production costs.

## Are these Prices Possible?

The break-even price we calculated provides an estimate of the lowest price required for a producer to consider growing switchgrass. Whether market prices ever reach or exceed production costs will

depend on wider energy markets and demand for new bioenergy crops like switchgrass. However, if market prices alone don't make switchgrass production profitable for farmers, introducing policy incentives that increase the price received per ton of switchgrass could incentivize switchgrass production and realize the many advantages it offers over conventional bioenergy feedstocks.

One example of an incentive program in which farmers receive financial assistance for establishing, producing, and delivering biomass feedstock from switchgrass, is the Biomass Crop Assistance Program administered through the USDA Farm Service Agency. Likewise, green energy tax-credits or carbon offset credits could increase demand for lower-carbon bioenergy crops like switchgrass, thus increasing demand and incentivizing farmers to produce switchgrass.

### Switchgrass vs. Other Crops

While switchgrass production *could* be profitable with sufficient yields and profitable prices above production costs in the UMRB, for farmers to consider voluntarily producing switchgrass, it would need to be both more profitable and less risky than the crops they are currently growing. For example, profits for an acre of switchgrass would need to exceed profits for an acre of grass hay for farmers to consider replacing grass hay with switchgrass. Moreover, there are many risks associated with changing farm-level operations—such as production risks and price variability from year-to-year, as well as possible changes to policy incentives—so profit margins would likely need to be even higher to incentivize farmers to take on this new bioenergy crop.

### Other Factors Necessary for A Switchgrass Market

Even if profit margins were high enough, these prices do not factor in the very low number of biomass processing facilities currently within or near the UMRB region. Distance from field to processing facility can add tremendous transportation costs to switchgrass production, which would require an even higher price received by farmers. Selling switchgrass in thin, geographically distant markets could pose marketing risks for producers. Ultimately, in order for switchgrass bioenergy markets to be successfully adopted in the UMRB, both switchgrass production and biomass processing facility locations must increase simultaneously.

**FURTHER READING**


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