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# The Outlook for Switchgrass as an Energy Crop

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# CORNHUSKER ECONOMICS

March 5, 2008

University of Nebraska–Lincoln Extension

Institute of Agriculture & Natural Resources  
Department of Agricultural Economics  
<http://www.agecon.unl.edu/Cornhuskereconomics.html>

## The Outlook for Switchgrass as an Energy Crop

Corn ethanol production has already had a big impact on Nebraska agriculture. What about switch-grass for ethanol? Will it become an important crop in the Great Plains, and if so, when? How much will it be worth?

These are important questions for Nebraska agriculture, and the future is murky. In this issue we summarize some of what is known at this point.

**Cellulosic ethanol** is the name used for ethanol derived from high-cellulose materials such as switchgrass, corn stalks, trees and even urban waste. The technology to convert cellulosic materials to ethanol on a commercial scale has been difficult to develop, because cellulose is tough stuff that must first be broken down into starch and sugar before it can be fermented into alcohol.

**A number of cellulosic ethanol plants are in operation**, including one in York, Nebraska, but most are pilot-scale plants. Construction is just beginning on six commercial-sized plants that have received heavy federal subsidies. Their combined capacity will be 140 million gallons per year (compared to current corn ethanol capacity of about 7.5 billion). The closest of these plants is one in Iowa that will focus on corn stalks and cobs, and one in Kansas that will use switchgrass and other crop cellulose. Three of these six hope to be in production by 2010, the other three in 2011, and there are perhaps another four to five plants that will be in operation by then, but none are expected to provide a market for switchgrass grown in the Northern Great Plains.

**The renewable fuels standard** enacted in December, 2007 mandates the use of 100 million gallons of cellulosic biofuel in 2010, possibly more than will be produced. The mandate increases to one billion gallons by 2013, which would require that ground be broken for *an additional 30 plants* or so during the next three years. It could happen.

Market Report	Yr Ago	4 Wks Ago	2/29/08
<b><u>Livestock and Products,</u></b>			
<b><u>Weekly Average</u></b>			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight.....	\$93.09	\$88.36	\$93.13
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb.....	120.43	121.27	125.17
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb.....	101.24	*	98.73
Choice Boxed Beef, 600-750 lb. Carcass.....	149.29	143.44	149.41
Western Corn Belt Base Hog Price Carcass, Negotiated.....	61.73	54.29	56.41
Feeder Pigs, National Direct 50 lbs, FOB.....	71.58	53.15	49.76
Pork Carcass Cutout, 185 lb. Carcass, 51-52% Lean.....	68.51	59.32	60.45
Slaughter Lambs, Ch. & Pr., Heavy, Woolled, South Dakota, Direct.....	80.00	87.87	89.63
National Carcass Lamb Cutout, FOB.....	240.84	258.14	258.01
<b><u>Crops,</u></b>			
<b><u>Daily Spot Prices</u></b>			
Wheat, No. 1, H.W. Imperial, bu.....	4.61	9.20	10.90
Corn, No. 2, Yellow Omaha, bu.....	3.91	4.78	5.27
Soybeans, No. 1, Yellow Omaha, bu.....	6.50	11.92	14.40
Grain Sorghum, No. 2, Yellow Dorchester, cwt.....	7.00	8.50	9.29
Oats, No. 2, Heavy Minneapolis, MN, bu.....	2.61	3.22	4.23
<b><u>Hay</u></b>			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton.....	*	135.00	135.00
Alfalfa, Large Rounds, Good Platte Valley, ton.....	*	85.00	85.00
Grass Hay, Large Rounds, Good Northeast Nebraska, ton.....	*	*	*
* No market.			

It is likely that mandates for cellulosic ethanol in these early years will be waived or modified, but as we saw with ethanol prices during 2006, *mandated use could drive the price of cellulosic ethanol quite high*, relative to corn ethanol and gasoline.

**What is the cost of producing switchgrass as a biomass crop?** In a recent study conducted with UNL-USDA agronomists, we collaborated with ten farmers who produced switchgrass on 15-20 acre fields over a five-year period. The fields were located from Southern Nebraska to North Dakota, on marginal cropland that would have qualified for the Cropland Reserve Program (CRP).

The farmers followed (mostly) site-specific agronomic practices recommended by team agronomists. We monitored their crop during the year, and farmers reported all costs and time they incurred in growing and harvesting their crop.

The results are summarized in Table 1. The average production cost was about \$60/ton, and the average annualized yield was about 2.2 ton/acre (about 3 tons during the four production years). Results varied widely, though, due to differences in both weather and management. On the best five fields, yields averaged 2.5 ton/acre at a cost of \$47/ton, while on the five poorest fields, yields averaged 1.6 ton/acre at a cost of \$80.27/ton.

**Table 1. Annualized Average Switchgrass Production Cost on Ten Collaborating Farms**

Cost Item	\$/Acre	\$/Ton
Planting	12.15	5.47
Herbicide Applied	13.53	6.09
Fertilizer Applied	15.03	6.77
Harvest	32.64	14.69
<b>Operating Costs</b>	<b>73.35</b>	<b>33.02</b>
Land Rent	59.67	26.86
<b>Total Cost</b>	<b>133.02</b>	<b>59.88</b>

By contrast with the \$73/acre operating cost for switchgrass, operating costs for dryland corn and soybeans in Nebraska during this era were about \$180 and \$109 per acre, respectively.

**Land rental rates were quite low** on these fields during 2000-2005 when these data were taken – only \$60/acre. Rental rates have risen since then, even for marginal cropland. Doubling of rental rates would have increased average production cost by 45 percent, to \$87/ton.

**Fertilizer rates**, both recommended and applied, were low, averaging 67 lbs N/acre during the four production years (no fertilizer was applied in the establishment year).

Finally, note that the crop was grown only five years, whereas it seems likely that any switchgrass field grown for biomass would be grown for closer to ten years. By projecting yields and expenditures, we calculated that the average annualized cost for a ten-year rotation would fall by a little more than ten percent, to about \$54/ton.

**The feedstock cost of ethanol** produced from this switchgrass would have been about \$0.75/gal, if 80 gallons could be extracted per ton, as is generally assumed. This compares to about \$1.00/gal for corn as a feedstock at \$4/bu, so the cost of switchgrass as a feedstock is competitive, even with higher rental rates. Processing costs for cellulosic ethanol will be higher than for corn, but we must wait to find out how much higher.

**There will be no significant market** for feedstock switchgrass in Nebraska for another three to four years. Once plant construction begins, however, you can expect plants to begin contracting for future switchgrass production – perhaps at attractive prices if federal mandates raise the value of cellulosic ethanol sufficiently.

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