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## Prospects for Switchgrass as an Energy Crop

Richard K. Perrin

*University of Nebraska-Lincoln*, [rperrin@unl.edu](mailto:rperrin@unl.edu)

Lilyan E. Fulginiti

*University of Nebraska-Lincoln*, [lfulginiti1@unl.edu](mailto:lfulginiti1@unl.edu)

Mustapha Alhassan

*University of Nebraska-Lincoln*

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# Cornhusker Economics

## Prospects for Switchgrass as an Energy Crop

Market Report	Year Ago	4 Wks Ago	8-27-16
<b>Livestock and Products, Weekly Average</b>			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight. . . . .	147.00	117.50	114.64
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb. . . . .	247.40	167.07	161.83
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb. . . . .	215.83	152.52	146.93
Choice Boxed Beef, 600-750 lb. Carcass. . . . .	243.97	198.79	200.34
Western Corn Belt Base Hog Price Carcass, Negotiated . . . . .	71.55	66.74	60.53
Pork Carcass Cutout, 185 lb. Carcass 51-52% Lean. . . . .	85.74	82.65	75.12
Slaughter Lambs, woolled and shorn, 135-165 lb. National. . . . .	156.09	167.15	164.27
National Carcass Lamb Cutout FOB. . . . .	358.76	346.84	359.00
<b>Crops, Daily Spot Prices</b>			
Wheat, No. 1, H.W. Imperial, bu. . . . .	4.03	2.96	2.73
Corn, No. 2, Yellow Nebraska City, bu. . . . .	3.51	3.08	2.81
Soybeans, No. 1, Yellow Nebraska City, bu. . . . .	9.01	9.68	9.27
Grain Sorghum, No.2, Yellow Dorchester, cwt. . . . .	5.75	4.63	4.31
Oats, No. 2, Heavy Minneapolis, Mn, bu. . . . .	2.69	2.55	2.35
<b>Feed</b>			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton. . . . .	183.00	165.00	158.75
Alfalfa, Large Rounds, Good Platte Valley, ton. . . . .	85.00	70.00	72.50
Grass Hay, Large Rounds, Good Nebraska, ton. . . . .	87.50	*	80.00
Dried Distillers Grains, 10% Moisture Nebraska Average. . . . .	142.50	120.00	117.50
Wet Distillers Grains, 65-70% Moisture Nebraska Average. . . . .	45.50	34.00	33.00
<b>* No Market</b>			

President Bush startled many of us when in his 2006 State of the Union address he promised, “We will also fund additional research *in cutting-edge methods of producing ethanol*, not just from corn but from wood chips and stalks or *switchgrass*.” The “but” refers to the fact that chips, stalks and grass are cellulosic feedstocks, and commercial technology for extracting ethanol from cellulose was then way behind the millennia-old technology for extracting ethanol from grain.

### Is cellulosic ethanol from switchgrass really viable?

Ten years on, cellulosic ethanol from switchgrass is still just an idea. We aren’t making ethanol from switchgrass, at least not on a commercial scale. Abengoa intended to produce ethanol from switchgrass by 2014 at its Hugoton, KS, plant, but that plant never reached serious production. It is out of commission and is now for sale due to Abengoa’s worldwide bankruptcy reorganization. During construction, however, their feedstock focus turned from switchgrass to corn stalks. The two other cellulosic plants, Poet in Emmetsburg, IA, and DuPont in Nevada, IA, are producing ethanol only from corn stalk residues, a cheaper and more readily available feedstock than switchgrass.

The Renewable Fuels Standard (RFS), authorized by the Congress under the Bush administration in 2005 and expanded in 2007, ensured a market for cellulosic ethanol by imposing mandates on the motor fuel industry to blend it

in the motor fuel supply along with gasoline and grain ethanol. But despite the mandate, the economics of the technology was just too intractable to overcome on the required scale, so the Environmental Protection Agency (EPA) exercised the power granted by the legislation for it to (1) reduce the mandates to levels close to what the industry could supply, and (2) provide obligated parties the opportunity to purchase cellulosic waiver credits. For 2016, the required volume is about 5% of the original RFS requirement envisioned for 2016, and the cost of waiver credits was set at \$1.33/gal.

So it appears that the government has abandoned support of ethanol from biomass such as switchgrass? The EPA has, perhaps, but not the Department of Energy (DOE), which released its Multi-Year Program Plan for Bioenergy this spring. They have established a technology R&D timeline to achieve a cellulosic hydrocarbon industry supplying motor fuel at \$3 per gallon of gasoline equivalent by 2017. The timeline includes a goal for cellulosic feedstock supplies delivered to conversion plants at a cost of \$84/dry ton. So there is still life in the federal cellulosic biofuel program, whether or not it may include switchgrass as a feedstock. As for switchgrass itself, recent research is providing improved varieties and agronomic practices (Schmer *et al.*, 2014) that promise to reduce production costs to make it more competitive with feedstocks such as corn stover.

### **North Central U.S. farmers' willingness to produce switchgrass for biomass**

Given the administration's reaffirmed intent to make cellulosic ethanol a success, we mounted a mail survey to determine whether farmers in the North Central U.S. would be willing to produce switchgrass for biomass at delivered prices envisioned by the Department of Energy. We constructed a referendum-type contingent valuation survey in which we simply presented the recipients with an estimated average net return per acre, and asked if they would be willing to produce switchgrass at that "bid level" for five years on their least-productive field.

The amount of net return specified (the "bid" level) on the survey questionnaires was randomly assigned to each farmer from a set of nine values ranging from \$25/acre to \$260/acre. We mailed out 2100 questionnaires to randomly-selected farmers throughout 358 counties in 12 states in the North Central U.S., 1,124 of whom responded. Figure 1 summarizes results we

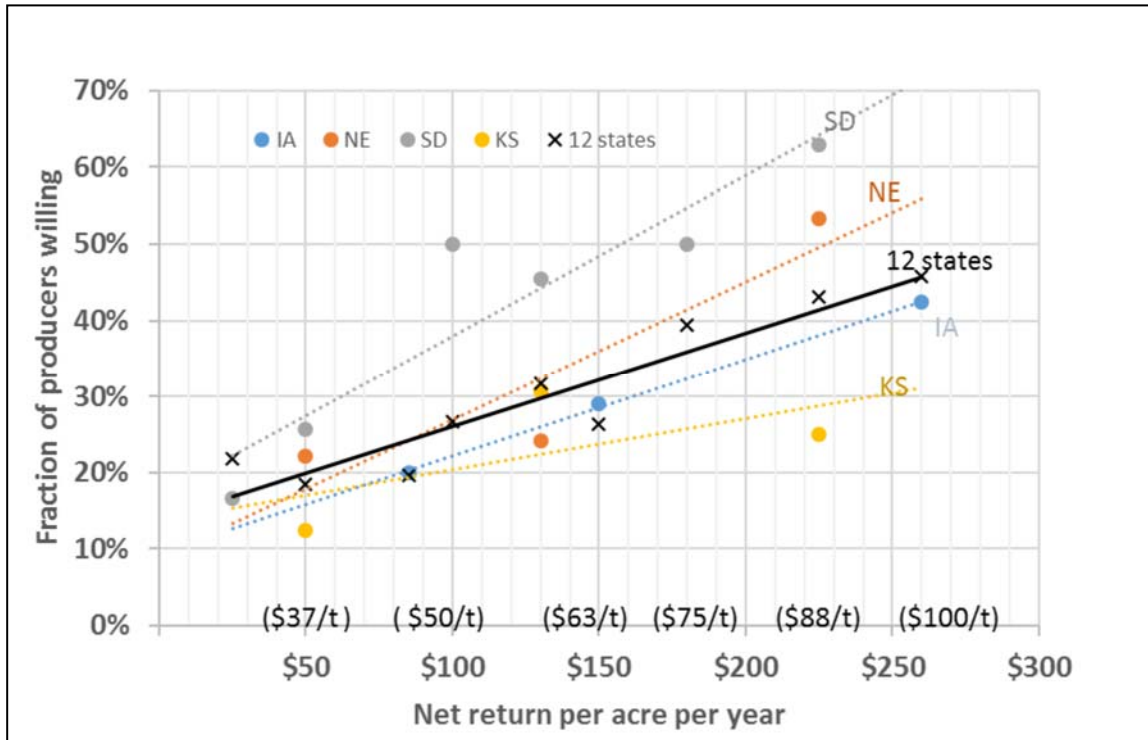
obtained from the full sample, and by selected states.

Looking first at the results for the 12-state region, 22% of farmers who received the very lowest bid, \$25/acre, indicated they were willing to produce switchgrass at that net annual return over five years. At the highest bid rate, \$260/acre, 46% said they were willing to produce. The solid black line in Figure 1 is a linear approximation of the relationship between bid level and willingness to produce for the North Central region as a whole. We were surprised to find such a large fraction of respondents willing to produce at the low rate of \$25/acre, but also surprised to find that only 46% were willing to produce at \$260/acre. This responsiveness to price was lower than we expected.

In Nebraska, the lowest bid offered was \$50/acre, at which 22% were willing to produce, while the highest bid was \$225/acre at which 53% of farmers expressed willingness. The dotted red line is a linear approximation of the bid-response relationship in Nebraska, where we found producers to be more responsive to bid level than in the 12-state average. Among neighboring states, South Dakota producers were even more willing to produce, while Kansas producers were least willing.

On the secondary horizontal axis of Figure 1, we have shown a very approximate conversion of bid levels from net returns per acre to dollars per dry ton of switchgrass produced. (This is based on an estimated variable cost of \$100/acre and an average yield of 4 dry tons per acre.) With this conversion we can see that approximately 40% of our respondents (nearly 60% in South Dakota) expressed a willingness to produce switchgrass for a net return of \$200/a, which is approximately equivalent to a farm gate price of \$75/dry ton. Given that delivery costs are \$10-12/dry ton, we conclude that one-third or so of our respondents were willing to produce at the \$84 target delivered price proposed by the DOE for 2017. We do not yet know if these producers are sufficiently concentrated to supply quantities needed for a processing plant, and the transactions costs are high to establish a network of several hundred producers contracting to provide a single processing plant. But in general, it appears that switchgrass as a biomass crop may still emerge as a viable cellulosic feedstock in Nebraska and the North Central region.

Figure 1. Fraction of producers willing to produce switchgrass for biomass based on net returns per acre



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Richard K Perrin  
 Jim Roberts Professor  
 Agricultural Economics Department  
 University of Nebraska-Lincoln  
 402-472-9818  
 rperrin@unl.edu

Lilyan E. Fulginiti  
 Professor  
 Water for Food Global Institute Fellow  
 307B Filley Hall  
 Dep. of Agricultural Economics  
 University of Nebraska-Lincoln

Mustapha Alhassan  
 Graduate Assistant  
 Agricultural Economics Department  
 University of Nebraska-Lincoln