

Center for Agricultural Policy and Trade Studies North Dakota State University

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Corn's Impact on The North Dakota Agricultural Economy

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Introduction

During the last thirty years, corn's impact on the North Dakota agricultural economy has grown tremendously. In the 1970s corn acres were about 2% of the state's cropland. Today that number is over 7.5%. In addition to the additional planted acres, corn processing, for both high fructose corn syrup and ethanol has become major users of North Dakota's corn. The gross economic activity of the production corn sector is larger than the amount of planted acres indicates. Corn is a high value and cost crop. An acre of corn will generate more economic activity than an acre of most other crops. For this study, alternative crops are wheat and soybeans, depending on location.

The objective of this study is to estimate the gross economic impact of the corn sector opposed to alternative crops, wheat and soybeans. In addition, gross revenues from the various corn processing plants will be estimated to determine the total economic impact of the industry. Various assumptions were made to simplify the study:

1. Gross returns for corn, wheat, and soybeans; (planted acres \times yield \times price), were calculated for the years 2004-2007 and estimated for 2008.
2. All commodities grown in North Dakota are sold in North Dakota by North Dakota producers.
3. North Dakota corn sold to processing plants was removed from the processing plants gross revenue to eliminate double counting.
4. In the South Eastern region and Red River Valley, the alternative crop to corn was soybeans. In the rest of the state the alternative crop was wheat.
5. The processing plants at Wahpeton and Underwood purchased one-half of their corn from out of state. The other plants purchase corn from North Dakota.
6. The ethanol plants under construction or ready to open, are assumed to open.

Total gross returns from two sectors, production and processing, were used to estimate the economic impact of the corn industry on the North Dakota economy. The impact of corn fed to livestock was not estimated as it is difficult to obtain data on cattle numbers and feed consumption.

Corn Production

Table 1 shows the planted acres of corn, soybeans, and wheat for North Dakota from 2004 to 2008. Corn acres increased from 1.8 million acres in 2004 to a high of 2.55 million acres in 2007. Corn acres fell to 2.25 million acres in 2008. Corn acres have increased from 800 to 900 thousand acres during the late 1980s and early 1990s. North Dakota soybean acres did not follow an increasing trend during the 2000s (Figure 1). They tended to increase one year and decrease the following year.

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For the late 1980s to early 1990s, soybeans acres have increased from 600-700 thousand acres to 3 million acres. Soybean acres have further increased to over 3 million acres for the 2004-2008 period. Wheat acres have increased since 2004, however, wheat acres have decreased about 40% from the recent high of 12.9 million acres in 1996. Total acres of the three crops increased from 13.7 million acres in 2004 to about 15 million acres in 2008. This indicates that producers are concentrating production away from other crops: barley, oats, and sunflowers. There are about 26 million acres of cropland in North Dakota which indicates that corn, soybeans and wheat occupy just over one-half of the crop acres.

Total revenue for corn, soybeans and wheat are shown in Figure 2. During the 1970s, 1980s, and 1990s, corn and soybeans share of North Dakota's gross revenue was small compared to wheat. However, during the 2000s revenue increased to \$1.32 billion for wheat, \$480 million for corn and \$620 million for soybeans. The combined revenue of corn and soybean is about 83% of wheat revenue (Figure 3). During 2004-2008, revenue increased to \$1.65 billion for wheat \$694 million for corn, and \$802 million for soybeans; the combined revenue account for 91% of wheat revenue. The trend is clear, corn and soybeans production will continue to expand into the near future.

Total gross returns per acre for the three crop were similar in 2004. Corn, soybeans, and wheat generated \$126.12, \$125.90, and \$127.26 per acre gross returns, respectively, 2004. These gross returns are based on state averages. This indicates that there were little or no differences in economic activity between the three crops. In 2005, both corn and soybean revenue increase to over \$190 per acre where wheat revenue fell to \$118 per acre, indicating that corn and soybeans generated between \$72 and \$79 per acre more than wheat, respectively. During 2007 and 2008, corn revenue increased to \$401 per acre and \$591 per acre, respectively. Yields in the RRV and the Southeastern region are higher than yields across the state. If corn was not planted in North Dakota, soybeans would replace most of the acres in the southeast and RRV. Those additional soybeans acres would increase the state soybean yield. Likewise, wheat planted in those regions to replace corn would have higher yields than the state average.

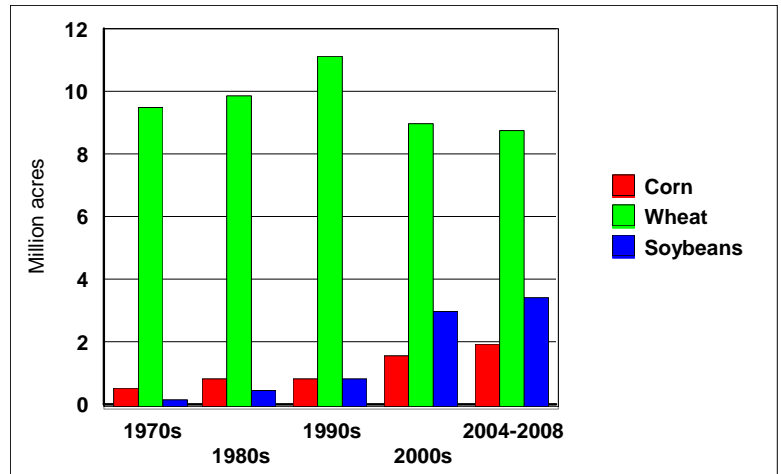


Figure 1. Planted Acres for North Dakota Corn, Wheat, and Soybeans

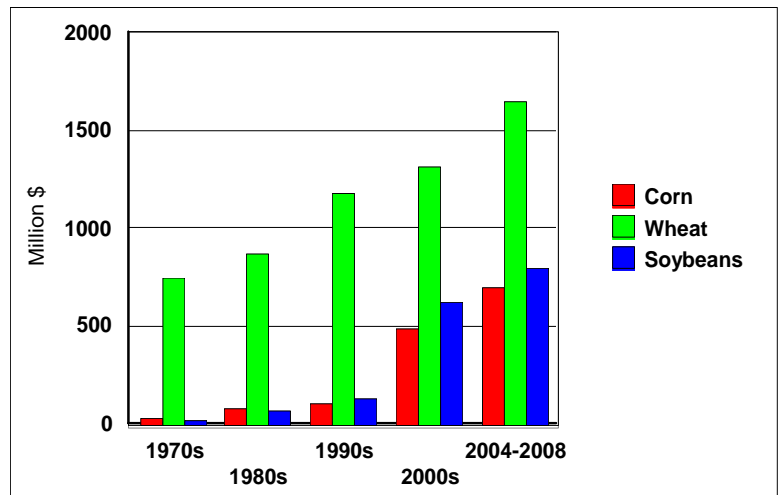


Figure 2. North Dakota Gross Commodity Returns for Corn, Wheat, and Soybeans

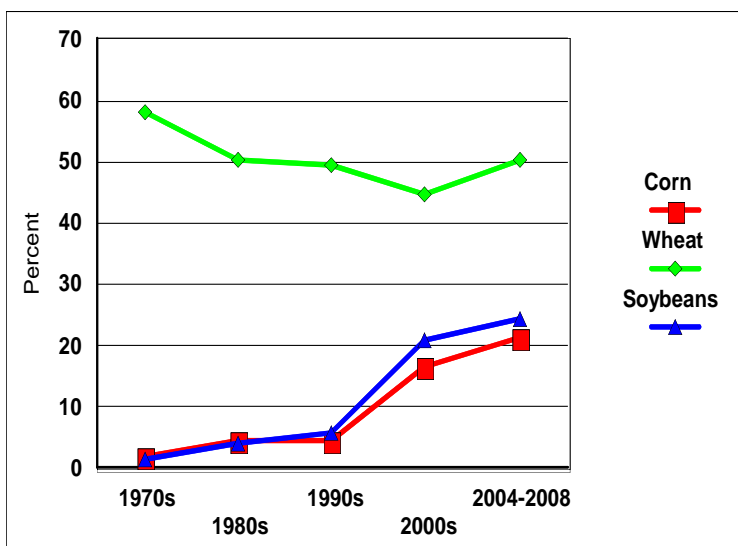


Figure 3. Market Share, Value Basis, for North Dakota Corn, Wheat, and Soybeans

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The bottom third of Table 1 shows the increased addition to economic activity in North Dakota of corn production over soybeans and wheat. The differences were obtained by determining the difference between per acre returns for corn and soybeans and those between corn and wheat. Those differences were multiplied by the acres of corn to determine the increase or decrease in gross revenue of corn. For example, in 2004, soybeans generated \$0.22 per acre less returns than corn and wheat generated \$1.14 per acre more than corn. Therefore, if corn was not planted in North Dakota in 2004, an additional 1.8 million acres of soybeans and wheat would have been planted. That would have generated \$224 thousand more in gross revenue than the actual plantings. This assumes that in the RRV and the Southeastern region, soybeans replaces corn and wheat replaces corn in the rest of the state. However, from 2005 to 2008, corn generated the largest gross returns of the three crops. In 2005 corn revenue was \$8 million higher than soybeans and almost \$28 million more than wheat, totaling a gross revenue of \$36 million. The increase was \$143 million for 2006 and \$206 million for 2007. It is estimated that the increase for 2008 will be about \$380 million. The five year total increase in gross returns is \$765 million because of North Dakota corn production.

Table 1. Total Planted Acres, Per Acre Return, and Difference Between Corn and Alternative Crops

Planted Acres	Corn	Soybean	Wheat	Total
-----Acres-----				
2004	1,800	3,750	8,195	13,754
2005	1,420	2,950	9,090	13,450
2006	1,690	3,900	8,800	14,390
2007	2,550	3,050	8,595	14,195
2008	2,250	3,550	9,200	15,000
-----Dollars/acre-----				

2004	126.12	125.90	127.26	
2005	197.62	190.04	118.50	
2006	254.71	183.95	128.45	
2007	400.88	336.25	271.37	
2008	519.01	366.21	302.29	
<u>Total Difference</u>				
	Corn vs Soybeans		Corn vs. Wheat	
-----1,000 Dollars-----				
2004		290	(514)	(224)
2005		8,009	27,889	35,899
2006		89,682	53,345	143,026
2007		123,605	82,566	206,171
2008		257,855	121,903	379,758
Five Year Total (2004-2008)				764,630

Corn Processing

North Dakota’s corn processing industry consists of six ethanol plants and one high fructose corn syrup (HFCS) plant (Table 2). The ethanol plant in Walhala closed in late October, 2007 and the Richardson and Underwood opened during 2007. The plant in Hankinson is currently completed and will open in September of 2008 and the Casselton plant will be completed in late 2008. The processing plant in Wahpeton is a HFCS plant that has been in operation since 1996. Two other processing plants are due for ground breaking this fall; Williston and Scranton, both with capacities of 55 million gallons per year. Total corn

processing capacity of the plants will be 225 million bushels or about 82% of North Dakota's corn crop using 2007 as base. Substantial amount of corn is purchased from outside of the state, but actual numbers are not available. We assumed that Wahpeton and Underwood purchases one-half of the corn from out of state, while the remaining plants purchase corn produced in North Dakota. We assumed that Wahpeton and Underwood purchases one-half of the corn from out of state, while the remaining plants purchase corn produced in North Dakota.

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Table 2. North Dakota Corn Processing Plants

	Operation	Date started	Corn capacity million bu	Ethanol output million gal	DDG million lbs	
Walhala	Closed	10/07	1995	10	28	170
Richardson	Open		2007	20	56	340
Hankinson	09/08		2008	35	98	595
Underwood	Open		2007	20	56	340
Casselton	12/08		2008	35	98	595
Wahpeton	Open		1996	31	1,093*	527
Spiritwood	Not open		2010	35	98	595

*Million pounds HFCS

Hankinson will also purchase corn from out of state. Product prices used in the study are shown in Table 3. These are obtained from USDA and represent yearly averages. Prices for 2008 are estimates.

Table 3. Prices Used in Analysis

	Ethanol \$/gallon	DDG \$/ton	HFCS \$/cwt
2004	1.50	75.96	20.54
2005	2.09	85.59	21.12
2006	2.42	109.07	21.77
2007	2.58	161.25	25.49
2008	3.08	185.00	28.41

Table 4 shows the annual gross revenue less the cost of North Dakota corn purchased. Until 2007, the Wahpeton plant dominated the North Dakota corn processing industry with gross revenues of about \$205 million, while total gross revenue for the entire state was about \$250 million. In 2007, gross revenue with ethanol plants in Richardson and Underwood was about \$397 million. For 2008, with Richardson and Underwood operating for the entire year, Hankinson opening from September 1, and Casselton opening in late 2008, the corn processing industry should generate about \$563 million. The total revenue for the corn processing industry will be about \$1.7 billion at the end of 2008, for the five year period.

Table 4. North Dakota Corn Processing Industry Economic Returns

	2004	2005	2006	2007	2008
	-----million \$-----				
Walhala	29.7	47.8	49.3	36.3	0.0
Richardson	0.0	0.0	0.0	48.4	93.9

Hankinson	0.0	0.0	0.0	0.0	53.6*
Underwood	0.0	0.0	0.0	67.2	148.9
Casselton	0.0	0.0	0.0	0.0	12.5*
Spiritwood	201.0	210.7	208.5	245.1	254.1
Total	0.0	0.0	0.0	0.0	563.0
Five Year Total	230.7	258.5	257.8	397.1	1,707.1

*Hankinson and Casselton will be operated later 2008.

Summary

Corn has become a major agricultural crop in North Dakota during the past 10 years. In the mid 1990s corn was produced in 3 or 4 counties in the southeast corner of the state. Since that time, corn production has spread northward to the Canadian border and westward beyond the Missouri River. Planted acres have grown by 147% during the past 10 year to where almost 1 in every 10 acres is planted to corn in the state. The production impact has grown due to corn plantings to about \$380 million in 2008 or \$764 million over the past 5 years. That impact is above and beyond the revenue that would have been generated if those acres were planted to soybeans or wheat. The processing industry is also growing rapidly. With the new ethanol plants coming on line, gross revenue in 2008 should be \$563 million. That should continue to grow for 2009 as other plants in the state open. The estimated 5 year impact of the corn industry, both production and processing, is \$2.47 billion. In 2008 that impact should be about \$932 million. To put that into perspective, the entire North Dakota wheat crop for 2008 should generate gross revenues of \$2.78 billion. Of course, if North Dakota did not produce substantial corn, some processing would not occur at the current level.

References

Tom Lilja, Executive Director, North Dakota Corn Growers. Personal Communication, July 2008.

National Agricultural Statistics Service. North Dakota Agriculture. Various Issues.

Nebraska Ethanol Board. Website, www.ne-ethanol.org. <http://www.ne-ethanol.org>.

Renewable Fuels Association. Website, www.ethanolrfa.org. <http://www.ethanolrfa.org>.

United States Department of Agriculture-Economic Research Service. Website, www.ers.gov. <http://www.ers.gov>.

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