Impacts of Dramatic Increase in Corn Based Ethanol Production on Grain Production and Marketing Patterns in South Dakota

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1. Introduction

Corn, soybeans and wheat are the three most important crops in South Dakota. During the year 2005, South Dakota producer harvested 3.9, 3.8, and 3.2 million acres of corn, soybeans, and wheat, respectively, and produced 470, 134, and 133 million bushels of these grains, respectively (USDA, NASS). Country grain elevators provide an important link in moving these grains from farmers to processors or exporters. Information on the total volume of grain moving through country elevators, and the destinations of the grain shipments are essential for evaluating and improving the operation of the grain marketing system. Previously, a grain marketing patterns study for South Dakota was completed in 1997 (Qasmi and McDaniel). In 1997, there were 275 licensed grain elevators in South Dakota and these elevators handled 175, 81, and 98 million bu. of corn, soybeans, and wheat, respectively, accounting for 52%, 95%, and 98% of state's production, respectively. It was estimated that about 72% of corn, 91% of soybeans and 93% of wheat handled by the elevators were shipped to the out-of-the state locations in 1997.

Ethanol production in the United States increased from 1.7 billion gallons in 2001 to 6.5 billion gallons in 2007 – an almost three fold increase (Figure-1). As of September 2008, there were 165 ethanol plants in the United States, with a total capacity of 9.9 billion gallons per year. Assuming the continuation of the policies adopted under Energy Independence and Security Act of 2007 (EISA Act), ethanol production in United States is projected to reach 11.9 billion gallons by crop year 2010-11 (FAPRI, p83). The top five states, Iowa, Nebraska, Illinois, South Dakota, and Minnesota, account for 64 percent of the current ethanol production capacity in the United States (RFA, 2008).

Presently, more than 98 percent of all ethanol in U.S. is produced from corn. By crop year 1999-00, the ethanol use of corn increased to 563 million bushels accounting for 5.9 percent of the total domestic disappearance. Since then, there has been an exponential growth in ethanol production as well as in the proportion of the U.S. corn usage by the ethanol producers. For the crop year 2007-08, the ethanol producers are estimated to take 3.1 billion bushels of corn, accounting for 24.4 percent of domestic disappearance of corn in the United States. The proportion of corn going into ethanol production in major ethanol producing states is much higher. The proportion of corn used for ethanol production in South Dakota was 68.7% during crop year 2006-07, the highest in the nation, and is projected to stay high (66.3% in year 2009-10 according to FAPRI projections).

Compared to the average for 1993-95, corn and soybeans production in the state for year 2005 increased by 95% and 98%, respectively. The corn and soybeans production increases in all five regions located on the east side of the Missouri river in the state (North Central, Northeast, Central, East Central and Southeast) are impressive (Table 1). Large increases in ethanol production are expected to have dramatic impacts on grain marketing patterns in South Dakota and elsewhere. Specifically, a large decrease in the proportion of corn destined for out-of-state is expected. However, changes in the wheat and soybean flows are difficult to predict. The general objective of this paper is to investigate the impacts of dramatic increase in corn based ethanol production and the cropping pattern changes on grain marketing patterns in South Dakota. Specific objectives are: 1) To investigate the changes in the volume of grain handled by the South Dakota grain elevators during the last ten years, 2) To identify changes in the destinations and buyers for South Dakota grains, and 3) To identify the impacts of ethanol plants

on corn and other grains handled by the elevators especially those which are located close to ethanol plants.

2. Review of Literature

The impacts of bio-fuel on cropping patterns, food grain prices and global agricultural markets have been widely investigated (Banse et al., Dela Torre et al., Koizumi and Ohga, Schnepf, Trostle, and Westoff). The impacts on grain flows, however, have been sparsely investigated. A brief review of three of these studies (one dealing with the impacts on global grain production and flows patterns, and two concerning with local grain flows) follows.

Wilson et al. evaluated the impacts of ethanol related developments in the United States on world cropping patterns and grain trade flows for corn, soybeans, and wheat utilizing a global spatial optimization model. They showed that the U.S. energy policy and explosion of the ethanol industry "will result in increased domestic demand for corn, increased planting of corn to the extent technically possible, and reduced plantings of wheat in the United States." They noted that this "will result in increased [corn] plantings in other countries and reduced exportable supplies from United States." They further noted "the increase in shipments to the eastern and western corn belts, reflecting the increase in domestic demand for ethanol use." They further projected a significant shift in flows of corn from Northern Plains for export markets through Pacific North West ports to shipments to domestic destinations in the United States.

Doodly estimated that corn used in Indiana for ethanol will increase from 5% in the baseline (2005) to 18% in the short term (2 years) and 38% in the long term (5 years). Dooly also estimated a decline in the proportion of corn shipped out-of-Indiana from 52% in the baseline (2005) to 39% in the short term (2 years) and 25% in the long term (5 years). He concluded that

more corn will be hauled by trucks, bypassing grain elevators, to the ethanol plants leading some grain elevators within 50 miles of ethanol plants likely to close or consolidate.

Yu, and Hart analyzed changes in grain utilization and distribution as a result of biofuel expansion in Iowa by comparing the results of Iowa grain handlers survey conducted in 2006-07 with the one conducted in 1999-00. They reported that during 2006-07 marketing year, Iowa grain handlers received 1.1 billion bushels of corn. The corn destined for ethanol plants in Iowa, feeders in Iowa, and other processors in Iowa accounted for 26%, 23%, and 18% of the corn handled by Iowa grain handlers, respectively. Out-of-state feeders and elevators (Mississippi, Illinois, and Missouri) accounted for 26%, and 23%, respectively. About 11% of the corn handled by the Iowa handlers went directly to export markets (Gulf Coast, West Coast, Mexico, and others). Comparing the flows of corn handled by the Iowa grain handlers during the marketing year 2006-07 with the marketing year 1999-00, they noted that: a) the corn going to the corn processors including ethanol plants stayed unchanged (44%), b) the share of corn going to livestock industry increased from 27% to 33%, c) the share of corn going to river terminals for export declined from 15 to 4 percent, and d) the total volume of corn for all uses and destinations increased as total availability of corn increased. They concluded that, between the two surveys, share of the Iowa corn handled by the Iowa grain handlers have decreased while the direct deliveries from farms to processors and ethanol plants have increased. These results are very similar to that of Dooly for Indiana.

3. Data and Methodology

The primary data were collected through a mail survey of country grain elevator operators in South Dakota using a variant of the method proposed by Salant and Dillman (1994). The survey sought the information on the grain handled during the crop years 2004-05 and 2005-

06 and was completed during 2007 and 2008. A current list of all licensed country elevators was obtained from the South Dakota Commerce Commission. A questionnaire was developed and pre-tested. After pre-testing, the questionnaire was mailed to all licensed operating country elevators in South Dakota. In order to achieve a higher rate of response; a) endorsements from South Dakota commodity groups and the South Dakota Feed Grain Association were obtained and visibly noted on the cover letter as well as on the survey questionnaire, b) the survey questionnaire was kept as simple and as short as possible, and c) the survey was mailed to elevator managers during a low activity season when the elevator personnel are expected to be less busy. Two follow up letters, each with a copy of the questionnaire, were mailed after two weeks interval. Questionnaires returned with incomplete information were completed by follow up telephone interviews or personal interviews as needed. In total 95 useable completed surveys were received. The overall response rate was 42%. Five regions of South Dakota located on the east side of the Missouri river in the state, and commonly referred to the "East-River," account for predominant production of corn, soybeans, spring wheat, and winter wheat and location of country elevators. The grain elevators in each of these five regions are well represented among the completed survey responses, with regional response rates varying from 29% to 59% (Table 2). The remaining four regions are located on the west side of the Missouri river in state and are commonly referred to "West-River." These four regions have limited production of these crops and relatively fewer and smaller grain elevators. Accordingly, the data and results for these four regions are aggregated and reported under "others" region.

In addition to the primary data, the secondary data on elevator capacity, regional harvested acres, and regional production for these crops were collected from South Dakota

Commerce Commission, and United States Department of Agriculture, National Agricultural Statistics Service (USDA, NASS), respectively.

The responses in completed surveys were tabulated and analyzed by region. In order to arrive at the total quantity handled by all elevators in South Dakota, the quantity of the grain handled by the non-responding elevators were estimated by assuming that the grain mix and the capacity utilization for these elevators are similar to the responding elevators in the region.

The results from the 2005-06 survey are compared with the results from the survey conducted in 1994-95 to identify major changes in the grain marketing patterns. The average quantities of grain handled by the elevators located at varying driving distances from the nearest ethanol plants were computed and compared. Spearman correlation coefficients for quantities of different grains handled by the elevators, minimum driving distance from elevator to the nearest ethanol plant, the existence and the level of rail car loading facility at the elevator, and the capacity of the elevator are computed. These correlations are also used to draw conclusions regarding the impacts of ethanol plants on the quantity of corn handled by the elevators.

4. Changes in Grain Handling Industry

The grain handling industry in South Dakota has been consolidating for some years resulting in trends for fewer and larger elevators over time. Between 1996 and 2008, the total number of grain elevators in the state decreased from 275 to 225, a decrease of 18% (Table 3). During this period the total elevator storage capacity in the state increased by 91% to 229.5 million bushels and the average elevator capacity in the state increased by 134% to 1.02 million bushels. Three regions with the largest total elevator storage capacities as well as the largest average elevator storage capacities are North Central, Central, and Southeast (Table 3).

5. Volume of Grain Handled by the Country Elevators

Quantities of grain handled by South Dakota country elevators and their market share are shown in tables 4 and 5. During the crop year 2005-06, South Dakota grain elevators handled 248 million bushels of corn and 120 million bushels of soybeans (Table 4). Compared to the year 1994-95, grain elevators in South Dakota handled 42% more corn and 49% more soybeans in 2005-06. Elevators in four out of the six regions reported handling more corn during the crop year 2005-06 as compared to the 1994-95. Similarly, elevators in five out of six regions reported handling more soybeans during the crop year 2005-06 as compared to the year 1994-95.

During the crop year 2005-06, South Dakota grain elevators reported handling 63 million bushels of spring wheat (31% up from1994-95) and 56 million bushels of winter wheat (11% up from 1994-95). Elevators in five out of six regions in the state reported handling more spring wheat during the year 2005-06 as compared to 1994-95. Unexpected increase in the spring wheat handled is most likely the result of relatively poor spring wheat crop in 1994-95. The elevators in the North East region reported substantial increase (200%) in the winter wheat handled during the year 2005-06 as compared to the year 1994-95.

The grain handled by all South Dakota elevators during the year 2005-06 as a percent of the total grain available in the state are reported in the Table 5. During the year 2005-06, South Dakota elevators handled 52% of the total available quantity of corn. Between the crop years 1994-95 and 2005-06, the elevators' share has remained same for corn. These results relating to the share of corn handled by the elevators in South Dakota are contrary to the results reported by Yu and Hart for Iowa.

During the marketing year 2005-06, the elevators handled 85% of the total available quantity of soybeans in the state (a drop of 10 percentage points since crop year 1994-95)

indicating larger share of the soybeans bypassing the elevators. During the marketing year elevators handled all (101%) of the spring wheat, and 91% of the winter wheat available in the state. Between the marketing years 1994-95 and 2005-06, the elevators' market share increased by about 13% points for spring wheat and decreased by 19% points for winter wheat.

6. Destinations and Buyer Types for Grain Sold by the Country Elevators

Relative importance of different destinations and types of buyers for South Dakota grain during the marketing years 2005-06 and 1994-95 are depicted in Tables 6 and 7, respectively. The three most important destinations for South Dakota corn during the marketing year 2005-06 were local destinations within 30 miles, Pacific North West terminals, and other in-state destinations accounting for 54% (up from 24% in 1994-95), 35% (down from 47 % in 1994-95), and 10% (up from 4% in 1994-95), respectively. During the year, South Dakota corn destined for Minneapolis area, Sioux City area, Foreign and other destinations jointly accounted for only 2% (down from 25% in 1994-95). Responding elevators reported selling 43% of their corn to the ethanol producers in 2005-06 compared to only 5% of the corn in 1994-95 (Table 7). In contrast, during the marketing year 2005-06, the corn sales by the elevators to the Terminals were reported to be 35% (down from 51% in 1994-95). South Dakota corn flows showed a slight shift away from Pacific North West terminals for exports to in-state destinations for ethanol production. These findings are in line with the projections by Wilson et al.

During the marketing year 2005-06, two most important destinations for South Dakota soybeans were Pacific North West terminals, and Sioux City Area, accounting for 45% (up from 39% in 1994-95), and 15% (down from 26% in 1994-95), respectively. South Dakota soybeans destined to in-state locations accounted for 22% (up from 9% in 1994-95). During the year 2005-06, South Dakota soybeans destined for Minneapolis accounted for 10% (as in 1994-95). During

the year, the Terminals accounted for 52% of soybeans shipped by South Dakota elevators (slightly down from 49% in 1995-96) while the processors claimed 41% of the soybeans shipped by the elevators (down from 38% in 1995-96).

Minneapolis is the most important destination for spring wheat as well as winter wheat. Spring wheat destined for Minneapolis accounted for 82% in 2005-06 (up from 88% in 1994-95). Minneapolis Spot Market and Minneapolis Area Grain Dealers jointly claimed 75% of the spring wheat in 2005-06 (up from 51% in 1994-95). Similarly, winter wheat destined for Minneapolis accounted for 50% in 2005-06 (down from 60% in 1994-95). Minneapolis Spot Market and Minneapolis Area Grain Dealers jointly took 40% of the winter wheat in 2005-06 (down from 43% in 1994-95). During the year 2005-06, processors accounted for 6% of the South Dakota spring wheat (down from 36% in 1994-95), and 16% of the South Dakota winter wheat (down from 26% in 1994-95). It seems that South Dakota grain elevators are relying less to sell wheat directly to the processors.

7. Impacts of Ethanol Plants on Quantities of Grain Handled by Country Elevators

How do ethanol plants impact country elevators especially those located close to the ethanol plant? Do ethanol plants compete with the country elevators for corn or complement the country elevators corn business? Answer to these questions, even in the short run, will depend on many factors including; the size of the ethanol plant, corn production density in the area, size of the elevator, availability of rail service to the elevator, and the size of the rail car loading facility at the elevator. In the long run the changes in the country elevators' structure and the cropping patterns will also come into play.

The information on elevator capacity, rail service, rail loading facility, and quantity of different grains handled by the elevators combined with the driving distance to the nearest

ethanol plant does lend to some insight. South Dakota Elevators located closer to an ethanol plant, on average, have higher capacity, are more likely to be on rail, and have a larger loading facility (Table 7). For the marketing year 2005-06, the quantity of different grains handled by the elevators located at various driving distances (from the nearest ethanol plant) is shown in Table 8. The elevators located with in 10 miles of an ethanol plant, on an average, handled 4.2 million bushels of corn. The average quantity of corn handled by elevators decreased as the driving distance to the nearest ethanol plant increased, and was the lowest for the elevators located at 60 or more miles of driving distance from the nearest ethanol plant. This spatial pattern was only in the case of corn. In the case of soybeans, average quantity handled per elevator was highest (1.7 million bushels) for elevators located at 10-30 miles driving distance from the nearest ethanol plant. Similarly, in the case of spring wheat and winter wheat, there was no consistent spatial pattern.

Spearman-correlation coefficients between quantities of spring wheat, winter wheat, corn, and soybeans handled by the elevators, minimum driving distance from the nearest ethanol plant (distance), existence and size of the rail loading facility (rail), and the elevator capacity (capacity) are reported in Table 10. Elevator capacity is negatively correlated with the distance, and positively correlated with the size of the rail cars loading facility. Both corn and soybeans are negatively correlated with the distance, and positively correlated with the rail and the capacity, indicating that the elevators located closer to an ethanol plants handle more corn as well as soybeans. Spring wheat and winter wheat are not negatively correlated with the distance indicating that the elevators located further away from an ethanol plant handles more wheat. This is not unexpected as ethanol plants are only located in the high corn growing area. Spring wheat and winter wheat are both positively correlated with the rail and the capacity confirming

that the elevators with the larger capacity and the larger rail cars loading facility handle more wheat.

These data provide an indication that, in South Dakota, there is perhaps a complementary relationship between the ethanol plants and the corn handling elevators. At the minimum, one can conclude that the establishment of ethanol plants did not adversely impact the quantity of corn handled by the elevators located near ethanol plants. These finding are contrary to those reported by Dooly for Indiana, and Yu and Hart for Iowa.

8. Summary

Between 1995 and 2005, drastic increase in ethanol production in United States led to increased production of corn and substantially increased share of corn destined for ethanol plants. The objectives of this paper are to investigate/identify: 1) the changes in the volume of grain handled by the elevators in South Dakota, 2) the changes in the destinations and the type of buyers for South Dakota grains, 3) the impacts of the ethanol plants on corn and other grain handled by the elevators which are located close to ethanol plants. The results presented in this paper are mostly from a survey of grain elevators in South Dakota, completed in early 2008. The results from the survey are also compared to the results from a similar survey completed in 1996.

South Dakota grain elevators handled more quantities of corn, soybeans, and wheat in 2005-06 as compared to the quantities of these grains handled in 1994-95. During the period, the increases were larger for Corn (42%) and soybeans (49%) compared to the increases for spring wheat (31%) and winter wheat (10%). Contrary to the estimates projected by Dooly for Indiana, the elevators' market share for corn did not decrease in South Dakota. During the period, the elevators' market share increased for spring wheat, but decreased for winter wheat and soybean.

South Dakota corn flows showed a slight shift away from Pacific North West terminals, for exports to in-state destinations for ethanol production. Slightly larger share of soybeans handled by the elevators are flowing to the processors and Terminals. South Dakota elevators are relying less on direct sales to the processors, and more on Minneapolis area grain dealers and spot market for their spring wheat sales. Similarly they are relying less on direct sales to the processors, and more on Minneapolis spot market for winter wheat sales.

South Dakota elevators located closer to an ethanol plant have higher capacity and are more likely to be on rail and with a larger rail cars loading facility. During the crop year 2005-06, the elevators located with in a driving distance of 10 miles from an ethanol plant, on an average, handled the most corn. The quantity of corn handled by the elevator, on an average, consistently decreased as the driving distance from the elevator to the nearest ethanol plant increased. This pattern is only in case of corn. Elevator capacity is negatively correlated with the driving distance from the elevator to the nearest ethanol plant, and positively correlated with the size of the elevator's rail cars loading facility. Both corn and soybeans are negatively correlated with the minimum driving distance to the nearest ethanol plant. Spring wheat and winter wheat are not negatively correlated with the distance from the nearest ethanol plant. Contrary to the projections/findings by Dooly for Indiana, and Yu and Hart for Iowa, these findings indicate that the establishment of ethanol plants did not adversely impact the quantity of corn handled by the elevators, located near the ethanol plants, in South Dakota.

References

Banse, M., H. van Meijl, A. Tabeau, and G. Woltjer. 2008. "Will EU Biofuel Policies Affect Global Agricultural Markets" *European Review of Agricultural economics*. 35(2):117-141.

De La Torre Ugarte, D., B. English, and K. Jensen. 2007. "Sixty Billion Gallons by 2030: Economic and Agricultural Impacts of Ethanol and Biodiesel Expansion" *American Journal of Agricultural Economics*. 89(5):1290-95.

Dooly, Frank. 2006. "The effect of Ethanol on Grain Transportation and Storage" Purdue University Extension publication on Bio Energy ID-329. http://www.ces.purdue.edu/extmedia/ID/ID-329.pdf. Accessed on June 15, 2009.

Elobeid A. and S. Tokgoz. 2008. "Removing Distortions in the U.S. Ethanol Market: What Does It Imply for the United States and Brazil." *American Journal of Agricultural Economics.* 90(4):918-32.

FAPRI 2008: US and World Agricultural Outlook. Ames, Iowa. 2008

Koizumi, T. and K. Ohga. 2006. "Impacts of the Chinese Fuel-Ethanol Program on the World Corn Market: An Econometric Simulation Approach." *Japanese Journal of Rural Economics* 8:26-40.

Qasmi, B.A. and Kelly McDaniel, June 1997. "Grain Marketing Patterns in South Dakota: Methods of Purchase, Methods of Sale, Grain Destination, and Modes of Transportation" South Dakota State University. Economics Research Report 97-1.

Qasmi, B.A., Y. Hamda, and S.W. Fausti, October 2008. "Ethanol Co-products: Trends in Production, Domestic use, and Potentials for International Market Development." Proceedings of South Dakota International Business Conference, October 9-12, 2008, Rapid City, South Dakota, pp280-301.

Renewable Fuel Association, 2008, The Industry - Statistics http://www.ethanolrfa.org/industry/statistics/ Accessed on June 2008.

Salant, Priscilla, and Dillman, Don A. 1994."How to Conduct Your Own Survey", John Wiley & Sons, Inc. 1st Edition.

Schnepf, R. 2008. High Agricultural Commodity Prices: What are the Issues? CRS Report for Congress, Order Code RL34474 http://www.nationalaglawcenter.org/assets/crs/RL34474.pdf. Accesses on June 15, 2009.

South Dakota Public Utility Commission, Records of Licensed Elevators in South Dakota.

Trostle, R. 2008. Global Agricultural Supply and Demand: Factors Contributing to the Recent Increase in Food Commodity Prices, USDA Economic research Service Report WRS-0801. http://www.ers.usda.gov/Publications/WRS0801/ Accessed on June 15, 2009

USDA, NASS, http://www.nass.usda.gov/QuickStats/PullData_US_CNTY.jsp Accessed on June 10, 2009

Westoff, P. 2008. "Farm Commodity Prices: Why the Boom and What Happens Now?" *Choices*, 23(2):6-10

Wilson, W.W., W. Koo, B. Dahl and R. Taylor. 2008. "Impacts of Ethanol Expansion on Cropping Patterns and Grain Flows" *Review of Agricultural Economics.* 30(4):642-663.

Table 1. Production of wheat, corn, and soybeans in South Dakota, 2005, by region

Region	Spring Wheat	Winter Wheat	Corn	Soy-beans
		Million Bushels.		
North Central	25.4	5.2	92.7	31.9
Northeast	15.7	1.6	85.0	29.6
Central	13.3	18.3	44.7	10.4
East Central	2.4	3.1	127.1	34.8
Southeast	1.2	6.8	107.8	27.2
Others[1]	9.6	30.6	12.8	0.9
South Dakota	67.6	65.6	470.1	134.8
USA	504.5	1,499.1	11,114.1	3,063.2
		Change from Average (1993-95)		
North Central	26%	9%	226%	338%
Northeast	29%	113%	155%	112%
Central	127%	41%	65%	424%
East Central	86%	41%	294%	85%
Southeast	95%	150%	42%	5%
Others[1]	49%	7%	25%	121%
South Dakota	45%	26%	95%	98%
USA	-9%	-9%	91%	40%

[1]Include Northwest, West Central, Southwest, and South Central regions.

SOURCE: USDA, NASS USDA, NASS, http://www.nass.usda.gov/QuickStats/PullData_US_CNTY.jsp Accessed on June 10, 2009

Table 2. Regional Distribution of All and Responding Elevators in South Dakota

Region	No. of All Elevators	Number of Responding Elevators		Responding Elevators on Rail		Avg. Capacity of Responding Elevators	Avg. Capacity of Non-Responding Elevators[2]
	(No.)	(No.)	(%)	(No.)	(%)	(Mil. Bu.)	(Mil. Bu)
2005-06 Survey							
North Central	37	22	59%	10	45%	1.61	0.96
Northeast	37	16	43%	11	69%	1.19	0.57
Central	21	9	43%	7	78%	2.03	0.76
East Central	43	20	47%	10	50%	0.74	0.83
Southeast	52	15	29%	6	40%	1.72	1.12
Others[1]	35	13	37%	9	69%	0.44	0.64
South Dakota	225	95	42%	53	56%	1.25	0.85
1994-95 Survey							
North Central	49	22	43%	9	43%	0.64	0.37
Northeast	56	17	30%	11	65%	0.52	0.39
Central	23	15	65%	12	80%	0.58	0.46
East Central	58	24	41%	12	50%	0.34	0.45
Southeast	49	22	45%	11	50%	0.42	0.47
Others[1]	40	21	52%	9	43%	0.39	0.37
South Dakota	275	120	44%	64	53%	0.47	0.41

[1]Include Northwest, West Central, Southwest, and South Central regions.

[2]Source: South Dakota Public Utility Commission.

Table 3. Changes in Grain Elevator Numbers and Sizes in South Dakota, by Region

Region	Grain Elevators in 2008	Change in Grain Elevators Since 1996	Total Elevator Capacity in 2008	Change in Total Capacity Since 1996	Average Elevator Capacity in 2008	Change in Avg. Elevator Capacity Since 1996
	(No.)	(%)	(Mil. Bu.)	(%)	(Mil. Bu.)	(%)
North Central	37	-24%	49.9	107%	1.35	174%
Northeast	37	-34%	31.0	29%	0.84	95%
Central	21	-9%	27.4	122%	1.31	143%
East Central	43	-26%	34.0	45%	0.79	96%
Southeast	52	6%	67.4	207%	1.30	190%
Others[1]	35	-13%	19.8	30%	0.57	49%
South Dakota	225	-18%	229.5	91%	1.02	134%

[1]Include Northwest, West Central, Southwest, and South Central regions.

Table 4. Estimated Quantities of Grain Handled by All SD Elevators, 2005-06

Region	Spring Wheat	Winter Wheat	Corn	Soybeans
		Mil. Bu.		
North Central	18.81	5.06	48.59	27.08
Northeast	24.58	2.64	45.08	22.06
Central	6.07	11.30	29.30	8.86
East Central	1.21	0.69	41.47	32.76
Southeast	0.88	7.71	80.96	29.09
Others	11.63	28.45	2.55	0.20
South Dakota	63.18	55.84	247.95	120.05
		Change from 1994-95		
North Central	-28%	-21%	87%	102%
Northeast	139%	200%	19%	28%
Central	46%	-13%	229%	511%
East Central	148%	-51%	-18%	68%
Southeast	8%	60%	71%	2%
Others	79%	20%	-41%	-37%
South Dakota	31%	11%	42%	49%

Table 5. Quantities of Grain Available and Handled by All SD Elevators

Description	Spring Wheat	Winter Wheat	Corn	Soybeans
		Mil. Bu.		
Production 2005-06	67.60	65.56	470.05	134.75
Total Available Qty.[1]	62.56	61.60	480.62	141.44
Total Qty. Handled by Elevators in 2005-06	63.18	55.84	247.95	120.05
		Percent of Total Available Qty.		
Elevators' Market Share in 2005-06	101%	91%	52%	85%
Elevators' Market Share, in 2094-95	88%	110%	52%	95%

[1]Production minus stock change. Stock changes are based on marketing years: July through Jun for Wheat; Oct through Sep for Corn; and Sept through Aug for Soybeans. Stock Changes for all Wheat are assigned to Winter and Spring Wheat based on their respective five year production share in SD.

Source: Data on Production and stock changes are from USDA, SDASS, 2009

Table 6. Grain Sold by the Responding Elevators, by Destinations, 1994-95 and 2005-06

Sales Destination	Spring Wheat		Winter Wheat		Corn		Soybeans	
	1994-95 Survey	2005-06 Survey	1994-95 Survey	2005-06 Survey	1994-95 Survey	2005-06 Survey	1994-95 Survey	2005-06 Survey
Number of Respondents	81	60	74	54	81	78	87	66
SALES DESTINATION:								
1. Locals, with in 30 miles.	5%	2%	5%	4%	24%	54%	7%	8%
2. Others in S.D.	2%	1%	2%	3%	4%	10%	2%	14%
3. MPLS Area	88%	82%	60%	50%	3%	0%	10%	10%
4. Sioux City Area	0%	1%	6%	1%	4%	0%	26%	15%
5. Pacific NW Terminals	0%	2%	0%	8%	47%	35%	39%	45%
6. Duluth	2%	2%	0%	0%	0%	0%	4%	5%
7. Foreign Buyers	0%	0%	0%	1%	7%	1%	7%	2%
8. Others	3%	9%	27%	34%	11%	1%	5%	3%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%

Table 7. Grain Sold by the Responding Elevators, by Type of Buyers, 1994-95 and 2005-06

Sales Destination	Spring Wheat		Winter Wheat		Corn		Soybeans	
	1994-95 Survey	2005-06 Survey	1994-95 Survey	2005-06 Survey	1994-95 Survey	2005-06 Survey	1994-95 Survey	2005-06 Survey
Number of Respondents	81	60	74	54	81	78	87	66
TYPES OF BUYERS:								
1. Farmers as Feed	0%	0%	0%	0%	15%	12%	0%	0%
2. Feed Mills	0%	1%	0%	0%	3%	6%	0%	1%
3. Ethanol Producers	0%	0%	0%	0%	5%	43%	0%	0%
4. Other Processors	36%	6%	26%	16%	8%	3%	38%	41%
5. MPLS Spot (cash) Market	43%	35%	10%	32%	0%	0%	1%	0%
6. MPLS Area Grain Dealers	8%	40%	33%	8%	0%	0%	0%	2%
7. Terminals	9%	8%	5%	10%	51%	35%	49%	52%
8. Foreign Buyers	0%	0%	0%	1%	7%	1%	7%	2%
9. Others	3%	9%	27%	34%	11%	1%	5%	3%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%

Table 8. Responding Elevator Capacities and Rail Loading Facilities[1]

Distance From Ethanol Plant	Average Capacity	No. of Responding Elevators	On Rail	Shipping by Rail	25-27 Cars Loading Facility	54 Cars Loading Facility	110 Cars Loading Facility
	.(Mil. Bu.).	……..		(No.)	……..……		…….
< 10 Miles	2.533	8	8	6	4	2	2
10-30 Miles	1.478	38	22	17	14	3	5
30-60 Miles	1.160	28	12	12	4	4	4
> 60 Miles	0.613	21	10	10	8	0	2
All	1.282	95	52	45	29	9	13

[1]Based on the responses in 2008.

Table 9. Average Quantity of Grain Handled by the Elevators, 2005-06

Distance From Ethanol Plant	Measure	Spring Wheat	Winter Wheat	Corn	Soybeans
		……..…….....	….. Mil. Bu.	……	
< 10 Miles	Avg.	1.493	0.053	4.231	1.566
	Max.	9.505	0.160	11.000	7.926
	Min.	0.146	0.061	0.455	0.074
10-30 Miles	Avg.	0.348	0.216	2.170	1.746
	Max.	3.608	2.500	15.875	28.000
	Min.	0.002	0.004	0.004	0.094
30-60 Miles	Avg.	0.625	0.248	1.257	0.540
	Max.	2.923	1.500	6.200	2.300
	Min.	0.005	0.019	0.120	0.090
> 60 Miles	Avg.	0.361	0.683	0.219	0.063
	Max.	3.990	4.700	1.120	0.418
	Min.	0.010	0.020	0.008	0.016
All	Avg.	0.529	0.315	1.643	1.003
	Max.	9.505	4.700	15.875	28.000
	Min.	0.002	0.004	0.004	0.016

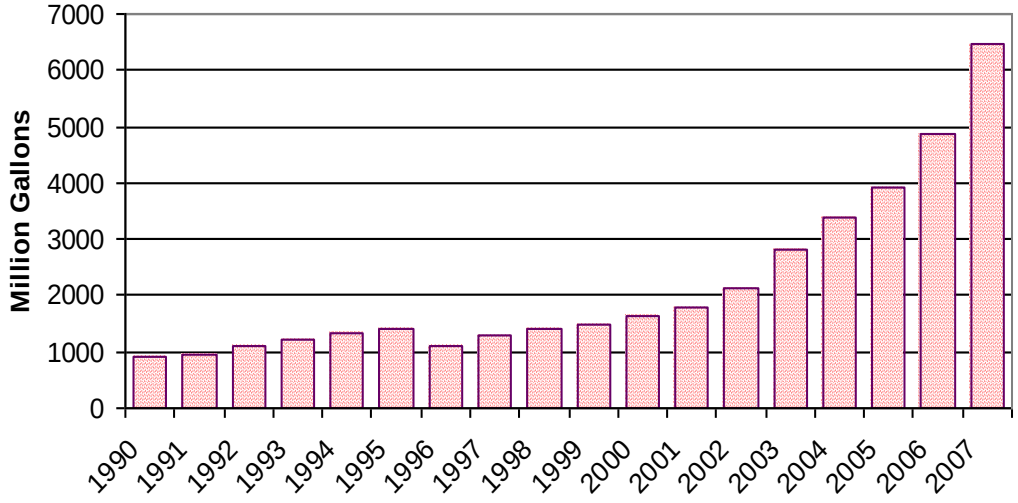
Table 10. Spearman-Correlation Coefficients

Spearman Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	Spring Wheat	Winter Wheat	Soybeans	Corn	Distance	Rail	Capacity
Spring Wheat	1.00000	0.58171	0.29891	0.34826	0.04535	0.58068	0.39726
		<.0001	0.0033	0.0005	0.6626	<.0001	<.0001
	95	93	95	95	95	95	95
Winter Wheat	0.58171	1.00000	-0.02496	0.00651	0.34357	0.36216	0.17404
	<.0001		0.8123	0.9506	0.0007	0.0004	0.0952
	93	93	93	93	93	93	93
Soybeans	0.29891	-0.02496	1.00000	0.81012	-0.56432	0.33180	0.54502
	0.0033	0.8123		<.0001	<.0001	0.0010	<.0001
	95	93	95	95	95	95	95
Corn	0.34826	0.00651	0.81012	1.00000	-0.50375	0.40121	0.59014
	0.0005	0.9506	<.0001		<.0001	<.0001	<.0001
	95	93	95	95	95	95	95
Distance	0.04535	0.34357	-0.56432	-0.50375	1.00000	-0.06584	-0.31585
	0.6626	0.0007	<.0001	<.0001		0.5261	0.0018
	95	93	95	95	95	95	95
Rail	0.58068	0.36216	0.33180	0.40121	-0.06584	1.00000	0.56619
	<.0001	0.0004	0.0010	<.0001	0.5261		<.0001
	95	93	95	95	95	95	95
Capacity	0.39726	0.17404	0.54502	0.59014	-0.31585	0.56619	1.00000
	<.0001	0.0952	<.0001	<.0001	0.0018	<.0001	
	95	93	95	95	95	95	95

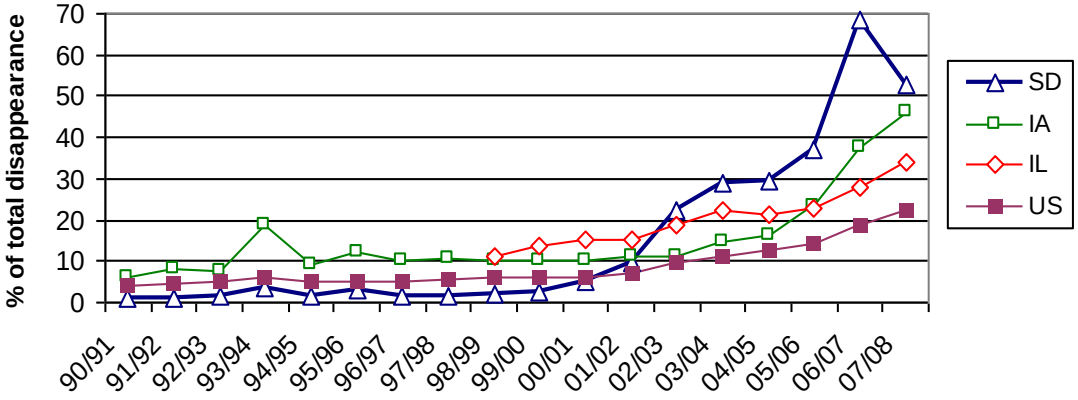
Where Spring Wheat, Winter wheat, Corn, and soybeans are the bushels of respective grain handled by the elevators during the crop year 2005-06, Distance is the minimum driving distance from elevator to the nearest ethanol plant in miles, Rail is a rank variable (=0 for no rail facility, =1 for 27 or less rail cars loading facility, =2 for 54 cars loading facility, and =3 for 110 cars loading facility), Capacity is the elevator capacity for year 2008 in bushels.

Figure 1. U.S. ethanol production, 1990-2007



Source: Renewable Fuel Association, Industry Statistics.

Figure 2. Proportion of corn used for ethanol in selected states, 90/91-07/08



Calculated from calendar yr. ethanol production RFA-Industry Stat. converted to crop yr. & USDA corn disappearance data.

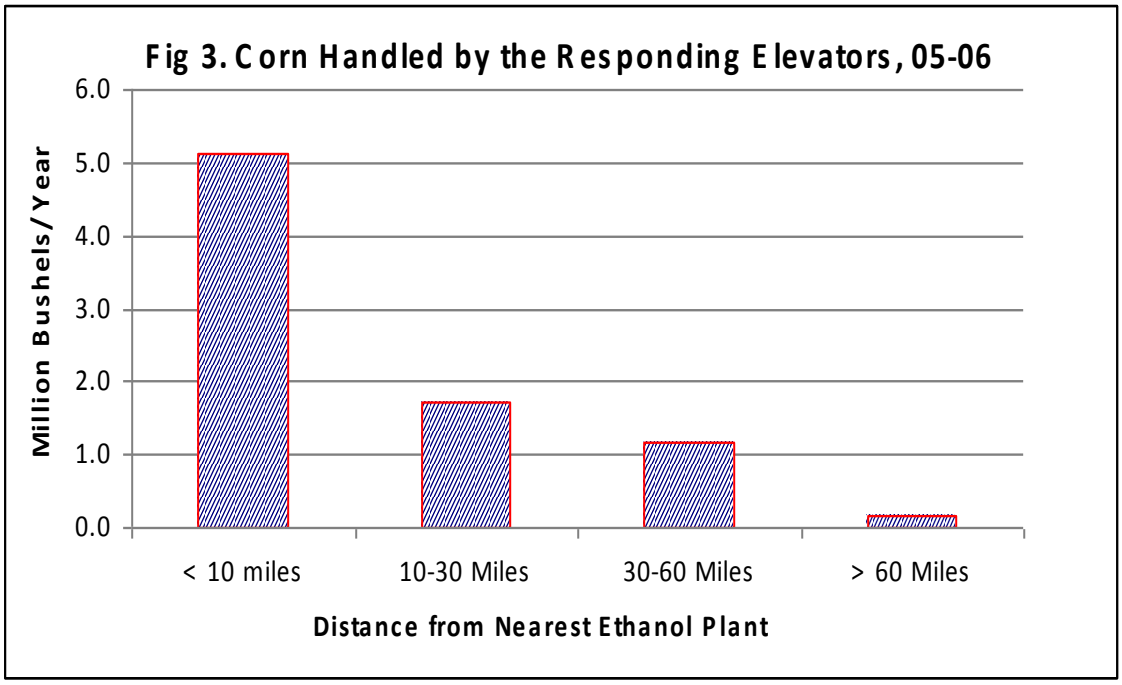


Fig 3. Corn Handled by the Responding Elevators, 05-06
Million Bushels/Year
6.0
5.0
4.0
3.0
2.0
1.0
0.0
< 10 miles
10-30 Miles
30-60 Miles
> 60 Miles
Distance from Nearest Ethanol Plant

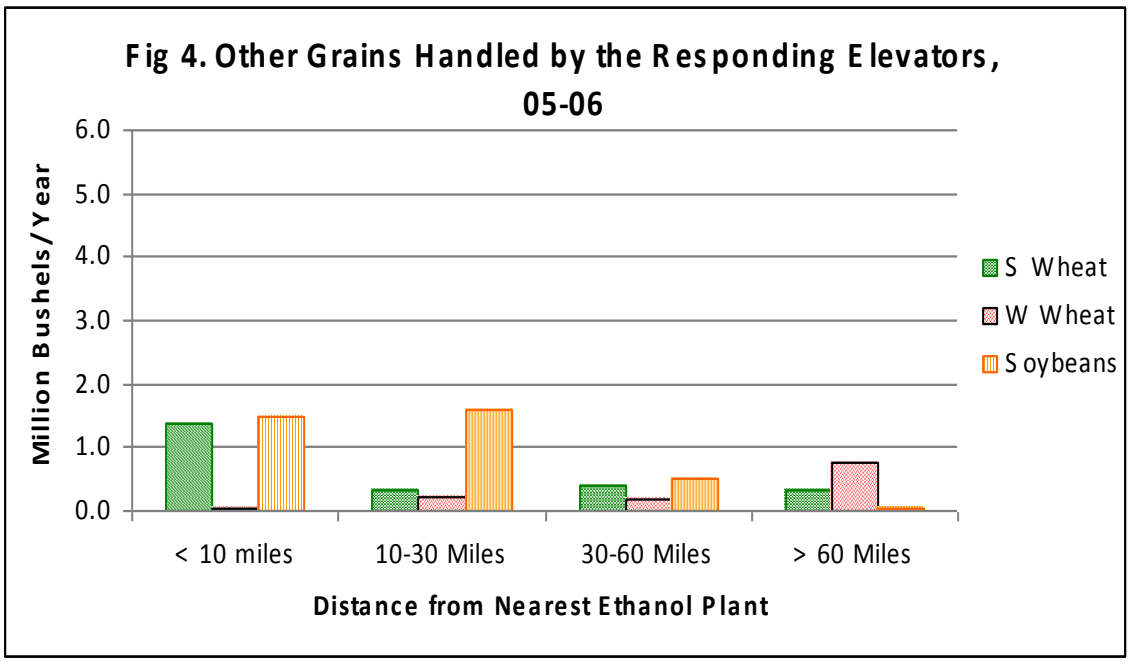


Fig 4. Other Grains Handled by the Responding Elevators, 05-06
Million Bushels/Year
6.0
5.0
4.0
3.0
2.0
1.0
0.0
< 10 miles
10-30 Miles
30-60 Miles
> 60 Miles
Distance from Nearest Ethanol Plant
S Wheat
W Wheat
Soybeans