2009 Risk and Profit Conference
Breakout Session Presenters

"Knowledge for Life"

8. The Impact of Kansas Grain Industry Structure on Corn and Wheat Bids

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Daniel O'Brien was raised on a grain and livestock farm in south central Nebraska, in which he still has an interest with his father and three brothers. He received both Bachelor of Science (1978) and Master of Science (1980) degrees in Agricultural Economics from the University of Nebraska-Lincoln. The focus of his M.S. thesis was on analyzing the impact of agricultural cooperatives on rural Nebraska fertilizer markets. O'Brien then worked as an extension agent in western (Lincoln County) and northeastern (Pierce County) Nebraska for seven years beginning in early 1981. While attending graduate school at Iowa State University beginning in 1987, O'Brien worked as an Extension Assistant in Agricultural Marketing, focusing on analysis grain and livestock market situation and outlook and price risk management strategies. He completed his Ph.D. in December 1993, focusing his dissertation research on developing a method by which to forecast the probability of alternative U.S. harvest time corn futures price outcomes. While working as Extension Farm Management Specialist in Northwest Iowa during 1993 through early 1995, he became heavily involved in analysis of the structural changes in the Iowa livestock industry associated with contract hog production. From March 1995 through May 2003, O'Brien worked as the Extension Agricultural Economist in Northwest Kansas based out of the Northwest Research and Extension Center in Colby. He held the position of Northwest Area Extension Administrative Director starting in June 2003 before returning to his Extension Agricultural Economist position in January 2007. Daniel O'Brien's ongoing extension and applied research interests and efforts are in the areas of a) grain market supply-demand analysis, bioenergy impacts and price-income risk management strategies, b) grain industry market structure, conduct and performance – focusing on grain handling and transportation issues, and c) economic analysis of irrigated and dryland cropping systems, and associated cropland leasing arrangements.

Abstract/Summary

The corn and wheat cash prices in Kansas are affected by a number of local supply-demand, market structure, transportation access and other factors. Kansas corn prices in 2008 were affected by form of business organization, local feedgrain production and livestock feed usage, elevator storage capacity, access to railroad grain handling facilities, and to a limited degree by the number of competitors in local markets. During 2008 geographic proximity to grain ethanol plants did not have a positive statistically significant impact on local corn prices, although a number of mitigating factors may have existed during that time period. Kansas wheat prices in 2008 were affected by local wheat production, elevator storage capacity, the number of competitors in local markets, and by location relative to flour mills in the state. Evidence of operating cost and efficiency differences among grain elevators indicate the presence of market power in local Kansas grain markets.

A disparity exists in the size of grain storage and handling facilities and rail car capacities among grain elevators in Kansas. A small number of larger capacity grain elevator facilities exist throughout the state along with a large number of medium to small facilities. There is also a marked disparity among geographic crop reporting districts in Kansas in terms of grain production, grain elevator capacity, and associated rail car handling capacity. A large number of multiple location agribusiness firms exist in Kansas. These multiple location firms are mostly Cooperatives operating in regional markets, but there are also a limited number of major Independent and Joint Venture multi-location firms in the state. A small number of multiple site Independent firms exist that have large grain handling and rail capacity which are widely dispersed across the state. Competitive market conditions in local/regional grain markets in Kansas tend to be affected by the existence and location of shuttle and/or unit train grain handling facilities and major grain terminals. Delineation of rail procurement areas offers an "upstream – downstream" perspective of grain markets and grain market flows in regions that depend on rail transportation to move grain from producing areas to exporters, processors and/or livestock feeders. Truck transport of grain is a major factor in movement of grain and feed products over all distances less than what is economically serviceable via rail.

2009 Risk and Profits Conference Presentation:

"Kansas Grain Handling and Transportation Systems"

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Introduction

This purpose of this paper is to describe the infrastructure of grain handling and rail transportation systems in Kansas. Cooperative and independent grain elevators in Kansas are in an on-going, competitive process of adjustment as they seek to enhance their profitability and improve their likelihood of economic sustainability.

Economically health grain-handling agribusinesses are in an on-going process of positioning and re-positioning themselves to respond to such market influencing factors as a) bioenergy-related demand for feedgrains, b) handling and use of bioenergy processing bi-products to livestock feeders, c) consolidation and changes in ownership of grain elevators in their market area, and d) possible changes in railroad service availability to either themselves or competitive rural grain elevators. In recent decades the local-regional competitiveness of grain elevators has been affected by the increased emphasis of railroads on servicing larger shuttle or unit train handling facilities. In some regions of Kansas the de-emphasis by railroad service providers on serving low volume branch railroad lines has lead to abandonment and cessation of rail service to particular grain elevators, making them completely reliant upon truck transportation to move grain to and from their facilities. These and other factors are having a measurable impact on the infrastructure of the Kansas grain handling system and the direction and quantity of flows of grain and grain processing bi-products in the region. These changes are expected to affect local grain basis bids and the relative grain price competitiveness of different areas of the state.

This paper provides a description of the grain handling and transportation system in Kansas, focusing on the capacity of grain elevators and the rail transportation systems for grain in the state. To address impacts from the growth of the bioenergy industry in the region, the location of existing and expected ethanol plants will also be provided, with an emphasis on the proximity of ethanol plants to grain handling and transportation facilities. This presentation will be largely descriptive in nature, focusing on the state of the current grain marketing and handling industry in the state of Kansas. It is intended to provide a starting place for future, more focused analyses of grain market infrastructure and competitive forces in Kansas and the Great Plains region.

Economic Principles and Issues

There are several economic principles of significance to this study. Oligopsonistic competition is a concept from the field of study in economics known as industrial organization, and is descriptive of economic structure of local/regional grain markets. In oligopsonistic grain markets a small number of buyers compete with each another to buy grain. Competition among grain buyers in these local and regional markets is limited by significant barriers to entry which prevent other firms from readily entering the market to compete to buy grain. Barriers to entry exist in terms of the cost of building grain storage and handling and rail car handling facilities and distance from other grain elevators. Partially because of the limited number of grain elevators in oligopsonistic local grain markets, the firms within a particular grain marketing region maintain an ongoing awareness of the levels of each other's competitive cash grain bids (and implicitly their local basis bids). They also maintain an awareness of the other types of non-price customer services their local competitors are offering. Even though barriers to entry exist, these markets may be considered to be "contestable" in most cases in that grain elevators both outside of these the local/regional markets often monitor cash grain bids and strategically bid for grain to maintain interregional price competition. This form of cross-region competition is usually reliant upon the profitability of strategically transporting grain by truck into a particular region from outside grain markets.

Economies of scale and scope are relevant to this study of local grain market structure. Scale economies exist for a grain elevator if the average cost of handling grain falls as the amount of grain handled or as grain handling capacity increases. Scope economies exist if it is less costly for one (1) firm to perform two activities than for two (2) specialized firms to perform them separately. The formation of multi-location firms or even Joint Ventures may be motivated by the desire to gain efficiencies in grain procurement, customer service, or administrative costs. These efficiency gains can be classified as economies of scope.

The means by which grain prices are transmitted from stage to stage through the grain handling and distribution system is relevant to this study. Grain transportation cost economies available to individual grain elevators from access to either unit (approximately 50-100 cars) or shuttle (approximately 110 railcars) train handling facilities may impact local competitive grain bids and grain market competition. These cost economies may be due to either lower rail car service rates offered by railroads for utilizing unit or shuttle trains or to scale economies related to grain handling.

The concepts of "upstream" and "downstream" locations in grain market procurement regions are also relevant to discussions of local grain market competition. Locations that are "upstream" from a particular grain elevator have to transport grain through and past that location to reach their point of final use. Locations that are "downstream" from a grain elevator facility are closer to the point of final use for the grain than the specific grain elevator, and do not need to ship grain to or past such facilities to reach their point of final use.

Sources of Information

A primary source used in this paper was the 2008 Kansas Official Directory of the Kansas Grain and Feed Association. This directory provides information on grain dealers, millers, seed dealers, seed processors, feed dealers, manufacturers and alfalfa processors in Kansas. For each grain elevator or other type of grain industry-related agribusiness listed in the directory, the following types of descriptive information is provided: the type of membership (active, station, or non-member), elevator grain capacity, number of elevators operated at the same location, flat storage capacity, presence of a mechanical sampler at the elevator facility, whether the elevator is a state or federal licensed grain warehouse, warehouse capacity, daily milling capacity, rail service provider, a description of the services offered by to clientele by the company, location of headquarters (if affiliated with other locations), and contact information/address/town and county location.

Other information on rail services and grain elevator capacities were available from the websites of major railroads and agribusiness firms. The Burlington Northern Santa Fe (BNSF) railroad (www.bnsf.com/) provides rate information, listing of grain elevators and their associated grain handling capacities (www.bnsf.com/markets/agricultural/elevator/index.html), and other associated information on their website. The Union Pacific Railroad (UP) (www.uprr.com) provides similar transportation rate and elevator capacity and rail service descriptions (www.uprr.com/customers/ag-prod/index.shtml) on their website. Other rail providers serving Kansas also provide useful information on their public websites, but do not list specific public information on grain elevator capacities, etc. to the degree of the UP and BNSF public websites. The Kansas Department of Transportation provides descriptive information regarding grain-oriented rail service Kansas (http://www.ksdot.org/burRail/Rail/default.asp). The publication titled "*Statewide Freight Plan, 2009*" produced by the Kansas Department of Transportation provides specific geographic descriptions of areas served and types of products hauled by railroads in Kansas. This publication provides an in-depth assessment of current and future use shipment of agricultural and other products in Kansas via truck and rail transportation.

The locations, capacity and corn usage of Kansas ethanol plants was obtained from the Kansas Ethanol website (www.ksgrains.com/ethanol/kseth.html) with information current through August 6, 2009. Some information for this paper was also obtained via personal interviews (in person and by phone) with a number of Kansas grain elevator operators and agribusiness managers.

Elevator Grain Handling Capacity in Western Kansas

Defining Kansas Crop Reporting Districts: Nine (9) separate crop reporting districts are defined by the National Agricultural Statistics Service (NASS) (http://www.nass.usda.gov/), an agency of the United States Department of Agriculture (http://www.usda.gov). These crop reporting districts represent the Northwest (CRD 10), West Central (CRD 20), Southwest (CRD 30), North Central (CRD 40), Central (CRD 50), South Central (CRD 60), Northeast (CRD 70), East Central (CRD 80) and Southeast (CRD 90) geographic regions of Kansas.

Grain Elevator Characteristics: Six hundred ninety five (695) Kansas grain elevators were identified in this study (Table 1). The average upright storage and handling capacity (i.e. Elevator Capacity) was 1,128,000 bushels, with a median capacity of 657,000 bushels. The median represents the "middle" value of a data set. That the average elevator capacity was greater than the median value indicates that elevator sizes were skewed, i.e., that a few large elevators existed in comparison to those elevators that were moderate to smaller in size. The existence of grain handling facilities with "0" elevator capacity was indicative of limited number of businesses that had flat storage but no vertical or upright elevator capacity. Maximum upright storage and handling capacity was 47,000,000 bushels. The coefficient of variation (CV) is a measure of the relative variability of elevator capacity. In a statistical sense, higher coefficients of variation indicate relatively greater amounts of variability for one variable as opposed to another.

Table 1. Characteristics of All Grain Elevators (695 agribusinesses)

Descriptive Variable	Number	Average	Median	Min.	Max.	CV
Elevator Capacity (1,000 bu.) (Upright storage + handling)	695	1,128	657	0	47,000	2.54
Flat Storage Capacity (1,000 bu.)	695	199	0	0	40,000	8.31
Total Elevator & Flat Storage Capacity (1,000 bu.)	695	1,307	726	0	47,000	2.62
Warehouse Storage Capacity (Tons)	695	115	0	0	2,000	2.19
Railroad Car Capacity / Location (# cars handled)	695	13	5	0	280	2.02
	Rail Access?	Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	46-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity	(457) 66.2%	(287) 40.6%	(277) 39.2%	(102) 14.4%	(15) 2.1%	(26) 3.7%

Sources: Kansas Grain and Feed Association, Union Pacific Railroad (UP) and Burlington Northern Santa Fe Railroad (BNSF) Websites, and direct interviews of agribusiness managers.

Average flat storage capacity for elevators was 199,000 bushels, but for other than a few locations, the vast majority of locations had minimal flat storage capacity. This variability was reflected in the large CV value (i.e., 8.31). Total elevator and flat storage capacity averaged 1,307,000 bushels per location, with a median value of 726,000 bushels, again indicating the skewing influence of a small number of very large locations. Warehouse storage capacity (in Tons) was relatively small in comparison to overall grain handling capacity.

Railroad Car Handling Capacity: Nearly 2/3 (i.e., 457 of 695 locations or 66.2%) were identified as having access to railroad transportation (Table 1). Overall, 287 firms (41.3% of 695 locations) had zero or no rail capacity, while 277 (39.2%) had 1-15 railcar handling capacity, 102 (14.4%) had 16-45 rail car capacity, 15 (2.1%) had capacity for 45-90 rail cars, and 26 (3.7%) had capacity to handle 91 rail cars or more. The difference or gap between the proportion of grain elevator locations that had access to no rail cars (41.3%) and those had no rail access (33.8% = 100% less 66.2%) may be due to either lack of rail siding or decisions by either railroad service providers or grain elevators to no longer make use of available railroad tracks near grain handling facilities.

Elevator Characteristics by Type of Business Ownership: Of the 695 grain elevator locations identified, 484 (70%) were classified as cooperatives, 205 (29%) as independent companies, and 6 (1%) as joint ventures, which may have been owned by a combination of cooperatives and/or independents (Table 2). Cooperative grain elevators generally had smaller elevator capacity than Independent and Joint Venture grain handling locations.

Table 2. Characteristics of Cooperative, Independent, and Joint Venture Grain Elevators

Descriptive Variable	Number	Average	Median	Min.	Max.	CV
Cooperatives						
Elevator Capacity (1,000 bu.)	484	818	666	0	4,082	0.76
Total Capacity (1,000 bu.)	484	894	720	0	4,550	0.77
Warehouse Capacity (Tons)	484	136	0	0	2,000	2.03
RR Capacity per Location (#cars)	484	10	9	0	110	1.60
	Rail Access?	Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	46-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity	(314) 65.1%	(185) 37.9%	(225) 46.1%	(66) 13.5%	(5) 1.0%	(7) 1.4%
Independents						
Elevator Capacity (1,000 bu.)	205	1,839	592	0	47,000	2.78
Total Capacity (1,000 bu.)	205	2,267	764	15	47,000	2.69
Warehouse Capacity (Tons)	205	68	0	0	1,200	2.66
RR Capacity per Location (#cars)	205	19	3	0	280	2.05
	Rail Access?	Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	46-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity	(139) 68.1%	(100) 46.9%	(52) 24.4%	(35) 16.4%	(10) 4.7%	(16) 7.5%
Joint Ventures						
Elevator Capacity (1,000 bu.)	6	2,302	2,254	1,200	3,500	0.49
Total Capacity (1,000 bu.)	6	2,602	2,254	1,200	4,700	0.62
Warehouse Capacity (Tons)	6	0	0	0	0	---
RR Capacity per Location (#cars)	6	56	63	0	110	0.95
	Rail Access?	Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	46-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity	(4) 100.0%	(2) 33.3%	(0) 0.0%	(1) 16.7%	(0) 0.0%	(3) 50.0%

(n = 695 agribusinesses), Sources: See Table 1 footnote.

Although the average capacity of Independent grain elevators was similar to that of Joint Venture elevators, they (Independents) were more variable in terms of capacity. A small number of very large facility locations impacted the aggregate Independent measures. As a whole, grain handling facilities for Joint Ventures were consistently larger than those of either Cooperatives or Independents. The proportion of locations with rail access for Cooperative and Independent elevators were nearly identical (65.1% and 68.1%, respectively). Seven (7) Cooperative locations had capacity for 91+ car unit or shuttle trains, and 5 locations had capacity for 46-90 car unit trains. Sixteen (16) Independent locations had capacity for 91+ car unit or shuttle trains, and 10 locations had capacity for 46-90 car unit trains. All (100%) of the Joint Venture locations have railroad access, but 2 locations were identified as having zero rail car capacity (i.e., not using their rail access in this case). Three (3) Joint Venture locations had capacity for 91+ car unit or shuttle trains, and 1 location has capacity for 1-15 rail cars.

When grouped together by their (sometimes multiple-site) business affiliations, these separate grain elevator locations represented 92 separate cooperative firms, 113 independent firms, and 3 joint ventures (Table 3). Cooperative firms averaged 5 locations, Independents averaged 2 locations, and Joint Ventures averaged 2 locations. The aggregated totoal grain elevator capacities of the 113 Independent firms were larger than those of the 92 Cooperatives (5,972,000 bushels versus 4,763,000 bushels, respectively). However, relatively low median elevator capacity value for Independent firms (475,000 bushels) in comparison to the average elevator capacity reflects a large disparity in grain handling capacity among the group of firms, perhaps even more-so than among the cooperative firms. The six (6) Joint Venture firms had a smaller average but larger median elevator capacity than either the Cooperative or Independent firms. Total elevator grain handling capacity in Kansas summed to 431,930,000 bushels for Cooperatives (48% of total); 464,773,000 bushels for Independents (51%); and 10,407,000 bushels for Joint Ventures (1%).

Table 3. Combined Characteristics of Affiliated Agribusiness COOPs, Independents, and Joint Venture Grain Elevators (n = 208 affiliated agribusinesses organizations)

Descriptive Variable	Number	Average	Median	Min.	Max.	CV
Cooperatives						
# Locations / Multi-Site Firm	92	5	4	1	20	0.80
Elevator Capacity (1,000 bu.)	92	4,333	2,662	87	25,611	1.13
Total Capacity (1,000 bu.)	92	4,763	2,846	87	28,429	1.13
Warehouse Capacity (Tons)	92	700	200	0	7,600	1.68
Rail Access/Location (%Yes)	92	67%				
RR Capacity-Company (#cars)	92	51	30	0	359	1.21
Independents						
# Locations / Multi-Site Firm	113	2	1	1	24	1.50
Elevator Capacity (1,000 bu.)	113	4,946	402	0	253,030	5.24
Total Capacity (1,000 bu.)	113	5,972	475	15	293,719	5.00
Warehouse Capacity (Tons)	113	168	0	0	4,986	3.25
Rail Access/Location (%Yes)	113	59%				
RR Capacity-Company (#cars)	113	50	0	0	2,676	5.35
Joint Ventures						
# Locations / Multi-Site Firm	3	2	1	1	3	0.69
Elevator Capacity (1,000 bu.)	3	2,567	3,027	1,200	3,500	0.47
Total Capacity (1,000 bu.)	3	2,976	3,027	1,200	4,700	0.59
Warehouse Capacity (Tons)	3	0	0	0	0	
Rail Access/Location (%Yes)	3	100%				
RR Capacity-Company (#cars)	3	103	100	100	110	0.06

Sources: See Table 1 footnote.

Kansas Crop Production by Crop Reporting District

Production of the four primary crops in Kansas (corn, grain sorghum, soybeans and wheat) varied considerably by region of the state and by year during the 2005-08 period (Table 4).

Table 4. Crop Production by Crop Reporting District (Years 2005-2008)

Descriptive Variable	Average	Median	Min.	Max.	CV
Northwest KS (CRD 10)					
Corn production (1,000 bushels)	66,676	65,515	48,739	86,935	0.25
Grain Sorghum production (1,000 bu.)	14,557	14,000	10,129	20,102	0.34
Soybean production (1,000 bushels)	2,176	2,246	1,661	2,550	0.17
Wheat production (1,000 bushels)	35,470	38,388	19,440	45,665	0.29
Total for CRD 10 (1,000 bushels)	118,880	120,149	79,969	155,252	---
West Central KS (CRD 20)					
Corn production (1,000 bushels)	31,827	30,470	23,318	43,050	0.27
Grain Sorghum production (1,000 bu.)	23,118	22,072	18,251	30,078	0.24
Soybean production (1,000 bushels)	522	518	440	611	0.14
Wheat production (1,000 bushels)	38,626	39,168	24,585	51,585	0.30
Total for CRD 10 (1,000 bushels)	94,093	92,227	66,594	125,324	---
Southwest KS (CRD 30)					
Corn production (1,000 bushels)	131,680	139,195	99,820	148,510	0.16
Grain Sorghum production (1,000 bu.)	30,159	30,727	23,456	35,725	0.18
Soybean production (1,000 bushels)	4,252	4,541	2,518	5,409	0.30
Wheat production (1,000 bushels)	54,360	56,438	32,985	71,580	0.33
Total for CRD 10 (1,000 bushels)	220,451	230,900	158,779	261,224	---
North Central KS (CRD 40)					
Corn production (1,000 bushels)	26,208	27,655	18,842	30,680	0.19
Grain Sorghum production (1,000 bu.)	44,136	45,129	33,270	53,014	0.18
Soybean production (1,000 bushels)	15,249	13,619	13,089	20,669	0.27
Wheat production (1,000 bushels)	51,779	54,650	41,600	56,215	0.13
Total for CRD 10 (1,000 bushels)	111,163	113,398	87,959	129,898	---
Central KS (CRD 50)					
Corn production (1,000 bushels)	14,359	15,263	10,192	16,720	0.19
Grain Sorghum production (1,000 bu.)	34,627	35,568	24,277	43,095	0.22
Soybean production (1,000 bushels)	8,637	7,623	6,307	12,996	0.39
Wheat production (1,000 bushels)	53,334	59,015	27,945	67,360	0.30
Total for CRD 10 (1,000 bushels)	110,957	117,468	68,721	140,171	---
South Central KS (CRD 60)					
Corn production (1,000 bushels)	54,945	57,895	45,689	58,300	0.11
Grain Sorghum production (1,000 bu.)	27,546	28,260	22,081	31,584	0.15
Soybean production (1,000 bushels)	11,554	11,542	8,836	14,295	0.20
Wheat production (1,000 bushels)	68,051	77,348	29,980	87,530	0.35
Total for CRD 10 (1,000 bushels)	162,096	175,044	106,586	191,709	---
Northeast KS (CRD 70)					
Corn production (1,000 bushels)	64,691	67,243	51,148	73,130	0.14
Grain Sorghum production (1,000 bu.)	5,868	5,517	5,050	7,386	0.19
Soybean production (1,000 bushels)	26,018	26,134	24,976	26,828	0.03
Wheat production (1,000 bushels)	7,026	6,958	5,860	8,330	0.19
Total for CRD 10 (1,000 bushels)	103,603	105,851	87,034	115,674	---

Table 4. (continued). Crop Production by Crop Reporting District (Years 2005-2008) (continued)

Descriptive Variable	Average	Median	Min.	Max.	CV
East Central KS (CRD 80)					
Corn production (1,000 bushels)	29,478	31,130	21,490	34,160	0.18
Grain Sorghum production (1,000 bu.)	38,852	34,410	3,036	5,551	0.35
Soybean production (1,000 bushels)	19,015	19,520	14,130	22,889	0.19
Wheat production (1,000 bushels)	6,288	5,865	4,790	8,630	0.29
Total for CRD 80 (1,000 bushels)	58,632	59,925	43,446	71,230	---
Southeast KS (CRD 90)					
Corn production (1,000 bushels)	31,389	32,228	25,762	35,340	0.13
Grain Sorghum production (1,000 bu.)	7,101	5,993	4,624	11,739	0.54
Soybean production (1,000 bushels)	15,102	14,977	11,639	18,813	0.19
Wheat production (1,000 bushels)	12,816	14,168	4,220	18,710	0.48
Total for CRD 90 (1,000 bushels)	66,408	67,365	46,245	84,656	---
State of Kansas (All CRDs)					
Corn production (1,000 bushels)	451,253	476,085	345,000	507,840	0.15
Grain Sorghum production (1,000 bu.)	190,963	202,175	145,000	214,500	0.16
Soybean production (1,000 bushels)	102,598	102,005	86,130	120,250	0.14
Wheat production (1,000 bushels)	327,750	323,600	283,800	380,000	0.15
Total for State (1,000 bushels)	1,072,563	1,103,865	859,930	1,222,590	---

Total average grain production among the four primary crops over the four year period was largest in the Southwest Kansas (CRD 30), averaging 220,451,000 bushels, comprised of 60% corn, 25% wheat, 14% grain sorghum, and 2% soybeans. Total average grain production in South Central Kansas (CRD 60) among the four primary crops over the 2005-08 period averaged 162,096,000 bushels, comprised of 42% wheat, 34% corn, 17% grain sorghum, and 7% soybeans. After these two areas of the state, total crop production among these four crops in Northwest Kansas (CRD 10) averaged 118,800,000 bushels, followed by 111,163,000 bushels in North Central Kansas (CRD 40), 110,957,000 bushels in Central Kansas (CRD 50), 103,603,000 bushels in Northeast Kansas (CRD 30), 94,093,000 in West Central Kansas (CRD 20), 66,408,000 bushels in Southeast Kansas (CRD 90), and 58,632,000 bushels in East Central Kansas (CRD 80).

In typical grain marketing years in Kansas, a large proportion of the summer wheat crop is harvested, handled and transported from grain elevators to end users or other markets prior to fall harvest in these same regions (July harvest for wheat versus October-November harvest for fall crops such as corn, grain sorghum, sunflowers, and soybeans). Handling the flow of grain from wheat harvest into the fall harvest season can be a managerial challenge for Kansas elevators, especially in large crop years. Regions of the state producing larger crops have the need for larger grain handling and transportation facilities. The following section shows the concentration of elevator grain handling and transportation capacity in the same areas of the state where crop production tends to be greatest.

Elevator Grain Handling & Rail Service Capacity By Crop Reporting District

The total grain handling and rail car capacities for Kansas crop reporting districts reflect both the crop production history and potential capacity for those same geographic regions. The grain handling capacity of grain elevators and their associated rail car handling capabilities in these regions are reported in Table 5. The South Central and Southwest Kansas crop reporting districts had the largest amounts of grain handling and storage capacity (195,377,000 and 179,487,000 bushels, respectively). These were followed by Central and Northeast Kansas (125,316,000 and 124,486,000 bushels, respectively) (although one firm controlled 38% of the total Northeast Kansas grain storage capacity).

Table 5. Characteristics of Grain Elevators by Crop Reporting District (n = 695)

Descriptive Variable	Number	Average	Median	Min.	Max.	CV
Northwest KS (CRD 10)						
Total Storage Capacity (1,000 bu.)	49	1,165	816	0	4,700	0.91
RR Capacity/Location (#cars)	49	11	5	0	100	1.60
	Rail Access?	Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	45-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity	(36) 77.0%	(21) 42.9%	(16) 32.7%	(9) 18.3%	(2) 4.1%	(1) 2.0%
West Central KS (CRD 20)						
Total Storage Capacity (1,000 bu.)	56	1,095	978	100	2,911	0.64
RR Capacity/Location (#cars)	56	18	9	0	110	1.50
	Rail Access?	Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	45-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity	(48) 86.0%	(11) 19.6%	(31) 55.4%	(8) 14.3%	(2) 3.6%	(4) 7.2%
Southwest KS (CRD 30)						
Total Storage Capacity (1,000 bu.)	99	1,813	1,216	0	40,100	2.21
RR Capacity/Location (#cars)	99	17	10	0	110	1.53
	Rail Access?	Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	45-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity	(78) 79.0%	(26) 26.3%	(45) 45.5%	(20) 20.2%	(2) 2.0%	(6) 6.0%
North Central KS (CRD 40)						
Total Storage Capacity (1,000 bu.)	75	802	675	15	4,550	0.85
RR Capacity/Location (#cars)	75	12	6	0	110	1.80
	Rail Access?	Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	45-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity	(41) 55.4%	(31) 41.3%	(29) 38.7%	(11) 14.7%	(1) 1.3%	(3) 4.0%

Table 5. (continued) Characteristics of Grain Elevators by Crop Reporting District (n = 695)

Descriptive Variable	Number	Average	Median	Min.	Max.	CV
Central KS (CRD 50)						
Total Storage Capacity (1,000 bu.)	114	1,092	575	0	32,000	2.86
RR Capacity/Location (#cars)	114	10	5	0	152	2.30
	Rail Access?	Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	45-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity	(75) 65.8%	(53) 44.9%	(41) 44.6%	(11) 9.3%	(0) 0.0%	(4) 3.3%
South Central KS (CRD 60)						
Total Storage Capacity (1,000 bu.)	133	1,469	739	50	28,506	2.09
RR Capacity/Location (#cars)	133	14	7	0	280	2.28
	Rail Access?	Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	45-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity	(86) 64.7%	(57) 14.3%	(49) 35.5%	(25) 18.1%	(0) 0.0%	(7) 5.0%
Descriptive Variable	**Number**	**Average**	**Median**	**Min.**	**Max.**	**CV**
Northeast KS (CRD 70)						
Total Storage Capacity (1,000 bu.)	59	2,124	736	50	47,000	2.98
RR Capacity/Location (#cars)	59	17	9	0	85	1.39
	Rail Access?	Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	45-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity	(33) 56.9%	(20) 33.9%	(20) 33.9%	(12) 20.3%	(7) 11.9%	(0) 0.0%
East Central KS (CRD 80)						
Total Storage Capacity (1,000 bu.)	49	1,447	478	0	40,779	4.02
RR Capacity/Location (#cars)	49	9	0	0	259	4.14
	Rail Access?	Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	45-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity	(22) 45.8%	(36) 70.6%	(8) 15.7%	(5) 9.8%	(1) 2.0%	(1) 2.0%
Southeast KS (CRD 90)						
Total Storage Capacity (1,000 bu.)	61	547	365	30	3,700	1.12
RR Capacity/Location (#cars)	61	5	0	0	30	1.48
	Rail Access?	Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	45-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity	(38) 62.3%	(32) 51.6%	(29) 36.8%	(1) 1.6%	(0) 0.0%	(0) 0.0%

The presence of terminal elevators in and near Salina in the Central CRD, in Hutchinson and Wichita in the South Central CRD, and in Topeka in the East Central CRD are reflected in relatively large amounts of elevator capacity in these regions in comparison to their average crop production capacity. These large terminal elevators receive and handle grain from both within and outside of their respective crop reporting districts, with their grain handling capacities developed for purposes other than just adequately handling and transporting local or regional crop production marketing needs.

A short coming of viewing Kansas crop reporting districts as separate geographic production and handling regions is that domestic U.S. grain markets are not limited by such geopolitical boundaries. Significant grain handling agribusiness entities exist in the immediate vicinity of or "just across the border from" these Kansas geographic regions that likely have marked impacts upon competitive grain markets in these areas. This is likely to be particularly true in regards North Central, South Central, Southwest and possibly other crop reporting districts. To the degree this is true, this analysis needs to be extended to include a broader region.

Rail Service Providers in Kansas

In the state of Kansas, the Union Pacific (UP) and Burlington Northern Santa Fe (BNSF) railroads are classified as Class I carriers, with annual gross revenues of $250 million or more for their total domestic operations. Other railroads serving Kansas are Class III or short line railroads with annual gross revenues of less than $20 million. These include the Kansas and Oklahoma (K&O), the Kyle Railroad Company (KYLE), Cimarron Valley Railroad (CVR), Southern Kansas and Oklahoma Railroad (SKO), and the Northern Kansas Colorado Railway (NKC). Other rail lines with limited mileage also exist in the state, including the Garden City Western Railway (GCWR), the Wichita Terminal Association Railroad (WTA), and the St. Louis Southwestern Railway (SSW). The WTA is primarily a switching railroad in the city of Wichita.

Grain Elevator Capacity by Railroad: The UP and BNSF Railroads had access to the largest number of grain elevators in Kansas (165 and 161 elevators, respectively), followed by the K&O (89), KYLE (48), CVR (23), SKOL (21) and NKC railroads (10) (Tables 5a-5g). However, grain elevators directly associated with the BNSF railroad had the largest average grain handling capacity (2,751,000 bushels), followed by the UP (2,296,000 bu.), CVR (2,102,000 bu.), K&O (1,267,000 bu.), KYLE (1,126,000 bu.), NKCR (955,000 bu.) and SKOL (491,000 bu.). Taken together, the BNSF Railroad has direct access to the largest amount of total grain handling capacity among Kansas grain elevators (415 million bu.), followed closely by the UP (358 million bu.). The K&O (158 million bu.), KYLE (54 million bu.) and CVR (48 million bu.) had lesser amounts of grain storage access via their grain loading locations.

Table 5a. Union Pacific (UP) Railroad Services and Elevator Characteristics

Descriptive Variable	Number	Average	Median	Min.	Max.	CV
Total Storage Capacity (1,000 bu.)	156	2,296	1,002	0	47,000	2.43
RR Capacity/Location (# cars)	165	26	10	0	280	1.60
		Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	46-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity per Location		(30) 18.2%	(73) 44.2%	(35) 21.2%	(11) 6.6%	(16) 9.6%
Joint Working Arrangements	BNSF	K&O	KCS	SSW	KYLE	CKRY
With Union Pacific (UP) Railroad	36	7	6	5	3	3

Table 5b. Burlington Northern Santa Fe (BNSF) Railroad Services and Elevator Characteristics

Descriptive Variable	Number	Average	Median	Min.	Max.	CV
Total Storage Capacity (1,000 bu.)	151	2,751	1,229	0	47,000	2.27
RR Capacity/Location (# cars)	161	27	12	0	280	1.57
		Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	46-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity		(26) 16.1%	(66) 41.0%	(46) 28.6%	(8) 5.0%	(15) 9.3%
Joint Working Arrangements	UP	KCS	K&O	SSW	KYLE	NCKR
With BNSF Railroad	36	6	5	4	3	2

Table 5c. Kansas & Oklahoma (K&O) Rail Services and Elevator Characteristics
(Including former Central Kansas Railway (CKRY) Capacity)

Descriptive Variable	Number	Average	Median	Min.	Max.	CV
Total Storage Capacity (1,000 bu.)	87	1,267	791	88	17,700	1.65
RR Capacity/Location (# cars)	89	17	10	0	110	1.47
		Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	46-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity		(19) 21.3%	(48) 53.9%	(17) 19.1%	(0) 0.0%	(5) 5.6%
Joint Working Arrangements	UP	BNSF	WTA			
With K&O Railroad	11	5	1			

Table 5d. KYLE Rail Services and Elevator Characteristics

Descriptive Variable	Number	Average	Median	Min.	Max.	CV
Total Storage Capacity (1,000 bu.)	48	1,126	1,031	41	4,700	0.75
RR Capacity/Location (# cars)	48	15	10	0	100	1.47
		Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	46-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity		(13) 27.1%	(21) 43.8%	(11) 22.9%	(1) 2.1%	(2) 4.2%
Joint Working Arrangements	UP	BNSF				
With KYLE Railroad	3	3				

Table 5e. Cimarron Valley Railroad (CVR) Services and Elevator Characteristics

Descriptive Variable	Number	Average	Median	Min.	Max.	CV
Total Storage Capacity (1,000 bu.)	23	2,102	2,232	288	4,082	0.54
RR Capacity/Location (# cars)	23	19	10	0	110	1.21
		Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	46-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity		(1) 4.3%	(14) 60.9%	(6) 26.1%	(1) 4.3%	(1) 4.3%
Joint Working Arrangements	BNSF					
With CVR Railroad	5					

Table 5f. Southern Kansas & Oklahoma Railroad (SKOL) Services and Elevator Characteristics

Descriptive Variable	Number	Average	Median	Min.	Max.	CV
Total Storage Capacity (1,000 bu.)	21	491	355	30	1,958	0.94
RR Capacity/Location (# cars)	21	10	9	0	32	0.79
		Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	46-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity		(1) 4.8%	(18) 85.7%	(2) 9.6%	(0) 0.0%	(0) 0.0%
Joint Working Arrangements	SEK	UP	BNSF	KCS		
Cimarron Valley (CVR) Railroad	3	2	2	1		

Table 5g. Nebraska Kansas Colorado Railway (NKCR) Services and Elevator Characteristics

Descriptive Variable	Number	Average	Median	Min.	Max.	CV
Total Storage Capacity (1,000 bu.)	10	955	832	94	2,050	0.62
RR Capacity/Location (# cars)	10	16	15	4	34	0.66
		Zero-No RR Cars	1-15 RR Cars	16-45 RR Cars	46-90 RR Cars	91+ RR Cars
Railroad Car Handling Capacity		(0) 0.0%	(5) 50.0%	(5) 50.0%	(0) 0.0%	(0) 0.0%
Joint Working Arrangements	BNSF	KYLE	OmniTrax			
Cimarron Valley (CVR) Railroad	2	1	1			

Grain Elevator Rail Car Capacity by Railroad: As a group, the grain elevators directly associated with the BNSF and UP railroads had the largest amount of total rail car capacity among Kansas rail carriers (4,347 and 4,290 rail cars, respectively) (Tables 5a-5g). The K&O (1,513 rail cars) railroad has the third most, followed by the KYLE (720 rail cars), CVR (437), SKOL (210) and NKC (160) railroads.

In terms of direct access to grain elevator facilities with the capacity to handle large capacity (mostly shuttle trains) of at least 91+ rail cars at one time, there is a distinct disparity among alternative rail carriers. The Union Pacific and Burlington Northern Santa Fe railroads had direct access to 16 and 15 shuttle train handling facilities, respectively, with some crossover or joint access at different locations. The K&O, KYLE, and CVR railroads follow with access to 5, 2 and 1 facilities that can handle 91+ cars, respectively. In terms of handling trains with 46-90 rail car handling capacities (mostly unit trains) , the UP and BNSF railroads had access to 11 and 8 such facilities, respectively, while the KYLE and CVR railroads had access to 1 such sized train facility a piece.

Location of Kansas Ethanol Plants

The physical location of grain elevator handling capacity and railroad transportation services are likely to be closely associated with the location of ethanol plants in Kansas. If local feedstock supplies are inadequate for the plant to run at full capacity, they plants would find it necessary to use feedstock supplies that are imported into the region either directly to their plants or indirectly through local / regional grain elevators. Either trucks or rail transportation may be used depending on the distance and logistical realities involved. Ethanol plants also may need rail access to transport both ethanol and ethanol bi-products (either distiller's dried grains (DDGs) or wet distillers grains) over longer distances to buyer-users.

Table 6. Kansas Ethanol Plants Currently in Operation

Company	Location	Current Capacity (million gallons)	Bushels of Grain Used (million bushels)
MGP Ingredients	Atchison	10 mg	3.6 mb
Arkalon Energy (Conestoga)	Hayne	110 mg	39.0 mb
Western Plains Energy	Campus	45 mg	16.1 mb
Abengoa Bioenergy	Colwich	25 mg	8.9 mb
Bonanza Bioenergy (Conestoga)	Garden City	55 mg	19.6 mb
Reeve Agri-Energy	Garden City	15 mg	5.4 mb
East Kansas Agri-Energy	Garnett	35 mg	12.5 mb
ESE Alcohol	Leoti	1.5 mg	0.5 mb
Kansas Ethanol LLC	Lyons	55 mg	19.6 mb
Prairie Horizon Agri-Energy	Phillipsburg	40 mg	14.3 mb
White Energy	Russell	48 mg	17.2 mb
NESIKA Energy LLC	Scandia	10 mg	3.6 mb
Total for All Ethanol Plants		**449.5 mg**	**160.6 ,b**

(Source: Kansas Ethanol Website: www.ksgrains.com/ethanol/kseth.html, information current through August 6, 2009)

The company name, location, current plant capacity, and estimated amount of feedgrains used for Kansas ethanol plants currently in operation (as of August 6, 2009) are listed in Table 6 (Source: Kansas Ethanol Website). These calculations assume that 1 bushel of corn or grain sorghum produces approximately 2.8 gallons of ethanol. Projected feedgrain (i.e., "feedstock") use can then be compared to historic and potential crop production within each plant's geographically associated grain production region. If within these local/regional grain procurement areas grain supplies are projected to be adequate to meet feedstock demand for a particular ethanol plant or group of plants (taking into account grain elevator and on-farm handling and storage capacity and relying on truck transportation), and if transportation and distribution of ethanol process products and feed bi-products from these plants is adequately handled via truck transportation, then access to rail transportation may not be as critical of an issue to consider in ethanol plant location. However, if local/regional feedstock supplies are not likely to adequately fulfill ethanol plant demands or if regional livestock feed demand is inadequate to use up ethanol bi-product supplies, then access to rail transportation will be a necessity for the economic sustainability of an ethanol plant.

Concluding Observations

The information from this study on the grain storage and handling of grain elevators and their associated railroad car handling capacities is useful in gaining an understanding of the infrastructure of the grain handling and distribution system in Kansas. The larger purpose for this study is to understand the competitive market infrastructure of Kansas' grain handling and transportation system, and then with this knowledge to a better understand how bioenergy plant establishment and possible changes in the inflow and/or outflow of feedstocks and ethanol bi-products may impact the region's grain and feed product markets.

These results indicate a notable disparity in the size of grain storage and handling and rail car capacities among grain elevators in Kansas. A small number of centrally located larger capacity grain elevator facilities exist in the state along with a large number of medium-to-small local facilities. These differentials in elevator size and relevant geographic market areas also lead to a marked disparity among Kansas crop reporting districts in terms of grain production, grain elevator capacity, and associated rail car handling capacity.

Access of grain elevators to rail service and investment in multiple rail car unit train and shuttle train handling capacity is dependent upon the location of primary rail routes in the state. A limited number of larger capacity rail car handling facilities appear to be somewhat strategically and competitively placed along key rail lines in Kansas in key crop production areas. These rail car loading and handling facilities may have been built in the past for the purpose of exporting wheat and grain sorghum from the region, but may now prove instrumental in the transport of ethanol-related feedstocks and bi-products to and from Kansas.

A large number of multiple location agribusiness firms exist in Kansas. These multiple location firms are mostly Cooperatives operating in regional markets, but there are also a limited number of major Independent and Joint Venture multi-location firms in the region. A small number of Independent firms exist that have large grain handling and rail capacities which are widely dispersed across a number of geographic locations. Joint Ventures in this area are characterized by unique and varying business ownership arrangements. In some cases both Independents and Cooperatives jointly have interests in a Joint Venture, while in other cases Cooperatives and/or Independents themselves have joined together to form such arrangements. Access to shuttle and/or unit train handling facilities consistently mark these Joint Ventures.

A limited number of large terminal elevators with high capacity rail access are located in the central, south central, and east central parts of Kansas in and around the communities of Salina, Hutchinson, Wichita and Topeka. These terminal elevators typically function as intermediate receivers and handlers of grains from other Kansas grain elevators within the state's grain handling system. As such their "procurement function" should be accounted for in analysis of Kansas grain elevator and rail car capacity as well as grain market competition. Competitive market conditions in local/regional grain markets in Kansas are also affected by the existence of shuttle and/or unit train grain handling facilities. The competitive positions of these larger rail car handling facilities may be affected by the rail car handling rates paid to railroad service providers as well as by possible scale economies in grain handling.

Delineation of rail procurement areas offers an "upstream – downstream" perspective of grain markets and grain market flows in regions that depend on rail transportation to move grain from producing areas to exporters, processors and/or livestock feeders. Truck transport of grain is a major factor in movement of grain and feed products over all distances less than what is economically serviceable via rail.

A weakness of this study is that although it identifies grain elevator's grain handling and storage capacities as well as their rail car handling capacities, it does not identify the amount of volume of grain that moves through these individual grain elevator facilities throughout the year. Although the "through-put" of these individual grain elevator locations is not identified, on a crop reporting district basis the cumulative grain handling and rail car capacity is directly comparable to the amount of wheat and fall harvested crops produced – providing an implicit, aggregate perspective of necessary grain elevator and rail capacity "throughput" or usage.

The establishment of ethanol plants in Kansas is and will continue to have a dynamic influence upon the grain handling and distribution system of the state. Our intent at K-State Research and Extension in the Agricultural Economics and other University departments is to adequately analyze these impacts and provide useful decision making information for farmers, agribusiness, and other decision makers in the state of Kansas.