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# Buyer Willingness to Pay for Irrigation Systems: Evidence from the 2011 Nebraska Farm Real Estate Market Survey

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# CORNHUSKER ECONOMICS

## Buyer Willingness to Pay for Irrigation Systems: Evidence from the 2011 Nebraska Farm Real Estate Market Survey

Market Report	Yr Ago	4 Wks Ago	9/2/11
<b><u>Livestock and Products,</u></b>			
<b><u>Weekly Average</u></b>			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight.....	\$96.62	\$113.23	\$114.00
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb....	128.65	154.47	161.95
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb....	116.29	137.12	131.78
Choice Boxed Beef, 600-750 lb. Carcass.....	163.12	173.41	183.22
Western Corn Belt Base Hog Price Carcass, Negotiated.....	78.13	105.75	82.06
Pork Carcass Cutout, 185 lb. Carcass, 51-52% Lean.....	91.78	108.34	97.02
Slaughter Lambs, Ch. & Pr., Heavy, Wooled, South Dakota, Direct.....	141.75	192.00	184.87
National Carcass Lamb Cutout, FOB.....	310.45	403.63	406.99
<b><u>Crops,</u></b>			
<b><u>Daily Spot Prices</u></b>			
Wheat, No. 1, H.W. Imperial, bu.....	5.85	6.67	7.67
Corn, No. 2, Yellow Omaha, bu.....	4.10	6.93	7.48
Soybeans, No. 1, Yellow Omaha, bu.....	10.25	13.09	14.11
Grain Sorghum, No. 2, Yellow Dorchester, cwt.....	7.27	11.52	12.39
Oats, No. 2, Heavy Minneapolis, MN, bu.....	2.93	3.45	3.84
<b><u>Feed</u></b>			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton.....	135.00	182.50	185.00
Alfalfa, Large Rounds, Good Platte Valley, ton.....	72.50	110.00	117.50
Grass Hay, Large Rounds, Good Nebraska, ton.....	*	75.00	85.00
Dried Distillers Grains, 10% Moisture, Nebraska Average.....	115.50	192.50	209.00
Wet Distillers Grains, 65-70% Moisture, Nebraska Average.....	37.00	67.75	110.25
<b>*No Market</b>			

In Nebraska, irrigation is the best risk management tool to hedge against weather variations that negatively impact crop production. An agricultural producer's ability to "make rain" is insurance against yearly variation in both yields and financial returns. As technology has progressed, reducing labor requirements and increasing efficiency of water application, irrigation has become a mainstay on thousands of Nebraska farms. In fact, the state ranks first in irrigated acres.

Along with increased irrigation come irrigation regulations to control over-use or abuse of water rights. With legal restrictions forcing the year to year management of irrigation allocations, some producers in Nebraska are faced with another management decision. System capacity, or a well's ability to produce a certain volume of water, can become problematic during a growing season. If a producer encounters a period of dry weather during a critical period of crop development, and cannot meet the crop requirements due to limited system capacity, they may experience a reduced yield.

Each year the University of Nebraska Department of Agricultural Economics conducts a statewide survey of agricultural real estate appraisers and other real estate professionals. The survey gives a unique insight into the Nebraska agricultural real estate market. Rather than glean market value estimates from tax information or recent sales data, the survey participants report the values they observe in their respective regions for a variety of land classes. The State of Nebraska is aggregated into eight reporting districts. The 2011 response rates for the survey by entire state and reporting districts were as follows: Entire State-57%; Central-61%; East-67%; North-58%; Northeast-59%; Northwest-62%; South-47%; Southeast-96%; and Southwest-35%.

Given that irrigated land is such a critical component of the state's land resource base, a specific question set

about irrigation system capacity was included in the 2011 survey. Each reporter was asked to assign a per acre value to each of the following; gravity systems with 300 gpm, 650 gpm, and 1000+ gpm well capacities; and pivot systems with 300 gpm, 650 gpm, and 1000+ gpm well capacities. This portion of the survey exhibits a willingness to pay for system capacity and system type based on water volume of the associated water source.

The average market value reported in the 2011 survey for dryland cropland with irrigation potential is \$3,598. This value is a baseline for the values reported in Figure 1 below, which is the average willingness to pay for system capacity for the entire state.

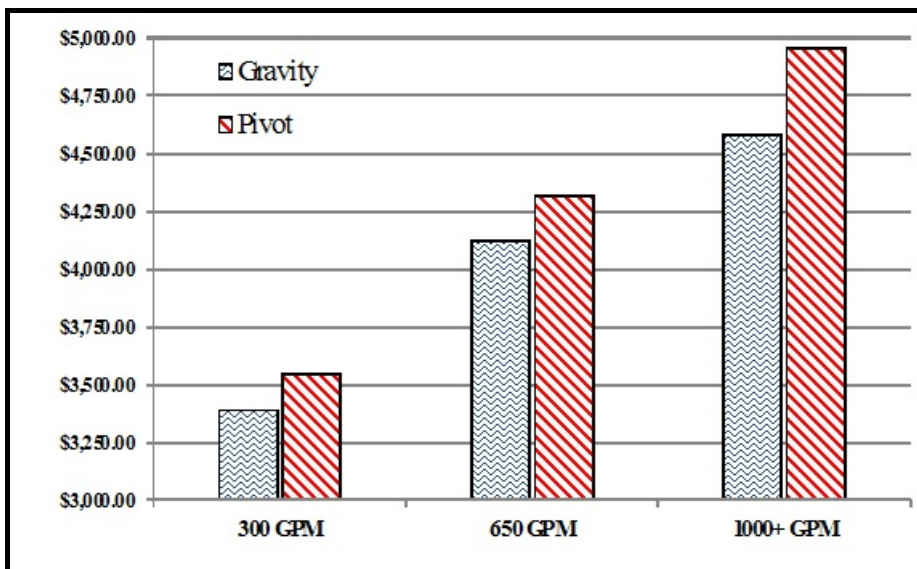


Figure 1. Average Reported Willingness to Pay per Acre for Agriculture Land with a Specific System Capacity and Type in Nebraska, 2011.

As historically demonstrated over the life of the survey series, the survey reporters have indicated a market premium for pivot irrigation over gravity systems. This reflects the relative water efficiency advantage of center pivot systems, as well as a considerable labor savings. However, new information from the 2011 survey reveals for the first time the value associated with water system capacity. Each reporting district reported a significant differential between system capacity quantities. By comparing the reported values of irrigation capabilities to the reported market value of dryland cropland with irrigation potential, we can derive a willingness to pay for the value added by having a well with a higher capacity (Table 1 and 2, on next page). Note that in several instances the value added for the lowest performing well capacity (300 gpm), is actually negative. In other words, market participants, when bidding on land with irrigation potential are anticipating a significantly higher well capacity needed to make irrigation profitable.

As discussed in Krantz et al., minimum irrigation system design should be able to accommodate the peak evapotranspiration of the crop, in at least nine out of ten years. This system design depends on the area a producer

is located in and the associated soil type of their operation. These authors suggest that the net capacity of systems in Nebraska should be able to produce from 3.85 gpm/acre in Eastern Nebraska on a loam soil, to 5.89 gpm/acre on a fine sand soil in Western Nebraska (Krantz et al., 2008). Meeting these requirements and allocating additional gpm for load control and downtime will define what size of irrigation system and capacity of well is needed. Krantz goes on to explain how efficiency of the system also affects system capacity needs. The more efficient the system, the lower the system capacity can be to irrigate the same number of acres, hence the higher contributory value of irrigation capacity associated with center pivot systems.

When purchasing land in Nebraska, a producer can tolerate a low capacity well only if the system is designed to run a small irrigation system. If a well moratorium is in place the direct cost to a producer from having a low capacity well is producing less irrigated acres, or the financial burden of drilling a replacement well immediately and dealing with the transaction costs to do so. The Nebraska Farm Real Estate Market Survey defines three system capacities, 300 gpm, 650 gpm, and 1000+ gpm. Using the example from Krantz et al., ( silty clay loam, Antelope County, 24 hour load control, and three hours downtime) a 300 gpm capacity can properly irrigate 51 acres. A 650 gpm well can irrigate 110 acres, which may accommodate a pivot without an end-gun. A 1000 gpm well can properly

irrigate 168 acres. If the same property had a gravity system, the possible irrigated acres would fall due to reduced water efficiency.

Each system capacity evaluated above represents a direct loss of net return if the system is designed inadequately. Exacting potential losses from reduced capacity is based on weather probabilities and crop response functions. While the derivation of potential annual losses is beyond the scope of this short paper, we assume all potential annual losses are capitalized by market participants, and will show up in the market as willingness to pay for the added benefit of a larger system capacity.

In summary, market participants clearly exhibit a willingness to pay for added water capacity, as well as more efficient irrigation systems. The greater the capacity of the well, the increased willingness of market participants to pay much more per acre than they would for the same piece of property with a lower capacity. In some areas of the state this value differential may be close to \$1,500 per acre between low-capacity and high-capacity irrigation systems. Market participants also exhibit an increased willingness to pay for irrigation system types, as illustrated

in Figure 1. The market shows an average premium for center pivot over gravity of about \$300 when a 1000 gpm well is available, while only about \$200 when a 650 gpm well is available. In short, water capacity is being valued in Nebraska's agriculture land markets.

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**Table 1. Average Value Added per Acre for Irrigation Capabilities for Cropland with Pivot Systems by Agriculture Statistics District in Nebraska, 2011**

Agriculture Reporting District	Estimated Market Value of Dryland Cropland*	Reported Value Added From:		
		300 GPM Capacity	650 GPM Capacity	1000+ GPM Capacity
Central	\$2,375	\$460	\$1,404	\$2,194
East	\$4,855	\$489	\$1,414	\$1,817
North	\$1,325	\$8	\$738	\$1,375
Northeast	\$4,200	\$240	\$900	\$1,427
Northwest	\$543	\$382	\$1,019	\$1,569
South	\$2,090	\$860	\$1,466	\$2,326
Southeast	\$3,593	\$229	\$1,217	\$2,174
Southwest	\$906	\$919	\$1,844	\$2,115
<b>State Average</b>	<b>\$3,598</b>	<b>-\$48</b>	<b>\$725</b>	<b>\$1,358</b>

\* Dryland Cropland with Irrigation Potential

**Table 2. Average Value Added per Acre for Irrigation Capabilities for Cropland with Gravity Systems by Agriculture Statistics District in Nebraska, 2011**

Agriculture Reporting District	Estimated Market Value of Dryland Cropland*	Reported Value Added From:		
		300 GPM Capacity	650 GPM Capacity	1000+ GPM Capacity
Central	\$2,375	\$288	\$1,208	\$1,763
East	\$4,855	-\$70	\$763	\$1,374
North	\$1,325	\$175	\$875	\$1,475
Northeast	\$4,200	\$425	\$1,000	\$1,325
Northwest	\$543	\$257	\$790	\$1,157
South	\$2,090	\$527	\$1,196	\$1,501
Southeast	\$3,593	-\$143	\$590	\$1,157
Southwest	\$906	\$844	\$1,327	\$1,960
<b>State Average</b>	<b>\$3,598</b>	<b>-\$208</b>	<b>\$525</b>	<b>\$981</b>

\*Dryland Cropland with Irrigation Potential