9-19-2012

The Value of Irrigation in a Drought Regime: The Case of 2012

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University of Nebraska–Lincoln Extension

September 19, 2012

Institute of Agriculture & Natural Resources
Department of Agricultural Economics
http://agecon.unl.edu/cornhuskereconomics

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Market Report	Yr Ago	4 Wks Ag	9/14/12
Livestock and Products, Weekly Average			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight	$116.80	$120.68	$126.97
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb.	150.26	159.00	162.91
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb.	137.46	144.82	153.29
Choice Boxed Beef, 600-750 lb. Carcass	184.27	190.23	191.50
Western Corn Belt Base Hog Price Carcass, Negotiated	88.62	85.32	63.46
Pork Carcass Cutout, 185 lb. Carcass, 51-52% Lean	95.09	91.82	78.05
Slaughter Lambs, Ch. & Pr., Heavy, Wooled, South Dakota, Direct	183.50	118.13	84.00
National Carcass Lamb Cutout, FOB	404.92	320.41	317.08
Crops, Daily Spot Prices			
Wheat, No. 1, H.W. Imperial, bu.	6.71	8.01	8.58
Corn, No. 2, Yellow Nebraska City, bu.	6.82	8.04	7.67
Soybeans, No. 1, Yellow Nebraska City, bu.	13.09	16.96	17.09
Grain Sorghum, No. 2, Yellow Dorchester, cwt.	11.20	13.29	13.07
Oats, No. 2, Heavy Minneapolis, MN , bu.	3.60	4.02	3.99
Feed			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton.	185.00	242.50	247.50
Alfalfa, Large Rounds, Good Platte Valley, ton.	117.50	220.00	212.50
Grass Hay, Large Rounds, Good Nebraska, ton.	92.50	155.00	185.00
Dried Distillers Grains, 10% Moisture, Nebraska Average.	204.50	307.50	292.00
Wet Distillers Grains, 65-70% Moisture, Nebraska Average.	75.00	120.88	103.63

*No Market

This issue is another article in a series addressing drought conditions, economic impacts and resources for Nebraska agriculture.

The 2012 drought that bore down on much of the United States Corn Belt left a wide swath of production loss and commodity market spirals. For many dryland crop producers across the country, the short crop will make their economic picture somewhat reliant on crop insurance indemnities - payments, by the way, which will be enhanced by record price levels for the insured crops. But for irrigated crop producers, 2012 will look quite different. And here is where the value of irrigation comes into focus. [Note: The value of water (irrigation) is not to be confused with the cost of water. While the cost of water as an input for production is the cost required to pump and distribute water, the value of the water can be attributed to the difference in irrigation revenue vs. dryland revenue.]

The economics of irrigation largely hinges upon the productivity enhancement which irrigation provides from year to year. For example, in the case of corn, Nebraska's primary crop, yield differentials between irrigated and non-irrigated can range from 60 to 100 bushels per acre in any given year, depending on where one is in the state. However, in addition to this productivity-enhancement pattern, irrigation also serves as a very critical risk management tool for dealing with crop losses due to extreme rainfall-deficit conditions - such as occurred this year. This downside risk of extreme weather events creates a *whole new ballgame* for the value of irrigation.

To illustrate these impacts for 2012, we have constructed three different scenarios for an Eastern Nebraska corn irrigated farm.

Scenario I is the farm under more historical production patterns, as well as cost and revenue conditions. It is basically a *"without drought"* condition, with irrigation water only supplementing the historical rain-fed conditions. This scenario essentially represents the economic factors as producers entered the 2012 crop season.

Scenario II is the *"with drought"* situation we have actually experienced. Certainly, the dependence on supplemental water and the additional expenses of pumping could hardly have been anticipated at the beginning of the year. But even more so, the commodity price run-up due to the geographic pervasiveness of this year's drought (which climate experts are calling a "once in 50 to 100 year event") was not even on the screen - a seemingly expected annual probability of one to two percent.

Scenario III would be considered a "Nebraska-only drought" situation, with the rest of the country experiencing more normal 2012 production. The obvious result would be production shortfalls in Nebraska, but without the extreme commodity price run-up which has been experienced this year.

Using University of Nebraska-Lincoln crop budgets and our UNL Farm Lease Calculator (http://agecon.unl.edu/resource.html), we have constructed the various cost and price conditions under these different scenarios that would ultimately impact the acreage revenue differential between irrigated and non-irrigated cropland in corn production (Table 1 on next page).

Under **Scenario I**, which reflected early 2012 conditions, per-bushel costs of production at the more normal expected yield levels were fairly similar for both irrigated and non-irrigated corn producers. And at projected commodity prices of the time, the net revenue differential was in the $80/acre range. This might essentially reflect the income attributed to irrigation over the long-run.

Enter widespread drought across the major corn belt states (**Scenario II**), and the water differential takes on considerably greater magnitude. To be sure, irrigated yields were also reduced (we estimate here 10%), and costs of irrigation in 2012 rose an additional $75 per acre. But these changes were more than compensated for by commodity prices rising nearly 50 percent. And while non-irrigated revenues were also buffered by commodity price spikes that essentially brought revenues to without-drought levels, the irrigated revenue differential spiked to $375 per acre. In short, some $295 of this differential basically represents a risk premium attributed to irrigation this season. Of course, not all irrigated acres in the state were able to apply water to levels to limit yield losses to just ten percent. In areas of pumping restrictions, irrigated yield reductions were much greater than that. But even in those areas, with few exceptions the revenue differential attributed to supplemental water was considerable.

Scenario III poses quite a different situation, such that the commodity price run-up would have been much less if the 2012 drought would have been limited to Nebraska. Yield impacts and cost increases for irrigation would have still occurred in Nebraska, but the commodity price side run-up would not have been there to buffer yield losses. The irrigated producer would have seen a more modest return above costs in 2012, but the dryland producer would have experienced negative net revenues. The revenue differential attributed to water is reduced, but still significantly greater than what would be considered a more normal production pattern.

Scenarios II and **III** highlight the importance of the Ogallala Aquifer, which is relied upon even more heavily during drought years. Research of climatologists suggest that the 'water cycle' has been gaining more energy in recent years, the implication being more 'harsh' weather conditions, such as flooding and drought. Under the extremes, underground water resources such as the Ogallala Aquifer function like a 'natural insurance' for crop production. In our illustration above, the value of water is nearly 75 percent higher under **Scenario III** and increases by more than four-fold in **Scenario II,** which is reflecting the basic economic principle that as the resource becomes more 'scarce' the value (price) increases. The other aspect of the story is that Nebraska is on the 'forefront' of water technology for irrigation. Nebraska's irrigation system is, without doubt, one of the most efficient irrigation systems in terms of water used. Had this not been the case, the additional cost of water in 2012 would have increased more than our estimated $75 per acre, and reducing the overall net revenue differential.

In summary:

- Irrigation in Nebraska is paying a considerable dollar premium in 2012.
- While 2012 drought conditions may not be replicated again for some time to come, it is safe to say that climate-related extremes from year to year are more likely to increase and not decrease in the years ahead.
- Long-term sustainable management of Nebraska's portion of the Ogallala Aquifer will become increasingly critical on a more weather-variable future.

Table 1. Corn Production in Eastern Nebraska Under Three 2012 Scenarios

Items	Scenario I "Without Drought"		Scenario II "With Drought"		Scenario III "Nebraska-Only Drought"	
	Irrigated	Non-irrigated	Irrigated	Non-irrigated	Irrigated	Non-irrigated
Corn Yield (Bushel/Acre)	220	135	200	95	200	95
Corn Price (per Bushel)	$5.25	$5.25	$7.75	$7.75	$5.50	$5.50
Total Cash Receipts ($/Acre)	$1,155	$709	$1,550	$736	$1,100	$523
Total Production Costs:						
($/Acre)	$916	$550	$989	$550	$990	$550
($/Bushel)	$4.16	$3.93	$4.95	$5.79	$4.95	$5.79
Net Dollar:						
Revenue ($/Acre)	$239	$159	$561	$186	$110	($28)
Revenue Differential:						
Attributed to Irrigation ($/Acre)	**$80**		**$375**		**$138**	

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