

The Impact of Drought on Grain Handling Firms

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Abstract

Drought impact both producers and agribusinesses. This study investigates the impacts of the 2004-2007 droughts on Oklahoma grain handling and fertilizer supply firms. The results indicated an average decline in firm revenues of 30%. Individual firms had single year revenue declines of 85% and drought period declines of 75%.

Background

The risks and impacts of drought and other adverse weather on crop producers are well recognized. Commonly recognized impacts from drought include reduced crop yields, reduced pasture and rangeland productivity and increased livestock mortality rates. These impacts lead to a reduction in farm income with ripple impacts throughout the local rural economy. A wide variety of policy tools have been developed to mitigate producer's risk from adverse weather. Multiple-peril crop insurance (MPCI) are available for most crops with a variety of options including yield based plans, revenue assurance plans and catastrophic coverage. Producers in regions heavily impacted by drought may also receive funds through federal disaster assistance programs.

Grain handling firms and other agribusinesses are also face weather related risks. Grain elevator managers often contend that drought impacts their firms more than grain producers. Grain elevators receive income through a per bushel sales margin and storage charges. Both of these income streams are impacted by drought and other adverse weather that reduces area grain production. Because their margins are largely volume related, grain handling firms do not benefit from the higher crop prices that may be associated with an adverse production year. Grain elevator managers also often contend that grain storage income is disproportionately impacted during short production years because producers sell their crop more rapidly to meet cash flow needs.

Sustained drought may also reduce fertilizer sales. Fertilizer application rates are presumably based on soil test information and yield goals. Soil tests following a drought year would be expected to show higher residual as some portion of the previously applied fertilizer may be available. A poor production year could cause producers to lower their yield expectations and reduce fertilizer rates. Drought impacted producers could also reduce fertilizer inputs due to cash flow constraints.

Grain handling firms and other agribusinesses do not benefit from crop insurance and disaster assistance programs which are targeted at the producer level. Crop insurance programs generally allow producers to “disaster out” crops at low yield levels, allowing the producer to receive an indemnity without harvesting the crop. While beneficial to the producer, this practice further reduces a grain handling firm’s potential throughput.

Hard red winter wheat is the major crop in Oklahoma with over 2 million acres in production. One implication of continuous wheat cropping system is that wheat producers and grain handlers are more severely impacted by droughts relative to other areas where producers are diversified across summer and winter crops. Oklahoma experienced below average wheat crops in the 2005, 2006 and 2007 crop years (Table 1). Oklahoma’s state wheat production for the 2005-2007 period averaged 70% of the average of the previous 5 year period. In some counties the 2005-07 period average was less than 25% of the 5 year average. Due to the escalation of wheat prices during the same time period, the value of wheat production actually increased.

During the fall of 2007 a collation of agricultural industry organizations organized a forum with Oklahoma policy makers. The purpose of the forum was to call attention to the adverse impacts of the three year drought and explore possibilities for state level

assistance. This effort brought to light the need to better understand and quantify the drought impacts on diverse sectors of the agricultural economy. The Oklahoma Grain and Feed Association, an industry organization representing Oklahoma grain handlers requested assistance in determining the drought impacts on grain handling and farm supply firms.

Table 1: Oklahoma Wheat Production

| | Average 2000-2004 | 2005 | 2006 | 2007 |
|---------------------------------|-------------------|-------------|-------------|--------------|
| Bushels Produced | 139,196,562 | 128,000,000 | 81,600,000 | 98,000,000 |
| Percent of 200-2004 Base Period | 100% | 91.9% | 58.6% | 70.4% |
| Value of Production (\$) | 383,019,800 | 459,962,000 | 383,601,000 | 640,000,000* |
| Percent of 200-2004 Base Period | 100% | 120.0% | 100.2% | 167.1% |

Source: Oklahoma Agricultural Statistics , *estimated

Previous Research

The impact of weather related risks on agricultural producers has been an extremely popular research topic for agricultural economists. Numerous studies have examined the impacts of drought and other events and effectiveness of strategies to reduce these risks. Morehart et al. examined the national impacts of the 1999 drought on the agricultural economy. The report concluded that the drought reduced farm income by \$1.29 billion with the hardest hit areas in the Northeast bearing 62 percent of these losses. While the impacts were very significant in the severely effected areas they represented only 3% of expected U.S. farm income.

Leistritz, Ekstrom, Wanzek and Mortensen examined the impacts of the 1988 drought on North Dakota producers. Their survey results indicated drought losses of 71% for small grain producers. Ninety one percent of the respondents reported receiving drought assistance with the payments averaging over \$14,000. Sixty one percent of the respondents indicated that they had crop insurance coverage with loss payments averaging over \$12,000. Net cash income for 1988 was reported to be similar to 1987.

Johnson and Smith examined the adverse impacts of the prolonged 1998 to 2001 drought on North Central Montano. In addition to impacts on agricultural producers the authors noted that “upstream and downstream, agribusinesses experienced reductions in the demand for inputs such as fertilizer and machinery and reduction in throughput in grain and other crop handling facilities.” The study did not attempt to quantify the drought impacts on agribusiness and the authors noted “...publically available data useful for tracing the adverse impacts of drought on agribusiness are sparse.”

While tracing drought impacts on agribusiness is difficult, a number of studies have modeled the indirect and induced (multiplier) effects of drought on agricultural economies. Diersen and Taylor used an IMPLAN model to investigate the impacts of 2002 on South Dakota. In addition to direct impacts on agricultural producers of \$642M the results indicated induced and indirect impacts of 760M. Flanders, McKissick and Shepherd used a similar approach to measure the impacts of the 2007 drought on the Georgia economy. The study determined that producers bore direct losses of 787M while the total impact on the economy was estimated at \$1.3B. While reflected the impact of drought on agribusiness, the IMPLAN approach does not quantify impacts on specific agribusiness industries such as grain handling firms.

Objectives

The objective of this research is to explore and quantify the impact of three consecutive years of adverse weather on Oklahoma grain handling and farm supply firms. Impacts on fertilizer sales are also investigated and the impact of multiple branches in diversifying weather risk is also examined.

Data and Methods

In cooperation with the Oklahoma Grain and Feed Association a survey of all licensed grain warehouses in the state of Oklahoma was conducted during the fall of 2007. The survey elicited information on grain and fertilizer warehouse capacity and historical grain and fertilizer sales. The managers were also asked to estimate grain volume, grain margin and storage income and fertilizer margins, for the 2005, 2006 and 2007 seasons. The survey was sent to 189 main office and branch locations and 113 managers responded. The responses included managers contacted in follow up phone surveys.

Results

Before discussing the survey results it is important to acknowledge the limitations of the data. The survey was designed to be quick and easy for the managers to complete. The information on grain volume and grain and fertilizer margins was based on estimates supplied by the responding managers. Some managers supplied precise values while other managers provided estimates rounded to the nearest thousand or ten thousand units. It should also be noted that while the survey questions elicited information on fertilizer profit margins, information on application services was not elicited. This omission may have distorted the true changes in fertilizer related revenue since some firms build margin

structures into application charges. Finally, while the survey instructions elicited information from the single location it is possible that some responding managers included information from branch locations leading to double counting. Conversely, many surveys mailed to branch locations which were operated on a seasonal basis were not returned and these type operations were probably underrepresented in the results.

The responding elevators reported grain receipts of slightly over 1.1M bushels with grain related income (margin and storage charges) of approximately \$470,000 and fertilizer margin income of \$72,000 for the base year period (Table 2). The reported margins from fertilizer sales were lower than anticipated, suggesting that some firms may structure fertilizer profits through application charges. As expected, the results indicated that Oklahoma grain and farm supply firms were substantially impacted by the three drought seasons. Reported grain throughput for the three year period averaged 70% of the previous five year average, a result which matched state production data. Grain margins and storage income followed a similar pattern. This result did not support the contention that elevator storage income falls disproportionately in short crop years as producers sell grain more rapidly to meet cash flow needs. Fertilizer margins for the 2005, 2006 and 2007 seasons were substantially lower than levels reported for the base period. However, the decline was less pronounced relative to the decline in wheat throughput.

Table 2 Average Grain Throughput and Fertilizer Volume for Responding Elevators

| | 2000-2004 Average | 2005 | 2006 | 2007 |
|--|----------------------|-----------|-----------|-----------|
| Grain Throughput (bushels) | 1,173,936 | 1,054,516 | 716,318 | 790,998 |
| Grain Margins and Storage Income (\$) | \$469,578 | \$421,806 | \$272,201 | \$208,489 |
| Fertilizer Margins (\$) | \$72,784 | \$70,436 | \$49,041 | \$52,944 |
| Grain Throughput relative to 2000-04 Average | 100.0% | 88.3% | 59.3% | 64.8% |
| Grain Margins and Storage Income Relative to 2000-04 Average | 100.0% | 89.8% | 57.8% | 65.7% |
| Fertilizer Margins relative to 2000-04 Average | 100.0% | 91.1% | 67.4% | 72.7% |

While the adverse crop conditions during the 2005-07 period were perceived to be wide spread, the reported impacts on grain and fertilizer income varied dramatically across respondents (Tables 3, 4). Some elevator locations were severely impacted with reported income for the 2005-07 period of 25% of the base period. Conversely some firms reported higher income for the 2005-07 period suggesting that their was less impacted by the drought and/or experienced low yields during the base period.

Table 3: Grain Throughput as Percent of Previous 5 Year Average

| | 2005 | 2006 | 2007 |
|---------------------|-------|-------|-------|
| Average | 88.3% | 59.3% | 64.8% |
| Minimum | 24% | 17% | 15% |
| Response Maximum | 179% | 172% | 185% |

Table 4: Elevator Margins from Grain and Farm Supply Relative to Previous 5 Year Average

| | 2005 | 2006 | 2007 | 2005-07 Average |
|---------|--------|--------|--------|--------------------|
| Average | 89.8% | 56.8% | 64% | 70.4% |
| Minimum | 37.1% | 15.4% | 16.1% | 25.4% |
| Maximum | 158.8% | 140.1% | 171.7% | 137.0% |

Similar to other regions, the grain handling and farm supply industry in Oklahoma has been rapidly consolidating. The Oklahoma Grain and Feed Directory list 189 individual elevator locations and 53 firms. This reflects the fact that many firms have expanded to multiple locations through acquisition and mergers. One rationale for consolidation of elevator and farm supply firms is to obtain greater geographic diversification. In order to examine whether elevator and farm supply firms with multiple locations were in fact less impacted, the results for elevator firms with over 5 locations (as listed in the Oklahoma Grain and Feed Directory) were combined (Table 5). The results suggested that the number of branch locations had little influence on the firm's ability to maintain income during drought periods. Elevator firms tend to expand into locations overlapping or adjacent to their existing trade territory. This consolidation strategy may provide relative little geographic diversification. Previously acknowledge shortcomings in the data may also contribute to this unexpected result.

Table 5 Elevator Margins from Firms with 5 or More Branch Locations Relative to Previous 5 Year Average

| | 2005 | 2006 | 2007 | 2005-07 Average |
|---------|--------|--------|--------|--------------------|
| Average | 87.4% | 56.7% | 62.9% | 69.1% |
| Minimum | 55.7% | 33.6% | 22.6% | 46.4% |
| Maximum | 129.4% | 140.1% | 166.5% | 124.0% |

Implication and Discussion

The survey results confirm and quantify the impact of adverse weather on grain handling firms and other agribusinesses which provide marketing and farm supply infrastructure for producers. While the increase in wheat prices offset some of the drought's impact on wheat producers (at least the sub-set that had grain to sell) grain

handling firms experienced a 30% decline in revenues. Some firms were severely impacted with one firm reporting a 85% revenue decline during 2006 and a 75% decline over the entire 2005-07 period.

Fertilizer revenue was less severely impacted. This suggests that, contrary to the beliefs of farm supply managers, producers do not limit fertilizer expenditures due to drought related cash flow pressures. Farm supply firm managers may also adjust margin structures during low volume years. Firm with multiple locations appeared to experience impacts similar to single location firms.

The impacts of drought and adverse weather on the revenues of agricultural producers has been widely recognized. Federal farm policy, periodic disaster assistance programs and various risk management tools are all designed to address these losses. This, admittedly simple, research suggests that agribusiness firms providing marketing services and agricultural inputs are also severely impacted by regional droughts. Weather related future contracts along with associated derivative products have been available on the Chicago Mercantile Exchange since the late 1990's and have been used by utility companies as a risk management tool. The usefulness of these products or other strategies to address the weather related risks of grain handling firms would be a topic worth of additional research.

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