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ECONOMICS COMMENTATOR

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Direct and Indirect Effects of Drought on South Dakota's Economy

Matthew A. Diersen, Gary Taylor, and Alan May¹

The drought in South Dakota has had a significant economic impact on agricultural production and on expected production costs and gross revenue from crops and livestock. The total direct dollar impact already amounts to \$829 million. The direct impact includes lost value of pasture, culled livestock sold for less than their value as breeding animals and the uninsured portion of crop losses. The effect of the drought of 2002 is not reflected only in the value of lost agricultural production. The losses incurred in other sectors of the economy, as a result of decreased earnings in the agricultural sector, should also be included to obtain a true picture of the total effect on all industries and consumers in South Dakota. The indirect dollar impact amounts to \$638 million and induced impacts total \$340 million. The combined total shows a \$1.8 billion effect on South Dakota's economy.

Livestock Effects

Range and pasture conditions declined steadily as the drought continued to worsen and spread east across South Dakota. While 17 percent of pasture was rated "very poor" or "poor" in May, it rose to 78 percent in August.² Based on these conditions and other anecdotal evidence it was assumed that one-third of the cow-calf pairs have been affected for 4 months, and another one-third for 2 months. Given the lack of growth it was further assumed that all pasture would suffer an additional 2 months of losses. Aggregating the already lost and likely lost pasture amounts to the equivalent of all the cow-calf pairs needing 4 months of pasture. Using a price for pasture of \$18.30 per cow-calf pair per month, the loss accumulates over 4 months across 1.9 million pairs, yielding \$138 million.

The number of pairs is actually higher than the 1.8 million head of beef cows reported as of July 1, but no allowance was made for replacements, yearlings, bulls, etc. in the pasture loss estimation. The pasture losses will be reflected in lower per-head prices received for early-weaned calves and cull animals. The pasture loss measure does not account for market price differences. Nor was an allowance made for this year's excellent calf crop. The drought is assumed to be isolated enough to not be impacting the national price level of cattle. The federal Noninsured Crop Disaster Assistance Program (NAP) will offset some pasture loss, but to what extent remains unclear.

The current and expected loss of pasture requires producers to place cows into feeding programs. Assuming that two-thirds of the beef cows need purchased summer feed of 30 lbs. of hay a day for 3 months, and with hay priced at \$60 per ton, the expense amounts to \$100 million. The presence of old stocks of hay, cheaper alternative feeds, and culling practices would alter that figure.

If producers cull 30 percent of their beef cows this year compared to about 15 percent in a normal year, then early culls would total 285,000 head. Those animals that are being culled early would normally have value as breeding stock, but producers are receiving slaughter animal prices instead because so many are moving through local markets. Following the price difference between old and young breeding stock, from *Drovers*, the loss would amount to \$150 per animal. At that rate, the expected loss from drought-related culling of beef cows totals \$43 million.

During the 1976 drought, South Dakota cow numbers dropped dramatically. The number of beef cows dropped from 1.9 million to 1.4 million head. Producers have said that this drought is worse and started earlier in the year.

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²Crop condition, inventory, and price data are from the National Agricultural Statistics Service unless otherwise noted.

A fair number of culls have been marketed already. Further, producers not directly affected by extensive and early pasture losses anticipate reduced feed supplies will force additional liquidation to occur across South Dakota. The assumed culling level would not be as extensive as the culling that occurred in 1976. In 1988 the inventory was hardly reduced at all, but the base number was relatively small at 1.5 million head.

Crop Effects

Crop conditions for the major crops in South Dakota (corn, soybeans, wheat, sunflowers, and oats) were used to estimate losses. Over 60 percent of the small grain crops were rated “very poor” or “poor” before harvest. In addition, as of August 4, 47 percent of the corn crop was rated “very poor” or “poor”. Soybeans remain in relatively good condition.

In a normal year, the value of South Dakota crops, excluding hay, totals \$1.9 billion. Some crops such as corn and soybeans are typically insured at higher levels than small grains, but a uniform coverage level of 65 percent is assumed. Hence, the uninsured value totals \$665 million. Assuming that conditions of “very poor” or “poor” would be bad enough to trigger insurance indemnity payments, the percent of the crop in those conditions was used as the percent of the uninsured value that would contribute to the loss. Losses from grains and oilseeds are estimated to total \$323 million after accounting for insurance payments.

Further evidence of the decline in crop production comes from the August *Crop Production* report. The winter wheat estimated yield of 24 bushels per acre is down 8 bushels from a year ago. Production of winter wheat in South Dakota was actually lower in 2001 due to a dramatic drop in harvested acres versus planted acres. This was due to very severe winter kill of the wheat crop. The 2002 spring wheat crop has an estimated yield of 22 bushels per acre, 17 bushels per acre lower than the record high yield of a year ago.

The corn yield of 95 bushels per acre would be the lowest yield per acre since 1995. This yield per acre is 13 bushels lower than the average of the five previous years. The estimated soybean yield of 29 bushels per acre would be the lowest state yield since 1993. The estimated yield per acre reflects a decline of 6 bushels per acre compared to the average of the previous five years.

Crop insurance data from the U.S. Department of Agriculture’s Risk Management Agency (RMA) and future crop production estimates will more accurately

refine the loss estimate for crops. A natural hedge may also offset some crop losses if a portion of the crop is harvested and sold at above-loan rate prices. The natural hedge is most prominently displayed for hay production. However, the natural hedge on most other crops in South Dakota is substantially less than that for hay.

The higher current price for hay is explained in part by the natural hedge, which becomes important at the state level. Hay that is produced is worth more because of reduced supplies and relatively stable demand. There is some evidence that hay price responds to current yields in South Dakota. The estimated price flexibility (see Tomek and Robinson) of current yield at the point of means is -0.34 . The price flexibility implies that with yields down 40 percent this year, the price in South Dakota would be expected to increase by 14 percent above the mean price. The market also dictates increases, as the July all hay price in South Dakota is \$78 per ton.

Hay stocks in 1976 exceeded production and old stocks, implying a large inflow of hay into South Dakota. As of May 1, South Dakota had large old stocks of hay. Production statistics for other hay will eventually cover wheat hay, oat hay, abandoned acres, and Conservation Reserve Program hay. Thus, a clearer picture of the hay and feed situation will develop over time.

RMA reports that only 500,000 acres of hay in South Dakota are covered by crop insurance for the 2002 crop year. Perhaps coverage is low because a majority of the hay raised in the state goes for livestock use, not for sale. The reported liability is about \$35 million. Assuming the liability represents 60% of crop value, the insured acres are valued at \$60 million. Assuming uniform coverage across South Dakota, the total 4.5 million acres of hay would have an insured value of \$540 million. The total is consistent with 9 million tons of production worth \$60 per ton.

South Dakota had expected to harvest 4.5 million acres of hay this year, and the August 12 *Crop Production* report suggests the all-hay yields will be 1.1 tons per acre compared to 1.8 tons per acre in a normal season. The expected 9 million ton crop worth \$60 per ton is reduced to a 5 million ton crop worth \$75 per ton. The difference between the expected value and the current value amounts to \$165 million. Such losses would exceed the 1988 disaster payments for hay that totaled over \$43 million in South Dakota (Dismukes, Zepp, and Smith). However, hay yields and prices have both increased since then. Finally, indemnity payments will eventually offset a portion of projected losses, but only up to \$35 million in liability.

Other Effects

Producers are absorbing an estimated \$60 million in other costs from the drought. Those include pasture lost for yearlings, reduced dairy production, and a wide range of drought-related expenses. Water hauling, additional transportation of cattle, additional interest, and building fences to graze Conservation Reserve Program lands are such costs. An Economic Research Service study of drought impacts estimated that drought-related activities increase costs 2-5 percent above normal (Morehart, et al.).

Indirect and Induced Effects

The total effect of the drought on the South Dakota economy can be divided into three separate facets. The direct effect, with a multiplier of 1, will be the current \$829 million loss in agricultural income. The indirect effect, or the effect on businesses related to agriculture, would be the \$829 million times the indirect multiplier of 0.77, which is \$638 million. The induced effect, or the effect on local consumers, is the same \$829 million times 0.41 or \$340 million. These three total to a \$1.8 billion impact to the South Dakota economy to date. As the season progresses this total could change, depending upon conditions in the state. Recent rains have helped mitigate the effects of the drought but in most cases the damage has already occurred. Crop yield potential has been reduced and pastures/rangeland will not recover this year. However, the rain does give some hope that there will be subsoil moisture to produce crops and grass next spring.

The magnitude of these three effects is dependent on a number of different factors, including the population of the state, the number of industries in the state, and how much of the economic activity stays in the state and how much “leaks” out due to the buying or selling of goods into or out of the state and the in or out migration of labor. The state multiplier was derived using IMPLAN Pro, a social accounting and impact analysis software package(see box at right). The three parts of the multiplier are as follows: the direct effect is 1, the indirect effect is 0.77, and the induced effect is 0.41. This results in a total multiplier for the state of 2.18.

Conclusions

The drought effects will not be easily offset. Off-farm income is not as prevalent in South Dakota as in other states, especially in the northwest part of the state. Further allocations of losses across South Dakota would require additional assumptions about the spatial distribution of losses and the rate at which they occurred, which might be gleaned from crop conditions information. More will also

be known about the extent of culling by analysis of “Auction Agency Reports” from South Dakota’s Animal Industry Board.

The direct effect of \$829 million is over 20 percent of South Dakota farm receipts from crops and livestock in recent years. To put the total effect of \$1.8 billion in perspective, the total gross state product for South Dakota was \$23 billion in 2000 (United States Department of Commerce). The gross state product is the value of all the goods and services produced in the state during a one-year period.

Summary of Drought Effects

Factor	Impact (\$ million)
Livestock Effects	
Pasture Losses	138
Feed Costs	100
Culling Losses	43
Crop Effects	
Grains/Oilseeds	323
Hay	165
Other Effects	60
Indirect Effects	638
Induced Effects	340
TOTAL	\$1,807

IMPLAN Pro is a commonly accepted software package used to create a predictive model of a local economy that may be used to analyze shocks to the economic system. The name of the program is derived from its function, IMPact analysis for PLANning. The program uses data from 528 different industrial sectors to create a model of the economy, including employment, value added activities, and business-to-business transactions, to create a baseline economy. Impacts to the system, either increases or decreases in economic activity or investment, may then be compared to the baseline scenario. The multipliers developed by the program represent the actual linkages between businesses, government, and households in the study area. They do not model the number of times a dollar is turned over in the economy; instead, they measure the actual increases, or decreases in spending that occur due to the economic shock being analyzed.

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Click on "additional information and links", scroll down to the Farm Bill section and click on the words "2002 Farm Program Decision Aid".

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Near the top of this page find "2002 Farm Program Decision Aid" and click on the words "Excel Version".

For more information or assistance with this spreadsheet, contact your local County Extension Office or contact Donald Peterson or Alan May at the SDSU Economics Department at 605-688-4141.



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