the Southwest ECONOMY

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The 1989 Drought: A Risk to Texas Farmers

In 1988, insufficient rainfall crippled agricultural production across much of the United States.[1] Throughout the nation, soil moisture conditions have improved, but drought remains severe and extreme in many areas of the country. Early reports indicate that much of the winter wheat crop shows signs of moisture stress.

In Texas, soil moisture conditions have worsened since last summer. Current dry conditions raise concern for the upcoming crop year. Some South Texas farmers fear that there will be inadequate moisture for their spring crops, which they began planting in February.

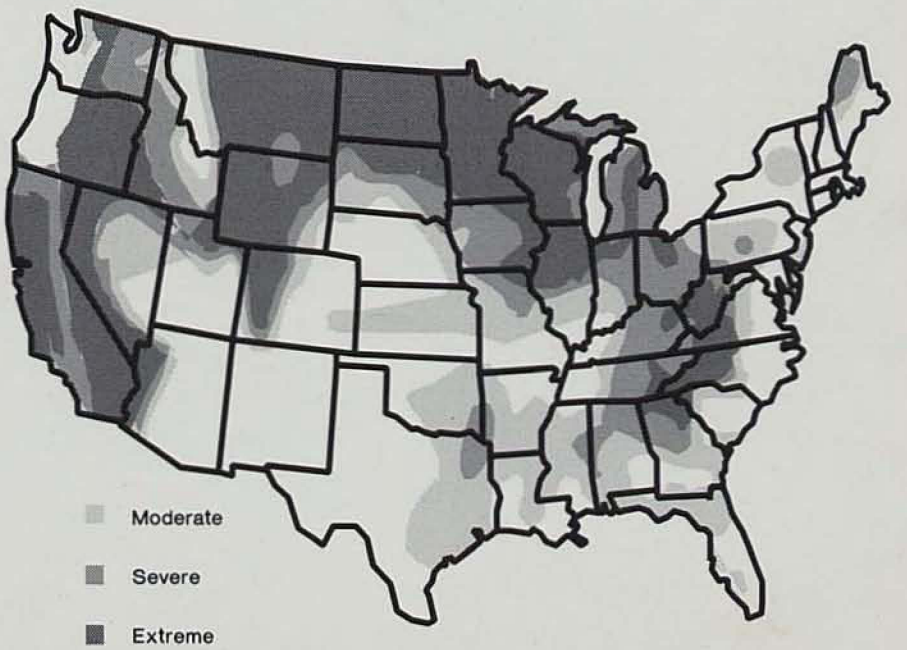
In comparison to last year, insufficient rainfall in 1989 would mean more serious problems for Texas crop farmers and livestock producers. Last year, farmers with damaged crops maintained their income by selling from inventory at high prices. Their action restrained last year's rise in grain prices, and held down losses for livestock producers. Grain inventories are now reduced. Poor grain yields in 1989 could mean lower net cash income for some area grain producers and higher grain prices. Higher grain prices would further reduce livestock margins.

Although well-timed rains could bring bumper crops to Texas farmers in 1989, dry soil increases the risk associated with inadequate rainfall. This suggests two issues facing the Texas farming community. What risks do current soil moisture conditions present for 1989 operations? And what measures can farmers take to reduce their financial exposure to the risk associated with drought?

Soil Moisture Conditions

Drought is dry soil resulting from a prolonged period of inadequate rainfall. Despite improving soil moisture conditions across much of the country, the 1988 drought is still with us. Portions of the United States are still in extreme drought. Texas soil moisture conditions have deteriorated.

Map 1
Palmer Drought Severity Index
July 30, 1988



Southwest soils remained in relatively good shape at the peak of the drought. Map 1 shows the Palmer Drought Severity Index by climatic division for July 30, 1988, when last summer's drought was at its worst. The Palmer index measures long-term soil moisture. Drought conditions are described in terms of increasing intensity: moderate, severe, and extreme. The map shows that, while the drought was widespread and intense in July, the Southwest was suffering less than much of the rest of the United States.

Map 2, the last Palmer map of the 1988 growing season, shows soil conditions as of December 10, 1988. As the map shows, the drought has lessened in severity throughout much of the United States since July. Still, areas of the country remain in extreme drought. And in Texas, the drought has intensified and become more widespread.

Rains Unlikely to Help Texas Drought Significantly

Rains are unlikely to end the Texas drought before July. If a drought area receives only normal amounts of rain or snow, the soil-moisture deficit remains. Normal precipitation simply prevents the drought from getting worse. Above-normal rainfall is required to end drought conditions.

Given historical rainfall, the Texas drought is unlikely to end, or lessen from a severe drought to a moderate drought by mid-April (*See Map 3*). In the drought-afflicted areas of the state, the probability of the drought ending ranges from 0.1 to 13.3 percent. That is, for one severe drought area of the state, scientists have estimated that sufficient rain to end the drought by mid-April occurs only once every thousand years. For some other areas of the state, scientists have estimated that sufficient rain to end the drought occurs once every seven years. In the severe drought areas of the state, the probability of drought conditions improving to moderate ranges from 11.6 to 17.5 percent.[2]

Though the odds are somewhat better, the Texas drought is unlikely to end, or lessen from a severe drought to a moderate drought by mid-July (*See Map 4*). In the drought-afflicted areas of the state, the probability of the drought ending ranges from 5.5 to 25.9 percent. In the severe drought areas of the state, the probability of drought conditions improving to moderate ranges from 21.6 to 34.5 percent.

Map 2
Palmer Drought Severity Index
December 10, 1988

Texas Crops at Risk

Dry soil conditions do not guarantee a poor crop year, but dry soil puts Texas crop production at risk. With odds against adequate rainfall ending the drought before the middle of the growing season, well-timed rains will be essential for good crop yields.

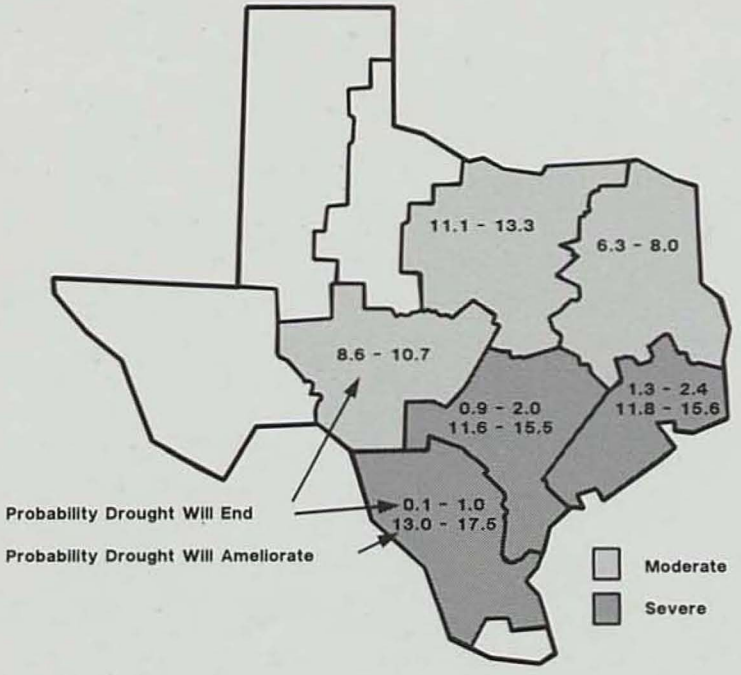
Historical evidence for Texas and other states shows that reduced crop yields are likely in drought years. Nonetheless, good production is still possible during drought years. Well-timed rains have produced good crop yields during periods of dry soil.

If production remains low in other parts of the state or country, Texas farmers with irrigated fields will benefit. Less than 10 percent of U.S. cropland is irrigated, but irrigation is used on more than 20 percent of Texas cropland. Prolonged drought, however, will increase the demand for irrigation, limit the availability of water, and increase costs.

Texas Livestock at Risk

In 1988, much of the pasture and range forage in the eastern half of Texas was simply burned up by the drought. When pasture and range feed conditions deteriorated, ranchers were forced to provide supplemental feed, increasing their demand for feed grains. At the same time, drought conditions across the nation shrank supplies of feed grains, boosting their prices. As Chart 1 illustrates, Texas

Map 3
Probability of January 14, 1989 Drought Conditions
Ending or Ameliorating by Mid-April



Map 4
Probability of January 14, 1989 Drought Conditions
Ending or Ameliorating by Mid-July

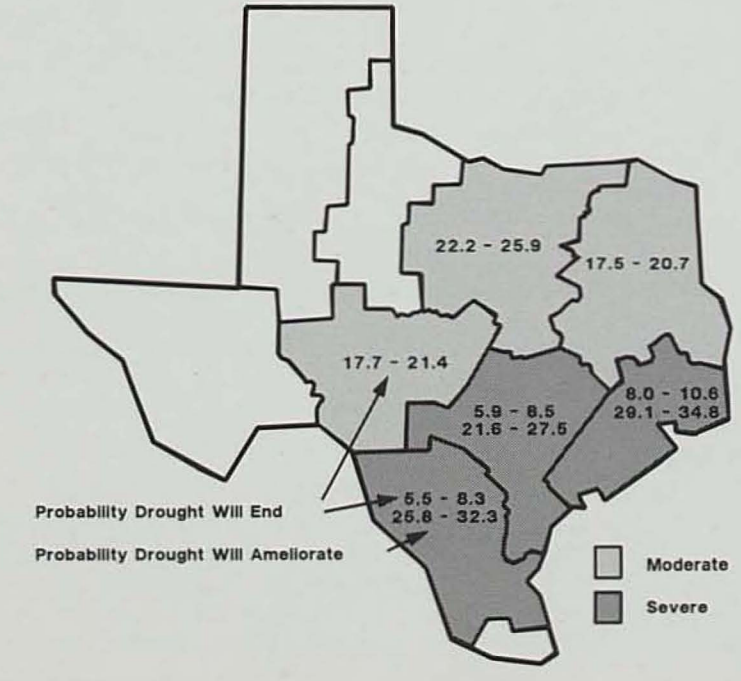
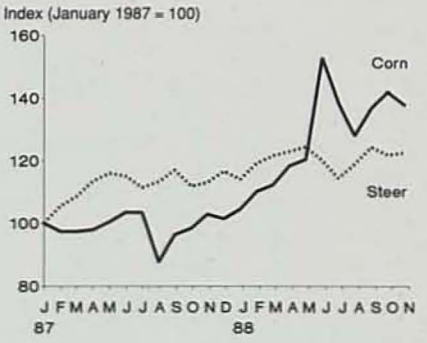


Chart 1
Corn and Steer Prices
1987-1988



beef producers saw their margins shrink as grain prices rose.

If range forage remains scarce and national grain production does not recover in 1989, Texas beef producers will continue to see poor margins. Ample supplies of competing meats may make it difficult for Texas cattle producers to raise their prices. Furthermore, continuing drought could delay herd rebuilding another year, reducing long-run cattle supplies.

Agricultural Risk Management

Farmers manage their operations through many uncontrollable events. Drought is just one example of a shock that introduces price and yield variability. Insects, freezes, floods, hail, and other natural phenomena badly damage or totally destroy many acres of crops each year. Agricultural prices fluctuate with world supply and demand.

Agricultural producers can reduce their exposure to price and yield risks by using the options market or by purchasing crop insurance. But many farmers seem reluctant to use these risk-management tools.

Agricultural options. Farmers can use the agricultural options market to hedge against price movements. Purchasing an option allows a farmer to reduce risk by setting a floor on price declines or a ceiling on price increases.

Some crop farmers purchased options last fall when prices were high, setting a floor on their 1989 crop prices. These farmers have now guaranteed that they can sell their 1989 crop at no lower than the option price. In

purchasing the option to sell, the farmers have reduced their expected income but have limited their exposure to price declines. These farmers can still reap the benefits of higher crop prices by simply allowing the option to expire.

Livestock producers can hedge against both fluctuating feed and livestock prices. Livestock producers would seek to reduce exposure to falling livestock prices by purchasing options to sell their cattle, and exposure to rising feed grain prices by purchasing options to buy. Surprisingly, only 7 percent of feeder cattle are priced ahead of sale by options, futures, or forward contracting.[3]

Crop insurance. Crop insurance allows agricultural producers to reduce the risk associated with variable quality and yields. Private insurers have long provided crop insurance against specific hazards like fire and hail. In the past, private insurers have found it unprofitable to provide insurance against all risks. Adverse selection and government programs are two factors inhibiting the development of private all-risk crop insurance.

Adverse selection occurs when insurance companies lack enough information to identify the risk characteristics of their customers and the customers have better information. Rates are based on average claims, yielding premiums that are above or below the expected losses for specific farmers. The low-risk farmers, who would pay premiums above their expected losses, will find the insurance unattractive, leaving only the high-risk farmers to insure.

Earlier in this century, a number of small private insurers provided all-risk crop insurance. Because they were small, they had a limited ability to spread risk across geographic regions of the country. A number of these insurers failed when they had insufficient assets to pay off widespread losses in service areas.

Widespread drought and depression in the mid-1930s encouraged the U.S. government to provide all-risk crop insurance. Although the government subsidizes its provision, crop farmers have been reluctant to participate in the federal crop insurance program. Only one-fourth of the country's eligible crop acreage is currently insured by federal crop insurance.[4] Farmers have identified several reasons for their reluctance to carry crop insurance. Their most common reason is that, despite subsidies, coverage levels are too low and rates too high.

Disaster Payments Discourage Ex-Ante Risk Reduction

U.S. government disaster payments in bad years make options and crop insurance less attractive to farmers. The purchase of either of these instruments reduces a farmer's expected income. Given the government disaster programs, however, options and crop insurance may not reduce significantly the farmer's exposure to risk. For the 1988 crop year, the federal government provided more than $3.5 billion in disaster assistance to U.S. farmers.

In recent years, Congress became concerned that disaster payments threatened the viability of the federal crop insurance program. In 1981, Congress made changes in the disaster program to increase the emphasis on crop insurance. The 1988 Disaster Assistance Act includes a provision that, with certain exceptions, requires farmers to carry crop insurance in 1989 to be eligible for disaster payments based on anything greater than a 65-percent crop loss in 1988. In addition, Congress recently created a commission to determine why the crop insurance program has not developed into an effective substitute for disaster payments.

Texas Farmers at Risk

In summary, dry soil has increased the risk to Texas agricultural production in 1989. Soil conditions are unlikely to improve before the crop year is well underway. Well-timed rains will be essential for good crop production.

Poor or inadequate rain in 1989 would limit crop production on non-irrigated Texas farmland. Farmers with irrigated land would benefit from higher prices, but would face higher irrigation costs. Livestock producers would see another year of poor margins.

In short, drought puts 1989 Texas agricultural income at risk. Yet, farmers seem reluctant to reduce their exposure to the financial risks associated with drought and other perils. Government disaster programs probably contribute to their reluctance.

— Fiona Sigalla and Hilary Smith

[1] For further analysis of the 1988 drought, see Hilary H. Smith, "Drought 1988: Farmers and the Macroeconomy," Federal Reserve Bank of Dallas *Economic Review*, September 1988, 15-22; and John Rosine and Nicholas Walraven, "Drought, Agriculture, and the Economy" *Federal Reserve Bulletin* 75 (January 1989): 1-12.

[2] The National Climatic Data Center used the Palmer index and historical precipitation data to calculate the likelihood that a drought will be eliminated or lessened to moderate conditions within the next two, three, or six months. The probability of an area receiving at least the precipitation needed was calculated from the Gamma Distribution using maximum likelihood techniques. By definition, a drought is considered ended when the Palmer drought index reaches -0.5. The drought is considered ameliorated when its intensity rises to -2.0 (the lower threshold of a moderate drought). See *Probabilities and Precipitation Required to End/Ameliorate Droughts*, Historical Climatology Series 3-16, National Oceanic and Atmospheric Administration, National Climatic Data Center, Asheville, North Carolina, June 1986.

[3] See Calvin Pigg, "Growers Turn to Commodity Pricing Clubs," *Southwest Farm Press* 16 (January 19, 1989): 8.

[4] "Taking a Hard Look at Crop Insurance," *Agri Finance*, December 1988, 34-5.