

Drought Effects On Rural Communities Vary by Strength of Local Nonfarm Economy

Farmers make adjustments continually to changing conditions that are beyond their control. One factor, critical to their success, is especially changeable, unpredictable, and uncontrollable: the weather. Unusually hot and dry weather is an ever-present threat to agriculture and, in turn, to rural communities which rely on the local agricultural sector for prosperity and economic well-being.

The worst drought year since 1936. That is how 1988 will be remembered in many parts of the United States because severe drought conditions were so widespread. That we were in for an unusually serious and far-reaching drought became apparent in early summer, just weeks after completion of normal spring planting. By late fall the cumulative moisture shortfall had caused billions of dollars of losses to crop and livestock producers. The drought was most severe in parts of the Pacific Coast States, northern Rocky Mountain States, most of the Northern Plains, large parts of the Lake States and the Corn Belt, and some areas of Appalachia and the Southeast. Many other areas also suffered some reduction of output because of the hot, dry weather.

However, it is the extent of the drought and not its existence that was unusual in 1988. What most people forget, or may be unaware of, is that drought is a recurrent phenomenon in the United States. Virtually every year at least one region in the Nation is suffering from drought or recovering from a previous one. Each region responds differently to the resulting swings in

agricultural income because of differences in the makeup of the local economy. After a drought, these differences may enable some areas to regain their economic health more easily and more fully than others.

When drought causes an economic downturn in a region's agricultural sector, it can bring substantial reductions in business activity throughout the community. If farm operators and their employees account for much of the local purchasing power, a drop in farm revenue without a compensating increase in government assistance can mean large decreases in local retail sales. Where farmers are substantial borrowers, their inability to make loan payments could weaken local thrift institutions and threaten the availability of rural credit to others. When local farm production is an important input to other area businesses, a decline in agricultural output can cause shortages in local processing industries and an increase in unemployment.

Our purpose in this article is to illustrate that the impact of a drought depends on the structure of the local economy, namely the importance of farming to the overall economy of the area, the diversity of the area's economy, the types of farming enterprises that dominate the area, and the distribution of Federal drought assistance payments. To do that, we examine how drought affected five different geographic areas that experienced extreme drought during the summer of 1988 (fig. 1).

Northeast Montana

The eight-county area of northeast Montana (Daniels, Dawson, Garfield, McCone, Richland, Roosevelt, Sheri-

dan, and Valley Counties) is highly dependent upon farm production for its economic base. More than one in five jobs (23 percent) is in the farm production sector with another 5 percent in agribusiness industries such as farm inputs and farm processing and marketing (fig. 2). More than 80 percent of all farm sales in the area are wheat and cattle sales from farms that average over 3,500 acres, eight times the national average. However, average farm sales (\$60,452) are only slightly above the U.S. average (\$58,857), suggesting low productivity of the soil and low labor intensity of the area's farming and ranching operations (fig. 3).

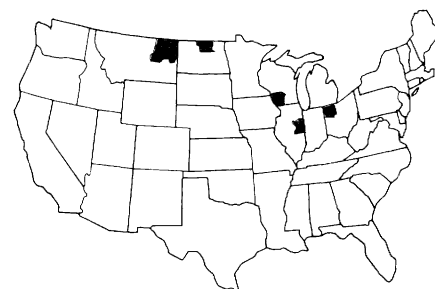
During the early 1980's, northeast Montana experienced modest growth stemming from rapid expansion in the energy sector. But since 1983, problems in the U.S. energy sector have translated to some loss of jobs and population in the local economy. The 1988 drought reduced wheat and barley yields in this region by 70-75 percent; it also increased the cost of feeding cattle. Given the importance of farming and the farm sector's dependence on two drought-affected commodities, a significant drop in farm income translates to a potential slowdown in total business activity throughout the local area.

North Central North Dakota

This five-county North Dakota area (Benson, Bottineau, McHenry, Pierce, and Rolette Counties) is the smallest in terms of population, employment, and general economic activity of the five areas selected for drought impact analysis. It is also the most dependent on farm production activities for its

Figure 1

Five multicounty areas selected for drought impact analysis



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economic base. In 1985, over 32 percent of all jobs in the area were in the farm production sector with another 3 percent in agribusiness. Farms in this area produce mainly wheat and feed grains (mostly barley). These crops accounted for over three-fourths of all farm sales in 1982. Sales in the livestock sector are primarily beef cattle, but include some dairy and swine. Average farm sales were lower than the national average with most sales coming from medium-sized (\$40,000-\$250,000) farms.

As with northeast Montana, the early 1980's brought some expansion in energy-related industries in this area. But by the mid-1980's, problems in the energy sector as well as in the farm sector caused a reversal in the modest growth of the local economy. The 1988 drought reduced wheat and feed grain yields in the area by 70 percent, resulting in substantial income losses to the area's agriculture-dependent economy.

Southwest Wisconsin

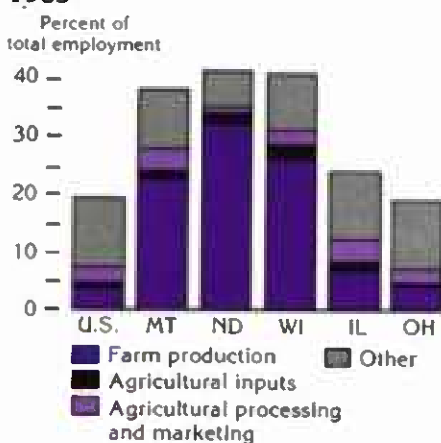
The economy of the seven-county southwest Wisconsin area (Crawford, Grant, Iowa, Lafayette, Richland, Sauk, and Vernon Counties) is based in large part on farm-related industry. Twenty-six percent of all employment in the area is in farm production activities with another 5 percent employed in the closely linked agribusiness industries. Dairy alone accounts for over half of all farm sales, with livestock sales (cattle and calves) making up another 18 percent. Most of the livestock sold is cull and excess cattle from dairy operations. Since 1983, four of the seven counties have lost population and the 1986 population figure for the area was only slightly higher than in 1980.

The 1988 drought affected the southwest Wisconsin area mainly by causing feed shortages that raised feeding costs for dairy operations. With a single primary type of farm enterprise in the area, the squeeze on farm profits cut sharply into farm income available for local spending in other businesses.

East Central Illinois

The seven-county area of east central Illinois (Champaign, Ford, Iroquois, Kankakee, Livingston, Piatt, and Ver-

Figure 2
Agriculture-related employment, 1985*



*Data are for counties indicated on map in Figure 1.

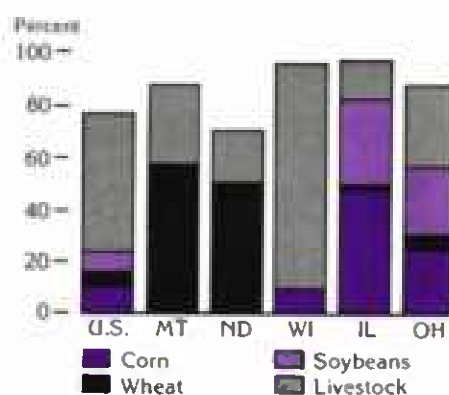
million Counties) represents one of the most productive farming areas of the Nation. Located in the heart of the Corn Belt, this area produces corn yields that average 40 percent above the U.S. average. While the farm sector is important to the area, the area's economy is not very dependent on farming. Most of the local jobs are in nonfarm industry or government. Farm production accounts for about 7 percent of total employment while agribusiness accounts for an additional 5 percent. Although it has a much larger population than the other areas studied, this area has also lost population since 1980 with six of the seven counties having some population loss during the 1980's. Such losses reflect recent adjustments in the industrial base of the area and are somewhat typical of many areas throughout the industrialized Midwest.

The farm sector is dominated by medium to large corn-soybean farms, with over 80 percent of total farm sales coming from corn and soybeans. The livestock sector, producing mainly hogs, accounts for about 6 percent of all sales. The corn yield for 1988 was estimated to be half the normal yield and soybean yields were down 25 percent. Given the greater diversity in this local economy, losses from the drought may be large in the farm-related sector but the overall impact on business would be relatively small.

Northwest Ohio

The 11-county area of northwest Ohio (Allen, Defiance, Fulton, Hancock,

Figure 3
Distribution of farm sales, 1982*



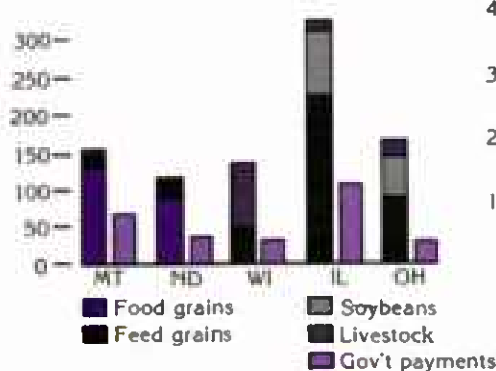
Henry, Lucas, Paulding, Putnam, Van Wert, Williams, and Wood Counties) is dominated by nonfarm economic activities. The farm production sector accounts for only 4 percent of total employment and employment in the agribusiness sector accounts for 3 percent. Manufacturing is the most important nonfarm sector. Corn and soybeans account for over 50 percent of all farm sales, hogs 12 percent, and cattle and calves 9 percent. Farms in the area are smaller than the U.S. average, both in sales and in acres. Farms selling less than \$40,000 per year were more numerous than in the other areas studied. This reflects the importance of part-time farming in the area and the strong nonfarm influence on the farm sector.

Corn and soybean yield losses in northwest Ohio were estimated to be 40 percent and 25 percent. As in Illinois, farm and nonfarm losses were large but the drought would be expected to have relatively little effect on the overall economy because agriculture does not play a major role in the local economy.

Calculating Drought Effects

In estimating drought effects, one should take into account the direct income effects on the local farm sector, the overall economic effects on the regional economy, and the compensating effects of Federal drought assistance. Direct income effects in this paper are based on: crop yield

Figure 4
Direct drought losses in the farm sector are partially offset by government aid*
(Million dollars)



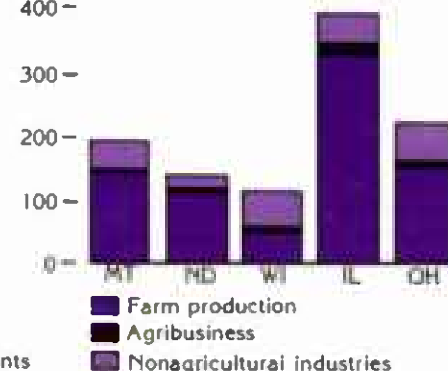
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loss estimates for wheat, feed grains, and soybeans; estimated income losses of the livestock sector (beef, dairy, and hogs) resulting from higher drought-induced feed grain and forage prices; and estimated payments to the crop sectors based on the provisions of the Federal Disaster Assistance Act of 1988.

The effect of drought-induced price changes was not estimated in our analysis. Higher market prices benefited producers of nonprogram crops who were fortunate enough to have near normal yields or large crop inventories to sell in place of current production. Price increases had little effect on producers of crops covered by Federal commodity programs (such as wheat and barley), because increases in market prices for program crops were offset by decreases in deficiency payments. Instead, program participants had an opportunity to increase production and thereby farm income in the following year because of the easing of set-aside restrictions. However, for farm operators experiencing serious crop failure, price increases were too small to make up for yield losses.

A regionalized input/output model, IMPLAN, developed by the U.S. Forest Service, was used to estimate the total drought effects on farm-related and nonfarm sectors of the five selected areas. IMPLAN takes into account the economic links within the entire regional economy, including the regional links between farm and non-

Figure 5
Estimated drought-related decline in total gross output, 1988*
(Million dollars)



farm sectors, and links to economic activities outside the region.

Direct Drought Effects Depend on Importance of Farming And Amount of Government Help

Our estimates of direct drought effects (crop production losses and drought-induced income losses in the livestock sector) range between \$115 million in north central North Dakota to \$326 million in east central Illinois. The direct farm loss in north central North Dakota was mostly in the dominant food grains (mainly wheat) sector (fig. 4). An estimated Federal drought assistance payment of \$35 million reduced this loss to \$79 million. The farm economy in northeast Montana is similar to North Dakota's and had an estimated net direct loss of \$85 million. In southwest Wisconsin, the net direct loss was \$105 million, mainly because the feed shortage brought higher feed costs to the dominant dairy sector. Estimated drought assistance payments for southwest Wisconsin may be underestimated since dairy operators, who normally do not produce all their feed requirement, were eligible to purchase CCC-owned grain at 75 percent of the loan rate. Such potential assistance to livestock enterprises was not estimated. However, drought assistance payments to dairy operations that produce their own feed are included in our estimates if the claims were made through the crop provisions. For northwest Ohio and east central Illinois, net direct farm losses of \$134 million and \$218 mil-

lion are accounted for by the large feed grain and soybean sectors.

Indirect Drought Effects Depend on Pattern of Local Spending

Based on our estimates of yield reduction in the crop sector and net income reduction in the livestock sector, declines in total business activity ranged from about \$116 million in southwest Wisconsin to \$389 million in east central Illinois if no Federal disaster assistance is considered (fig. 5). Except for Wisconsin, most of the decline in total gross output is due to the direct effect of the drought, the decrease in farm production. The indirect effect of the drought is the slowdown in the rest of the local economy (in this analysis, mainly in the nonfarm economy) that results from reduced farm income caused by the decrease in farm production or the increase in costs of production.

In Wisconsin, the indirect effect of the drought is primarily the result of increases in farm production costs and is estimated to be a decline of 54 percent in total gross output. In the other areas studied, the indirect effect is mainly caused by the decrease in farm output, and the drop in total gross output is estimated to be 25 percent or less. Only a small proportion of the indirect effect can be attributed to the decline in the agricultural inputs and agricultural processing sectors. The slowdown in those sectors was minimal because the inputs industries had already sold most of the 1988 seed, fertilizer, and chemicals before the drought hit and the processing industries could purchase commodities from outside the area. Hence, the primary indirect effect of the drought is a decline in the nonfarm economy, mostly as a result of smaller personal consumption expenditures by farm households.

In all the areas, lower farm income meant less discretionary spending by farm households. Even some non-discretionary spending would be postponed. Nonfarm businesses, especially those in the retail and service sectors, would be expected to suffer declines. But, smaller spending by farmers affected each region differently as illustrated by southwest Wisconsin and north central North

About the Model

The regional input-output model used in this analysis describes interindustry relationships within each study area and was used to estimate the magnitude of total change in each economy after an initial change worked its way through the local industries. Using the model we can shock the local economy in many ways such as decreasing the final demand for a product, introducing a new industry, or removing an industry from the economy, and then examine the resulting changes in area income and employment. In our study we shocked the economy by decreasing final demand because of a drought-induced reduction in income.

IMPLAN (Impact Analysis for Planning) is a microcomputer-based system for constructing regional economic accounts and input-output tables. The IMPLAN system provides descriptive accounts of interindustry and intersector transactions, and it estimates employment and income effects stemming from changes in product demand, supply-side constraints on industry production, and structural changes in regional economies. The county-level database uses the 1977 U.S. industrial structure updated to 1982 prices for 528 industries. IMPLAN is maintained by the USDA Forest Service at the Ft. Collins, Colorado, Computer Center, with assistance from the University of Minnesota, St. Paul.

Dakota. In southwest Wisconsin, drought losses (forgone business) to nonagricultural industries were estimated at close to \$58 million. The virtual dollar-for-dollar decrease in farm and nonfarm total gross output occurred because the nonfarm economy of southwest Wisconsin is large and diversified, so income dollars are recycled many times among local businesses within the region. In north central North Dakota, on the other hand, drought losses to nonagricultural industries totaled \$19 million, accounting for only about 14 percent of the decrease in local gross output.

Although agriculture is more important in the total economy of north central North Dakota, the percentage impact of a \$1 decrease in farmers' income on the local nonfarm economy is less because farmers make close to 50 percent of their purchases of goods and services outside the region. In North Dakota, a substantial portion of farm income may be spent in a large, metropolitan area such as Fargo because the sparsely developed, farm-based communities cannot provide as full an array of consumer goods and services.

Federal disaster assistance partly mitigated the nonfarm sector declines, but the distribution of Federal monies to drought-stricken farmers benefited some industries and some areas more than others. For example, our estimate of Federal disaster assistance to drought-stricken farmers ranges from \$29 million to \$35 million in northwest Ohio, north central North Dakota, and southwest Wisconsin, to \$68 million in northeast Montana and \$108 million in east central Illinois. Although payments are made directly to farmers who, for the most part, reside in the area, some proportion of those payments will be spent on goods and services from outside the region. In the Montana, Ohio, and Wisconsin study areas, the average propensity to respond money on local goods and services is about two-thirds. In the North Dakota and Illinois study areas, the respective percentages are close to 50 and 40 percent, suggesting that more than half of the disaster assis-

tance funds in these areas will likely bypass the local business centers.

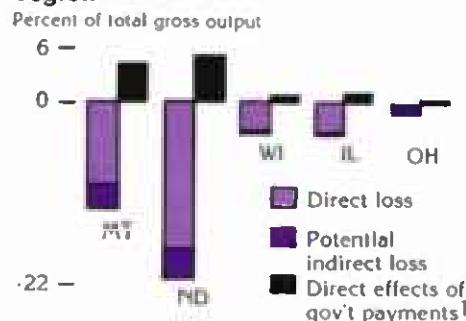
In terms of which local industries may suffer or even profit in the longer term, the picture is somewhat mixed. Federal disaster assistance may do little to bail out specific local industries. However, the wholesale and retail trade sector and the service-producing industries stand to benefit indirectly from direct infusions of Federal funds to the farm sector. Depending on the pattern of local spending, such funds could over time compensate for the initial drop in business due to the drought.

Drought Causes Drop in Total Business Activity in the Regional Economy

The direct impact of the drought on regional economies is a loss of income to the farm sector, which would then cause actual and potential drops in business activity for the local nonfarm industries. Our estimated direct income loss due to drought, as a percentage of total gross regional output, ranges from almost 18 percent in sparsely populated north central North Dakota to less than 1 percent in the more industrialized northwest Ohio (fig. 6). Federal drought assistance compensates for some of the losses, but not completely. Even after Federal drought assistance, direct income losses range from about 12 percent in north central North Dakota to less than 0.5 percent in northeast Ohio.

These initial shocks to the regional economies imply potential drops in total business activity of almost 22 percent in the North Dakota area and about 13 percent in northeast Montana. In the more industrialized regions, the potential drops in total business activity are much less: about 3 percent in the Wisconsin and Illinois area and less than 1 percent in northwest Ohio. We did not estimate the effect of drought assistance payments on specific businesses because we did not have information on how farmers might actually spend this money. However, it is clear that there will be severe adjustment problems for many participants in some local economies because drought assistance compensates for only 20-45 percent of direct income loss.

Figure 6
Importance of drought losses and government payments varies by region*



¹Indirect effects of government payments were not estimated because part of such payments will be spent outside the local area. How large a part depends on the structure of the local economy.

*Data are for counties indicated on map in Figure 1.

ROP