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Droughts and California Agriculture

During the drought last year, agricultural producers in California avoided much of the trouble that plagued farmers in the Midwest. In fact, last year's drought actually proved to be a boon to California farmers. Because of the availability of irrigation water, farmers in California were able to maintain normal levels of production *and* enjoy higher prices for many of their crops. Cash receipts from livestock and crops received by farmers in California rose 9.1 percent through November 1988 compared to cash receipts in the first eleven months of 1987. This increase was more than double the gains of midwestern farmers, who had to resort to major sales out of inventories to maintain gross receipts.

Much of the West, including California, requires irrigation to grow crops even in years with average rainfall. Thus, despite below normal precipitation last year, adequate levels of stored water made it possible to maintain normal water supplies to farmers.

Earlier this year, however, reservoirs were seriously depleted, and severe cuts in irrigation supplies to agricultural producers were planned. More recently, substantial rainfall has alleviated drought conditions in most parts of the State, and although some areas face rationing, the draconian cutbacks thought necessary at the beginning of March have become unnecessary.

In any event, as discussed in this *Letter,* even relatively severe droughts in California, such as that experienced in 1976-77, have considerably smaller effects on production and cash receipts than do droughts in other parts of the country.

The role of irrigation

Reliance on irrigation helps explain why California farmers fared much better than did their midwestern counterparts during the most recent drought. In the Midwest, only two percent of agricultural land is irrigated. Consequently, midwestern farmers must have abundant precipitation during the spring planting season and timely rains during the summer for strong crops. When these conditions did not materialize last year, yields for the Midwest's major crops dropped sharply. Yields fell 21 percent for soybeans and 31 percent for corn from year-earlier levels.

In contrast, nearly 80 percent of the commercial farmland in California is irrigated. Precipitation comes mainly in the winter months and is accumulated in reservoirs and mountain snow packs. In addition, ground water in many areas can be used to supplement these surface water supplies. Although last year's precipitation levels were below normal in California, there was no significant change in water usage by agricultural users.

This year, however, concern over shortages of stored water prompted plans to cut water deliveries sharply. As recently as March 1, water supply indicators in California pointed to another year of drought. Precipitation was just 65 percent of normal, compared to 85 percent of normal last year. Dry ground conditions also contributed to the discouraging outlook. Despite a rise in the water content of the mountain snow pack over 1988, the run-off forecast for April to June called for just 60 percent of the average level. Finally, California reservoirs on March 1 held just 65 percent of average levels, compared to 90 percent of normal last year. Only reservoirs in coastal southern California held above-average levels.

These indicators prompted the state's two largest providers of water to announce severe cutbacks in water deliveries, something they were able to avoid in the previous two years. The Federal Bureau of Reclamation's Central Valley Project announced that it would cut supplies to most farm customers by 50 percent this year. And the State Water Project expected to reduce water supplies to farmers by 60 percent. Together, these sources typically provide about 30 percent of California's total water needs, 85 percent of which is allocated to agriculture.

Since these announcements, a series of storms have hit California. Between March 1 and March 20, the state received double its normal March

rainfall, boosting precipitation levels for the year to over 80 percent of average. Cuts in agricultural water supplies may still be required in some water districts, but the magnitude of the cuts has decreased sharply. Both the Central Valley Project and the State Water Project now expect cuts to agriculture of no more than 25 percent.

Despite this improved outlook, farmers still will need to adapt to cutbacks in water supplies. Compared to midwestern farmers, California farmers enjoy several advantages. Because water supplies are known prior to the planting season, California farmers can take steps to adjust to reduced surface water. First, they can compensate with increased pumping of ground water. Ground water is fairly abundant in most areas, although it generally is more expensive to apply than surface water. Estimates of the additional costs of obtaining ground water vary widely depending on the depth of the well and efficiency of the pumping system. Where water is close to the surface the additional costs can be minimal; however, the costs can be up to four times greater than surface water sources when ground sources are deep and difficult to draw out.

Second, California farmers can change the mix of crops under cultivation. Unlike midwestern farmers, California farmers enjoy climate and soil conditions that allow them to switch to less thirsty crops quickly and relatively inexpensively.

Lessons from 1976–77

To evaluate the likely impact of a potential 25 percent cutback in water deliveries, it is useful to look at how California farmers responded to the much more severe cutbacks imposed during the last major drought in 1976–77. Evidence from this drought reveals a highly resilient agricultural sector in California. Although farm expenses rose sharply, production acreage, cash receipts, and prices for most commodities held steady at close to their pre-drought levels.

The principal change in farming practices caused by the 1976–77 drought was a shift in the allocation of acreage among crops. Field crops that require large amounts of water like sugar beets, cotton, and rice were replaced with vegetable crops that use less water. In 1977, harvested acreage fell 30 percent for sugar beets and 27 percent for rice, while acreage allocated to tomatoes rose 18 percent. California farmers also increased production of fruits and nuts, in keeping with a long term trend in California's agricultural output mix.

In addition to reducing total acreage assigned to field crops, farmers also allocated less water per acre to field crops. Consequently, in 1977, field crop yields fell 13 percent per acre. At the same time, they allocated a larger share of their water to non-field crops, and fruit and nut crop yields dropped just two percent, while vegetable and melon crop yields actually *rose* eight percent.

Also, during the 1976–77 drought, ground water use increased by 50 percent and accounted for nearly 60 percent of total water supplies. The availability of ground water allowed farmers to avoid reducing production acreage. In 1976, total acreage harvested in California fell less than one percent, and in 1977, even those acres were back in production despite continued drought conditions.

Because of these adjustments in production, cash receipts from crops did not decline, although their rate of growth slowed. Instead of the 13 percent average growth rate of the previous five years, receipts increased nine percent in 1976 and five percent in 1977.

Increased production costs associated with pumping ground water, however, offset these modest gains in cash receipts. After rising 14 percent a year from 1970 to 1975, net farm income did not grow during the 1976–77 period.

Prices and farm incomes

Higher production costs during drought years tend to have a direct impact on agricultural income because it is difficult for California producers to pass along these higher costs in the form of higher wholesale prices. Drought-induced increases in the production of fruits and vegetables (as farmers shift away from field crops) put downward pressure on the prices of these commodities (unless consumers suddenly develop a craving for them). Thus, the higher cost of pumping ground water tends to come out of farmers' incomes since the wholesale prices they receive actually tend to fall.

Moreover, the income generated by the numerous specialty crops that are produced almost

entirely in California also tends to fall during droughts. Prices of these specialty crops are determined primarily by California production levels. Production levels for these commodities tend to remain high even in drought years since farmers are concerned that cutbacks in the water given to tree-grown fruits and nuts, vine-grapes, and other such fruits could cause damage that would affect future crops. Consequently, output of these specialty crops is not changed much by droughts, and prices remain constant even though farmers incur higher costs pumping the ground water to grow these crops. These higher expenses come out of farmers' incomes.

Conversely, the prices for crops most likely to experience drought-induced cutbacks this year in California are determined in world markets. In 1988 this worked to California's advantage, as drought conditions cut national supplies of field crops. This large drop in supplies of many commodities last year pushed prices up sharply. California farmers benefitted from these price increases particularly since they were able to maintain relatively normal production. This year, however, production is expected to rebound in other areas of the country, and prices for last year's drought-affected crops may fall from their current high levels. Water rationing in California, then, would mean that California field crop farmers could face lower prices at the same time that their production is falling and costs are rising.

Livestock

Livestock producers were hit harder than crop farmers during the 1976–77 drought. Dry conditions forced early liquidation of herds, making the second year of the drought worse than the first for ranchers. Feed costs rose, and although beef prices also rose, the reduced herd size constrained sales. Cash receipts from marketing meat animals fell one percent in 1976 and seven percent in 1977.

The effects of the current drought on livestock producers depends largely on herd sizes. Unlike the 1976–77 experience, when herds were relatively large, at present, livestock producers are not extremely vulnerable to drought conditions. The number of cattle and calves in California is unchanged from year-earlier levels, and remains six percent below the 1986 level. Prices are expected to remain high because of reduced herds nationally. Costs may remain high, particularly to ranchers that rely on unirrigated grazing lands, but the higher beef prices still should yield strong profits in the cattle industry even with continued drought conditions.

Modest impact

A closer examination of the effects of the 1976–77 drought demonstrates that the California agricultural sector enjoys considerable insulation from the effects of a drought. There is no doubt that a drought reduces net farm income by boosting water pumping costs. But two key factors make a drought less onerous to California producers than to producers in unirrigated areas of the country. First, sufficient water is available in the form of ground water, although this method raises costs and squeezes income. Second, favorable climate and soil conditions, as well as early warning of reduced water supplies, give California farmers the ability to switch to less water-intensive crops quickly. Consequently, a drought tends to change the mix of output, rather than cause severe cutbacks in production.

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