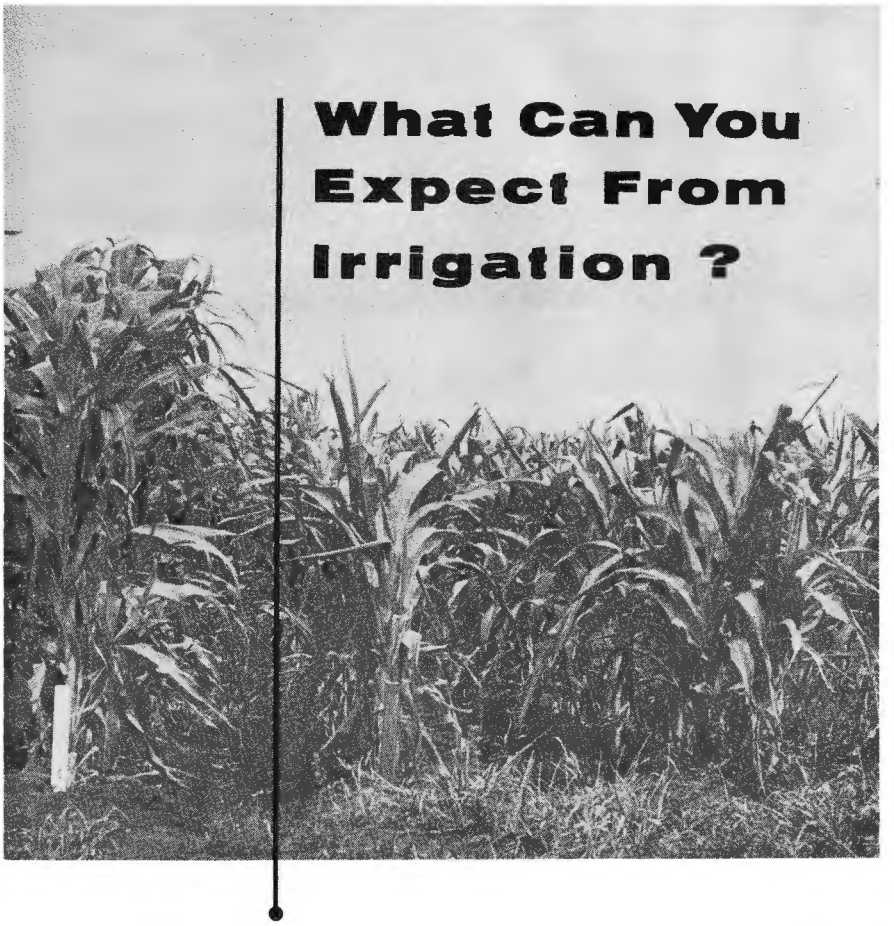

What Can You Expect From Irrigation ?

by W. D. Shrader, Howard Johnson, Laurel Ericson and Don Gray

WHAT KIND of results can you expect from irrigation in Iowa? Is it practical? Is it worth it? Large-scale irrigation of field crops in the state started about 10 years ago, and about 45,000 acres are now equipped for irrigation. And we now have 7 years of experimental results on corn irrigation in Iowa.

We still can't give exact answers to these questions. For one thing, Iowa's rainfall, on the average, exceeds that in the states where field crop irrigation is a regular and generally necessary year-to-year practice. In Iowa, irrigation has tended to be mainly a "drouth year" practice. Also, the 7-year period of our experiments didn't include all types of seasons.

We can, however, report on the results of our experiments so far concerning corn yields and the soil management problems that can be expected with irrigation.

The Situation: Most of the 45,000 acres now equipped for irrigation in Iowa are irrigated in dry seasons. Only a small fraction is irrigated in seasons of above-normal rainfall. Though there are at least a few fields that are irrigated in nearly every county, most of the irrigation expansion has taken place in the Missouri River flood-plain. This includes parts of Woodbury, Monona, Harrison, Pottawattamie, Mills and Fremont counties. About 400,000 nonirrigated acres of land in these counties are similar to the land now being irrigated, so there's a potential for much larger expansion in this area.

What Can You Expect? Chart 1 indicates the type of corn yield response that can be expected from the use of supplemental water in a dry year. If the season is dry enough so that nonirrigated corn is damaged by drouth, each added inch of water may increase corn yields some 6-8 bushels per acre.

Chart 2 shows the average yields of irrigated and nonirrigated corn in our tests at two locations in the 1952-58 period. Yields of nonirrigated corn averaged 81 bushels per acre, compared with 120 bushels for irrigated corn. Both irrigated and nonirrigated corn yielded more in good seasons than in drouth years. But in the drouth years, the yields of irrigated corn were much better than the yields of nonirrigated corn.

Corn yields during the 7-year period varied from 33 bushels per acre in 1956 to 141 in 1958—a range of 108 bushels. Corn on irrigated plots with the same stand and fertility treatments varied from 110 bushels per acre in 1955 to 142 in 1958—a range of 32 bushels, only 30 percent as much year-to-year variation as for the nonirrigated corn.

These 7 years of results, however, aren't enough to have encountered all types of seasons. We don't, for example, have data in Iowa on the effect of irrigation followed by an extremely wet period, though it's likely that irrigation, in this case, would give no response and might depress yields somewhat.

But from our tests so far, here's what seems to be the general picture for *well-drained* land:

- Most of the yield reduction caused by drouth can be prevented by proper irrigation.
- Average corn yields slightly above 100 bushels per acre can be obtained with irrigation under Iowa conditions. (The yield figures quoted for our tests are for small plots, averaging perhaps 10 percent higher than field yields.)
- To obtain this yield, it's essential that stand and fertility levels be kept high and that weeds be controlled. (Our work indicates a stand level of 18,000-20,000 stalks per acre.)

If your land is well drained, if you're already following the best cultural and fertilizer practices and if your fields over the past 10 years have averaged about 70 bushels per acre, you could expect to increase your average yields by some 30-35 bushels

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through irrigation. If your average yields are around 60-70 bushels, but have been depressed in as many years by excessively wet conditions as by drouth, irrigation can help mainly only during drouth years.

On soils with a low water-holding capacity (such as sandy or gravelly soils), large yield increases usually are possible from irrigation. But the costs of irrigation are higher than for medium-textured soils since it is necessary to irrigate more frequently.

How Much Water? For full advantage from irrigation, it's necessary to keep plants well above wilting at all times. The corn leaves should never curl, and there should be moist soil in the root zone throughout the growing season. The soil should not, however, be saturated with water for long periods of time.

About 10 inches of water can be held in a form available to plants in the upper 5 feet of most medium-textured soils in the state. Sandy soils hold much less. For maximum yields, it's best to hold the water supply at about 60 percent of the soil's water-holding capacity. Thus, irrigators should learn the water-holding capacity of their soils.

If the soil is essentially dry through about 40 percent of the root zone at any time after early July, it's time to irrigate. From about the time the corn is laid by on through the season, you can assume that corn will use soil moisture to a depth of about 5 feet. So, when any 2-foot portion of the upper 5 feet of the soil appears to be dry, it's time to irrigate.

In hot, dry weather, corn uses some 1½-2 inches of moisture per week. On a soil with a 10-inch water-holding capacity, irrigation would be needed once every 2-3 weeks in periods of no rainfall. Apply enough water to bring the moisture content of the soil up to or nearly to field capacity. On this soil, about 4-6 inches of water should be applied at each irrigation—the extra 1-2 inches being added for efficiency in application.

Sandy soils hold much less water, and more frequent, light irrigations are needed. A sandy soil, such as Thurman or Sarpy loamy sand, probably will have a water-holding capacity of about ½ inch per foot—holding about 2½ inches of available moisture in the upper 60 inches of soil. Corn on these soils will make the best yields if it receives about 1 inch of water every 4-6 days. High corn yields can be obtained on the sandy soils as well as the medium-textured soils when water is applied as needed and when sufficient fertilizer and proper cultural practices are used.

During the dry seasons when irrigation can be expected to be of most benefit, you'll probably need to add a total of some 10-15 inches of water during the growing season.

Don't Overwater: Our work indicates that overwatering tends to depress yields the following year. Two years of study on this particular problem indicates that it's helpful to give corn as much water as it needs. But it doesn't help the current crop to overwater, and the excess water may reduce yields the next year. Overwatering also increases irrigation costs.

Soybeans: The results of our work with soybeans may be summarized briefly as similar to those for corn—but response has been less and not as consistent. Beans are more severely affected than corn by the high temperatures which commonly accompany drouths. Irrigation hasn't removed as much of the seasonal variation as for corn, and up to now soybeans haven't responded as well or as consistently as corn. Beans also have shallower roots and require more frequent irrigations.

CHART 1.

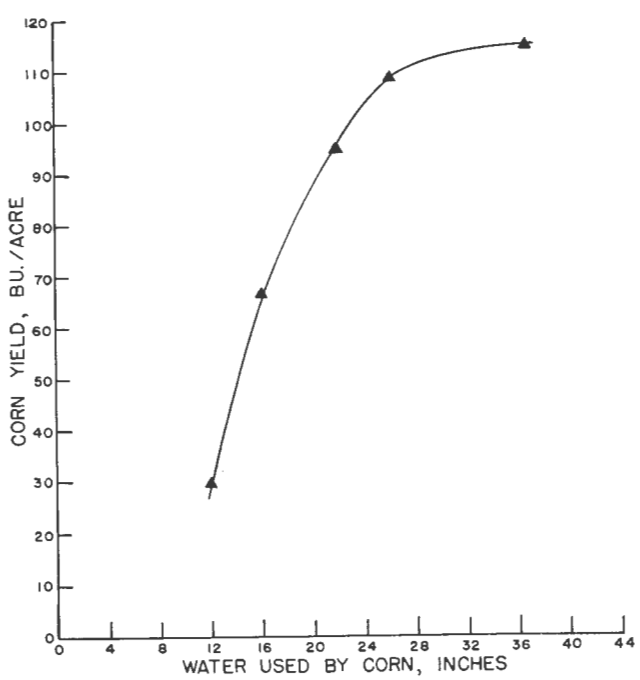

CHART 2.