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G80-526 The Effect of Weather on Corn: Preseason Precipitation and Yield of Unirrigationed Corn

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The Effect of Weather on Corn: Preseason Precipitation and Yield of Unirrigationd Corn

This NebGuide examines the results of studies done on the effects of weather on unirrigationd corn.

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Studies of the effects of weather on unirrigationd corn in Nebraska between 1950 and 1974 show the following four factors to be closely related to yield:

- **Technology**--the availability of better hybrids, nitrogen fertilizer, herbicides, insecticides and other improvements have resulted in a yield increase averaging 1.3 bushel per acre per year since 1950.
- **Preseason precipitation**--that which occurred between September 1 and May 15 had a beneficial effect. Yield increased on the average of 1.1 bushel per acre for each inch that preseason precipitation was above normal.
- **Temperature stress**--this had a negative effect during ear formation, tasseling and grain filling stages. Yield decreased an average of 1 bushel per acre for every day between ear formation (12-leaf stage) and denting that temperature was 95°F or higher.
- **Rainfall during grain fill**--this had a positive effect. Yield increased an average of 1.5 bushel per acre for each inch of rainfall between tasseling and denting.

Preseason Precipitation and Yield

The following discussion concerns the relationship between preseason precipitation and yield.

About half of Nebraska's annual precipitation falls during a 105-day season (May 16 to August 31), the time during which the corn crop is grown. The remaining 50 percent, which is called preseason

precipitation and occurs between September 1 and May 15, is also very important for corn. When not impeded by stone or "hard pan" clay layers, corn roots are able to grow and extract moisture to a depth of 5 feet. Fortunately, most Nebraska soils are that deep. Each foot of soil can hold about 2 inches of moisture so 5 feet of moist soil is actually a reservoir containing 10 inches of moisture for the next growing season. The quantity of subsoil moisture available at planting time depends on the amount of preseason precipitation.

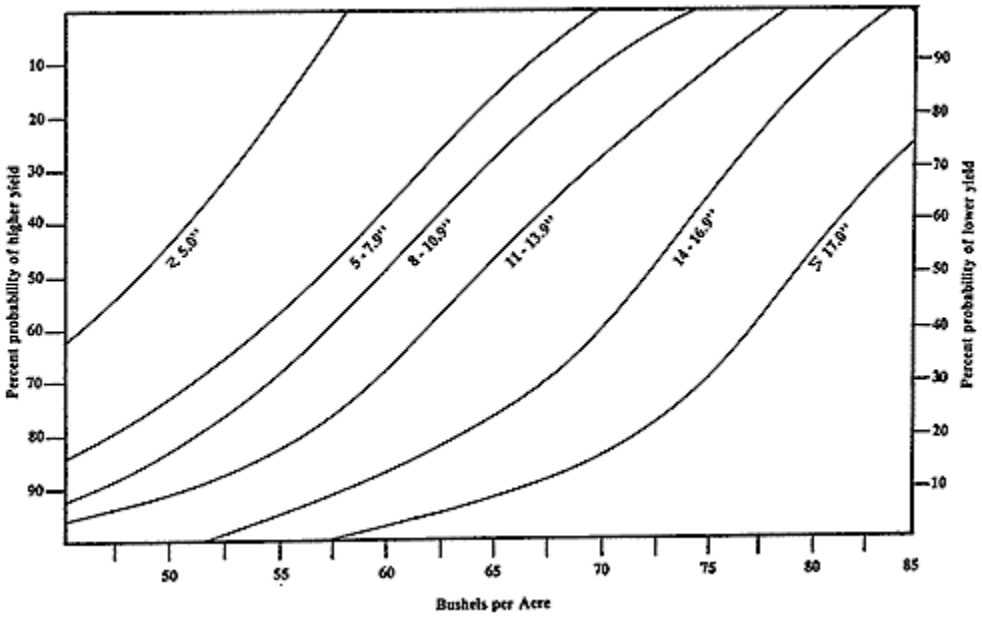
Rains following planting are usually sufficient for growing the plant up to the time of tasseling when the grain begins to fill. Unfortunately, this time coincides with the hottest time of year when the fully grown plant reaches its greatest demand for moisture. When adequate subsoil moisture is available from preseason precipitation, the roots are able to extract it, grow deeper and, with current rainfall, help meet the needs of the developing grain. Thus, above normal preseason precipitation is more likely to result in above average yields; below normal preseason precipitation, below average yields.

Years with above normal preseason precipitation are more likely to give favorable response to higher plant populations and nitrogen fertilizer. Lower plant populations, less or no nitrogen fertilizer, and more drought tolerant crops such as sorghum may be considered when preseason precipitation is below normal. Side dress nitrogen application is possible as late as mid-June in the event moisture conditions decidedly improve following planting.

Preseason Precipitation and Yield Probabilities

The percentage of time that unirrigationd corn yield can be expected to be equal to, above, or below certain yield levels are plotted for different amounts of preseason precipitation in *Figure 1*. These graphs are based on weather data and corn yields from 17 counties in Nebraska between 1950 and 1975. The yield expectance can be determined as an intersection of lines from the probability and yield scales with the appropriate preseason precipitation graph. For example, with 5.0 to 7.9 inches there is a 72 percent probability that the yield will be 50 bushels per acre or higher and a 62 percent probability that it will be less than 60 bushels per acre. With 14 to 16.9 inches, there is an 86 percent probability that it will be greater than 60 bushels per acre and a 61 percent probability that it will exceed 70 bushels per acre.

Figure 1. Yield probabilities of unirrigationd corn related to preseason precipitation.



These yield probabilities assume that average weather conditions will prevail between planting and maturity. If the growing season is cooler and wetter than normal, the yield is expected to be higher; if hotter and drier, it is expected to be lower. The yield levels are also based on a regional average. If management or soil productivity for a particular field is higher than the regional average (for example, 15 percent greater), the estimate should be correspondingly raised. If lower, it should be reduced.

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