MODERN efficient farmers are operating at high-level production and their costs have increased appreciably as a result. It is essential that weather factors be included as an integral part of management considerations so that losses are minimized under unfavorable conditions and income is maximized under favorable conditions. The interrelationships between the soil, the plant and the weather are complex and are not fully understood. When adequate recognition is given to the weather variable, progress in understanding plant response and variety adaptation will be much more rapid. Progress has been made, however, and this paper will discuss the use of presently available moisture and precipitation information. Less information is available on temperature and light factors which are not considered in this paper.

With present scientific knowledge and facilities, an accurate seasonal long-range forecast or outlook cannot be made. This limitation makes it impossible for farmers to adequately and precisely plan their fertilizer use, cropping sequences, cultural practices, and production. Hedging of various kinds and degrees becomes part of each farmer's management. The extent varies with his attitude toward risk and uncertainty. Hedging thus represents an added cost of production for which there is seldom a commensurate return.

Lacking a long-range forecast, the alternative is the use of suitable climatic probabilities. However, to better utilize either a weather forecast or a climatic probability, a better understanding of the soil-plant-climate interrelationships is needed. The climatology group at Iowa State University, in cooperation with personnel from the U.S. Weather Bureau, has been moving aggressively toward the solution of some of these problems.

Even though this paper does not deal directly with Weather Bureau activities, it is desirable to understand something of the facilities and information available from this organization.

Weather Bureau Observations with Agricultural Implications

Basic weather forecasting depends upon data from a reporting synoptic network. This network includes approximately 20 automatic weather stations, 91 weather surveillance radar stations, 146 upper air sounding stations, 314 first order (or commissioned stations) U.S.W.B. stations, 229 FFA stations and other facilities. The information from synoptic stations is used primarily in forecasting, but also becomes a valuable part of the climatological record. The synoptic stations are essentially the sole source of humidity, sunshine and wind information. This information is valuable for agricultural work. The day-to-day basis is particularly effective and valuable for aviation purposes and is useful in agricultural planning.

In addition to the synoptic stations, a network of sub-stations furnishes some supplementary information maintained for and contribute primarily to the organization in the Midwest, about one temperature and precipitation station per county is the rule. The data are used primarily as a "expected weather" and its variation at the local level. They provide a means for estimating the recurrence probability of weather events considered to be critical to agriculture. They are useful in long-range planning. But, in the Midwest, about one temperature and precipitation station per county, the data it supplies may present serious limitations to precise interpretation at the "within county level". Figure 1 is presented as an example of what can happen.

The data are for a northeast Iowa county, approximately 24 miles square, for the summer of 1959. These data as part of a 4-H climatology program. They show how rainfall varied greatly between nearby stations, even the substation data it supplies may present serious limitations to interpretation at the "within county level". Figure 1 is presented as an example of what can happen.

Dale has pointed out that while relatively little change has been made in the day-to-day rain and temperature at the local level, which already are at a high level of considerable improvement has been made in understanding weather. Also, real progress has been made in the effective use of radar and tornado tracking and forecasting. An important part of improving local agricultural forecasts is illustrated by the agricultural meteorological service initiated at the Mississippi Delta project (3) in 1958. It is being expanded to other states with great promise for more precise short-run agricultural forecasts.