Measurement of the Productivity of Soils Under Various Environmental Conditions
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Many different soil types occur in Illinois and they vary greatly in their ability to produce crops. Variations in soil productivity result from differences in the chemical, physical, and biological characteristics of the soil, as well as in climatic conditions, management practices, crops grown, and hazards such as diseases and insects. There is a persistent demand from farmers, farm managers, land appraisers, and others for information on the productivity of soil types.

Since 1938 the Agronomy Department of the University of Illinois has been collecting data on the productivity of soil types (8, 9). This work has consisted of mapping the soil types and collecting crop yield and soil treatment information on farms for which detailed farm accounts are available for 10 or more years. The use of crop yield and soil treatment information by fields as taken from detailed farm accounts is rather economical of time and money but is limited primarily to the study of the major soil types within an area.

Soil productivity information for special soil conditions, minor soil types, or soil types which occur in association with other types in an intricate pattern must be obtained by some method other than from field records in farm accounts. Small plot sampling methods provide a practical way of securing soil productivity information to complement that obtained since 1938 from farm accounts.

The purpose of the study which is reported in this paper was to determine, by objective sampling methods, yields of corn obtained on two dark-colored prairie soils as influenced by weather conditions, depth of surface soil, density of corn stand, rock phosphate applications, crop sequence, and direction of slope.

Materials and Methods

Corn yields were determined, during 1946 and 1947, on a series of plots located in farmers' fields in north-central Illinois on Tama silt loam and Swygert silt loam (Fig. 1). The plots were located in two separate areas, each approximately 70 miles long and 20 miles wide.

Selection of Plots

In 1946, 64 and 62 plots were located on Tama, respectively, and in 1947, 64 plots were located on Swygert (Table 1). The plots were located on farms for which detailed farm accounts were being kept in cooperation with the University of Illinois Department of Agricultural Economics. Annual records of cropping history and soil treatment were available since 1931 or longer in connection with field yield studies in progress (8, 9), were also available for each farm.

A list of tentative plot locations was assembled from the soil map, cropping history, and soil treatment on farms included in the field yield studies. During June a visit was made to each farm which had one of the combinations of soil type, cropping system, and soil treatment which were to be studied. Prospective plot locations were examined, and if suitable areas were found, a detailed soil map was made and the soil type, per cent slope, and depth of surface soil was determined. The depth of surface soil was divided into intervals of 1%. Depth of surface soil (zon) was determined to the nearest inch at points of observation and then grouped into 3-inch intervals as follows:

- 0-2.9 inches of surface soil
- 3.0-5.9 inches of surface soil
- 6.0-8.9 inches of surface soil
- 9.0-11.9 inches of surface soil
- 12.0-14.9 inches of surface soil
- 15.0-17.9 inches of surface soil

Fig. 1.—Location of areas where plots were located in field yield studies on Tama silt loam and Swygert silt loam in 1946 and 1947.