THE reactivity of certain commercial varieties of sugar beets to varying levels of soil fertility has long been observed by trained investigators, sugar company fieldmen, and farmers engaged in growing this crop. European beet seed firms engaged in the business of supplying the United States trade with beet seed, sought to meet the need by furnishing a choice of varieties listed as tonnage, intermediate and sugar types, designed to meet the varying needs of soil and climatic conditions of the areas where sugar beets are grown. More recently with the development of domestic varieties of sugar beets, either resistant to certain diseases or better adapted to certain areas—to the extent that more than 85% of domestic needs for beet seed is now supplied through home sources—the number of varieties has been reduced, making it necessary to develop a more adequate program of soil fertilization fitted to the variety or varieties found best for any one area.

To this end the present study, which is a forerunner of other studies that are to follow, was undertaken. The results presented herein are therefore to be considered in the nature of a progress report.

EXPERIMENTAL PROCEDURE

The soil type on which this study was conducted was classified as Rocky Ford fine sandy loam with a pH of 7.5. The field was broken out of alfalfa in 1935 and planted to barley in 1936 and to onions in 1937. In the fall of 1937 an 8-ton coating of cattle manure was applied per acre immediately prior to fall plowing.

In the spring of 1938 the field was prepared for planting. Two domestic varieties of sugar beets were used, one being a "sugar" variety and the other a "tonnage" variety. Both of these varieties were somewhat more uniform as to type than the European varieties used in previous tests.

The commercial fertilizers used were 4-16-4, 4-16-0, 0-16-4, and 0-16-0, in comparison with the unfertilized check plats. The same amount of plant food per acre was applied from each mixture assuring thereby a comparison of equal amounts of plant food regardless of the difference in formula used. The rates of application for each fertilizer formula were 200, 400, and 600 pounds per acre of the equivalent of a 20% mixture, or 40, 80, and 120 pounds per acre, respectively, of total plant food. All the fertilizer was applied with the seed at time of planting.

The plat arrangement was fully randomized and of such layout as to permit unbiased evaluation of interactions between varieties, treatments, and rates of fertilizer application. Each treatment was replicated seven fold, the plats being...