Physical Properties of Sassafras Silt Loam as Affected l Long-Time Organic Matter Additions

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WITH the introduction of the tractor and the development of a highly mechanized method of farming in the potato growing section of Long Island a considerable change was made in soil management practices. Previous to the general use of the tractor, the horse was the source of power and also the source of a considerable amount of manure. Now that machines are being used little or no manure is available and the potato crop is fertilized primarily by means of commercial fertilizers. Considerably more heavy wheel traffic is involved in the tillage of the soil than formerly.

The addition of organic matter to the soil as a means of modifying the physical properties of the soil is widely practiced. The effect of organic matter on the water relationships, aggregation, bulk density, resistance to compaction, and numerous other physical properties of the soil has been widely studied.

At the Long Island Vegetable Research Farm, Riverhead, Long Island there were available plots that had received differential organic treatments for a 25-year period. These plots were located on a Sassafras silt loam. In the summer of 1948 a study of these plots was started to evaluate the effect of the organic matter levels that had been built up over the 25-year period on various physical properties of the soil. This paper is a preliminary report of the results of this study.

EXPERIMENTAL MATERIAL AND METHODS

The plots used in this study were located on the Long Island Vegetable Research Farm at Riverhead, N. Y. The soil was a Sassafras silt loam, quite level with some variation in texture and in depth to the gravelly subsoil. Each plot was 20 feet by 48½ feet and was separated from neighboring plots by a 4-foot aisle. Various manure and fertilizer treatments had been applied to these plots annually since 1923 and 11 of these treatments were selected for study. Each treatment was replicated three times. In designating these treatments, M10 indicates 10 tons of horse manure per acre per year and the numbers such as 3–3–3, following the manure level, indicate the number of units of N, P, and K applied per acre per year. Thus M20, 0–2–0 designates a treatment consisting of 20 tons of horse manure per acre per year, and two units of phosphorus per acre per year. A unit of N was 40 lbs N/A, a unit of P was 60 lbs P_2O_5/A, and a unit of K was 40 lbs K_2O/A. Duck manure is indicated by the symbol DM. A wide variety of vegetable crops had been grown on the plots in no particular rotation since the treatments were started. Since 1945 manure treatments were last applied in the grow 1947 and since then have been discontinued. effects of the treatments are being studied.

Soil samples for aggregation, moisture equival ing point determinations were taken in August, 1 purpose each plot was divided into three strata posite sample consisting of six subsamples take stratum at a depth of 0 to 6 inches. The same pl pled again in March, 1949 and in July, 1949 fo determinations.

The samples were passed through a ¼-inch si being air dried, a portion of the bulk sample through a 2 mm screen and used for moisture e terminations by the centrifuge method (1).[3] V determinations were made using sunflowers (3 stability was determined on the 2–5 mm fracti dry samples, using a single screen wet sieving tech A 5-gram sample of 2–5 mm air dry aggregates for 5 minutes on a 40-mesh screen under water giving a 1⅛-inch stroke. The amount of mater on the screen at the end of the agitation peri as a measure of the stability of the aggregates. was made for primary particles by dispersing remaining on the agitator screen and washing 40-mesh screen. The residue consisting of prin was then dried, weighed, and the weight subtrac weight of the aggregates plus the primary particl

For the purpose of estimating the amount of the percentage of 2 to 5 mm aggregates as deter sieving was determined.

Bulk density determinations were made in A using a core sampler by means of which an cylinder of soil 2 inches in diameter by 1⅜ inch be obtained. The plots were planted to potatoes and the rows were ridged. The bulk density taken from the side of the row ridges at a depth Two cores were composited into one sample and were obtained in each stratum, making a total of cores from each plot.

The "undisturbed" core samples were obtained the core sampler into the soil with a hydraulic cyli on a frame on the rear of a tractor. By this mean were easily obtained, with little shattering or distu

In 1949, bulk density measurements were co determinations of the per cent air filled pores, model of an air picnometer (6, 8). On a given the bulk density, per cent air filled pores, and p ture were all determined.

Penetrometer studies were made in 1949 on plots, one receiving no manure, and the other impact type penetrometer (2, 5) was used to m sistance of the soil to penetration. Measurement