The Influence of Treatment on Fertility Level and Crop Response of Maryland Soils

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Fertilizer and lime recommendations are made to improve soils so that they can produce better crops. The basis of most of these recommendations is general observations, field tests, greenhouse work, and laboratory studies. Usually only data from one or two of these methods are available for making lime and fertilizer recommendations. Consequently, our suggestions to farmers may be very general and the farmers' soil treatments not adequate. It was thought that a check on some of the usual farm fertility practices would be desirable. Several farms in the state were selected for such a study. Practices of these farmers and the fertility levels of their soils obtained from laboratory studies were recorded. This is a partial report of both the field and laboratory observations.

Several of the more progressive farms of the state were selected for this study. These farms were selected both on the basis of good farming and also on soil type. A detailed soil map, 400 feet to the inch, was made of each farm. On each of the more important fields of each farm a specific area was designated for careful sampling. This sampling area was selected to be a good representative of more abundant soil type and of the field as a whole. Since many of the farms had more than one type of soil on them, sometimes two sampling areas were selected in each field. These sampling areas were about an acre in size. For the spring seeded crops, the soils were sampled usually in May, June, July, and August. For the fall seeded crops, samplings were usually made in October, April, May, and June. The plowed layer was sampled for the cultivated and rotated crops. (Usually about 12 points or stations in each area were used for the removal of the soil in sampling.) In the case of pasture and long time hays, only a 3-inch depth was taken; and these samples were usually secured during the month of August.

At the time of taking the samples the soils were treated with toluol unless they were brought to the laboratory the same day as sampled. There the pH value, nitrate nitrogen and rapid soil tests were made on every one of these field samples. At the end of each crop season the four samples taken during that crop growth period were composited. The exchangeable calcium, magnesium, potassium, and manganese were determined on each year's composite sample for each field.

In the laboratory the following procedure for analysis was used. The pH value was determined with the glass electrode. The "quick" tests were made by a modification of the Morgan method (3). Exchangeable cations were displaced by ammonium acetate (2). The total exchange capacity was determined by washing the ammonium acetate leaching water and displacing the ammonium with potassium (1). The exchangeable calcium was determined by oxalate, magnesium by Titan yellow or 8 hydroxycin, the potassium by sodium cobalt nitrite, and the manganese by potassium periodate oxidation.

At each farm visit notes were taken on the appearance of crops, soil conditions, cultivation practices, fertilizer and lime treatments, and yields in as possible these notes were checked with the farmers. Most of the farmers were very much interested in the results of our laboratory studies. They frequently asked us to talk about them at each of the monthly times. There was a tendency for them to ask for specific recommendations to improve their yields. From our laboratory studies it was possible to make rather specific recommendations and follow these through to improved yields. Consequently, many of the fertilizer practices made it difficult and almost impossible to compare one 4-year period with another with regard to the fertility level of the soil.

The data obtained during these 12 years, both on the farm and also from laboratory studies, is arranged according to individual fields on the different farms. An indication of how this was arranged can be seen in Tables 1 and 2. Table 1 presents the crop areas and amounts of fertilizer used, and the manure and lime treatments. Table 2 gives an example of the exchangeable calcium, magnesium, potassium, and pH values obtained for the yearly tests of each field. Since there are nearly 400 of these individual sheets, it is impossible to present this material in its entirety. These data have been summarized by region or a number of fields grouped together. The fertilizer and exchangeable data given in these tables show the growing conditions that crop that year and at all other years.