FERTILIZER APPLICATION RATIONALIZED

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At the start the authors wish to emphasize that the system of fertilization here discussed and proposed applies primarily to general farming areas located in temperate humid regions as exemplified by the agriculture in the Middle West. It is not suggested that this system be followed where leaching is severe, as is the case with sandy soils in the South, or where fixation is excessive, as is the case when soluble phosphate is applied to certain soils, particularly those high in content of hydrated iron oxides. For these special conditions, properly adapted systems of fertilization need to be followed.

The fertilizer practice as regards rate and time of application often followed in field experiments and recommended to farmers for building up a depleted soil devoted to general farm crops, particularly hay, small grains, and corn, is to apply a moderate amount of fertilizer once and sometimes twice in the rotation with the expectation that in the course of 10 to 15 years the soil will be built up to a good state of fertility. Since it is now possible to determine quite satisfactorily by chemical analysis the amounts or levels of readily available phosphorus and potassium present in soils, and since, the levels of these nutrients in readily available forms needed for good crop production are now known fairly well, the question may well be asked if it would not be more rational and profitable in many cases to apply at once sufficient fertilizer to provide those levels which are known to be needed, and thereafter simply make maintenance applications once or twice in the rotation.

AN IMPORTANT QUESTION IN WISCONSIN

This question is of particular importance in Wisconsin, because here there exist large areas of land devoted to dairying and general livestock farming which contain only about one-half as much readily available phosphorus and potassium as is needed for satisfactory production of small grains, corn, and hay. The common rotation is corn, oats, and two years of hay. A customary application of 200 to 300 pounds per acre of 0-20-20 fertilizer for the oats, which serves as a nurse crop for clover or alfalfa, usually makes possible a satisfactory crop of oats but is often inadequate for the mixed legume hay that follows, particularly a second year of hay. As a consequence, the second year of hay often reverts largely to timothy and quack grass, which not only produce hay of rather low feeding value, but also often give rise to a poor seedbed for the corn that follows, even if some of the fertility is restored by manure applied for the previous year and another application of fertilizer made in the fall. In order to obtain an answer to the question raised above, extensive field experiments dealing with this question have been gotten under way in Wisconsin. The first experiments started in connection are on Spencer and Antigo silt loams located in Barron County, which is situated in the northwestern part of the state. A four-year rotation of corn, oats, and two years of hay, consisting of a clover-alfalfa-timothy mixture, is being followed.

Results of crop yields for all of the crops in these experiments have now been obtained for three seasons. The two types of soil on which these experiments are located are naturally strong acid, and if not previously limed, require an application of at least 4 tons of ground limestone to raise the pH to 6.5. The readily available phosphorus and potassium contents in much of the cropped areas run in the neighborhood of 20 and 100 pounds, respectively. Even in the virgin soils, these contents were not much greater, except for a highly organic surface layer of about 2 inches, which, because of the high contents of readily available calcium, potassium, and phosphorus, made possible fairly good crop production from this experiment. The two types of soils from which the yields obtained under the different levels of readily available phosphorus and potassium were established are given. The amounts of phosphate and potash fertilizer added to establish the adequate levels of these nutrients are needed.

FIELD EXPERIMENTS STARTED

While the experiments under way involve rates and methods of application of lime, phosphate, and potassium, only those portions of the investigation dealing directly with the main thesis of this paper will be considered here. Accordingly, in the present discussion, only those portions of the investigation involving extraction in 0.002 N H2SO4, and 40% H2O2 will be considered. The amounts of phosphate and potash fertilizer added to establish the adequate levels of the readily available nutrients are needed.