SOME NEGLECTED SOIL INVESTIGATIONS.

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The determination of the more pronounced physical and chemical characteristics of the soils of the United States, and the undertaking of classifying and mapping them by series and types is well under way. Heretofore emphasis has been put upon the more obvious soil properties, as texture, outstanding structural features, (chiefly friability, plasticity, and compactness), hardpans, character of subsections, drainage, content of lime carbonate and of alkali salts where these are present in excessive amounts. Chemical composition is being investigated in so far as analysis by the official methods permit. Considerable work has been done on the soil solution and the behavior of water-soluble salts contained in alkali soils under varying phases of concentration and salt complexity; but even these investigations probably have been carried to a point far short of complete solution of the problems involved. Soil colloids are receiving much attention at this time, as are all problems of hydrogen-ion concentration, nitrification, the bacterial life of soils, and so on.

It is not proposed to attempt a cataloguing of what has been done, nor of what remains to be done in the field of soil investigations. It will be undertaken to indicate briefly, suggestively, and perhaps argumentatively, some lines of soil study, that seem to offer productive ground from which illuminating and helpful results may be obtained, and also to point to some investigations which seemingly are not being pursued in the way that will yield the most valuable turnout of scientific facts. These suggestions have not been checked against the literature. It is not improbable that more has been done in some fields that will be referred to than the author of this paper is familiar with. Even so, no harm will be done, it is hoped, by calling attention to problems which may not be well understood by all of us.

Much of the work accomplished in the past undoubtedly has been of an exhaustive kind, carried in some instances to final conclusions, or approximately to that end. On the other hand, many lines of investigation have been extended to a point anywhere near finality and others only so far as to indicate need for much additional research. It seems desirable to emphasize the fact that much laboratory work has been carried on not upon soil types but with soil material, removed from its native situation, crushed beyond all resemblance to its original condition. Soil material of this kind is suitable for chemical and mechanical analysis, if the samples have been properly taken, and for the determination of various principles of soil physics; but for the study of such things as permeability, internal movement of moisture and rate of leaching, this kind of material is not at all suitable, it would seem, in so far as the results relate to soil types as they exist in place. The farmer needs facts which relate to the behavior of soil moisture in the