

Determining Soil Fertility

Valuable Information Given by E. B. Stookey, Assistant Agronomist of Washington State College.

MANY inquiries are received concerning the soil needs of different parts of Western Washington. There seems to be a general opinion that by an examination of a soil it can readily be told just what crops are best adapted to the soil, and just what fertilizers will give the best results. This opinion is based on the facts that a mechanical analysis will give the percentage of the different sized soil particles, and a chemical analysis will give the percentage of the different elements in the soil. Both of these analyses are of some value and both furnish a basis from which some suggestions can be secured. These, however, are only two of several things that must be considered.

This station is not in a position to make either mechanical or chemical analyses. There are, however, records which show analyses of most of the representative soils of western Washington. The United States Department of Agriculture in connection with the State Geological department has made reconnaissance soil surveys of the greater part of western Washington. The soil types have been fairly well defined, and the more representative soils have been analyzed. The state chemist also has made quite a number of analyses of Western Washington soils.

Available Records.

These records are available, and if the exact location of a farm is known, we can tell quite closely the general character of the soil. If soil samples are sent to this station we are glad to make a superficial examination. The sample will help us to determine the soil type. The sample should be a well mixed composite of several samples taken from different parts of the general type of soil. Only part of this composite sample need be sent. If there are types of widely differing soils they should not be mixed.

There are certain conditions besides the mechanical and chemical analyses that are quite important when crop adaptation and soil needs are to be considered. In fact, if these conditions are well understood and their meaning correctly interpreted, they may reveal more than chemical and mechanical analyses. Some of these conditions are enumerated below:

Necessary Conditions.

1st. It is necessary to know the depth of the surface soil, and the character of the subsoil. In any case a change in the depth of the surface soil would probably affect the sort of crop best adapted to the soil, and a difference in the character of the subsoil would materially affect any advice that might be given.

2nd. The position of the land, as to whether it is high or low land, will eliminate some crops that might otherwise be recommended. Some crops are better adapted to lower conditions than others.

3rd. The question of drainage is sometimes very important. A poorly drained soil is unfit for the production of some crops, and warms up so slowly that it is impractical to grow some others.

4th. The previous condition of the land. By this is meant whether the land was originally timbered or prairie; the kind and character of the natural vegetation; how long it has been cropped; what kinds of crops have been grown; and what kinds, if any, and with what results fertilizers have been used. It is easy to see how these may be of great help when studying any condition. The character of the natural vegetation on the soil, or adjoining soil, may indicate quite clearly that certain crops would be better adapted than others. The other conditions, too, are of considerable value.

5th. The crops that are giving the best results in the locality. Certain crops are known to grow best where certain other crops grow well. Any peculiarity of the growth of any plants, or any peculiar climatic condition will be of interest and value in arriving at a conclusion. When advice is wanted of a soil expert regarding any land the inquirer should give a clear detailed account of the character and history of the land in question.

These things are mentioned in order to show the factors that are valuable in determining the crops adapted to a soil, and help indicate the fertilizer needs. The soil analyses are valuable, but their value is too often overestimated.

Classification of Soils.

Soils are classified into groups according to the amount of the different sized particles present. A clay soil has a high percentage of clay; a sandy soil has a high percentage of sand, and so on through the different classes and sub-classes. It is of value to know the percentage of the different sized particles present so we can classify the soils; we know in a general way that certain crops are adapted to certain types of soil.

A chemical analysis gives the total amounts of the plant food elements present in too small amounts. It is known that a certain amount of each element is present in fertile soils, so we can say from a chemical analysis that such a fertilizer would probably give good results. This, however, is not an assured fact. Some soils may be very rich in a certain element, but this element may become available to the plant so slowly that an application of a fertilizer carrying this element may give very profitable returns.

Again, a chemical analysis may show that a soil is below normal in a certain element. Through cultivation and proper methods of handling, this element may become available to the plant as rapidly as it is necessary. It is clear then that an application of a fertilizer carrying this element would give negative results. So we see that while a chemical analysis may give an indication of the soil needs, it is by no means sure. Present methods of chemical analysis do not give the amount of the plant food in the soil that is available to the plant. They give the total amount present, so from a chemical analysis it is possible to tell the soil needs only in a general way, and then the results may not be what would be expected.

Best Fertilizers to Use.

From the number of analyses that have been made of western Washington soils it is possible to indicate in a general way what fertilizers will probably give the best results. The only way to be positive as to what fertilizers will pay is for a person to try them on his own, or similar soils, under similar conditions. This fact is generally recog-

nized, and in states where the most extensive soil surveys have been made, actual field experiments are being carried on by the progressive farmers to determine what fertilizers are paying investments. To get farmers and others to carry on the same line of work in western Washington this station will prepare simple plans for a farmer, grange, school or any interested organization so that they can carry on useful and instructive experiments with very little trouble. These plans call for a half to an acre or more of ground, indicate the crops to be grown, and the kinds and amounts of fertilizers to use. There are two general plans; one is designed for a one-year test, and the other is for a test covering several years. The one-year test will serve only to indicate what element if any is deficient in the soil. The longer test will be of greater value. To be of great value a fertility test should be continuous.

Opinion of an Expert.

An agricultural chemist is authority for the statement that 55 per cent or more of fertilizer experiments give negative results, so too much must not be expected. Many of the most valuable experiments now being carried on with fertilizers have given poor, and often negative, results for the first year, and often for the first three or four years.

The results of properly conducted experiments carried on in different parts of western Washington would be of great value to every district. We know in a general way that lime is needed in most parts of western Washington, potash is needed in the northern part, phosphorus is the southern part, and both in the middle western part. It is not known, however, what amounts of these different fertilizers will give profitable returns. It is for this reason that we favor the policy of the farmers or some organization carrying on local demonstration experiments.

Full and complete plans for simple experiments will be furnished to anyone making application. The only returns we ask is that results of the experiments be furnished us. We will be glad to interpret results and to make suggestions at any time called upon.

When it is desired that this station furnish plans for fertilizer demonstration experiments, the conditions of the soil and plant growth should be fully given. The amount of ground and the length of time that can be devoted to the experiment should also be given. This will help us to formulate a plan that will be best suited to the given conditions.

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