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NEW KNOWLEDGE OF SOIL FERTILITY

A radio talk by Dr. Henry G. Knight, chief, Bureau of Chemistry and Soils, delivered Wednesday, December 28, 1932, in the Department of Agriculture period, National Farm and Home Hour, broadcast by a network of 48 associate NBC radio stations.

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SALISBURY:

Today we're to have the fourteenth report in our series from the chief of the Bureau of Chemistry and Soils, Dr. Henry G. Knight, who has been giving us quite an extensive review of the results of recent research in farm chemistry and soil science. This talk, I understand, continues the discussion of results of soil fertility research which he began in his twelfth talk. All right, Dr. Knight.

KNIGHT:

Thank you, Salisbury.

Yes, today I want to round up the facts about recent soil fertility research results which I didn't give in the preceding two talks. You recall that in those talks I told briefly the story of the development of modern fertilizer practice, especially of the beginnings of manufacture and use of concentrated fertilizers and of the results of research into the best methods of applying the new types of fertilizers.

I also explained that different types of soils need different treatments to keep up or to increase their fertility. Also that soils require different treatments to make them most fertile for different crops. And I outlined for you our program of research on the fertility requirements of various crops on various soil types and told you how to obtain detailed statements of the results of these investigations.

Now I want to discuss with you some of the more general findings about soil fertility. I shall outline for you briefly the facts revealed by research in the problems of maintaining humus content of the soil, of finding and remedying the lack of some of the rarer fertility elements in some soils, and of using soil treatments to overcome some plant diseases. I also shall outline for you some of the recent advances in the methods of scientific work which promise to give us still more new knowledge of soil fertility.

Last week I recalled for you the basic fact that the fertility of any soil depends to a considerable extent upon the amount of humus or soil organic matter present in it. Now our scientists have confirmed the experience of farmers that the presence of soil organic matter and the proper tilth of the soil is necessary to insure an adequate supply of nitrogen.

We have come far in recent years toward the goal of finding out all available facts about this keystone of our agricultural system. We have learned how to use green manure plants to keep up the nitrogen supply of the soil. That's why sweet clover and soy beans and crotalaria and lespedeza are common

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crops now in places where they were hardly known 20 years ago. We are learning more about how to make artificial manures by treating straw, leaves, and other plant residues with ammonium sulphate and calcium carbonate. These artificial manures promise to be of increasing importance in many sections where it is hard to get enough natural manure to maintain the soil organic matter. Of course we are learning more, as I told you last week, about how to make nitrogen available in concentrated form through the new concentrated fertilizers.

But we cannot know too much about maintaining the soil organic matter.

Both farmers and soil scientists have found that soil organic matter is one of the most elusive of the factors which make for a good, mellow, rich soil, the basis of farm success. That is why we are pushing fundamental research in methods of maintaining it. We are trying to find how much nitrogen soil organic matter supplies under different conditions. We are trying to find methods of using farm waste products such as straw and corn stover in maintaining soil fertility.

Well, so much for the new knowledge of soil organic matter. Now the second general field of soil fertility research on which I promised you a report is the research into needs of different crops on different soils for some of the minor fertilizing elements. Recently we have learned that nitrogen, phosphorus, and potassium are not the only elements necessary for growth and production of plants. We have found that such elements as manganese, magnesium, boron, copper, zinc, and other elements are necessary plant foods for some crops. If a soil doesn't contain them, we have to supply them in order to produce these crops successfully. Here is an illustration:

We are making a special study of the Glade soils south of Miami, Florida. The farmers of the section use these soils mainly for growing tomatoes. We have learned that the soils consist mainly of calcium carbonate deposited from sea water. They lack manganese. Now tomato plants grown in a soil without manganese are weak. Their leaves bear white spots. They throw few blossoms and form few fruits. But supply manganese to the soil and the plants grow luxuriantly with a rich, deep green color, and flower and fruit more abundantly.

Other soils in other sections lack other elements, our investigations have shown. But I shall not spend any more time discussing this fascinating phase of soil fertility research. The third general line of inquiry on which I promised you a report of results has to do with soil treatments to control plant diseases. Scientists have established with remarkable accuracy the exact influence which soil types have on the presence or absence of some plant diseases. This is true of both nutritional and infectious plant diseases. Some examples of plant diseases influenced by the make-up of the soil are cotton rust, cotton root-rot, potash hunger of potatoes, and powdery and common scab of potatoes.

We have not been able to find soil treatments that will control all of these diseases, but investigations are in progress on all of them and on more too. The investigations have reached partial completion on some soil types. For instance, we now know how to use elemental sulphur to control potato scab on some soils. The development of scab disease is encouraged when the soil reaction is alkaline. But you can change an alkaline to an acid reaction by the controlled application of sulphur. This discovery has cleaned many of the potato regions of their formerly "scabby" fields.

Another clear-cut instance of success of investigations into soil treatments for control of diseases is the recent discovery by soil and plant scientists that using zinc compounds will control the pecan rosette disease.

Now, finally, the advances in the technique of soil scientific research, We have improved methods of finding quickly the deficiencies of soils in one or more of the elements of soil fertility. These already are proving very helpful to farmers in finding out just what fertilizers to apply. An example is the Indiana test for potash deficiency in corn soils.

The scientific methods of checking the investigations of fertility lacks in different soils for different crops have been enormously refined in recent years. Under modern methods there is much less possibility for error in calculating the results mathematically and in making practical application of them to farm problems than there formerly was.

In some fields of the study of soil physics the scientific advance has taken our men into fields that I can't attempt to explain in this brief talk. But you will hear more and more of them as you learn to discuss soil colloids and the base exchange of soils as you now discuss phosphorus and nitrogen requirements, or as you speak of potash hunger, or of the acidity of your soil. Remember all these terms which are being discussed among farmers today would have been so much hocus- pocus even 10 years ago.

Finally, the soil scientists have brought the bacteriologist to their assistance in finding out what influence the swarms of little creatures not visible to the naked eye have on the fertility of soils. But that is another story, and I shall tell it to you next week when I give the case for and against soil microbes.

Meanwhile, may I remind you again that this bureau and the State experiment stations are conducting cooperative research on the soil fertility requirements of cotton, corn, wheat, potatoes, sweet potatoes, sugar cane, sugar beets, truck crops, oranges, peaches, and pecans. If you grow one or more of these crops and wish reports on the results of soil fertility research on your soil type, look up your soil type in the report of the soil survey of your region, and write us a request for the soil fertility information you wish. If we have conducted research that reveals it, you shall have the results.

Now, I wish each of you the happiest of New Years.