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NEW KNOWLEDGE OF POTATO FERTILIZERS

A radio talk by Mr. B. E. Brown, division of soil fertility, Bureau of Chemistry & Soils, delivered through Station WRC and 39 other stations associated with the National Broadcasting Company, January 12, 1931.

I want to talk to you today about the potato crop and its fertilization. As a food crop I think you will agree with me that the potato will be found oftener on our tables than any other vegetable and probably eaten at least once a day in most American homes.

From the standpoint of production the reported world yield of potatoes, exclusive of Russia and China, was 5,245,000,000 bushels in one year, involving the utilization of 33,000,000 acres of land for an average yield per acre of about 160 bushels. Potato growers in this country produced commercially about 361,000,000 bushels of potatoes in 1930, accomplishing this on something like 3,400,000 acres, an average yield per acre of about 106 bushels. The farm value of the potato crops for 1929 and 1930 averaged about 400 million dollars.

In some sections of the United States the yields per acre run very high -- several hundred bushels to the acre. The highest yield on record in the United States was well over 1,000 bushels to the acre. In other sections they are as low as 60 to 70 bushels. Such low yields are largely attributable to less favorable climatic and soil factors. The potato, to do its best, requires a relatively cool climate, good soil, ample moisture supply and plenty of available plant food.

In certain sections of the United States the potato is one of our most highly specialized crops and is grown on a large commercial scale. This special treatment of the potato crop has tended to insure high yields, good quality and low unit cost of production, or, in other words, low cost per bushel.

You potato growers in the sections to which I refer, know what it means to produce potatoes on a commercial scale. You are fully aware that the high cost of producing your potato crop demands not only good soil and its careful preparation to insure a deep mellow seed bed, but also good seed, the best of cultural care and, in many sections, the use of plenty of available plant food. These, and other, cost-of-production items have to be watched very carefully by the wide-awake potato grower who seeks at all times to lower his cost per bushel.

A good potato soil should work easily and not get in poor physical condition after heavy rains; it should be well supplied with organic matter or humus; it should be well drained but possess a good water-holding capacity. The soil should by all means possess a satisfactory physical condition to some depth, partly through deep plowing, to enable the roots of the potato plants to enter the soil readily and to allow for proper tuber development. Deep sandy soils and heavy, poorly-drained clays, or clay loams with compact subsoils close to the surface, should be avoided for potato production.

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Now as to feeding the potato crop. We know that plants, like animals, must have food and drink. The potato grower will have quite a family of hungry young potato plants on an acre of ground--anywhere from 12 to 30 thousand, ordinarily from 15 to 20 thousand. These young plants will want plenty to eat, particularly the food elements nitrogen, phosphoric acid and potash. They can get a certain amount of food from the soil itself, but often what we term available plant food is not present in sufficient amounts to keep the potato plants growing as they should. This is why commercial fertilizer, which is primarily a mixture of available nitrogen, phosphoric acid and potash compounds, gives the young plants a good send-off and supplies them with the plant food they need during the growing season. Underfed potato plants are a poor investment and without sufficient plant food to keep growing properly the yield will more than likely be reduced.

Potato growers in the United States use approximately 40 million dollars worth of fertilizer and fertilizer materials annually to produce the crop. This is a sizeable expenditure for plant food to put in the ground every year. It represents about one-eighth of all the complete fertilizer used in the United States, and amounts to about 750 thousand tons. With this in mind, the need of fertilizer investigations to determine what constitutes the proper use of this tremendous outlay for plant food on your different potato soils can be more fully appreciated. Just to indicate briefly the effect of fertilizer on potato production I should like to call your attention to some of our experimental results, comparing fertilized and unfertilized land. The general average of 3 years' results in Maine, New York, New Jersey, Pennsylvania and Virginia gave an increase per acre of 81 bushels for fertilized, over unfertilized land. The increase in Maine was 109 bushels per acre; on Long Island, N.Y., 98; Pennsylvania, 98; New Jersey, 58, and Virginia 61. It is quite evident therefore that the use of fertilizer on potatoes pays, and pays well.

There are quite a number of matters that require consideration in fertilizing potatoes aside from what kind and how much fertilizer to apply per acre. Questions of considerable importance are: (1) What proportion of nitrogen, phosphoric acid and potash to use in potato fertilizers; (2) what sources of nitrogen to employ; (3) how much nitrogen can be used economically; (4) what is the most favorable amount of phosphoric acid, and (5) how much and what source of potash to use. These are practical questions of great economic importance to potato growers which are being given consideration by the United States Department of Agriculture, through the Bureau of Chemistry and Soils, in cooperation with a number of the State Agricultural Experiment Station, potato growers and their organizations.

An important study under way, which is comparatively new, relates to the use of concentrated fertilizers. By concentrated fertilizer is meant a fertilizer mixture weighing, say, one-third of a ton but containing as much plant food as a ton of ordinary high grade fertilizer. This greater concentration of plant food is accomplished by selecting certain fertilizer materials

containing high percentages of plant food. As an example, take Urea, an organic compound, now used to some extent in potato fertilizers. It contains about 46 percent of nitrogen, whereas many of the ordinary fertilizer materials contain less than 20 per cent of nitrogen. These concentrated fertilizers were first proposed as a means of saving on freight, handling, hauling, etc. While many problems connected with their use in crop production remain to be solved, it has been found through the cooperative studies that concentrated fertilizers are a big help to potato growers who, in many sections, use large amounts of fertilizer per acre, frequently 2,000 pounds or more.

We have found that the use of these concentrated fertilizers, 2 or 3 times as rich in plant food as ordinary fertilizers, requires more care on sandy soils than on heavier soils. A sandy soil dries out more quickly and does not have the water-holding capacity that the heavier loam or clay loam possesses. In a droughty period, unless the concentrated fertilizer is applied properly and well mixed with the soil, there is a greater chance of injuring the crop on the light soil. To avoid this as much as possible, the fertilizer should be applied so that it is equally distributed on both sides of the furrow in which the potato seed pieces drop, and a little below the level of the seed pieces rather than having all of it applied in the furrow.

Other studies of interest to potato growers being carried on are: Experiments to determine (1) the comparative value of different potash salts on yield, cooking quality and composition of potato tubers; (2) the influence of soil type on composition, cooking quality and yield; (3) the relation of soil reaction, both soil acidity and soil alkalinity, to potato production; (4) the relation of liming to potato production as it influences other crops in the rotation or prevents excessive acidity, (5) the influence of fertilizers and other materials to control certain soil-borne diseases like common scab, and finally, that of supplying the soil with organic matter. It has been stated that "humus is the real prop of any soil". Certainly the more organic matter you potato growers can get incorporated with your soil, the more moisture it will retain for the potato plants during dry years. This, in turn, means that more of your added fertilizer will be dissolved and utilized by the growing crop and that as a result you will be rewarded with larger yields at less cost per bushel.

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The following suggestions relative to the use of fertilizers may prove serviceable to potato growers:

- (1) Use a complete well-balanced fertilizer of high analysis;
- (2) Never let fertilizer come in direct contact with the potato seed pieces but try to get some of it placed near the seed piece.

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- (3) Mix fertilizer and soil together well;
- (4) Use a potato planter or fertilizer distributor that will do a good job. If you are getting a poor stand and your neighbor is not, dig up and examine some of your potato seed pieces or young plants. If they should show fertilizer "burn" the chances are the fertilizer was either distributed unevenly or placed improperly. It is poor economy to use good certified seed and have it permanently injured;
- (5) To insure even distribution in so far as the fertilizer itself is concerned, examine it before planting time. If it flows freely and doesn't separate, it should drill well;
- (6) Buy your fertilizer on the basis of plant food per ton, not on a fancy name at a cheaper price. Quality counts in a potato fertilizer just as much as in a pair of shoes or in what we eat;
- (7) Do not over fertilize, but by all means apply enough;
- (8) Conserve the manure supply. Reenforce it with superphosphate at the rate of 50-75 pounds to each ton of manure. Applied to sod land and plowed down this makes an excellent start toward good soil treatment for potatoes;
- (9) Keep down weeds. Those uninvited plant outlaws eat and drink too, and thereby seriously compete with your potato plants for food and moisture. It is again poor economy to let the weeds get away with food intended for your potato plants;
- (10) Grow your potato crop in a rotation if at all practicable to do so. Plowing under clover or alfalfa sod, sweet clover, rye, cowpeas, crimson clover, etc., are good ways to supply organic matter. The soil as a result can retain more rainfall and your fertilizer will be rendered more efficient.
- (11) Finally, if you have a soil or fertilizer problem relating to your potato crop, by all means get in touch with your county agent, your State Agricultural Experiment Station or the United States Department of Agriculture. Your potato crop is too valuable, and takes too much of your time and effort, to neglect these sources of information.