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Timely Farm Suggestions

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WHAT SOIL ANALYSES MEAN

Chemical Analyses Cannot Reveal the Physical Conditions of Soils Nor the Availability of the Plant Foods Contained, and Hence Are of Limited Value Only

A READER sends us a report of the chemical analyses of two soils and makes the following request:

"Tell me the right kind of fertilizer that I need to apply to this land to grow cotton? I know, of course, that the right thing to do is to plant and turn under legumes, which I shall do on some of it, but can not do this to all of it the first year. Tell me the per cent of potash, nitrogen, lime and phosphoric acid any soil should contain to grow successfully corn, oats, cotton and alfalfa."

The chemical analyses of these two samples of soils, taken within 10 feet of each other, but from soils having a different appearance to the eye, shows the following per cent of plant foods:

No. 1—	
Calcium oxide (lime) CaO.....	0.91 per cent
Potash	0.22 per cent
Phosphoric acid	0.09 per cent
Nitrogen	0.14 per cent
No. 2—	
Calcium oxide (lime)	0.65 per cent
Potash	0.29 per cent
Phosphoric acid	0.07 per cent
Nitrogen	0.09 per cent

To a depth of about seven inches we may assume that an acre of soil weighs about 2,000,000 pounds. On this basis there will be the following amounts of plant foods in the top seven inches of these soils, per acre:

No. 1—	
Calcium oxide (lime)	18,200 pounds
Potash	4,400 pounds
Phosphoric acid	1,800 pounds
Nitrogen	2,800 pounds
No. 2—	
Calcium oxide (lime)	13,000 pounds
Potash	5,800 pounds
Phosphoric acid	1,400 pounds
Nitrogen	1,800 pounds

The crops mentioned in our inquiry contain the following amounts of these plant foods:

	Lime	Potash	Phos. Acid	Nitrogen
Corn—				
2,800 lbs. grain—50 bushels	0.8 lbs.	11.2 lbs.	18.2 lbs.	46.2 lbs.
3,500 lbs. stover	15.0 "	49.0 "	10.5 "	35.0 "
Oats—				
1,600 lbs. grain—50 bushels	1.9 "	9.6 "	12.8 "	32.0 "
2,500 lbs. straw	9.0 "	31.2 "	5.0 "	15.0 "
Cotton—				
500 lbs. lint	0.5 "	3.1 "	0.5 "	1.0 "
1,000 lbs. seed	3.1 "	12.0 "	13.0 "	31.0 "
3,000 lbs. stalk, leaves, etc	76.0 "	46.4 "	12.2 "	40.0 "
Alfalfa—				
8,000 lbs. hay	344.8 "	168.0 "	40.0 "	196.0 "

Every one knows that no crop can obtain all the plant food in a soil, for long before the supply of any plant food is entirely exhausted the crops become unprofitable, or may even cease to grow. But were it possible for crops to obtain all the plant foods in these soils any one can, from the data given above, calculate the number of crops it would take to exhaust all the plant foods in them. For instance, there is as much phosphoric acid in soil No. 1 as in 99 crops of 50 bushels of corn grain, and in No. 2 as much as in 77 such crops. No. 1 contains as much potash as there is in 393 crops, and No. 2 as much as in 517 crops. The nitrogen in soil No. 1 is equal to that in 60 crops of 50 bushels of corn grain per acre, and that in No. 2 is equal to 39 such crops.

From these facts it ought to be plain to any one that these soils should not require fertilizers containing potash, nor do they probably need lime. Indeed, if the plant foods named—nitrogen, phosphoric acid, potash and lime—were the only things needed to make a productive soil these two soils should yield large crops for a number of years. These facts bring out the important truth that while there may be an abundance of these plant foods in a soil it may still be unproductive. This failure to produce well may be due to these plant foods not being available for the use of the plants and if they are in such condition that the plants can not use them they might as well not be present so far as the productiveness of that soil is concerned. Or these plant foods might be present in such state that there would be sufficient available to feed the crops if other conditions such as drainage, moisture and cultivation were right and yet if these other conditions were not right the yield would be small. A chemical analysis of a soil does not tell anything about these other essential conditions to crop production, nor does it tell what proportion of the plant foods present are soluble or available for feeding the crops, under the average or general conditions of that particular soil.

It is therefore apparent that a soil analysis alone is not sufficient to enable any one to state the fertilizers which must be applied to make any given soil productive. If the soil is unproductive it may be because there is not sufficient plant food present. In that case the analysis would show the fact; but the lack of productiveness may be due to the fact that the plant foods present in the soil in sufficient quantities for many crops are not soluble or available for feeding the crops; or the trouble might be any one of many other conditions which cause small crop yields and in such a case the chemical analysis would throw no light on the cause of the low production by that soil.

But while the plant food in any soil is not all available, if there is a very large amount present, sufficient is likely to be available for large crop production. Hence, there are arbitrary standards which have been fixed for estimating the fertility of a soil from its chemical analysis or the plant foods it contains.

For instance, Prof. Mooers, of the Tennessee Experiment Station makes the following classification on yields per acre and chemical analyses, which will be of value to the reader in studying the two analyses we have given above, as soils Nos. 1 and 2:

	Lime	Potash	Phos. Acid	Nitrogen
1. Very Poor— Less than 15 bushels Corn	Per Cent. Less than 0.08	Per Cent. Less than 0.10	Per Cent. Less than 0.05	Per Cent. Less than 0.07
2. Poor— 15 to 25 bushels Corn	0.08 to 0.12	0.10 to 0.15	0.05 to 0.10	0.07 to 0.10
3. Medium— 25 to 35 bushels Corn	0.12 to 0.20	0.15 to 0.25	0.10 to 0.15	0.10 to 0.14
4. Good— 35 to 40 bushels Corn	0.20 to 0.40	0.25 to 0.40	0.15 to 0.25	0.14 to 0.20
5. Rich— Over 50 bushels Corn	Over 0.40	Over 0.40	Over 0.25	Over 0 20

Judging the soils Nos. 1 and 2, analyses of which were stated at the beginning of this article, No. 1 is "rich" in lime; "medium" in potash; "poor" or nearly "medium" in phosphoric acid, and "medium" "to good" in nitrogen. No. 2 is "rich" in lime; "good" in potash; "poor" in phosphoric acid and "poor" in nitrogen.

Taking this classification as applied to the two soils in question, it seems that it should not be necessary to apply either lime or potash to these soils to obtain large crops. While they contain quite a large amount of phosphoric acid it is entirely probable that it will pay to use acid phosphate on these soils. As our inquirer says, these soils need legumes plowed under or stable manure; but until this can be done it is quite probable that a moderate application of nitrogen may also pay. At present prices, cottonseed meal is possibly our cheapest source of nitrogen especially for cotton and corn; but since any nitrogen applied to fall-sown oats should probably be applied in the spring, possibly nitrate of soda may be preferable for a top dressing for that crop.

Value of Different Sources of Lime

A READER asks: "Which would be better, an 'agricultural lime' containing 89.31 per cent of calcium carbonate or oyster shell lime?"

Oyster shell lime, when properly burned, contains from 85 per cent to 95 per cent calcium oxide. Assuming that the oyster shell lime is 90 per cent calcium oxide, then 100 pounds of this lime will contain as much calcium as about 180 pounds of the "agricultural lime," which is 89.31 per cent calcium carbonate. In other words, based on their calcium (or lime) content, which is probably the only true basis of comparing their values, 100 pounds of the oyster shell lime (90 per cent calcium oxide) is worth as much as 180 pounds of the "agricultural lime" (89.31 per cent calcium carbonate). Anyone can calculate the comparative values of different grades of burned lime (calcium oxide) and ground limestone (calcium carbonate) if he remembers that pure calcium oxide, is 71.4 per cent calcium and pure calcium carbonate is 40 per cent calcium.

Buy Cottonseed Meal Now

THOSE who expect to use cottonseed meal, either for winter feeding or for fertilizer next spring, should buy it now if they can possibly command the money to do so. With corn around 70 cents a bushel, or a little above, in the North, the cattle feeders are not going to be slow to increase their consumption of cottonseed meal. With corn at 70 cents a bushel they can well afford to pay $35 a ton for cottonseed meal to take the place of half the corn usually fed. That is, they can, at such prices, well afford to continue to take out two pounds of corn and put in its place only one pound of cottonseed meal until at least one-half the amount of corn usually fed is replaced with cottonseed meal. Owing to a prejudice against the liberal use of this excellent cheap feed Northern feeders are not likely to use cottonseed meal to the extent indicated; but they could well afford to do so and will certainly increase their use of it if prices remain low, because from a feeders standpoint the results would be as good or better and in addition there would be a second profit of considerable importance in the increased value of the manure. But while Northern feeders are not likely to appreciate the full value of the opportunity offered them, we fear our Southern feeders will also fail to profit by the present low price of meal, owing to the scarcity of money. When their cotton seed have been sold at a low price the price of meal is certain to advance as the demand increases and, we repeat, all those who expect to use meal should buy it at the present low prices if they can possibly command the money to do so.

Which Is the Cheaper Feed—Cotton Seed or Cottonseed Meal and Hulls?

WHICH is the best feed for cattle, cotton seed or hulls and meal? Seed are selling here for $15 a ton. Which would be best, keep the seed or sell the seed and buy hulls and meal?"

If our inquirer had given us the price of meal and hulls and the cost of hauling the seed to market and the meal back to his farm we could give a definite answer to his question. This and many other inquiries seem to indicate that some people think the seed will take the place of both hulls and meal. They will not do so for feeding cattle, because cattle need more roughage or coarse feed than is supplied by the amount of seed which may be satisfactorily fed. The meal in a ton of seed outweighs the hulls by around 100 pounds, as produced by the mills. The amount of meal obtained from a ton of seed is usually over 800 pounds and the amount of hulls under 700 pounds. But when meal and hulls are fed at least four pounds of hulls should be given to every pound of meal, if no other roughage is used. Cotton seed and cottonseed meal, both being concentrates, are more easily compared in feeding value. With seed at $15 a ton cottonseed meal is worth about $22.50 a ton, or possibly $23 a ton. This does not allow for the cost of hauling the seed to market and the meal back to the farm. On the other hand, as we have often pointed out, a full ration of seed can not be satisfactorily used, because the excess of oil which they contain is likely to cause scouring. A larger amount of nutrients, or a larger part of the ration, can be supplied from cottonseed meal. For instance, six pounds of meal daily is often given to steers weighing 800 to 1,000 pounds. To give an equal feed value in seed would require nine pounds of seed daily, and this would very likely cause scouring and unsatisfactory results. Three pounds of seed are about equal in feeding value to two pounds of meal, but this is only true up to the small amount of seed—three to five pounds a day—which can be satisfactorily used.

When three pounds of seed will not buy two pounds of meal and also pay for the hauling we advise using seed up to three to five pounds a day for an animal weighing 700 to 1,000 pounds, but if more feed is required we would then trade seed for meal or sell seed and buy meal on the best terms possible to obtain.

Hulls at $5 a ton are cheap, at the present prices of salable hays, but silage and corn stover may be produced on the farm and will form as good or better roughness at no greater cost than hulls at $4 to $5 a ton. If, however, roughage must be bought we know of none now selling as cheap as cottonseed hulls at $5 a ton.

When seed are selling for $15 a ton a ton of seed will buy 600 pounds of cottonseed meal and 3,000 pounds of hulls, allowing $25 a ton for the meal and $5 a ton for the hulls. If there is no other roughage for the cattle the meal and hulls will make a better ration than would the cottonseed and the proportions stated—one to five—are about the correct ones for mixing meal and hulls, when these form the entire ration of cattle.