Soil Fertility.

Before the Association of the American Agricultural Colleges and Experiment Stations, in convention at Washington in November, Dr. Cyril G. Hopkins, of Illinois, read a valuable paper on "Soil Fertility in Relation to Permanent Agriculture," saying in part:

"Are there fields in Virginia where once great crops of corn were grown, and now no one cares to pay the taxes? Are there farms in the famous Mohawk Valley that can be purchased for less than the farm buildings once cost? Are there agricultural lands in the Western Reserve which were sold a half a century ago for $100 an acre, now bought for $50 or less? Are the wonderful prairie soils of the West producing less and less? To all these questions men who know the facts answer, yes.

Without agriculture America is nothing. Intensive agriculture may be supported by large cities. Europe may support her farms from the feeds and phosphate rock sent from America. The United States can never hope to draw from its colonies for supplies of foods and fertilizer. The dairy system of farming, where only butter is sold, will nearly support itself, but we cannot all live on butter. If meat and milk are sold, and feeds are purchased, fertility is maintained, but meat and milk are not sufficient.

"Eighty per cent. of the farmers sell wheat, corn or cotton, and probably always will. Let no man presume that he had found a permanent system of agriculture that will not produce bread and clothing.

"I am not unmindful of a fundamental principal promulgated by the Bureau of Soils that soils contain sufficient plant food for good crop yields, and that to-day pot cultures show results from non-nutrient substances like carbon-black; but it is not yet proved, and I prefer to accept the evidence of chemistry and mathematics and the experience of ages regarding soil depletion. A quarter-section is one-fourth mile square, and four thousand miles deep in theory. In practice, however, it is limited to a few feet in depth, and the process of nutrification is limited to a few inches. Given six to eight feet of soil, open and retentive of water, with a rich surface, and we can grow crops, but of what use is a rich subsoil if the surface is gone? The Rothamstead experiments went to show that we could not depend on capillary rise of soil solutions. They also found that the main loss of nitogen was from the surface soils. The mixture of sub- and surface soil by earthworms is another theory, but the facts are that little mixing is done. We are investigating in Illinois to determine how deep different plants feet, and I urge assistance in this matter. From our meagre data at hand, I doubt about using fertility much below eighteen inches.

"I start with the premise that we cannot grow the great staple crops upon commercial nitrogen. The general farmer may buy water, but he should never buy nitrogen. In our Illinois soils, to a depth of seven inches, there is less than twelve hundred pounds of phosporous, and more than thirty-six thousand pounds of potassium. One hundred bushels of corn an acre would exhaust the phosphorus in fifty years. The potassium would last nineteen hundred years, and the next seven inches of subsoil has enough for another such term. Our potassium is, therefore, permanent, and our nitrogen we can supply. The problem, therefore, first, is to utilize the potassium. We hope this may be accomplished through the use of manure, green crops, etc.

COMMERCIAL FERTILIZERS.

"Next comes the problem of commercial plant food. The truck farmers of New Jersey will do well to follow the teaching and advice of Director Voorhees and use liberally of commercial nitrogen, but for the farmers of America to try to raise the 2,500,000,000 bushels of corn upon commercial nitrogen is not only absurd, but impossible. There is no great nitrogen problem. It was solved by Hellriegel and Atwater fifteen years ago. Limited areas of swamp lands need potassium, and German salts may be used. The analysis of forty-eight samples of Maryland soil gave practically the same determinations of phosphorus and potassium found in Illinois. It seems, therefore, that the single key to American agriculture is the element phosphorus. From available information, its absence limits the production of fully 80 per cent. of our soils. The supply is at present drawn from basic slag, bone, and the natural phosphate deposits of the Central South; but at the present rate of exhaustion they will not last fifty years.

A WOEFUL WASTE.

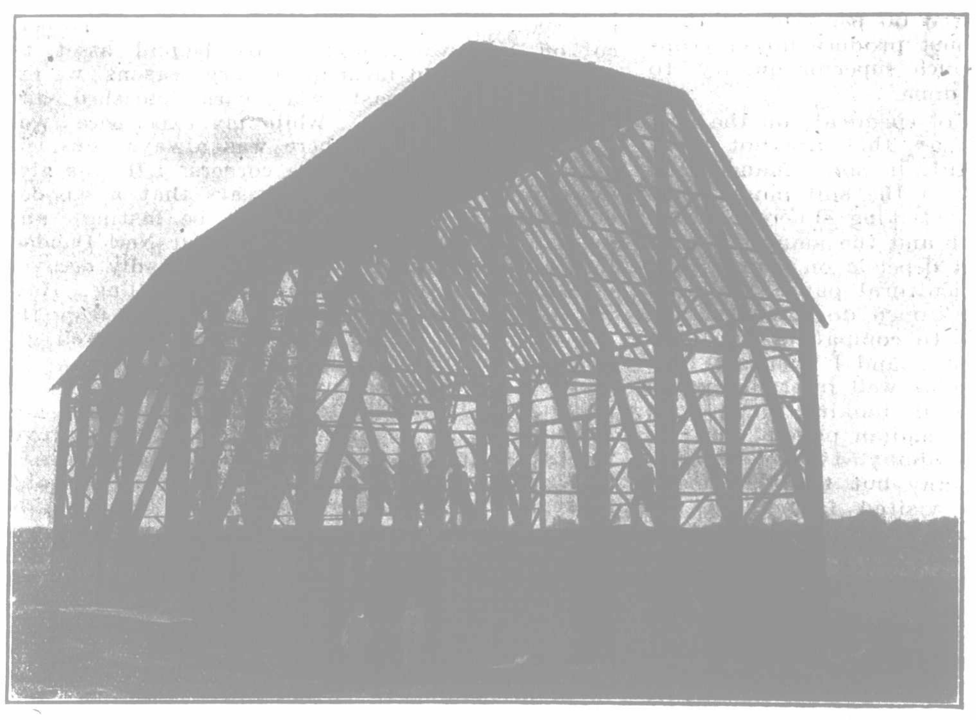
More than one and one-half million tons are mined, and more than two-thirds is exported. Is not this exportation America's greatest crime against her prosperity? And what is being done with this 500,000 tons of rock? It is mixed, ton for ton, with sulphuric acid, and that which costs $4 at the mines is reduced to 60 per cent. land plaster and 125 pounds of phosphorus a ton. A filler of two tons more is further added, and the 2—8—2 goods of the market are reproduced. This four tons will cost $80 or more, and will contain no more phosphorus than the original ton of raw rock. It is said that raw rock is not available, but I say it is the business of the farmer to make it so by the free use of organic matter. I am grateful to Directors Patterson, of Maryland, and Thorne, of Ohio, for planning systematic, long-termed experiments with raw rock. Patterson found, when turned under with crimson clover, it was as valuable as bone-meal; and Thorne found, when used with stable manure, it was more profitable than acid phosphate. In Illinois the results are essentially the same. So far as I can learn, those who have used the raw rock with an abundance of decaying matter have been rewarded beyond their expectations. How long will American farmers pay $80,000,000 a year for fertilizers containing less total phosphorus than we export to Europe for $4,006,000 at the mine, and which for $8,000,000 could be delivered at the farms.

Two dollars an acre is not counted a large bill for complete fertilizers, but $2 an acre would pay for a ton of raw rock every four years, and this would actually double the phosphorus content of the Illinois corn soils in twenty years. The following experiment is interesting:

	1902.	1903. Corn.	1904. Oats.	1905. Wheat.
Plant food applied	37	60	61	29
Nitrogen	35	60	70	31
Phosphorus	42	73	73	39
Potassium	38	56	63	33
Nitrogen-phosphorus	44	78	85	51
Nitrogen-potassium	40	59	66	30
Phosphorus-potassium	50	75	70	38
Nitro.-phos. potassium	53	81	91	52
Average gain for phosphorus	1	4	11	6
Average gain for nitrogen	10	18	15	14
Average gain for potassium	6	0	0	1
Value of increase	$3.85	$7.00	$5.00	$14.70
Average gain for phosphorus when added to nitrogen	11	20	20	21

Average cost of 25 pounds phosphorus—

In rock phosphate	$0 80
In steamed bone-meal	2 50
In acid phosphate	3 20
In complete fertilizer	8 00



Plank-frame Barn.

A Plank-frame Barn.

To the Editor "The Farmer's Advocate":

In answer to your request, I send you photograph of our plank-frame barn. I might say that there is not a stick of square timber in the frame. The basement posts are three pieces of plank, 2 x 10, spiked together.

The beams are made of five pieces of plank, spiked together, breaking joints every four feet, spiked every 20 inches, spikes being 4, 5 and 6 inches.

The main posts, purline posts, are 3 x 10. The deck plank 2 x 12 center, 2 x 8 ends.

The end posts are made of plank 3 x 12, with a block 3 x 4 between every 4 feet; the same in the main posts. False rafters and beams, 2 x 10; girts and rafters, 2 x 6; braces, 2 x 4; 70 bolts ¾ in., 10 in. long; 100 bolts ⅜ in., 4½ in. long; 2 kegs 6-in. spikes; 1 keg of 7-in. spikes; 2 kegs of 4-in. spikes; 2 kegs 5-in. spikes, were used in putting up frame.

The barn was raised with a movable scaffold, piece by piece. JOHN C. ASHTON.

Elgin Co., Ont.

Cattle versus Chemical Farming.

To the Editor "Farmer's Advocate":

To one practically engaged in agriculture, the best means of increasing and maintaining the fertility of the soil is an interesting subject, and it is becoming more important as labor becomes scarcer. Most farmers of middle age in Ontario Province have known of no kind of fertilizing but by animal manure and plowing under such crops as clover. The temptation to use chemicals is not strong where live stock is raised, but where animals have been dispensed with chemicals have been tried instead.

I was raised in the central part of Ontario, and have worked on and known of some good farms there these last forty years. About 1894 I began to make my home on the west end of Long Island, N. Y. State.

The soil around my early home is varied, such as clay, sandy, and even gravelly soil. The soil of Long Island, where I have been dwelling, is mostly of a sand and gravel kind. The fertilizer used in Central Ontario is animal manure and any roughage from surplus vegetable matter. The chief means of enriching the Long Island soil was by chemicals. There are sections of New Jersey State where chemicals are used with sod and manure, but the most convincing comparisons are by the use of either animal and vegetable products on one hand, or chemicals on the other, irrespective of the kind of soil.

Having been taught that animal manure and clover sod were absolutely necessary to the fertility of the soil, it was strange to see people sprinkling a dusty powder in a row, or putting a handful in a hill. A kind of intuition gave me an impression that the theory and practice were wrong. However, I took time to watch and consider results during seven years. I did not force conclusions on the advocates of the chemical theory, but let results speak for themselves. The two claims put out by the chemical-fertilizer agents were, first, the cost of putting on the animal manure; second, there would be no need of the investment in live stock and feed, neither of help to care for them. It was said that the cost of putting on animal manure would buy the chemicals for the land, irrespective of the size of the ground to be fertilized. The better to understand Long Island conditions, it must also be said that peavines and potato-tops, etc., are all carried off the ground where they are produced, as they interfere with the working of the land for a second crop the same season. The green-pea season is over by the first of July, and early potatoes by the middle of August. The combined cost of fertilizer and rent forbid the sod condition; all the land must be cropped every year. The least amount of fertilizer allowed is half a ton per acre every year. With these requirments and conditions, the following are some of the results, and they may be taken as a fair average where the conditions were similar.

The resulting condition of the land was that of sun-dried brick. Every particle of humus seemed to be completely absorbed. Constant stirring was necessary to retain moisture and enable the rootlets to permeate the soil. An eleven-acre field of hard corn, which was considered very good, and would yield nearly 50 bushels of shelled corn to the acre, was produced at a loss; the returns, including stalks, would be about $35, and the fertilizer, rent, seed and labor would be fully that amount.

The best and most reliable crop is potatoes. A good average crop of marketable tubers is 150 bushels per acre, at 50 cents per bushel. The cost of producing is, fertilizer, $30; seed, $10; rent and marketing, $12. This leaves less than $25 per acre for work and a surplus to help other crops. Last summer I saw a crop of potatoes which had been well fertilized, but did not yield 50 bushels per acre. Now it is a general practice to put soda onto crops which have been put in with fertilizer in which there is soda. The final statement about chemical-fertilizer farming is that the amount of fertilizer needed increases each year, and both the land and the tiller become poorer. As to the results to the fertilizer producers, we ask them to be honest enough to open their books. The list of farmers who are