

and just over the line in Canada—great deposits of copper pyrites, or "fool's gold," from which this sulphur can also be obtained. He caused great deposits of organic matter to be placed under the equator in Chili, which by heat and moisture has been converted into the chemical salt which we are now mining as nitrate of soda, and from which we draw a large supply of nitrogen, the most costly part of all plant food."

Mr. Bowker had, spread out upon a table before him, a quantity of specimens of all these different mineral deposits, and also of various vegetable and animal waste products, new utilized in the manufacture of commercial fertilizers. Taking prepared portions of some of these, he mixed them in a dish before the audience, and manufactured a "complete fertilizer," substantially as it is made on a large scale in the factory.

Following this, after having discoursed somewhat upon the insufficiency of stable manure, Mr. Bowker introduced a view of the subject of "plant-feeding" which Secretely Sessions of the Massachusetts Board of Agriculture, Secretary Gooke of our Vermont Board, Editor Cheever, and in fact about everybody else, felt obliged to protest against. It was the notion that hereafter we ought practically to regard our soil as exhausted of plant food, and should look upon the land as merely a place for the crops to stand while we feed them all they require for their growth in the form of manures and fertilizers. Mr. Bowker put his idea into this formula: "Feed the crop, and not the soil." This he placed in opposition to the old maxim, "Feed the land, and the land will feed you."

It is easy to see that this notion of Mr. Bowker—or Professor Stockbridge—practically means that farmers need never again expect to get any more plant food out of the soil, but must hereafter, and forevermore, go on to feed their crops in the field just as we feed our cows in the barn. The other view is, that we should feed our crops only what they need in addition to what they can extract from the earth—or, to carry out the comparison, that we should feed them just as we feed our cows in a more or less overstocked pasture. This whole question here turns upon the point whether the plant food in the soil is capable of being so completely "exhausted" as to make the remainder worthy of no further regard or consideration.

Let us look at the subject for one moment in the light of well known and universally-acknowledged truths—of the whole agricultural experiences of the human race. Mankind has been "farming it" without artificial fertilizers until within the last twenty-five years; and by far the greater part are doing so now. If the Bowker-Stockbridge doctrine were true, the whole earth ought to have become barren long, long ago. But we know that the longest settled countries are (with some exceptions, not due to loss of fertility) as productive to-day as they ever were. This bare statement settles the whole matter.

Do we repudiate artificial fertilizers? Not at all. Here in America we have been farming out the exuberant fertility of a virgin continent with little or no knowledge of the true principles of farming; and in doing so we have wasted the accumulated surplus of plant food in the soil. We now find ourselves confronted with an unexpected and unprepared-for decline in productiveness. If those who began this work had begun it with a sound knowledge of the principles of economic agriculture—we do not mean what are called scientific principles, but the principles derived from human experience, everywhere—this would not have occurred. The land in China has been under cultivation for thousands of years, yielding food for hundreds of millions of people, and is as productive to-day as ever. Why? Simply and only because the Chinese know what they have a right to ask from the land, and do not think of asking more. They comply with

the conditions which experience has shown that men must comply with in order to live.

No one good agricultural soil can ever be exhausted. All the best scientific authorities declare this to be a fact, and all human experience has confirmed it. What has happened to our soils here in New England? Are they exhausted of plant-food? The best chemists tell us that after we have farmed an acre of once fertile soil without manure until it does not "pay" to plant it longer, there still remains in it, within a foot of the surface, from four to eight tons of phosphoric acid, with a due proportion of other mineral elements of plant food. What is the matter, then, that it will not yield a crop? Let us ask the soil itself. Let us put the question practically, as a well-informed farmer may do. He has a field that in the first years after clearing gave his father from thirty to forty bushels of wheat to the acre. Wheat is a test crop; where wheat succeeds well we can grow almost anything. Now, gradually, under the old Yankee way of farming, such an acre, sown to wheat without manure, may return from six to ten bushels, according to the season. This will not pay. According to the "Feed the crop" theory Mr. Bowker would figure up the quantity of available nitrogen, phosphoric acid and potash required by a crop of, say, forty bushels of wheat, with its straw, and apply it in a fertilizer costing forty dollars a ton. A good yield would probably result that year; but if this or any other crop were to be planted the next year, the same process would (under this theory) have to be followed. "That way ruin lies." Farming would be impossible if this were the only way out.

But there is another way—easier, cheaper and far more business-like, even if it were less scientific, which it is not. The experienced farmer knows that where he can get a good crop of clover one year, he can get a good crop of wheat the year following. There are several cheap ways of getting a good crop of clover on a piece of land that would not, without liberal manuring of some sort, grow a profitable crop of wheat. On much land less than a dollar's worth of plaster to the acre will do it. When it will not, five dollars' worth of ashes will—or an equal value of a bone and potash fertilizer. You get a crop of clover hay that year that will pay expenses, interest and taxes, at least. The next year you get a full crop of clover; then plow down the second crop in the fall, and seed with wheat and grass-seed (either fall or spring), and get your twenty to thirty bushels of wheat, and a catch of grass that may be mown two or three years at least, without further expense for manure.

How has this been accomplished? Where did the food come from to grow these two cuttings of clover, one good crop of wheat, and several more of grass—not to say anything of a crop of beans or potatoes on a turned sod at the end? Have you been getting something for nothing, or out of nothing? Certainly not. "Out of nothing nothing comes." The plant food was there in the land all the time. Wheat could not find it, but clover could; and it found enough not only for its own needs, but left enough in the land available for four or five following crops, leaving the land at the end at least as rich as at the beginning—and the whole thing can be gone on with, in various ways, time after time, and so far as anybody knows, to the end of time. This is the difference between false science, that would "feed the crop," and a true science, that would—well, not exactly feed the land, but would enable the land itself to feed the crop, mostly out of its own "unavailable" resources, with a little help applied just in the right way and at the right time.

What, then, is the place of a commercial fertilizer upon New England farms? Speaking broadly, in a general way, its place is to help the farmer over the hard places while he is learning to be a farmer. It may also be used by a man who