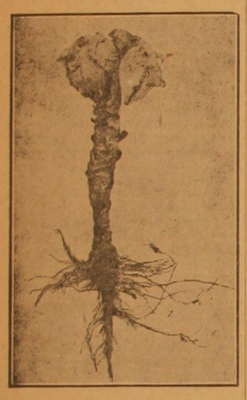
HOME COURSE IN SCIENTIFIC AGRICULTURE

SECOND ARTICLE — THE LIMING OF SOILS.

By H. J. WHEELER, Ph. D., Director and Chemist of the Rhode Island Agricultural Experiment Station.

THE recognition of the agricultural value of certain forms of lime is not new, and it appears from the writings of Pliny that liming was practiced by the Romans more than 2,000 years ago. In England, Germany, France and other European countries the application of lime in various forms has been and is still practiced extensively, but, as Roberts states, probably 99 per cent of the arable soil of the United States has never been limed, and indeed many large areas are not in need of it.

Authorities seem to agree that lime is necessary to the plant, and if it be wholly lacking in soils, even though an



Photograph by United States department of agriculture.

DISEASED CABBAGE PLANT — MUCH LESS APT TO OCCUR IN FIELDS TREATED WITH LIME.

abundance of all the other essential elements is present, the plant cannot develop normally. The plant cannot grow if any one of the essential elements of plant food is lacking. Fortunately, however, many soils are well provided with lime by nature, and it is seldom or never necessary for those who cultivate them to resort to liming.

The method usually resorted to for ascertaining the amount of lime in soils is to treat them with some strong mineral acid (usually hydrochloric) and determine the amount of lime which is thus dissolved. Some writers state that if only one-half of 1 per cent is thus shown to be present immediate resort to liming is desirable; others set the amount higher, and some seem to prefer to have present as much as 1 per cent.

The fact that beets of all kinds make a ready response to liming on soils which are deficient in carbonate of lime may be utilized as the basis for a practical and reliable method of testing the lime requirements of the soil. For this purpose lay out two plats of land, each about 12 by 30 feet, manure each of the plats with like amounts of a fertilizer containing potash, phosphoric acid and nitrogen and apply lime to one of the plats at the rate of from one to two and a half tons per acre (forty pounds per plat would be approximately two and a half tons per acre). A comparison of the growth and yields on the two plats will furnish a safe means of judging whether the soil will respond profitably to applications of lime.

Liming Sometimes Injurious.

Excessive amounts of lime, especially on light soils, may have an injurious action. This is particularly true of freshly slaked lime and of ground limestone upon light sandy soils, which are inclined to be dry and which contain only small amounts of organic matter. It hastens unduly the decomposition of organic matter and thus renders the soil more open and less retentive of fertilizers and moisture than before. If either ground burned lime or slaked lime must be used upon such soils it should be applied in small amounts at not too frequent intervals.

The arguments in favor of the use of lime are summarized thus:

The use of lime as a soil improver is very ancient, and its value for this purpose is generally recognized. Its action as a fertilizer is both direct and indirect.

There are many soils in which lime is deficient, notably such as are derived from granite, mica schist and certain sandstones, slates and shales. On such soils lime is often of direct value in supplying a necessary element of plant food.

Indirect Value of Lime.

The indirect value of lime is perhaps more important than its direct action, because probably the majority of cultivated soils contain sufficient lime to meet the direct demands of plants for food. Lime is of indirect value in unlocking the unavailable potash, phosphoric acid and nitrogen in the soil.

Lime exerts a decided influence on the mechanical condition of soils, rendering heavy compact soils looser in texture and tending to bind particles of loose, leachy soils.

Lime is also beneficial in furnishing conditions in the soil favorable to the activity of the micro-organisms which convert the nitrogen of organic matter into nitrates which are readily assimilated by plants, which decompose organic matter and which assist certain leguminous plants to assimilate the free nitrogen of the air.

One form of lime (gypsum) has been shown to be a most effective corrective of black alkali.

The continued use of lime unaccompanied by other fertilizers may prove injurious, especially on poor soils, since it converts the insoluble nitrogen, potash and phosphoric acid compounds of the soil into such as can be rapidly taken up by plants or washed out in the drainage, thus hastening the exhaustion of the supply of these substances in the soil. As the German adage states, "The use of lime without manure makes both farm and farmer poor."

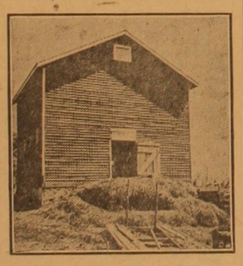
Behavior Toward Lime.

It has been shown that even upon many upland and naturally well drained soils, apparently in good condition otherwise, the sourness (acidity) is so great that most varieties of plants will not thrive. Lime is the most economical and effective substance thus far used for correcting this condition. According to experiments made by the Rhode Island agricultural experiment station on acid soils in that state, the plants tested may be classified with regard to their behavior toward lime as follows: Plants benefited by liming, spinach, lettuce (all kinds), beets (all kinds), okra (gumbo), salsify (vegetable oyster), celery, onion, parsnip, cauliflower, cucumber, eggplant, cantaloupe, asparagus, kohlrabi, cabbage, dandelion, Swedish turnip, pepper, peanut, English or flat turnip, upland cress (peppergrass), martynia, rhubarb, common pea, pumpkin, summer squash (scalloped), golden wax bean, red Valentine bean, horticultural pole bean, bush lima bean, lentil, Hubbard squash, saltbush, hemp, tobacco, sorghum, alfalfa, clover (red, white, crimson and alsike), barley, emmer, wheat, oats, timothy, Kentucky blue grass, Canada pea, Cuthbert raspberry, gooseberry, currant (White Dutch), orange, quince, cherry and Burbank Japan plum; plants but little benefited by liming, Indian corn, spurry (it has been reported in England that spurry is injured by liming, but such results have not been obtained in Rhode Island), rye, carrot, chicory, Rhode Island bent and redtop; plants slightly injured by liming, cotton, tomato, cowpea (drummondi), Concord grape, peach, apple and pear; plants distinctly injured by liming, lupine, common sorrel (Rumex acetosella), radish, velvet bean, castor bean, flax, blackberry, black cap raspberry and cranberry.

Frequency of Liming.

The frequency with which liming should be practiced depends, among other things, upon the character of the soil and the rate of application, the number of years involved in the rotation practiced, the plants grown and their order of succession. As a general rule, it may be stated that from one-half to one and one-half tons of lime per acre every five or six years is sufficient. Applications of two or three tons may, however, be advisable in cases of very acid soils which are to be seeded down and are to remain in grass for several years. The practice of applying small amounts of lime at somewhat frequent intervals is being generally accepted as preferable to the use of large amounts at rare intervals.

Lime combined as carbonate, as in marl, wood ashes, etc., can usually be applied with safety in the spring or at any other season of the year, but autumn is always the safest time to apply caustic or slaked lime. It is gen-



Photograph by United States department of agriculture.

WASTEFUL METHOD OF STORING MANURE.

erally considered best to apply the lime to the soil immediately after plowing and harrow it in thoroughly. Lime which is already slaked may be spread upon the soil directly from wagons or carts or dumped into heaps and then spread with a shovel, although the most satisfactory plan in such cases is to use a lime spreader or ordinary grain drill with a fertilizer attachment. Where a lime spreader or similar implement is not available the burnt lime may be placed on the soil in piles of from forty to fifty pounds each, covered with moist earth and allowed to slake before being spread with a shovel.

In conclusion, it may be said, ascertain first whether lime is needed. If it is, apply it judiciously, and never depend upon lime alone to maintain the fertility of the soil, for all of the ingredients which plants need must be present in the soil to insure the profitable production of crops.

HIS PREFERENCE FOR HOME

Oliver Wendell Holmes Unable to Get Any Real Pleasure in the Vaunted "Tavern."

Don't talk to me about taverns! There is just one genuine, clean, decent, palatable thing occasionally to be had in them—namely, a boiled egg. The soups taste pretty good sometimes, but their sources are involved in a darker mystery than that of the Nile. Omelettes taste as if they had been carried in the waiter's hat, or fried in an old boot. I ordered scrambled eggs one day. It must be that they had been scrambled for by somebody, but who—who in the possession of a sound reason could have scrambled for what I had set before me under that name? Butter! I am wondering why the taverns always keep it until it is old. Fool that I am! As if the taverns did not know that if it was good it would be eaten, which is not what they want. Then the waiters, with their napkins—what don't they do with those napkins! Mention any one thing of which you think you can say with truth, "That they do not do."

Every six months a tavern should burn to the ground, with all its traps, its "properties," its beds and pots and kettles and start afresh from its ashes like John Phoenix-Squibob.

No; give me home, or a home like mine, where all is clean and sweet, where coffee has pre-existed in the berry and tea has still faint recollections of the pigtails that dangled about the plant from which it was picked, where butter has not the prevailing character which Pope assigned to Denham, where soup could look you in the face if it had "eyes" (which it has not), and where the comely Anne or the gracious Margaret takes the place of these napkin bearing animals.—Oliver Wendell Holmes.

DISSOLVE BONE IN THROAT

Use of Lemon Juice at Critical Time Is a Thing Worth Keeping in Mind.

Sitting at a planked shad dinner in Yonkers, a laughing guest drew a bone into his throat and he began to strangle. Some one suggested that the sufferer swallow a fragment of dry bread.

"Oh, no," exclaimed an Ossining man. "Don't give him bread. It might catch the bone and it might not. Give him something that is sure to give relief." Beckoning to a waiter, he said: "Bring me a lemon, cut in two." And it was brought without delay. Taking one section, he offered it to the choking guest and told him to suck the juice and to swallow it slowly. Directions were faithfully followed, and in about a quarter of a minute the afflicted one placed the half lemon on his plate, looked into the anxious faces around the table and smiled.

"Well, Joe," said one, "how about it?"

"It's gone," was the reply, "the bone has slipped down."

"Not exactly that," said the Ossining man. "The bone slipped down, all right, but it was melted first by the citric acid. I never knew it to fail to dissolve a fishbone. You can test the power of lemon juice by dropping some on the fishbones you may have lying on your plate."

Several diners tried the experiment. In each case the acid reduced the bone to liquid gelatine.

Fawn and St. Bernard as Companions.

At the little village of Bauma, in Switzerland, a farmer recently found a young fawn in one of his fields.

Fearing that if left alone without its mother some mischief would befall it, he took it home and did everything possible for it. Now, he happened to have a large St. Bernard dog, and this dog and the fawn took to each other.

The fawn slept in the dog's kennel, and when it grew a little older and went out on its walks abroad, the dog accompanied it, and defended it against the attacks of other dogs.

Sometimes the St. Bernard and the fawn would be absent in the woods and fields for a whole day, but they always returned at night, the doors and gate being left open for them. The fawn is now much taller than the St. Bernard, and yet the dog still goes out with it.

Praise Be, the Brother Was Lying.

Police courts are not always marked by an atmosphere of piety, but the exception to the rule occurred in a court where a very religious man, against whom one of the neighbors had made a complaint, was being tried for some trivial offense. The complaining witness was called to the stand to relate his side of the story, and the defendant listened closely for several minutes. Then his personal feelings overrode court etiquette and he rushed up to the judge, fervently exclaiming: "Your honor, the brother is lying. Praise the Lord!"

Limit of the Borrowing Habit.

Little Margie was a frequent visitor at the Jones home, going there on errands of borrowing many times each day. On this occasion she asked the loan of a cooking utensil. But Mrs. Jones had become very much out of patience at the continual borrowing and sent word by Margie that she "had other fish to fry."

Imagine her surprise when in a few moments her neighbor's little Margie again appeared in her doorway, lisping:

"Mozzer thaid pleathe to thend thome of the fith, pleathe."