Action of Lime.

Limestone occurs in masses usually, is readily obtained and changed to a convenient form. When burned, the carbonic acid is driven off, and lime is left as the product, which is also known as caustic and quick-lime. Contact with water, even the moisture of the air, causes a union by chemical affinity of the water and lime, resulting in hydrate of lime, commonly called "slacked lime," and the two terms above given are also applied to this. Lime also has a great affinity for acids, especially carbonic acid, and if exposed to the action of this latter substance—so abundant in the air—for a sufficient length of time, the two unite and the hydrate becomes changed to the hard, practically insoluble and inactive carbonate of lime. Because of this affinity for carbonic acid, quicklime and slacked lime both have a powerful decomposing action upon organic matter, which is always largely composed of carbon and carbonic acid. Most organic substances also contain nitrogen in some form. The action of the lime causes the oxidation of the carbon and nitrogen (if ammonia is not already formed) to carbonic and nitric acids, which the lime unites with to form carbonate and nitrate of lime. When ammonia has been formed in decaying nitrogenous substances, which always happens after a very short period of decomposition, the effect of lime in connection therewith would be to drive off the ammonia.

Thus we see that lime mixed with fresh nitrogenous matter, such as excrements, carcasses, etc., is a preserver of the nitrogen; while with decaying or well rotted material of this sort, such as barn-yard manure, when ammonia has been formed, the lime is an unprofitable admixture.

During the decay of organic substances in the soil, lime aids and promotes the production of nitric acid, with which it combines to form nitrate of lime. Prof. Goessmann found a cave in the Mississippi valley, the earth of which contained 7 per cent. of nitrate of lime. Doubtless the great nitre deposits were in many cases formed by the action of lime on nitrogenous matter, then the potash or soda, as the case may be, intervened, and the result was the present nitrate of potash or soda.

Free acids and those in unstable compounds, are likewise taken up by lime. And many hurtful compounds (as of iron in peat and marsh lands), are neutralized and rendered harmless. According to Liebig, in soils rich in silicates, and abounding in organic matter, insoluble silicates accumulate. Lime serves to destroy these compounds and liberate the potash in a form suitable for use by the crops.

By chemical action in various ways in stiff clays, including several of the above, lime destroys their tenacity, and makes them porous and friable.

Application.

From the facts given, and the results of experience, an instructive lesson may be drawn concerning the application of lime. Soils rich in organic matter, even though they already contain it in considerable quantities, drained peat swamps, stiff clays and coarse heavy soils, and especially those destitute of it, are all benefited by an application of lime. Good results also follow its use on light soils after an incorporation of organic matter, as green manure, muck, or a thick sod or green crop ploughed under. Sterile soils are rapidly rendered more sterile by its application. Wet lands show least effect from treatment with lime. Hence such lands must either be drained, or receive an extra amount. Clays should also have organic matter applied in connection with lime. It acts most effectually near the surface. The apparent effect is greater the second season than the first, so that the most satisfactory results are obtained by sowing broadcast in the early fall, with at most only a light harrowing or brushing. It should be applied in an air slacked, fine mechanical condition. The most profitable quantity to apply depends much on the land, wet soils, those well filled with organic matter and clays, taking most—from ten to forty bushels being recommended, according to the circumstances.

A careful study of this subject will explain why soils containing lime are benefited by an addition; and also why, though an excess of lime in soils causes the production of coarse plants, yet its use often improves grasses and grains. It is said that turnips on some farms grown on land well limed, are better cattle food than otherwise, perhaps because of the potash set free for their use. But a great deal still remains to be learned about this substance. —*Scientific Farmer.*

Harrowing Wheat.

Mr Harris says his practice is to harrow the wheat three times in the spring. We go over the wheat both ways with the harrow, and then sow the clover seed and follow with the harrow to cover up the seed. If the ground is very hard, the harrows do not break up the crust sufficiently to afford a good covering for the seed, and if dry weather follows we have a poor catch on these hard spots. I have my doubts as to which is the better plan, but am inclined to think that so far as securing a good catch of timothy and clover is concerned, it is better to give up harrowing winter wheat in the spring and to sow timothy seed in the fall and clover seed very early in the spring. It depends very much on the soil and season. The harrowing helps the wheat and kills a good many weeds, and on sandy loam the harrow leaves a good seed bed for the clover, and if we are favored with a few showers, we are pretty sure of a good catch of clover.

This we find in the *Iowa State Register:* A correspondent inquires if it will do to harrow wheat where timothy was sown last fall or early this spring with the wheat. There can be no doubt about it, where the timothy was sown with the winter wheat last fall. It will be equally beneficial to both wheat and timothy. But where the timothy was sown this spring, it will not do to harrow until the timothy has taken thorough root. If the timothy has taken well, the wheat will not be too large before the grass will be large and strong enough to stand the harrow. If it tears out one-half of the timothy the balance will be better with harrowing than the whole will be without. Try and conquer some of your old ideas that harrowing will injure the plants. The agricultural world is advancing, and this is among one of the most important improvements. *Michigan Farmer.*

Hungarian Grass.

Hungarian grass (*Panicum Germanicum*) is now cultivated largely in many parts of Canada. Of its early history the first account we have, is that of its introduction into Hungary from India, thence into France, whence the seed was first brought to this country. The Hungarians named it Bengal millet, the French Moha de Hongrie. This grass is thought to contain more nutriment than common millet. It is leafy, remains green until the seeds mature and is valuable as a fodder when cut in the milk. It germinates readily and is remarkable for withstanding drought, its capacity in this latter respect being such that it is often green and flourishing when other vegetation is parched up; and even when arrested by excessively dry weather, the slightest shower will restore it to vigor. Its favorite soil is one of medium consistency, well manured. It is usually sown broadcast, in June, and yields from twenty to thirty bushels of seed to the acre. The seed is cheap, and being small, is easily sown and covered with an ordinary harrow. It will make a rank growth on rich land, maturing in a few weeks. The heads are very full of seeds which are rich in nutriment. If cut and cured at just the right time, it makes a very palatable and nutritious food for horses and cattle. Hungarian grass has some demerits. It is necessary that it be cut before the seeds are mature, to realize the greatest benefit from the stalk, and then it is sometimes difficult to cure it; and the fact that if fed when mature, the seeds having strong diuretic qualities, will injure the animals to which it is fed.

Improved Tile Draining.

A writer to the *American Farm Journal* describes the latest improved methods of tile draining in Illinois, with the cost as follows: For a few years all the tiling was done by one single Irishman, and he with, I think, only one tool, a long-handled, round-pointed shovel. Next we had an Englishman, with a variety of tools, who, by his quicker and better work, soon drove the Irishman out of the neighborhood, and I have not seen him since.

Farmers soon began to think that money invested in tile ditches was not lost, and the supply of ditchers was hardly up to the demand, so other men began the work. There are now from four to six men engaged in this vicinity the year round, excepting when the ground is very wet, or very hard from either being dry or frozen. The Irishman's plan was to dig a ditch from 1½ to 2½ feet deep, have the bottom almost as wide as the top, then lay the tile close to one side, fill up the ditch and the work was done. The Englishman's plan was to dig the ditch barely wide enough at the top to work in, and to narrow it downward so that there was only room for the tile on the bottom, and he always, when possible, finished all by night that he began during the day, so that his work was not to do over again. In preparing to work, the first thing he did was to put an iron pad on the sole of his boot, so as not to hurt his foot when digging. The next thing was to clear and level the ground for twenty or thirty yards ahead. Then he would stretch a line, and make it fast with two pegs; this was to keep him straight. Then he would go to work with a spade about fourteen inches long, and with this he would take out fourteen inches of earth every time, carefully paring down the sides, so that when at work in the ditch, he would not knock any dirt in. Then he would clean out the loose dirt, and the ditch would be straight, clean, and fourteen inches deep.

The next action was to take a spade eighteen or twenty inches long, about six inches wide at the top, and probably three at the bottom. With this long, narrow spade he would take out its full length every time, and was careful to spill as little dirt as possible. After digging four or five feet with this spade, he would pick up another tool, which he had laid handy, and clean out the loose dirt, gouge out all irregular places, and prepare the bottom of the ditch for the tile. This tool (gouge or gouger), which is to prepare the bottom of the ditch for the tile, is made something after the manner of a hoe, supposing the head to be as long as a tile, and both sides turned up so as to make it the shape of half a tile. By using this tool alternately with the long narrow spade, he shaped the bottom of the ditch with little trouble, as he went along.

The next thing was to place an iron pad to the back of one of his boot-heels; then after laying the tile alongside the ditch, he would get into the ditch, make the first tile secure, then he would take another tile and lay it carefully to the end of the first, then, with the foot, on which the iron pad had been secured to the heel, he would knock it firmly back against the other, and so on through the ditch, always leveling the ground and stretching his tile before beginning to work, and always partly, if not wholly filling up the ditch immediately after laying the tile.

Two men can do more in the same time working together than they can separately, one using the long spade and the gouge, and the other doing all the other work, excepting, perhaps, the filling in.

Since more men began the work, other improvements have been made. One man had a pair of shoes, made on purpose for the business, with wooden soles about an inch thick. By using cotton wood for soles, the shoes are no heavier than common shoes and a great deal better for this business. Instead of getting into the ditch to lay the tile, some of them have a tool for this purpose, it is simply a handle with a three-quarter inch iron rod, about a foot long, secured to the end and bent at a right angle with the handle. With this they can pick up a tile and lay it in its place, without getting into the ditch. Some have a rake with four or five teeth, eight or ten inches long, to fill in with. A set of tools for two men consists of one fourteen-inch spade, one line with two pegs, one long-handled shovel with the point cut off, and both sides turned up, to take out lose dirt, one long narrow spade, three gouges of different sizes, to suit the tile, one hook to lay the tile with, and two rakes to fill in with; altogether, about $20 worth of tools.

When their spades get worn so they cannot dig a ditch two and a half feet deep in the manner I have described, they will sell them, or throw them away and get new ones, preferring to do good work with good tools, to poor work with poor tools. The average price per rod for ditching is forty cents, when board is given and thirty-five cents,