The Farm.

Farm Drainage.

NO. I.

We purpose presenting our readers with a series of articles on farm drainage, which we hope will be useful and pleasant reading for the coming long winter evenings.

Drainage, as a source of soil improvement, should be studied in connection with other questions having the same end;—such as manuring, tillage, rotation of crops, and tree-planting. The very first question for every farmer to consider is, By which one or more of these means can he most profitably improve his soil? No one answer may be serviceable to an two farmers; indeed, a system of soil improvement which would be applicable to a given field might prove a failure with reference to an adjacent field. Last winter we published a series of articles on soil improvement by means of the different modes of manuring,—not that we considered this the most important means in a majority of instances, but because it can, and should be, profitably employed by every-farmer under all circumstances; whereas drainage is not always advisable, and besides, every farmer has not the necessary capital to carry it on to any considerable extent. But as an objection to this view it may be urged that manures cannot produce their best effects on undrained soils, and this is a valid objection.

With regard to soil improvement, the system by means of rotation of crops is the most important in many cases; of all the agricultural sciences it is the most difficult to comprehend, and in practice it is the most difficult to carry out; but as a true system of rotation is only advantageous on a drained soil, we give drainage the preference, leaving the rotation problem for a future series of articles.

In the practical carrying out of all farm operations, the first question to be determined is, Are we aiding or subverting nature's laws? It does not always follow that we should assist nature; for many domestic plants and animals are artificial things, although having originally flourished in a state of nature, and if treated in accordance with their primeval habits, they would rapidly become extinct. With regard to drainage, however, our object is, in a manner, to assist nature. In the aspiring wilderness the waving trees acting upon the roots open the soil for the percolation of water to great depths, and hence we find that the rains for the most part descend into the subsoil instead of washing over the surface, as is mostly the case in the artificial state of our lands. The same laws work in the ascent as in the descent of soil water. As a rule the practical question is, Shall the water percolate through the soil or be removed by surface washing? If then the subsoil is not of such a character as will remove the surplus water with due rapidity by percolation, the question of drainage becomes exceedingly practical. These observations lead to the question as to the effects produced by surface overflow compared with those produced by percolation. But before giving an answer, it will be necessary to explain the different sources of water and the conditions in which it may be found in the soil.

It is of great importance to consider whether the superfluous water is from rain, from overflowing of brooks or adjacent fields, or from underlying springs oozing to the surface. Again, it is important to know whether the water is in motion or at rest. If a pinch of soil were examined by a powerful microscope, it would look like a heap of stones of irregular shapes and sizes, and each stone may be compared to a sponge. But we shall call each stone a particle of soil. Now it is plain that three conditions may exist viz: (1) both the particles and the interspaces may be filled with water; (2) the particles may be saturated, and the spaces between them may be open for the free admission of air; (3) both the particles and the interspaces may be free from water, and filled with air. As growing crops require both air and moisture, it will now be plainly seen that the second condition is the one to be aimed at. Visible water which is free to flow off or sink down is called *hydrostatic*. Bottom water is permanently hydrostatic. If a well or hole be dug in the ground, and water be found therein, the level of this water will correspond with the bottom water in the soil. This depth should, on the average, be beyond the ordinary reach of the roots of the crops. *Capillary water* is a name given to the water held in the particles of soil, and in ordinary language is designated "moisture." This is not visible as a liquid, but may be recognized by the dark color of the soil. Capillary water, when the particles are completely saturated with it, makes the soil too wet for most plants. It does not obey the laws of gravity, like hydrostatic water, but is held by the surface attraction of the soil particles. The capillary power of the various soils differs very widely, being greater for fine than for coarse soils. Take a portion of soil and expose it in a dry atmosphere, and it will still be found to contain some moisture, for if heated to boiling point it will be found to lose in weight, and vapor will be given off. Moisture thus expelled is called *hygroscopic water*. This quantity varies with the temperature of the air and the character of the soil, ranging from 0.5 to 12 per cent. These distinctions are important in expressing the degrees of moisture in a soil, as well as from the fact that our agricultural plants derive their equal from the capillary and hygroscopic water.

Fall Wheat.

There are circumstances which will lead to the continued raising of fall wheat, even though the direct profit be inconsiderable. It is usually raised on the summer fallow, which affords work for man and team when they would otherwise have little to do; it is a convenient means of seeding down, and of disposing of a large portion of the manure at a season most suitable for its manipulation, and wheat can be kept within a small compass for higher prices with minimum risk of deterioration. Most all the work is done by machinery, and the crop can be harvested before the busy season fairly sets in.

It is the custom of writers to insist that fall wheat should be grown on a clayey soil. While it is true that wheat will flourish better on a heavy than on a light soil, yet this piece of news is of very little practical use to the farmer, for he must sow on all fields that require fallowing. What the farmer wants to know is how he can most successfully grow fall wheat on light soils. It is not the heaviness of the soil that causes the wheat to flourish, but because heavy soils are apt to contain that particular form of plant food upon which this cereal delights to feed, and which is almost invariably lacking in light soils. The remedy, therefore, lies more in the selection of the fertilizer than in the selection of the soil.

The question now is, How does wheat feed? If we examine the composition of wheat, we find that it is rich in phosphates—a form of plant food which is usually abundant in clay soils, and especially in the subsoil, where it can be reached by the deep roots of winter wheat. This cereal likes nitrogen in a dainty form, that is, in the form of nitrates, so that the vegetable matter of the manure or the decaying vegetation must be thoroughly decomposed before the plant can feed on its nitrogen. But all the decaying vegetable matter must not be in the same stage of decomposition, else large quantities of the nitrogen will be lost by drainage before it can be used by the crop. Wheat also requires a fine and firm seed bed, which cannot be attained if the manure is rough. It is also a matter of vital importance that the vegetable matter be thoroughly mixed with the soil. This is best accomplished by cultivator and harrow.

On light soils, naturally or artificially well drained, we would advise every farmer to test the worth of fine bone dust or superphosphate. Try it on at least one acre and compare the results with those of the remaining portion of the field. It may be applied at the rate of 200 to 300 pounds per acre in addition to a fairly liberal supply of farmyard manure. If the bone dust is used, it should be harrowed into the soil before the wheat is sown, or with the wheat if sown broadcast. The superphosphate, being soluble, is best sown in spring. Any one of these fertilizers will supply the plant food almost invariably lacking in such soils and in the farmyard manure under the ordinary system of curing. Unless fertilizers are skilfully applied, success in their use will be purely accidental.

Of the many new varieties of fall whea introduced, we know of none that has given such general satisfaction as the Martin Amber, and the Landreth (Bonnell).

In sections where the Hessian fly has been committing ravages, the wheat should be sown as late as practicable; if the wheat is up before the appearance of the first frost, look out for the eggs of this insect.

How to Destroy Grasshoppers.

Prof. Coquillet, of the U. S. Department of Agriculture, was recently sent to California to investigate the locust plague, and has reported the results of his experiments to the Sacramento "Bee." The following is the only one of his remedies which has proved a complete success:

"It consists of a mash composed of bran, arsenic, sugar and water, the proportions being one part of sugar, one and one-half parts of arsenic and four parts of bran, to which is added a sufficient quantity of water to make a wet mash. A common washtubful of this mash is sufficient for about five acres of grapevines. Fill the washtub about three-fourths full of