

Drainage.

In the July number of this paper in discussing the effects of drainage, we endeavored to show that it deepened the soil, assisted pulverization, prevented surface washing, lengthened the season for labor, and prevented freezing out or winter killing, made the land lighter to work, and now we will endeavor to further show its benefits.

Whether it is good farming to feed our mowing fields at any time is a question upon which farmers have a right to differ. Without discussing the question, it is enough for our purpose that most farmers feed their fields late in the fall. Whether we approve of it or not when the pastures are bare and burnt up and the second crop in the home field is so rich and tempting, and the cows are not giving much milk we usually bow to the necessity of the time and turn them in. The great injury of fall feeding is not usually so much the loss of the grass covering from the field, as the destruction of the roots by treading. A hard upland field is much less injured by feeding, than a low meadow and the latter less in a dry than in a wet season. By drainage, the surplus water is taken from the field. None can stand upon its surface for a day after the rain ceases. The soil is compact and the hoofs of cattle make little impression upon it, and the second or third crop may be fed off with comparatively little damage.

If a weed be dug or pulled up from land that is wet and sticky it is likely to strike root and grow again because earth adheres to its root whereas a stroke of the hoe entirely separates the weeds in friable soil from the earth and they die at once. Every farmer knows the different effects of hoeing or of cultivating with the horse-hoe or harrow in a rain storm and in dry weather. In one case the weeds are rather refreshed by the stirring, and in the other they are destroyed. The difference between the surface of drained and water soaked land is much the same as that between land in dry weather under good cultivation and land just saturated with rain.

Again there are many noxious weeds, such as wild grasses which thrive only on wet land, and which are difficult to exterminate, and which give no trouble after the land is lightened by drainage. Among the effects of drainage, mainly of a chemical nature on the soil are the following :

The atmosphere bears upon its bosom not only the oxygen essential to the vitality of plants, not only water in the form of vapor, to quench their thirst in summer droughts, but also various substances which rise in exhalations from the sea, from decomposing animals and vegetables from the breathing of all living creatures, from combustion and a thousand other causes. These would be sufficient to corrupt the very air and render it unfit for respiration did not nature provide for its purification. It has been already stated

how the atmosphere returns to the hills in clouds and vapors condensed at last to rain all the water which the rivers carry to the sea ; and how the well drained soil derives moisture in severest time of need from its contact with the vapor-loaded air. But the rain and dew do not return their waters to the earth without treasures of fertility. Ammonia which is one of the most valuable substances found in farm yard manures, and which is a constant result of decomposition, is absorbed in almost incredible quantities by water. About 780 times its own bulk of ammonia is readily absorbed by water at the common temperature and pressure of the atmosphere ; and freighted thus with the treasures for the fields the moisture of the atmosphere descends upon the earth. The rain cleanses the air of its impurities and convey them to the plants. The vapors of the marshes and of the exposed manure heaps of the thriftless farmer are gently wafted to the well-drained fields of his neighbor and there amid the roots of the well tilled crops, deposit at the same time their moisture and fertilizing wealth.

Of the wonderful power of the soil to absorb moisture both from the air and the earth itself—by the deposition of dew as well as by attraction—we shall treat of more fully in a subsequent issue as it is so intimately connected with the present topic.

Plants, if they do not breathe like animals, require for their life almost the same constant supply of air. All plants die in soils and waters destitute of oxygen ; absence of air acts exactly in the same manner as an excess of carbonic acid. Stagnant water on a marshy soil excludes air, but a renewal of water has the same effect as a renewal of air, because water contains it in solution. When the water is withdrawn from a marsh, free access is given to the air and the marsh is changed into a fruitful meadow. Animal and vegetable matters do not die or decompose so as to furnish food for plants unless freely supplied with oxygen which they must obtain from air. A slight quantity of air however is sufficient for putrefaction which is a powerful deoxygenizing process that extracts oxygen even from the roots of plants.

It has been stated on high authority that drainage raises the temperature of the soil often as much as 15 degrees F. Indian corn vegetables at about 55 degrees. At 45 degrees the seed would rot in the ground without vegetating. Winter rye, no doubt, makes considerable growth under snow. Cultivated plants in general, however, do not grow at all unless the soil is raised above 45 degrees. The sun has great power to warm dry soils and it is said will often raise their temperature to 90 or 100 degrees when the air in the shade is only 60 or 70 degrees. But the sun has no such power to warm wet soils.

If the water cannot pass through the land by drainage either natural or artificial it must escape, if at all, at the surface by

evaporation. Now it is a fact well known that the heat disappears or becomes latent by the conversion of water into vapor. Every child knows this practically at least who in winter has washed his hands and gone out without drying them. The same evaporation which thus effects the hands renders the lands cold when filled with water, every gallon of which thus carried off requires, and actually carries off as much heat as would raise five and one half gallons of water from a freezing to a boiling point. If therefore your soil is saturated with water, the heat of the sun in spring cannot warm it and your plowing and planting must be late and your crop a failure.

The Provincial Board of Health of Ontario, complying with the resolution adopted by the Council of the College of Physicians and Surgeons of Ontario, at its last meeting, has prepared the following statement of methods adopted by Dr. Alexander Stewart, Palmerston, in the preparation of vaccine at the Ontario Vaccine Farm :

1. The vaccine is prepared wholly from selected calves of from six months to a year old.
2. The part vaccinated is first cleanly shaved and subsequently well washed with hot soap and water and then scarified and inoculated with bovine virus from a previous vacciner. As taking the virus directly from one calf to another in a series slowly develops a virulence in the lymph, it is necessary from time to time to start afresh from a modified lymph.
3. The inoculated points gradually develop into vaccine vesicles, whose normal characters are readily recognized by the experienced eye. The vesicle when mature (which is usually from the fifth to the sixth day) commonly bursts, immediately upon which the lymph is taken on the prepared ivory points previously well sterilized by boiling.
4. The points thus charged are left a few minutes in the air to dry and are then coated with fresh albumen.
5. Having dried, they are at once packed in sealed jars and placed in the refrigerator.
6. When ordered, they are packed in tissue paper and wrapped in rubber film and transmitted by mail or express.

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It has been suggested in England to appoint a minister of physical education and that gymnasiums receive substantial aid from the government on the ground that the proper physical culture of the people is a matter of the greatest national importance.

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A stranger stepped up to a farmer recently and said : "What price do you put on that red cow of your's?" The farmer looked at the man a moment and then inquired, "See here, mister, are you an assessor or has she been run over by the cars."