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EDITORIAL

Irrigation from Below.

There are two ways of irrigating land—from above, and from below. Irrigating from above, by spreading water over the surface, is feasible only on areas that are favorably situated as to streams, springs or wells, and is usually expensive. Irrigating from below is practicable on any but the most arid soils, and if not so effectual as might be desired on grain and meadows, is very satisfactorily so on intercultivated crops, such as corn and roots, and is cheaper, so that for most farms in Eastern Canada it is decidedly more profitable.

The beauty of it is that subsoil irrigation is accomplished by Nature, Man's part consisting merely in protecting the moisture so far as possible from evaporation. In the case of intercultivated crops, such as corn, roots, vegetables and fruit, this is very easy to do. The means lie ready to hand, being nothing more or less than the earth itself, all that is necessary being so to manipulate the surface two or three inches, as to preserve it, during as much of the time as possible, in the form of a dry-dust mulch. In other words, don't let the crust form.

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Few of us comprehend what an immense natural reservoir there is in the soil beneath our feet. Year after year there falls upon the land an amount of rain, snow and dew equal to a depth of water amounting to a little over two feet, at Guelph, running up to something like forty inches at Bay View, Prince Edward Island. The annual precipitation varies somewhat, but these are approximate figures. There are some localities in Canada where the average is much lower than at Guelph, and higher than at Bay View, but these will answer for purposes of calculation. An acre of water twenty-five inches deep would measure up to 567,187½ gallons, or 2,835.9 tons; while an acre forty inches deep would contain 907,500 gallons, or 4,537½ tons of water.

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What becomes of all this volume? Much of it, falling in autumn, winter and spring, runs off the frozen or saturated soil into watercourses. Much of it evaporates from ponds, rivers and lakes, and from the surface of moist soil; a good deal of it seeps into streams and lakes from surrounding soil, but Nature has provided that an ample volume shall be held in the immense recesses of the earth, whence it feeds springs and wells, besides rising in liberal volume through the particles of soil, as through a sponge, to supply the roots of plants, and make good the continual summer loss by evaporation. The moisture is contained in the soil chiefly in two forms: (a) capillary moisture, and (b) free water. Capillary moisture cannot be removed by drainage; it surrounds the soil grains or particles as thin, film-like layers of moisture, amounting, in the aggregate, however, to an immense quantity of water. Then, in most localities, after passing a certain distance below the earth's surface, a level is reached, varying with season and other conditions, where the pore-space in the soil, sand and rock is filled with water, or nearly so. In sands and sandstones lying below drainage outlets, the amount of water may be as much as 15 to 38 per cent. of the total volume of the rock, which means an equivalent of 15 to 38 feet of water for every 100 feet depth of such rock. In such soils, and, for that matter, in most soils, there is abundance of moisture for crop-producing purposes.

And what do we mean by abundance of moisture for crop-producing purposes? We imply, first of all, enough to maintain a plentiful supply of capillary moisture in the root zone, in order to facilitate the elaboration and solution of plant food. Plant roots take up their nourishment in dilute solution, the surplus moisture being transpired through the leaves. It has been determined, by careful and extended observations in America and Europe, that almost any of the cultivated crops withdraws from 300 to 500 tons of water from the soil for each ton of dry matter produced. We see, therefore, that, while almost any soil in Eastern Canada may be supplied from below with plenty of moisture to mature abundant crops, so long as the supply is reasonably well husbanded and protected from evaporation, there is need to guard against waste of moisture, if maximum crops are to be obtained.

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For practical agricultural purposes, the physical condition of soil may be improved, and the percentage of moisture available to plants increased by drainage, tillage and manuring. The apparently anomalous effect of drainage in guarding against drouth, would make a chapter in itself. Sufficient to state that this is widely recognized by scientists and good farmers. Humus or decayed vegetable matter, resulting from decomposition of barnyard manures and crop residues, contributes to the sponge-like nature of soil, greatly increasing its capacity for capillary moisture. But apart, altogether, from drainage, manuring and ordinary tillage, we have a wonderful and simple means of conserving moisture in all crops permitting of intertillage. To explain:

As applied to soils, capillarity signifies the attraction of comparatively dry soil particles for the moisture of contiguous wet ones. By capillarity, moisture may be drawn either upwards or laterally through the soil. It works most freely in soils the particles of which lie comparatively close to each other. An enormous quantity of water is annually drawn to the surface of our fields by this agency, thence evaporated by sun and wind. It represents a waste which, in periods of drouth, is most serious, and a considerable percentage of it can be avoided by simply loosening the surface two or three inches of soil, thus interrupting the upward movement of soil moisture, and protecting it from the evaporating influences above. King found, by pot experiments in black marsh soil, that a one-inch mulch of loose, dry soil, saved at the rate of 233 tons of water per acre in 100 days; a two-inch mulch saved 318 tons; a three-inch mulch 331.6 tons, and a four-inch mulch 335.5 tons. In sandy loam, the saving was, for the several depths of mulch above mentioned, 367.8 tons, 402.2 tons, 454 tons, and 426 tons, respectively; and, on virgin clay loam, the quantities thus economized were, 1,154 tons by an inch mulch, 1,434.3 tons by a two-inch mulch, 1,525.8 tons by a three-inch mulch, and 1,630.1 tons of water per acre by a four-inch mulch.

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While, in practical field work, the saving would probably not be as great as in the pot experiments, the figures are very striking, and demonstrate to thinking farmers the great possibilities of subsoil irrigation of growing crops by means of a mulch of loose earth. The looser and drier it is, the more effective; and a consideration of the many factors bearing on the case, which space forbids treatment in this article, indicates the wisdom of frequent deep cultivation in the early part of the growing season, gradually shallowing toward the latter part of the season, as the feeding roots multiply near the surface, while the foliage more completely shades the ground. The time to cultivate is as soon after each rain as the ground has reached a nice crumbly condition, so that it may be broken up into a loose, dry surface mulch—the looser and drier, the better. With thorough surface cultivation, a fair crop of fodder corn could be grown on loam soil, without any rain after planting time.

Exploring One's Ignorance.

"Why, I can learn every year," an elderly man was once heard to ejaculate, in a spasm of open-minded humility, as someone showed him a new wrinkle in doing a familiar turn of work. Presumably, he meant that he could learn about one new thing a year. Needless to say, he was not a well-educated or widely-informed man, else he would have said, "I can learn every day."

The men who regard their knowledge of any subject as self-sufficient, are usually the ones who know the least about it. They do not know enough to realize how little they know. They have never explored the depths and recesses of their own ignorance. They grope about with a dim lantern of light in a vast cave of unexplored and all-unsuspected treasures of knowledge, thinking, because they see as far as the light sheds, that they have penetrated to the outermost bounds of their particular spheres. It is hard to instruct such a person, since it is so difficult for him to realize that there is anything in his line left to learn. Let him once get interested in his subject or occupation, and begin reaching out for more knowledge, and he will find that each step leads to a wider zone beyond, and, from a state of self-satisfaction, he soon comes to despair of ever exhausting the store of knowledge, and makes up his mind that he will do well, indeed, if he learns a little about a very few things. And so far from being surprised at discovering one or two new points a year, he expects to learn a great many every day. This is the experience of observant, open-minded, studious readers and thinkers. The more they learn, the more they find there is to learn.

Visit the College Again.

The foregoing little homily has been suggested by the remark of an excursionist at the Ontario Agricultural College a year ago. He said he had been coming to Guelph on these annual excursions for eleven years, and every time he learned something new. He was wiser than some of his fellows. There are some who go once or twice, and think they have found out practically all there is to be seen or heard, when the truth is that it requires half a dozen visits to show one what a vast field there is to cover, and how much information remains to be gleaned. The fact of having visited one's nearest agricultural college before, is no adequate excuse for not going again. It were extreme pressure of work, indeed, that should justify a farmer in failing to take repeated advantage of the annual excursions, which not only furnish opportunity to see these institutions in their best attire, but to learn definite data from observation, conversation and talks given by the staff. At the Ontario College, for example, days might be profitably spent on the experimental plots, with reports and bulletins in hand, to say nothing of the live stock, dairy, poultry, horticultural and scientific departments, the library, laboratories, and all the rest. If by so doing, one can assimilate the results of some definite experiments, to substitute for the impressions and guesswork that have previously been