THE DAILY EXAMINER.

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CALENDAR FOR JANUARY, 1891.

MOON'S CHANGES.

Third Quarter, 3rd day, 5h., 59m, a.m, S
New Moon, 10th day, 11h., 12m., a.m., S
First Quarter, 17th day, 2h., 5m, a. m., W, below horizon.
Full Moon, 24th day, 8h., 13m., p. m., S E.

DAY	DAY OF WEEK	Sun rises	Sun sets	Moon rises	High wat'r	Days lenh
		h m	h m	after	after	h m
1	Thursday	7 49	4 18	10 50	2 27	8 29
2	Friday	49	19	11 53	3 10	30
3	Saturday	49	20	morn	4 3	31
4	Sunday	49	21	0 57	5 5	33
5	Monday	48	22	2 5	6 15	34
6	Tuesday	48	24	3 15	7 23	35
7	Wednesday	48	25	4 19	8 23	36
8	Thursday	48	26	5 44	9 17	38
9	Friday	48	27	6 55	10 7	39
10	Saturday	47	28	7 59	10 56	40
11	Sunday	47	29	8 50	11 40	42
12	Monday	47	31	9 30	morn	44
13	Tuesday	46	32	10 4	0 26	46
14	Wednesday	46	33	10 31	1 9	48
15	Thursday	45	34	10 39	1 53	50
16	Friday	45	36	11 17	2 40	52
17	Saturday	44	37	11 48	3 36	54
18	Sunday	43	39	aft 2	4 43	56
19	Monday	42	40	0 27	6 1	58
20	Tuesday	41	41	1 1	7 12	9 0
21	Wednesday	40	42	1 42	8 13	2
22	Thursday	39	44	2 29	9 3	4
23	Friday	38	45	3 24	9 47	7
24	Saturday	37	47	4 22	10 27	9
25	Sunday	36	48	5 29	11 5	12
26	Monday	35	50	6 35	11 38	14
27	Tuesday	34	51	7 32	aft 11	17
28	Wednesday	33	53	8 40	0 42	19
29	Thursday	32	54	9 42	1 14	22
30	Friday	31	55	10 45	1 48	25
31	Saturday	7 40	4 57	11 50	2 26	9 27

Agricultural Meeting

AT VERNON RIVER BRIDGE.

Large Gathering and Great Interest.

Professor Shuttleworth and His Pupil.

Soil Water in Its Relation to the Plant.

Plant Food and Constituents of the Soil Sold Off the Farm and Fed on the Farm.

THE DIFFERENCE

Some Questions and Answers

ANOTHER PROOF of renewed interest in operations on the farm, another evidence of a desire for improved methods of farming, was shown in the very large audience present in the hall at Vernon River Bridge on the evening of Friday last. The leading farmers of the district were present, accompanied by their sisters, cousins, aunts and sweethearts, and headed by their representative in the Provincial Legislature, George Forbes, Esq. Edward Grant, Esq., occupied the chair.

PROFESSOR SHUTTLEWORTH, at the beginning, referred to the instruction in agriculture which is being imparted at Prince of Wales College and Normal School, pointing out that the pupil-teachers, even the girls, will in future, as a result of the policy of the Government, be enabled to learn enough about the principles of agriculture to impart to their scholars of the future an interest in the noble work of the farm. Every man, he said, should know all about his own business; and the farmer should have a good idea of the materials, the constituents, of the soil upon which he operates, and from which his livelihood and his wealth are drawn. To this end, some knowledge of chemistry is necessary in order that the farmer may understand agricultural chemistry, and agricultural chemistry is needed in order that he may know what to apply to the land in order to obtain the best results. Those branches are consequently taught at the College. He was not without hope that a portion of the Live Stock Farm may ere long be used for the purposes of experiment, so that there may be illustrated practically that which is taught theoretically. Professor Shuttleworth then introduced his pupil, Mr. Malcolm McLean, who, after a few preliminary remarks, read the following paper upon,

"SOIL WATER AND ITS RELATION TO THE SOIL"

"We are all familiar with the fact, that in going down into a soil it is found to be moist, becoming more so the farther we proceed downwards, until at length we come to a bed of standing water. This water is called the 'ground water.' The chief source from which it (this water) comes is rain; so that ground water may be considered as an accumulation of rain. Besides the ground water, there is water mechanically held in the soil which is called soil water. In this paper we will consider chiefly the soil water in its relation to the plant. Those of you who had any experience in digging wells will perfectly understand the above remarks.

The ground water tends to seek the level of the sea; in wet weather it rises and in dry weather it lowers; so that when a well has run dry the ground water has sunk below the depth to which the well has been dug. There are two distinct movements of the soil water. One is a downward movement called *percolation*, and the other is a movement in all directions above the ground water called 'capillary movement.' This capillary movement is due to the mechanical attraction between the particles of the soil and the particles of water. The downward movement is chiefly caused by gravitation. In times of dry weather the capillary movement is upwards to moisten the dry surface soil. We see, therefore, that the particles and pores of a soil absorb and hold moisture, and also that these pores and particles suck up the ground water just as a lamp wick sucks up the oil and moistens the top of the wick.

And this movement is kept up by evaporation from the surface, either directly by the action of the sun or wind, or indirectly through the plants by transpiration. As long as evaporation and transpiration tend to dry the surface soil this capillary movement is incessant; and this motion may be greatly assisted by thorough cultivation of the soil, thus rendering it porous and mellow.

Having thus considered the different movements of the water in the soil, we may now proceed to notice what great purpose this water serves to the growing plant. Plant food is composed of two classes of substances, viz: those belonging to the class called colloids and those belonging to the class callod crystalloids. The former class of these substances is contained principally within the plant, and the latter is contained in the soil.

It has been found by different experiments that water is the best solvent known. This can be shown by the following experiment: "There were taken 100 pounds of pulverized rock; this was moistened with pure water, and allowed to stand for one week with the following result: that $\frac{1}{4}$ of 1 per cent. dissolved. This is equal to 10,000 pounds dissolved from the soil of one acre in surface and the depth of one foot.

The above shows the great dissolving action of pure water. Again, natural or impure water has a much greater dissolving action on soils than pure water has, owing chiefly to the presence of carbonic acid.

There is always more or less carbonic acid in the atmosphere. It results from the decay of animal and vegetable matter, from combustion, the breathing of animals, &c; from this it can readily be inferred that rain always contains a considerable amount of this gas.

We are now in a position to see what an important function the soil water performs.

We have stated that ground water may be considered as an accumulation of rain. But all the rain which comes to the earth does not go to form the ground-water; for we have shown that some of this water is mechanically held by the particles of the soil. This serves the important end of dissolving the available plant food contained in the soil. This food is in turn carried to the surface of the soil by the capillary movement of which we have been speaking, where it comes in contact with the roots of the plant. In order to describe how this food enters the roots of the plant, we must refer to a simple illustration which will very clearly show it: If we take a membranum sac, for instance an inflated bladder, fill this with brine and place it in a vessel containing water; the water will also diffuse through the membrane to mix with the brine. This is due to the mechanical attraction which the particles of the membrane have for the particles of water. Now, the roots of plants are composed of cells, which may be regarded as a collection of these sacs containing the brine. These cells are separated by membrane and contain a solution of plant food different to that which is contained in the soil. Therefore, this soluble plant food which has been brought in contact with the roots enters these cells in much the same way that the water enters the brine. When this soluble food enters the first cell, the solution in this cell becomes of a different character to that which is contained in the other cells; this again enters the next cell for the same reason that the water and brine mix with each other; and so the food is distributed throughout the entire plant. Such plants have the power of obtaining food from very dilute solutions. For example: seaweed collecting iodine from sea-water. In sea-water iodine exists in such a small quantity, that a chemical analysis in some cases fails to detect it; but in seaweed it exists to such an extent as to afford the chief source of iodine for medicinal purposes.

In temperate regions it may be laid down as a rule that rain water does not furnish sufficient moisture for the growing plant.

According to an experiment conducted by Lawes and Gilbert, it was found that a good crop of hay, wheat or barley required 700 tons of water to the acre during the growing season. This is equal to about seven inches in depth over the entire surface.

When we consider that of the yearly rainfall only a comparatively small proportion falls during the growing season; and again, that owing to evaporation, percolation, &c., the plant can directly utilize scarcely one-half of what does fall, the importance of the ground-water and good capillary conditions becomes very evident.

The total rainfall at P. E. Island in 1889 was 29 19 inches. Of this there fell during May, June, July and August, 8 57 inches. Now, allowing that a plant can directly utilize one-half of the rainfall, we find in this instance that the plant can utilize half of 8.57, or 4.28 inches. But we have stated that a good crop requires 7 inches. We may ask, where do the remaining 2.72 inches come from? The answer is obvious. It comes from the subsoil through capillary movement. As we have stated above, about one-half of the water which comes to the earth as rain, is carried away by evaporation from the surface of the land, and is therefore wasted.

It is therefore of the greatest importance that we should know how we can prevent, or at least greatly hinder, this loss of moisture.

Let us consider *mulching* as a means of preventing evaporation. A mulch is a covering laid upon the surface of the soil. This may consist of anything, such as straw, leaves, sawdust, chips or stones. The action of these bodies may be seen by turning over a log or stone which has been lying during the summer, anywhere; or, again, by examining the ground which has been covered by a thick coating of leaves. It is found in these cases that the ground underneath these coverings is moist, whilst land which has not been covered may be very dry. About 22 per cent. less moisture evaporates from a mulched soil than from a simliar soil which is not mulched. Again, in a mulched soil, the capillary movement of the soil-water may continue to the very surface, for here evaporation is prevented by the mulch; and the amount of moisture which would otherwise be wasted, is preserved, and can be directly utilized by the growing plant. Another good result from mulching is the preventing of rain from puddling on the surface of the soil, thus converting it into a crust, which is very injurious to plant-growth. Having thus considered the advantages to be gained by mulching a soil, we may now proceed to notice how this form of cultivation may be applied in practical work. Of course it would not be practicable to cover our fields with straw or leaves or any such substance; but this form of mulching may be very well supplied by summer cultivation or surface tillage. This consists in stirring and loosening the surface soil, as in hoeing, harrowing, etc.

This loosening of the surface soil manifestly increases evaporation from the part which is stirred; but, on the other hand, it hinders or lessens evaporation from the soil immediately underlying the loosened surface soil.

We see, therefore, that the action of surface cultivation is to preserve the moisture. This is of the greatest importance, when we consider that plants depend upon this moisture in times of dry weather.

Hence one great advantage to be gained by drilling crops, such as potatoes, corn, turnips, rape, etc., is that the surface soil between the drills may at intervals be loosened, and thus the moisture may be preserved.

With nearly all farmers the last mode of cultivation which is made use of is rolling. This is apparently the very opposite to surface tillage. Its action is to break the lumps and to compress the surface soil. As far as breaking and compressing the lumps is concerned, rolling is beneficial. But by this means the capillary movement of the water is restored to the very surface, where mere evaporation takes place,

Therefore the best practice, especially in light soils, is to roll firmly after seeding, and afterwards to harrow the surface. By this means moisture is brought in contact with the seed or with the roots of the plant, but evaporation is prevented by this stirring of the surface soil. A soil must be well cultivated for any root crops, such as turnips, carrots, mangels, etc. The roots of such plants tend to develope very rapidly while the plant is young; therefore it is of the utmost importance that the soil be sufficiently mellow to admit of the free growth of the roots in all directions, and also that it contain sufficient pore space to admit an abundance of air.

Under proper conditions of soil, roots naturally tend to grow downwards. As we have stated, their growth is very rapid. For example:—A barley plant, in the single leaf, may have roots about 10 inches in length. When the second leaf commences to unfold, the roots will have grown 20 inches long. When the plant is one month old, roots will have grown to the length of three feet.

This also applies to many other plants, as clover, buckwheat, peas, etc. Any impediment to the growth of the roots of a plant lessens the amount of the crop. The roots may be impeded in their growth by lumps or denseness in a soil; by crowding the plants, or by having too much wet in a soil. In order to procure the most favorable conditions for the growth of root plants, soils should be ploughed deeply in the fall; by the action of frost the lumps are broken, and in spring the particles of soil settle into a good mellow seed bed, yet sufficiently firm to support the growing plant.

Fall ploughing should be deep, in order that there should be a sufficient depth of soil loose enough for the roots to penetrate easily, and also a sufficient depth to hold enough moisture for the direct use of the plant.

Spring cultivation should always be shallow, because by the action of the sun and wind the newly-turned soil may be rendered dry and dusty to the depth to which it has been cultivated, and thus plant growth may be impeded by an insufficient supply of moisture.

I will now close my paper by making a brief summary of the most important points which we have noticed.

1st. The soil water disolves the available plant food contained in the soil, and brings it into a condition in which it can be directly used by the growing plant.

2nd. The roots of plants are composed of cells by which this soluble food enters and is distributed throughout the entire plant.

3rd. The amount of water which comes to the earth as rain is not sufficient for the growth of plants; and it is of the greatest importance that we should have the soil in such a condition that it can use this water to the very best advantage.

4th. Surface cultivation is necessary to the preservation of this moisture; and hence, where possible, crops should be planted in rows, in order that this mode of cultivation may be carried on between the rows.

5th. In the growth of root crops, a deep, mellow seed bed is required, in order that the roots of the plant may grow freely in all directions, and that there may be sufficient moisture, mechanically held in the neighborhood of the plant.

6th. Soils should be ploughed deeply in the fall, and exposed to the frost of winter in order to procure the most favorable conditions for the successful growth of plants.

7th. Spring cultivation should be shallow, because the soil is rendered dry to the depth to which it is cultivated.

(TO BE CONTINUED)

GOOD TIME COMING.

A GRAND SUPPER and ENTERTAINMENT, to be held at New Glasgow Hall, on TUESDAY, the 27th day of January, in aid of the new Presbyterian Church. Admission, 25 cents. Doors open at 6 o'clock.