

cotyledon, the process of germination is very similar, though with slight modifications. As in these the single cotyledon always remains under ground, and the caulicle or embryo stem bursts the seed-coats and sends out in two opposite directions the plumule and radicle, the latter producing a number of rootlets as the former ascends and develops its alternate leaves one above another.

Figures 6, 7 and 8, are representations of a grain of maize, in Figure 6, seen flatwise and cut through the middle, showing the embryo in the centre, surrounded by the abundant albumen; figure 7, the same cut through the middle in the opposite direction; and Figure 8, the embryo taken out whole: the thick mass is the single cotyledon; the narrow body partly enclosed by it is the plumule; and the little projection at the base is the very short radicle. Figures 9 and 10 show the germination and subsequent increase of the young cornplant. The process is the same in wheat and the other cereals, grasses, &c.; but maize being a grain of large size, forms a better example for ready examination.

The foregoing illustrations have been taken from an excellent work by Dr. Gray, entitled "Structural and Systematic Botany," which we cordially recommend to any who may wish to pursue this interesting study.

In dealing practically with seeds, our object is not always to promote germination; sometimes we wish to check this tendency, as when we wish to preserve the seeds for future use, or to transport them to a distance: and as we should naturally expect, the requisite conditions for retaining the seed in a dormant state are just the reverse of those we have been considering as favorable to germination. For the latter object we require moisture, heat and air; for the former we aim to keep the seeds dry, cool, and shut out from the access of air; with this end in view, it is often best to transport seeds in their own pods or seed vessels, which form excellent non-conductors of heat, and serve effectually to exclude the air. The importance of fresh seed in preference to old, will also be apparent. For the newer they are, the more readily they germinate; and though in some instances their vitality is retained for a very long period, in others the power of germinating is soon lost, and the seed dies.

A Lecture on Manures

Among the many useful institutions of modern times, farmers' clubs hold an important place, and contribute not a little to agricultural progress. It is to be regretted that there are not more of them, and more cordially supported amongst ourselves. Occasionally, however, we obtain very gratifying reports of their proceedings; and of this character are the accounts we have received of the Peel Farmers' Club, the meetings of which are often highly interesting and ably conducted. At one of these meetings, held in Brampton, an admirable lecture was delivered by Mr. McLellan, on the subject of manures. We have not space to publish the whole of this lecture, but the substance was as follows:—

By the term manure is meant anything that is applied to increase the fertility of the soil. The food of plants exists in two different conditions, namely, in a state of chemical and of physical combination, the latter only being soluble and available for the use of plants; and when the soil has become exhausted, it is necessary either to apply directly fresh soluble material or such agents as shall render the material already existing in the soil soluble, and capable of being absorbed by the roots. In considering the subject of manure, then, Mr. McLellan proposed, 1st, to notice the methods of rendering the elements of food already contained in the soil in an insoluble state, or in chemical combination, soluble and available to the roots of plants; and, 2nd, manuring by barnyard and artificial manures. We must confine ourselves, for the present, to the first only of these topics.

The principal agents by which the disintegration and decomposition of plant food are effected are water and carbonic acid. To speak first of the latter, this agent plays an important part in the process, and the practical problem for us to solve is, how to add carbonic acid to the soil. One means of effecting this object is by ploughing in green manures; for in the decay of all vegetable as well as animal matter carbonic acid is produced. It is by the addition of this chemical agent, which forms new and soluble compounds of what was before insoluble, and therefore useless to plants, that the ploughing in of buckwheat, and all green crops, proves beneficial.

It has been asked, how can the ploughing in of a crop of clover benefit the soil? For, it is said, the clover previously abstracted the elements of plant food from the soil on which it grew, and by ploughing it in we only restore what was abstracted—nothing is, therefore, gained in the process. To this we reply, that the condition in which the mineral elements are restored is one of perfect solubility, precisely fitted for the immediate nourishment of the succeeding crop. Moreover, the growing clover has obtained a large amount of carbon and oxygen from the atmosphere, and these elements, in the condition of carbonic acid, are given out in the process of decomposition, and thus impart to the soil a large additional amount of a most important chemical agent for supplying fresh food. Again, the benefits of clover do not stop here. It is an established fact that clover, peas, turnips, and some other crops, draw the principal portion of their food from the subsoil, and not from the arable soil, by means of their deep, penetrating roots. These crops, therefore, when ploughed in, supply to the arable soil a large amount of inorganic matter, fitted for plant food, which was derived from the deeper subsoil, and thus render the additional food available to such cereals as wheat and barley, whose root ramifications are very limited and superficial.

As a question of manure simply, Mr. McLellan contended that ploughing in clover was preferable to eating it off by cattle, and subsequently applying the barnyard manure; for by the former process nothing was lost, whereas by the latter a considerable portion of nutriment was abstracted, and only a portion returned in the cattle-droppings. As a question of profit, taking into consideration the increased value of the animals, the advantage might be on the side of stock-raising.

All fields intended for fallow should be seeded with clover, which was especially recommended as a green manure, without which, indeed, the lecturer did not think it possible to maintain the productiveness of a farm.

Another important matter requiring attention in connection with this subject was the thorough pulverization of the soil, without which, however rich the ground might be in plant food, it was entirely beyond the reach of the delicate root fibres, which would fail to penetrate the indurated masses of earth that, in this condition, were no better than so much rock or stone. Hence the necessity of thorough and well-timed ploughing and efficient harrowing. Hence, also, the great advantage of under-draining, whereby the superfluous water would be carried off, and the arable soil kept in a friable state. When land is under-drained, a large quantity of water falling upon it is a benefit rather than an injury; for as it permeates the ground it loosens both arable and subsoil, rendering them friable and porous, admitting air, and enabling the roots of plants to penetrate freely in all directions, and to a greater depth. And again, the water, in its passage, dissolves a considerable amount of nutritive matter, which is retained by the arable soil by virtue of an inherent quality thus to absorb the elements of plant food. The nutriment thus dissolved is not washed away, as the soluble ingredients of a manure-heap are washed away and wasted by rains, but are absorbed and retained in the soil.

In concluding this part of the subject, Mr. McLellan observed, that if farmers would turn their attention to under-draining, and to those things which aid in rendering the nutritive matter already contained in the soil soluble and available, they would find the fertility of their land increased, in a great many cases, much more than by the application of barnyard and artificial manures. We hope to give a report of the remaining portion of the lecture in another issue.

Flax Culture.

To the Editor of THE CANADA FARMER.

SIR,—It is now some time since you had a word from me on this important branch of industry; not because I do not still consider it as important as ever; but while farmers have been getting nearly \$2 a bushel for wheat they are not likely to give it so large a share of their attention. Having heard lately several complaints of Midge and Weevil, which I fear we are still to suffer from more or less until we adopt a more regular rotation of crops, flax recommends itself to the attention of the agriculturist as one of the many remedies we have to fall back upon. And although we have had some little drawbacks this last year in quarters where we least expected, still others are taking the matter up in other sections of the country; and if our acres, under all these circumstances, are not on the increase, we certainly are holding our own. In the township of Mono, *one farmer alone, the Rev. Doctor Freeland*, who thoroughly understands the cultivation of flax from many years' experience in the old country, has no less than fifty acres under crop this season, and from him I learned, the other day, that it looked remarkably well. At St. Mary's and several other places the quantity is on the increase.

While some have been unsuccessful in their efforts, from perhaps having extended their operations a little too widely, it *must not be forgotten that this may happen in flax operations as well as in any other branch of business*. Those who have purchased largely of both wheat and flour may be unsuccessful in their operations, as well as those who may have gone too deeply into the flax business—we must always be prepared for such drawbacks; but to the farmers I would say, there can be no risk in their trying a few acres, say from two to three on each hundred. For seed alone they will find it compare favourably, as a paying crop, with most others. By referring to a letter in a former number of your paper, it will be seen that a farmer near Woodstock realised over twenty-one bushels to the acre from the sowing of only 50 lbs. of seed. At an average of \$2 per bushel, the current price the last season, this yield would net him over \$40 per acre, without looking to the fibre which produced this fine crop, and should, if properly cared for, have realised at least an equal amount. However, we have yet much to learn in connection with this new crop, and it may not be amiss to mention here, to those who have not a scutching mill within easy distance of say ten miles or so, that they would find it to their advantage to try this crop, if even for the seed alone; but there is a simple process by which they could turn the straw to account, if they will only take the trouble. After the seed is taken off, which can be most readily done by passing the flax through a thrashing mill like wheat or any other grain, let the straw be taken to the meadow and spread on the grass, say ten or twelve days, and it will be prepared for putting through a simple brake, which will make it fit for the upholsterer, and will bring from \$25 to \$30 per ton. There is little labour required, and it will be found to pay much better than making manure of it, like other straw. Several samples have been brought to my office measuring from 3½ to 4 feet long; but in all cases I find the farmers are too late in getting it in the ground. A small piece of my own growing this year, which I sowed on the first of April, on a piece of light sandy ground, is now over 3½ feet long, well covered with seed, and I have no doubt it will turn out from 2½ to 3 tons to the acre. I must again remind the portion of the farming community who have not yet given this new crop their attention, that while we boast of ten or fifteen thousand acres, we must turn out more in the New Dominion another year; this breadth is only about a sixth of one of our finest townships, and therefore there is plenty of room to make the trial.

It will be seen by the papers, a few days ago, that samples sent to the Paris Exhibition have gained a fair share of attention, this too in the midst of other fine flax-growing countries, such as Belgium, Finland and France herself; therefore we need not hesitate to go on and increase our number of acres.

JOHN A. DONALDSON.

Toronto, July 22, 1867.