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Nec aranearum sane textus ideo melior, quia ex se fila gignunt, nec noster vilior quia ex alienis libamus ut apes.

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LECTURE

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ON THE ADVANTAGES OF A KNOWLEDGE OF CHEMISTRY TO THE FARMER.

By the Rev. William Henderson.

Concluded.

Again, lime is useful as a manure, but if left too thick in any place, or not properly mixed with the soil, it will burn up and destroy the vegetation, till neutralized by combination with other substances.

Potash likewise is useful as a fertilizer, and as it abounds in the ashes of hardwood, these form an excellent manure. Last summer, however, I was in a garden, where hardwood ashes had been spread very thickly over beds of onions, carrots, and other garden seeds, in the hope of their raising a luxuriant crop, but the result was that not a single plant appeared, the alkali having been applied in such a quantity as to burn up and destroy all vegetable life.

The oxides of iron, when found in any considerable quantity in any soil, have a noxious effect, destroying vegetation. These oxides often exist in the subsoil, or where there is a hard pan of gravel mixed with clay under the soil. In this case, if the soil is shallow, vegetation decays when the roots strike down into the subsoil. Professor Johnstone mentions a curious fact, observed in the east of Fifeshire in Scotland, where the beans and oats, which look well up to April or May, often blacken and fail in June and July, on account of their roots then getting down into the ochrey subsoil, whence there is a local saying, when this happens, that "the beans or oats have gone to Auchtermuchty," a fair being held there about the time when the beans usually begin to fail.

But again, as vegetables and grains take out of the soil those substances which enter into their composition, so, if the same crops were often repeated on the same soil, the substances necessary for the nourishment of these crops would become exhausted, unless means could be employed for restoring the substances that are taken away. The means employed for this purpose is the putting on of manure.

Now as Chemistry teaches to analyse the vegetable productions of the soil, as well as the soil itself, so it also enables the farmer to obtain an acquaintance with the component parts of the different manures which he employs.

Different kinds of manure contain different kinds of simple substances, or different proportions of these substances. One kind of manure will answer better with one kind of soil than another. Some kinds of manure will answer better with some kinds of crops than with others.

The object of manuring land is to supply to it those substances in which it is deficient, but which are necessary to the successful raising of any particular kind of crop. When, therefore, chemical analysis has ascertained the substances which are deficient in the soil, and the proportion in which they are deficient, the same scientific knowledge will point out a manure, or composition of manures, adequate to supply the substances which are wanting to render the soil productive. By a mixture of different kinds of soils, by the application of stable manure, by putting on lime, or bone dust, or guano, by the burning of wood, and the ploughing in of the ashes produced, the richness of soils may be greatly increased, and consequently their fertility greatly improved.

Very great, then, are the advantages which the practical farmer would derive from a knowledge of Chemistry. Though experience

teaches him many of the lessons which Chemistry now reveals, yet a knowledge of the science would give him a certainty in his proceedings in all instances, and direct him in many instances to the use of means, which, without a knowledge of Chemistry, he could not have found out. And here I beg leave to introduce a quotation on this subject from Sir Humphry Davy's first lecture delivered before the Board of Agriculture in England:—

"If land be unproductive, and a system of ameliorating it is to be attempted, the sure method of obtaining the object is by determining the cause of its sterility, which must necessarily depend upon some defect in the constitution of the soil, which may be easily discovered by chemical analysis. Some lands of good apparent texture, are yet sterile in a high degree; and common observation, and common practice afford no means of ascertaining the cause, or of removing the effect. The application of chemical tests in such cases is obvious; for the soil must contain some noxious principle, which may be easily discovered, and probably easily destroyed.

"Are any of the salts of iron present? They may be decomposed by lime. Is there an excess of siliceous sand? The system of improvement must depend on the application of clay and calcareous matter. Is there a defect of calcareous matter? The remedy is obvious. (Lime must be put on.) Is an excess of vegetable matter indicated? It may be removed by liming, paring, and burning. Is there a deficiency of vegetable matter? It is to be supplied by manure.

"A question concerning the different kinds of limestone to be employed in cultivation often occurs. To determine this fully in the common way of experience, would demand a considerable time, perhaps some years, and trials which might be injurious to crops; but by simple chemical tests, the nature of a limestone is discovered in a few minutes; and the fitness of its application, whether as a manure for different soils, or as a cement, determined.

"Peat earth of a certain consistency and composition is an excellent manure; but there are some varieties of peats which contain so large a quantity of ferruginous matter, as to be absolutely poisonous to plants. Nothing can be more simple than the chemical operation for determining the nature, and the probable uses of a substance of this kind.

"There has been no question on which more difference of opinion has existed, than that of the state in which manure ought to be ploughed into the land; whether recent, or when it has gone through the process of fermentation? but whoever will refer to the simplest principles of Chemistry, cannot entertain a doubt on the subject. As soon as the dung begins to decompose, it throws off its volatile parts, which are the most valuable, and most efficient. Dung which has fermented, so as to become a mere soft cohesive mass, has generally lost from one-third to one-half of its most useful constituent elements. It evidently should be applied as soon as fermentation begins, that it may exert its full action upon the plant, and lose none of its nutritive powers."

These instances are surely sufficient to show that the practical farmer would derive a very great advantage from possessing a knowledge of the principles of Agricultural Chemistry; and therefore every facility should be afforded, and every encouragement given them, to attain such knowledge.

There is, however, one obstruction to the introduction of chemical researches among our farmers, which, if it could not be removed, would prove fatal to any recommendation which might be given on this subject. It is this. The instruments necessary, and the different chemical agents and re-agents required for conducting a course of experiments on the subjects which come within a farmer's practice, would cost a sum far beyond the reach of the great majority of our farmers; and some of the operations can be successfully performed only by those who are possessed of plenty of leisure, and have had long and careful training in the laboratory.

Now, to this we reply, that the practical farmer does not require himself to perform any of those complicated and tedious operations, which require much time, much practice, and an expensive apparatus. For all those substances whose combination is the same in all circumstances he does not require to enter into any chemical analysis. A knowledge of the results of the investigations of

chemists already established is sufficient for him, without seeking to perform the operations himself. Hence he can dispense altogether with the difficult operations required for ascertaining the composition of the various crops, which he raises from his fields; for the oats, the wheat, the potatoes, and the turnips, that are raised in the fields of Scotland or England, France or Germany, are the same in their constituent parts as those which grow in the fields of New Brunswick, and hence he can avail himself of the researches which have already been made by Johnstone and Shier, de Sasseure, Boussingault, Payen, or Liebig, without troubling himself with the operations by which these results were obtained.

Again, the qualities and uses of all the different kinds of manures, which the farmer has to apply to his lands, have already been investigated by eminent chemists, and he has only to study their works in order to obtain all the information which he requires on this head.

The chemical operations necessary for the practical farmer to perform are therefore few and the means of obtaining information sufficient to guide him are simple and easy. Though the quantitative analysis of soils, or the ascertaining of the exact quantity of ingredients which enter into the composition of each soil, may be beyond his reach, yet the quantitative analysis, or the ascertaining whether the necessary ingredients to constitute fertility be present, or whether any noxious substance be mixed up with the soil, is easy. It requires only to see whether the soil will burn when heated, what weight it loses when burnt, and whether it effervesces or changes color when an acid is poured upon it.

By a few simple and easy experiments, and by studying the writings of Agricultural Chemists, a very great amount of information might soon be acquired by the practical farmer, which he would find exceedingly advantageous.

But though Chemistry can furnish much important instruction to the farmer, it cannot overcome all the difficulties that he has to contend with, nor always ensure to him a bountiful crop.

There are some soils so deficient in the elements necessary to constitute a fertile soil, that the expense of supplying these materials would never be repaid by their produce; Chemistry would teach the farmer to leave these and go and look for a richer and better soil. There are others containing noxious ingredients which it would require an extent of labour and expense to remove, that would be ruinous to the farmer. Concerning these Chemistry would only say, You will find elsewhere a more profitable soil, on which to expend your labor and your money.

But even on good soils the farmer cannot always be sure of an abundant crop. The growth of vegetables is carried on by chemical processes, but most chemical operations require certain conditions in order to ensure their success. The ingredients must be employed in a certain proportion, and they must be brought to a certain temperature. In performing his experiments in the laboratory, the chemist can employ his weights and scales, his measures and pipettes, and thus can adjust the quantity of his materials to the thousandth part of a grain, or a single drop of liquid; he can, by his spirit-lamp or his furnace, produce the heat he requires to the nicety of a degree; and yet he will sometimes fail in performing his experiments. But in the fields of nature, the farmer has not the same power of adjusting the quantity of moisture or of heat at his pleasure. He can neither cause the sun to shine nor the rain to fall when and where he pleases, but must leave the disposal of this to the Father of lights, from whom cometh down every good and perfect gift. But such is the riches of our Heavenly Father's goodness, that even

the multitudes of our iniquities cannot stop up the full fountain of his mercy, but he continues still to give us rain from heaven and fruitful seasons, filling men's hearts with food and gladness: or if he does at times, to punish men for their transgressions, and to teach them their dependence upon Him, withdraw the bounties of his Providence, and disappoint their expectations, yet it is but seldom that such afflictive dispensations are sent. The general rule of God's Providence is, that when men go about their work with diligence, prudence, and a humble dependence on the Divine blessing, they seldom fail to realize a bountiful return for their labour.

Without a skilful application of labour, however, the husbandman cannot expect to reap an abundant harvest. Ever since Adam was expelled from Paradise, men have been appointed to eat their bread in the sweat of their brow: and the law under the New Testament dispensation is, that if any will not work, while they have the ability for doing so, neither should they eat.

Providence has bestowed on us here a fertile soil, and a healthful climate, and if we are not wanting to ourselves, the Province may soon become flourishing and happy. Indolence, and extravagance, and ignorance will lead to poverty and wretchedness in any place; while industry, economy, and attention will generally secure independence and comfort.

HINTS TO LOVERS OF FLOWERS.

A most beautiful and easily-attained show of evergreens may be had by a very simple plan, which has been found to answer remarkably well on a small scale. If geranium branches taken from luxuriant and healthy trees, just before the winter sets in, be cut as for slips, and immersed in soap-water, they will, after drooping for a few days, shed their leaves, put forth fresh ones, and continue in the finest vigor all the winter. By placing a number of bottles thus filled in a flower basket, with moss to conceal the bottles, a show of evergreens is easily insured for the whole season. They require no fresh water.

TO MILK COWS.

A cow should be milked *clean*. Not a drop if it can be avoided, should be left in the udder. It has been proved that the half-pint that comes out *last*, has *twelve times*, I think it is, as much butter in it, as the half pint that comes out *first*. The udder would seem to be a sort of milk-pan in which the cream is uppermost, and of course, comes out last, seeing that the outlet is at the bottom. But, besides this, if you do not milk clean, the cow will give less and less milk, and will become dry much sooner than she ought.—*Cobbett*.

FUEL.

An association in Dorsetshire, England, for the improvement of the condition of the working classes, recommends the following mode of saving the consumption of fuel in poor families:—

Take three or four pounds of chalk in lumps, not above half-a-pound each. Make a clear fire of coals, and place the lumps of chalk in the grate, or on the hearth, just as coal is laid. The chalk becomes red hot, so as to be scarcely distinguishable from burning cinders. A few ashes or small coal thrown lightly on from time to time, will keep up a clear bright fire all day. The same chalk may be used three or four days, when it becomes lime, and excellent as manure for gardens or allotments, or for whitewashing. Half-a-peck of coal used thus with chalk, and properly managed, will give a large, capital fire for fourteen or fifteen hours. The saving in coals is about one-half. In grates the chalk should be kept behind, and coals in front; because chalk will not burn unless it has coal or heat on all sides of it. In selecting the chalk, the whitest and softest should be taken.