

other things, and thereby reduce its quantity. This is what is meant by *exhausting* the soil. If rye-grass is the plant used, it will exhaust the soil generally, because it does not take away a great portion of any one of the substances. In the same way, different crops make the soil poor; but if I take the same crop say fifteen or twenty times—a practice which, as is well known to the most of you, existed not many years ago—the soil would by that time produce no crop at all.

The land then may be exhausted in two ways—generally of all the substances, and especially, of particular substances; and from this circumstance we are enabled again to make two or three practical deductions.

In the first place, inasmuch as the soil contains a limited quantity of these substances, and inasmuch as different crops carry off different portions, you at once see why it is judicious to have a rotation of crops. A soil may produce one crop abundantly when it cannot produce another.

Let us next inquire why land is manured. It is obvious that manure is applied to restore those things which are wholly or comparatively wanting. Chemistry tells practical men how to renew their exhausted soil. Suppose that fifteen crops of oats have been taken off a piece of land, then it will have lost a large quantity of lime, phosphoric acid, and potash, and in order to restore it, you must supply the soil with these ingredients of which it has been robbed. Manure from cattle being composed of the remains of vegetables taken off the land, and containing all these things of which plants consist, the farmer, generally speaking, is enabled by its application, to retain the fertility of the soil. But then, observe you, he adds all the things which are required for a fertile soil, and may apply too much of one substance, and not enough of another, which the land requires for a particular crop. Now, guided by chemical knowledge, he would be able, by other means, to provide for his land. If the farmer knows chemistry, he will, at far less cost, and far more effectually, secure good crops.

I come next to the organic part of the plant. You observe, when I take this flour dough, and wash it in water, it diminishes in bulk, and the water becomes milky. The portion that remains, for it will not all wash away, is a sticky substance, and this is called gluten. If the water is allowed to stand a short time, the white will fall to the bottom and form starch. The flour is thus easily separated into two parts, the starch and gluten. Wheat contains gluten to the extent of from ten to thirteen per cent; meadow hay, forty per cent. of starch. Of fat, (oil) wheat contains from two to four per cent; oats, six per cent.; Indian corn, nine per cent., and meadow hay, from two to five per cent. Thus the organic part of vegetable matter contains gluten, starch and fat.

I shall now make a few observations on the composition of animals. Of what does the ash of animals consist? The body is composed of various parts—of muscles, fat, and bone, and other elements which I need not detail. If we examine the composition of the muscle, we shall find that it contains 2.5 per cent. of phosphate of lime, and a third per cent. of other saline matters. In bones you do not have all the substances which exist in wheat, but you have some of them, such as lime, magnesia, &c. In ten gallons of milk, there is three-fourths of a pound of saline matter; so that if you take the composition of the muscle, of the bone, and of the milk together, you will find that animals contain the different substances which are to be found in the soil. Thus it is we learn the intimate connexion between the composition of the inorganic matter of the plant, of the animal, and of the soil.

But where does the animal get this inorganic matter? From the plants on which it feeds. In bone, six-tenths of the whole consists of phosphate of lime and magnesia. Now an animal could not support itself or walk about without some bone or firm substance to uphold it. It feeds upon herbage to obtain the different substances of which it is made up. But if the plant had no soda or magnesia, the bone could not be built up, no more than the walls of this house could be made without lime, stone and other substances. It is necessary then, that the plant

should have all these substances, in order to supply them to the animal. And where does the plant get these substances? It gets them from the soil; nor can a plant live without them. And here we have a beautiful example of the provisions of nature, for a plant cannot grow, unless it can acquire those elements—or, indeed, if it did live, it might deck the earth, but it would be useless for food for animals, which is the great purpose of its creation.

Some animals lay on fat very abundantly, and some, like myself, lay it on very sparingly. If you have an animal inclined to fatten, and you wish to fatten him, feed him with Indian corn.

There is an important difference between the composition of the vegetable and that of the animal. In the former there is gluten, starch, and fat only. The lungs of the animal are a sort of carbonic acid manufacturers. The starch which the animal throws off to the air, the plant sucks in: in this the leaves are continually employed—perpetually sucking in, with their thousand little mouths, the carbonic acid. The lungs of animals might suck in the same as plants do, but such is not the order of nature, and it falls to the plant to supply the deficiency.

You all know that every part of our body is continually undergoing a change, and that a certain quantity of gluten must be eaten every day to supply it; it is the same with young animals; they require an extra supply of the elements of muscle and bone.

Animals reject in dung and urine a great many substances, and as the plants contain substances which are soluble in water, it is of great consequence to take care of the liquid excrements, and to mix it with the solid, so that the whole the animal ate may be preserved, which being applied to the soil, it is provided with the same substances almost for ever. If you allow the liquid to run into the river, or pond, you deprive the land of what the plant gets from the soil, and which the animal gets from the plant. When the animal dies, all those things which it got is returned to the soil, and thus the same revolution goes on from the soil to the plant, and from the plant to the animals.

These are some of the points, gentlemen, by relating which I hoped to interest you, and which demonstrate the over-ruling presence of One mind, directing practical operations to the same end. If there was not the same Spirit pervading the nature of the soil, the plants, and the animals, there would be some confusion; but there is manifested the presence of One mind and of one principle, directing the whole cycle of animal and vegetable life, as there is to be seen in all the cycles and motions of the planetary bodies.

BURLINGTON AGRICULTURAL SHOW.—The annual show of stock and implements before the members and friends of the Burlington Agricultural Society took place at that town on Wednesday last, under circumstances as auspicious as could have been wished. The weather was fine, the exhibition generally good, particularly as regards the sheep and short-horned cattle; the attendance of visitors numerous and highly respectable (including all the influential land-owners and agriculturists of the district), and the after proceedings of the day of that spirited and exhilarating character which is alone sufficient to ensure success to the Burlington Agricultural Association.—*Doncaster paper.*

THE LARLAND HORSE.—This animal, according to Bengener, is small, but active and willing—somewhat eager and impatient, but free from vice. He is used only in the winter season, when he is employed in drawing sledges over the snow, and transporting wood, forage, and other necessaries, which in the summer are all conveyed in boats. During the summer these horses are turned into the forests, where they form themselves into distinct troops, and select certain districts from which they rarely wander. They return of their own accord when the seasons begins to change, and the forests no longer supply them with food.—*Youatt on the Breed of Horses.*