

USE AND PREPARATION OF THE FOOD OF VEGETABLES.

To understand the process of nature by which certain elements of earth, air, and water are transformed into living plants, and the best method of preparing these elements so as to produce the largest crops at the least expense, are objects worthy of the careful and profound study of every cultivator of the soil.

If we take 100 pounds of ripe hay, oats, wheat, or corn, including the roots, stems, and seed, and burn them carefully in the open air, we shall have only about 3 per cent. of alkaline earths left, most of which can be dissolved in water. If we burn a pound of oil, whether animal or vegetable, the whole of these substances (which are truly "the fat of the land" will be transformed into visible air and vapor. The atmosphere and water are nature's great storehouse for the serving an exhaustless supply of vegetable food. By *respiration*, *fermentation*, and *rotting*, all organic structures are transformed into gases and soluble salts. It is from the lime dissolved in the ocean that the oyster elaborates its shell, and the coral insect rears its massive mountains of coral rock. It is mainly from the phosphate of lime held in solution in its mother's milk, taken from her food, that the sucking calf elaborates its solid bone. Without lime to be dissolved in her gastric juices, and taken into her circulating blood, the hen can make no solid shell to her egg. The un-nursed infants in the great cities of London and Paris, brought up without milk, and fed on arrow-root and other food that contains little or no lime, have soft, cartilaginous, rickety bones, simply because neither animals nor plants can make *something* from *nothing*.

As a general rule it is strictly true, and moreover it is a truth of great practical importance, that a feeble, diseased stem in wheat, liable to rust, &c., and a shrunken berry, are owing to some removable defect in the food of the plant. So different are the essential elements of the seed of this plant from those of its straw, that it is practicable to raise wheat that will yield twice as much grain in weight as there is weight of straw, taking it from the root. That it is also practicable to grow wheat which will give five times as much straw as grain, most farmers know by sad experience.

It is more than twenty years since I first began to use pulverized charcoal to absorb the gases given off by decomposing vegetable and animal matter, urine, and the like, to be applied to garden and field crops. Its value in correcting the taint in meat, and purifying rain-water in filtering-cisterns, led me to believe that it would be just the thing to absorb the food of plants from the atmosphere, into which so much passes, and hold it about their roots in a condition that neither dew, rain, snow, frost, nor the heat of the sun, would injure it or take it away. To labor hard to save and draw out manure on to one's fields, and then lose 60 or 80 per cent. of this vegetable food by its solution in water, and washing away to form something like the Genesee flats in the bottom of Lake Erie, I never regarded as very good economy—which, by the way, is the soul of good husbandry.

The direct application of urine to the soil, after the German practice, is bad economy, unless the soil con-

tain a large portion of humus or vegetable mold, for its tenacious retention. It is a better plan to have a reservoir filled with pounded charcoal under the stable floor, or near to the stable, into which the liquid excretions of all animals should be conducted like cider from the press. When nearly, or quite saturated with urine, this coal will be manure of extraordinary power and durability—for nothing in the soil, but the roots of growing plants, will be likely to extract a particle of this vegetable food.

After wheat, corn, or grass has taken up all this nourishment, the coal (unlike lime, which has parted with its carbonic acid in the same way) is insoluble in water, and remains, as in a filtering cistern, to absorb and hold, for the benefit of the growing plant, more vegetable food from every rain that falls to the earth. For be it remembered, that dew, rain, and snow—the poor man's manure, bring back to the earth all the gaseous elements given off by all the fires, respiration, and other decomposition of solid and liquid matter.

For the same reason, coal should be largely used in the formation of compost heaps. And where the farmer has straw which he can use to make beds for his horses and cattle in the stable, this, with a quantity of coal pounded with a flail, can be spread upon the stable floor, to absorb all liquid excretions. All these excrementitious substances should be kept under shelter. Wood ashes, lime, and muck, or vegetable mold, are valuable ingredients in all compost heaps. The coal stratum should be placed between the lime and the manure, and the whole should be covered with turf or more coal.

The analysis of soils abounding in fragments of limestone rocks shows a marked deficiency of this important element in their composition. The reason of this perhaps unexpected deficiency I will now explain:

Disintegrated limestone is decomposed by the vital action of plants, and its carbonic acid is taken up by their roots. It will then combine with more of this gas which abounds in the air and soil, and will again give it out to growing vegetables. It is in this way that plaster (sulphate of lime) after it has parted with its oil of vitriol, often produces such wonderful effects, although the amount applied is less than one forty thousandth part of the soil from which plants draw their nourishment. The action of the sulphuric acid, as I understand the matter, I will not stop to elucidate. But I wish to fix public attention upon the circumstance, that when lime in the soil has parted with its acid, whether sulphuric or carbonic, and especially the latter, it is soluble in water, and hence very liable to be washed out of the soil by rains, &c. All water that has passed through a soil possessing sufficient lime to be good wheat land, is *hard*, or holds lime in solution of which it has robbed the soil. The same is true, in a less degree, with regard to teaching of the soil and its loss of allumina, potash, and soda. The cultivation of the earth, without allowing any vegetables to grow upon it, would exhaust its fertility very rapidly.

The remedy for this is, to cultivate less land in grain crops, and cultivate it far better; to remove all excess of water by draining; to plough deep, and turn up to the sun virgin earth from below, and apply