said contain, and what are the components of the substances used as manure? Until these points are satisfactorily determined, a rational system of Agriculture cannot exist. The power and knowledge of the physiologist, of the Agriculturalist, and Chemist, must be united for the complete solution of these questions; and, in order to attain this end, a commencement must be made.

The general object of agriculture is to produce in the most advantageous manner certain qualities, or a maximum size, in certain parts or organs of particular plants. Now, this object can be attained only by the application of those substances which we know to be indispensable to the developement of these parts or organs, or by supplying the conditions necessary to the production of the qualities desired.

The rules of a rational system of agriculture, should enable us, therefore, to give each plant that which it requires for the attainment of the object in view.

The *special* object of agriculture is to obtain an abnormal developement and production of certain parts of plants, or of certain vegetable matters, which are employed as food for man and animals, or for the purpose of industry The means employed for effecting these two purposes are very different. Thus the mode of culture, employed for the purpose of procuring fine pliable straw for Florentine hats, is the very opposite of that which must be adopted in order to produce a maximum of corn from the same plant. Peculiar methods must be used for the production of nitrogen in the seeds, others for giving strength and solidity to the straw, and others, again must be followed when we wish to give such strength and solidity to the straw as will enable it to bear the weight of the ears.

We must proceed in the culture of plants in precisely the same manner as we do in the fattening of animals. The flesh of the Stag and Roe, or of wild animals in general is quite devoid of fat, like the muscular flesh of the Arab, or it contains only small quantities of it. The production of flesh and fat may be artificially increased; all domestic animals for example, contain much fat. We give food to animals, which increase the activity of certain organs, and is itself capable of being transformed into fat. We add to the quantity of food, or we lessen the process of respiration and perspiration by preventing motion. The condition necessary to effect this purpose in Birds. are different from those in quadrupeds; and it is well known that charcoal powder produces such an excessive growth of the liver of a goose, as at length causes the death of the animal.

The increase or diminution of the vital activity of vegetables, depends only on heat and solar light, which we have not arbitrarily at our disposal; all that we can do is to supply those substances which are adapted for assimulation by the power already present in the organs of the plant. But what then are the substances? They may easily be detected by the examination of a soil, which is always fertile in given cosmical and atmospheric conditions; for it is evident, that the knowledge of its state and composition must enable us to discover the circumstances under which a sterile soil may be rendered fertile. It is the duty of the chemist to explain the composition of a fertile soil but the discovery of its proper state or condition, belongs to the agriculturalist; our present business lies only with the former."

Again, the same author observes:—

"Experience has shown in agriculture, that wheat should not be cultivated after wheat on the same soil, for it belongs, with tobacco to the plants which exhaust a soil. But if the humours of a soil gives it the power of producing corn, how happens it that wheat does not thrive in many parts of Brazil, where the soils are particularly rich in this substance, or in our own climate, in soils formed of mouldered wood, that its stalks under these circumstances, attains no strength, and droops prematurely! The cause is this, that the strength of the stalk is due to silicate of potash, and that the corn requires phosphate of magnesia, neither of which substances a soil of humus can afford since it does not contain them; the plant may, indeed, under such circumstances, become an herb, but will not bear good fruit.

Again, how does it happen that wheat does not flourish on a sandy soil, and that a calcarious soil is also unsuitable for its growth, unless of clay? It is because these soils do not contain alkalies in sufficient quantity, the growth of wheat being arrested by this circumstance even should all other substances be present in abundance.

It is not mere accident that trees of the fir tribe grow on the sand stone and limestone of the Carpathian mountains and the Java, whilst we find on soils of greiss, mica state, and granate in Bavaria, of clinkstone on the Rhone, of basalt in Vogelsberge, and of clay—slate on the Rhine and Eifel, the finest forests of other trees, which cannot be produced on the sandy or calcarious soils upon which pines thrive. It is explained by the fact that trees, the leaves of which are renewed annually, requires for their leaves six or ten times more alkalies than the fir-tree or pine, and hence when they are placed in soils in which alkalies are contained in very small quantity, do not attain maturity. When we see such trees growing on a sandy or calcarious soil—the red-beech, the service-tree, and the wild-cherry for example, thriving luxuriantly on limestone, we may be assured that alkalies are present in the soil, for they are necessary to their existence. Can we, then, regard it as remarkable that such trees should thrive in America, on those spots on which forests of pines which have grown and collected alkalies for centuries, have been burnt and to which the alkalies are thus at once restored.

Wheat will not grow on a soil which has produced wormwood, and, *vice versa*, wormwood does not thrive where wheat has grown, because they are mutually prejudicial by appropriating the alkalies of the soil.

One hundred parts of the stalks of wheat yield 15½ parts of ashes; the same quantity of stalks of barley 8½ parts; and one hundred parts of the stalks of oats, only 4½; the ashes of all these are of the same composition."

We have in these facts, a clear proof of what plants require for their growth. Upon the same field which will yield only one harvest of wheat.

The fallow-time, is that period of culture during which land is exposed to a progressive disintegration, by means of the influence of the atmosphere, for the purpose of rendering a certain quantity of alkalies capable of being appropriated by plants.

Now, it is evident that the careful tilling of fallow-land, must increase and accelerate the disintegration. Many plants in the family of the *Leguminosar* are remarkable on account of the small quantity of alkalies or salts in general, which they contain; the Windsor bean, for example, contains no free alkalies, and not one per cent. of the phosphates of lime and magnesia. The bean of the kidney-bean only ¾ per cent., that of the lentil ½ per cent. of phosphate of lime with albumen. Buck-wheat dried in the sun, yields only about ¾ per cent. of ashes, of which, a small part are soluble salts. These plants belong to those which are termed fallow-crops, and the cause wherefore they do not exercise any injurious influence on corn which is cultivated immediately after them is, that they do not extract the alkalies of the soil and only a very small quantity of phosphates."

(*To be Continued*).

We have always thought it bad management for Farmers, to sell any part of the wood-ashes made upon their farms, either in the field or in the house. There cannot exist a doubt, that wood-ashes is the most *valuable manure* that can be made upon a farm. In clearing new land, the produce of the soil for centuries, is cut down, burned, and the ashes produced from this burning converted into potash and sold. It does not require any argument, to prove that this must be robbing the soil of its most valuable qualities, and the ingredients that are essentially necessary to its producing subsequently, profitable crops of wheat or other grain. From our own experience, we are persuaded that wood-ashes are much better adapted to the production of wheat, than farm-yard manure. The latter may produce a crop of wheat that will have a luxuriant appearance but the straw will not be strong, and it will be more liable to disease, than a crop of wheat grown on land dressed with wood-ashes, or lime of alkalies are essentially necessary to be present in sufficient quantity in soils, that they may produce profitable crops of wheat. Who is it that takes the trouble in preparing land for wheat, to ascertain the composition of the soil, or to impart to it, the qualities that are required to cause it to grow a good crop of wheat. We have abundance of the most suitable soil for wheat, in this country, if it was only managed as land is in England. But we act here, as if we expected that the soil should produce good crops, without any regard to their cultivation by a proper system. When we prepare our soil as they do in England, we may expect such crops as they raise in that country, only then can we have good crops of wheat.

The Chemical Constitution of Plants.—Most of our readers are aware that the greater part of all vegetables, consists of but four elements, viz:—carbon, hyorogen, oxygen, and nitrogen; very often of the first three alone; while the remainder is composed of certain saline, earthy, and metallic compounds, which form the ashes that remain when vegetables are burned. The former are called the organic, the latter the inorganic elements of plants. Professor Liebig has demonstrated that the latter, although occurring in very small quantity are yet essential to the developement of the plant as the former; and it is obvious that the first enquiry, in such work as his, must be as to the sources from which all these necessary constituents are derived, and the best means of supplying them. With regard to the carbon of plants, the general opinion of writers on vegetable physiology, and of practical agriculturists, attributes its origin to the substance called humus, or vegetable mould, which is present in all fertile soils, and which is merely the remains of former vegetables in a state of decay. This substance either alone or in combination with lime, or other alkalies, is believed to be absorbed by the roots, and thus directly to furnish carbon for the plant. But this view has been shown by M. Liebig to be quite untenable,