in troops; the oldest in front, the young and feeble in the center, those of middle age and mature vigor in the rear. When at a distance from danger they travel with less precaution, never however separating so far but that they can hear one another's cries, and afford timely assistance.—*New York Evangelist.*

AGRICULTURE.

Composition of Humus.

It may be asked—Is the quantity of carbonic acid in the atmosphere, which scarcely amounts to 1-10th per cent. sufficient for the wants of the whole vegetation on the surface of the earth.—is it possible that the carbon of plants has its origin from the air alone? This question is very easily answered. It is known, that a column of air of 2441 lbs. weight rests upon every square Hessian foot (=0,567 square foot English) of the surface of the earth; the diameter of the earth and its superficies are likewise known, so that the weight of the atmosphere can be calculated with the greatest exactness. The thousandth part of this is carbonic acid, which contains upwards of 27 per cent. carbon. By this calculation it can be shown, that the atmosphere contains 3306 billion lbs. of carbon; a quantity which amounts to more than the weight of all the plants, and of all the strata of mineral and brown coal, which exist upon the earth. This carbon is, therefore more than adequate to all the purposes for which it is required. The quantity of carbon contained in sea-water is proportionally still greater.

If, for the sake of argument, we suppose the superficies of the leaves and other green parts of plants, by which the absorption of carbonic acid is effected, to be double that of the soil upon which they grow, a supposition which is much under the truth in the case of woods, meadows, and corn-fields; and if we further suppose that carbonic acid equal to 0.00067 of the volume of the air, or 1-1000th of its weight is abstracted from it during every second of time, for eight hours daily, by a field of 53,814 square feet (=2 Hessian acres); then those leaves would receive 1102 lbs. of carbon in 200 days.

But it is conceivable, that the functions of the organs of a plant can cease for any one moment during its life. The roots and other parts of it, which possess the same power, absorb constantly water and carbonic acid. This power is independent of solar light. During the day, when the plants are in the shade, and during the night, carbonic acid is accumulated in all parts of their structure; and the assimilation of the carbon and the exhalation of oxygen commence from the instant that the rays of the sun strike them. As soon as a young plant breaks through the surface of the ground, it begins to acquire colour from the top downwards; and the true formation of woody tissue commences at the same time.

The proper, constant, and inexhaustible sources of oxygen gas are the tropics and warm climates, where a sky, seldom clouded, permits the glowing rays of the sun to shine upon an unmeasurably luxuriant vegetation. The temperate and cold zones, where artificial warmth must replace deficient heat of the sun, produce, on the contrary, carbonic acid in superabundance, which is expended in the nutrition of the tropical plants. The same stream of air which moves by the revolution of the earth from the equator to the poles, brings to us, in its passage from the equator, the oxygen generated there, and carries away the carbonic acid formed during our winter.

The experiments of De Saussure have proved, that the upper strata of the air contain more carbonic acid than the lower, which are in contact with plants; and that the quantity is greater by night than by day, when it undergoes decomposition.

Plants thus improve the air, by the removal of carbonic acid, and by the renewal of oxygen, which is immediately applied to the use of man and animals. The horizontal currents of the atmosphere bring with them as much as they carry away and the interchange of air between the upper and lower strata, which their difference of temperature causes, is extremely trifling when compared with the horizontal movements of the winds. Thus vegetable culture heightens the healthy state of a country, and a previously healthy country would be rendered quite uninhabitable by the cessation of all cultivation.

Most vegetable physiologists have connected the emission of carbonic acid during the night with the absorption of oxygen from the atmosphere, and have considered the two actions as a true process of respiration in plants, similar to that of animals, and like it, having for its result the separation of carbon from some of their constituents. This opinion has a very weak and unstable foundation.

The carbonic acid, which has been absorbed by the leaves and by the roots, together with water, ceases to be decomposed on the departure of daylight; it is dissolved in the juices which prevade all parts of the plant, and escapes every moment through the leaves in quantity corresponding to that of the water which evaporates.

A soil in which plants vegetate vigorously, contains a certain quantity of moisture which is indispensably necessary to their existence. Carbonic acid, likewise, is always present in such a soil, whether it has been abstracted from the air or has been generated by the decay of vegetable matter. Rain and well water, and also that from other sources, invariably contains carbonic acid.—Plants during their life constantly possess the power of absorbing by their roots moisture, and, along with it, air and carbonic acid. Is it, therefore, surprising that the carbonic acid should be returned unchanged to the atmosphere, along with water, when light (the cause of the fixation of its carbon) is absent?

Neither this emission of carbonic acid nor the absorption of oxygen has any connexion with the process of assimilation; nor have they the slightest relation to one another; the one is a purely mechanical, the other a purely chemical process. A cotton wick, inclosed in a lamp, which contains a liquid saturated with carbonic acid, acts exactly in the same manner as a living plant in the night. Water and carbonic acid are sucked up by capillary attraction, and both evaporate from the exterior part of the wick.

Plants which live in a soil containing humus exhale much more carbonic acid during the night than those which grow in dry situations; they also yield more in rainy than in dry weather. These facts point out to us the cause of the numerous contradictory observations, which have been made with respect to the change impressed upon the air by living plants, both in darkness and in common day-light, but which are unworthy of consideration, as they do not assist in the solution of the main question.

There are other facts which prove in a decisive manner that plants yield more oxygen to the atmosphere than they extract from it; these proofs, however, are to be drawn with certainty only from plants which live under water.

When pools and ditches, the bottoms of which are covered with growing plants, freeze upon their surface in winter, so that the water is completely excluded from the atmosphere by a clear stratum of ice, small bubbles of gas are observed to escape, continually, during the day, from the points of the leaves and twigs. These bubbles are seen most distinctly when the rays of the sun fall upon the ice; they are very small at first, but collect under the ice and form large bubbles. They consist of pure oxygen gas. Neither during the night, nor during the day when the sun does not shine, are they observed to diminish in quantity. The source of this oxygen is the carbonic acid dissolved in the water, which is absorbed by the plants, but is again supplied to the water, by the decay of vegetable substances contained in the soil. If these plants absorb oxygen during the night, it can be in no greater quantity than that which the surrounding water holds in solution, for the gas, which has been exhaled, is not again absorbed. The action of water plants cannot be supposed to form an exception to a great law of nature, and the less so, as the different action of aërial plants upon the atmosphere is very easily explained.

The opinion is not new that the carbonic acid of the air serves for the nutriment of plants, and that its carbon is assimilated by them; it has been admitted, defended, and argued for, by the soundest and most intelligent natural philosophers, namely, by Priestly, Sennebier, De Saussure, and even by Ingenhouss himself. There scarcely exists a theory in natural science, in favour of which there are more clear and decisive arguments. How, then, are we to account for its not being received in its full extent by most other physiologists, for its being even disputed by many, and considered by a few as quite refuted?

Lime and Salt.—I tried this mixture on two acres of old grass land, having mixed them in the proportions recommended by Mr. Cuthbert Johnson, A heap was made, and the lime and salt were laid in alternate beds, and then mixed up together, and well covered over with sod and sods. After three months this was applied to the meadow in question; it was in a state resembling