

The bulk of cultivated lands of this country, and indeed of America generally, do not require this mechanical action of stable manure. The question then arises, How can we best turn these scientific discoveries to practical account? How can we concentrate manures, and having succeeded in this, how can we apply them? This brings us to the "new idea" we have referred to, and we shall allow one of the French writers on the subject to state the theory in his own words:—

"Boussingault, in his recent experiments in the production of what he calls a *limit* plant has proved that the seeds of many plants contain the necessary quantity of nitrogen, not only for the germination of the plant and the nutrition of the nascent stem and leaves before the radicles have been sufficiently developed to draw a supply from the soil, but also to the production of a perfectly organized plant, though exceedingly reduced in its dimensions. In fact, such a plant—after several months' existence in the open air, or even in a confined atmosphere—has been found to weigh but very little more than the seed from which it sprang. This clearly shows that the extent of the organism of that plant was limited by the quantity of the nitrogenous principles contained in the seed; but as soon as he applied to the soil (exclusively composed of calcined quartz sand, not containing a particle of decomposed matter or mineral manure) a small quantity of phosphate of lime, nitrate of potash, and vegetable ashes rich in silicate of potash, the plant immediately sprang up from its torpor and grew luxuriant and strong, bloomed and brought forth matured seed as well as did as rapidly as another plant of the same kind had done upon a garden-ripe richly manured.

"This experiment clearly shows that the soil upon which the plant grew exercised no immediate influence whatever upon the growth of the plant, so far as its nutrition went, but merely as a vehicle for heat and moisture, as well as the holder of the plant and of the pure mineral salts upon which it lived and developed itself. This naturally leads us to ask the question, whether, instead of incurring great expense and trouble in manuring the soil thoroughly with heaps of dung containing but a small percentage of fertilizing matter, which is still reduced and less available to the plant by being disseminated over a larger surface than the roots of the plant can possibly compass, it be not possible to manure the seed itself, that is, surround it by a crust formed of the very mineral substances which are necessary to its growth, in the same proportion as they are found to exist in the seed, and in a sufficient quantity to represent exactly the weight of the aggregate mineral substances which are abstracted from the soil by the well-matured normal plant? This crust could then be considered as the mere extension of the seed to a larger bulk; and as the seed contains what is necessary to feed germination, and even to form a complete plant, though limited in weight to the extent of food contained in the seed, so the seed being increased to any required number of times its size and weight by the agglomeration of substances, such as phosphates, nitrates, and silicates, would be enabled to supply to the growing plant the necessary elements of normal growth and perfect maturity.

"This is indeed no new theory, and many have been the attempts (even in times of remote antiquity to realize it in a practical manner. Many are the inventors of wonderful liquids, in which the seeds were to be steeped, and thereby imbibe all the required elements of nutrition and fertility. All these have failed, not because the principle was not a sound one, but because it was not properly applied. For it is obvious that a liquid manure, however rich in fertilizing elements, could not fix these round the seed in a sufficient quantity so as to increase its store of nutritive matters—this can only be done in a solid form. Then, until very recently there was also the insuperable difficulty arising from ignorance, science not having yet shed the light of its discoveries on the mysteries of vegetation; and the wonderful action of phosphates, nitrates, and silicates upon vegetation, although practically known, had not been determined with sufficient minuteness and accuracy to lead to anything like an authentic formula of proportion and quantity. But failures, however complete they may be, in carrying out great ideas, are no argument against a renewal of efforts; and when those failures, as in the case of steam-engine, railways, reaping-machines, or the application of steam to the cultivation of the soil, are found to act rather as incentives to the ingenuity of men, instead of damping their energy and the buoyancy of their hopes, we know it from the experience of the last thirty years that it is a sure sign that the idea is good, and will be ultimately carried out.

"But there are objections to this system. What system is free from objections? Some say