

physical state. Many failures of manures are to be attributed not to the fact that the soil was not deficient in their constituents, but that the manure used was not in a fit state or condition when applied to the land to be used by the plant. I have seen ground bones sold in large lumps instead of an impalpable powder. It is evident that a long time must elapse before they, in the former state, can be used by the plant, and a large quantity employed if we wish to supply every part of the soil with them.

An acre of land contains 6,272,640 square inches; a pound av. 7,000 grs. It requires, then, about 900 pounds of any manure to supply one grain to each square inch of soil. If, then, in the application of 1,000 pounds of a manure, say twenty bushels of bone dust, and there be fragments of it weighing from one to two hundred grains, as is often the case, there must be in some places nearly from 1 to 200 square inches entirely destitute of manure.

In order to give to the soil manure in the proportion of one grain to each cubic foot to the depth of 12 inches, we must apply about four tons. If we have the manure in large lumps, does not the least consideration show us that a large part of the soil must be left unmanured, even though we apply a very large quantity, a quantity too costly, frequently, ever to be employed?

Manure only can act in supporting the plant when it comes in contact with and can be taken up by its roots. How important is it, then, to have it thoroughly distributed, which is impossible except it be in the finest possible state of division. This should be looked to when large quantities of cheap manures are applied, more especially, then, when costly manures are used in small quantities. When, for instance, we apply two hundred pounds of guano, if it be not beaten up very fine, and then most carefully applied, a large part of the crop will receive no nutriment, while some will have too much, and although the appearance of the crop may be satisfactory, still there will be much less of it produced than if the manures were evenly applied. The above observations apply to compost, stable manure, and more strongly to lime, but with much greater force to guano, bone-dust and other expensive manures used in small quantities.

The great effects produced by bones in a state of solution are due to their thorough distribution in the soil; and we find that liquid manures, though containing but a small proportion of the necessary elements, yet, nevertheless, act with great intensity; this intensity of action is due to their form and to the fact that though every part of the soil may receive but a small portion, yet no part of it is left unsupplied.

Sir Gilbert Blane caused experiments to be made with flax water, which although containing a small portion of inorganic matter, yet acted very powerfully, a fact due to the complete so-