the one or to improve the other, by culture and manures, is now so generally conceded, and has been so fully set forth in my previous Reports to your honorable body, that I shall not speak of it to much extent here. The ability of the science of chemistry to determine the presence of substances in a soil necessary to crops, and the quantity which these crops require, is also now fully proven. Let it be conceded that lime, magnesia, plaster of Paris, phosphate of lime, common salt, or potash, are necessary for the growth and development of plants,—and this now no well informed man doubts, or if any do question it, they will only have to refer to their own experience in the use of these substances and the common practice of husbandry in every enlightened neighborhood, for all these substances have been used, some of them for many centuries with remunerative effect, (and no chemist, no vegetable physiologist, no scientific man, no practical farmer who knows how to appreciate the logical value of facts, doubts the truth of this doctrine;)—let this, I say, be conceded, and the only inquiry then of the husbandman, before applying manures, should be, does the field which I intend to improve already contain these substances in sufficient abundance, and is its physical character such as will enable it to obtain from the atmosphere the elements which plants require from *that* source?

All plants are nourished by the elements of the soil and those derived from the atmosphere. Their roots are implanted in the soil, their leaves expand and grow in the air from which are obtained those things which the soil does not afford. If the soil does not contain the proper substances which it is its duty to supply, then they must be supplied by the application of such manures as may contain them. These propositions are self-evident, and in the event of a barren or unproductive soil, these questions as to the cause of this must be asked—does the barrenness arise from such a defect in the physical condition of the soil as will not enable it to obtain the necessary food from the atmosphere? Is it defective in any of the mineral constituents which plants require for their full development? Or is its poverty produced by the joint influence of these two causes?

In other words, is the soil too stiff or too porous? has it enough of bone earth, or of lime, or of magnesia, or plaster of Paris, or of common salt, or of potash, to supply the demands of the crop which is to be planted or sown on it?

The first of these questions can generally be answered by the experience of practical cultivators of the soil. They can, and do judge correctly (from their personal observation and