USE OF SCIENCE TO AGRICULTURE.

From the American Farmer.

We have read with equal pleasure and instruction, the address, delivered by Dr R Richardson, Professor of Chemistry, in Bethany College, delivered before the Agricultural Society of Brooke and Ohio counties, Virginia, at its annual exhibition, in October last. In reading this production we have been so much gratified by the very familiar manner in which the author treats what may be considered the scientific portion of his discourse, that we lay that part before our readers, under the conviction that they will find in it a rich, entertaining, and instructive treat. Without burthening his auditors with the technicalities of *science*, he has sought an easier plan of conveying to the mind of the unlearned, an estimate of the value of its acquisition to the practical farmer, who desires to carry on the operations of his farm with intelligence and enlightened economy. His views are comprehensive and true; the language in which he expresses them is simple, and therefore, both the one and the other are peculiarly adapted to the purposes he had in view, the enlightenment and profit of of his hearers Had he selected the phrases of the mere student and contented himself with exciting *wonder* without imparting *instruction*, he might perhaps have elicited more surprise that "one small head could hold all he knew," but he would have failed in commending himself to the great majority of agricultural readers. The plain common sense of Professor Richardson's remarks will strike deep root in the mind of every intellectual practical farmer, because he has brought *science* down to the understanding of all, and divested it of those mysteries, which too many of its teachers delight to invest it, by the use of technical terms, beyond the comprehension of any but those who are Chemists.

Mr. Richardson is maintaining that science is essential to successful agriculture, and enforces the truth of his proposition thus:

"Take any one of the arts of civilized life, and consider if it does not improve and become important just in proportion as its principles become known and settled? The practice of no art can be fixed, unless its principles are so, and it can never rise to elevation or perfection unless upon the firm foundation which such principles alone afford This is what we mean by science. Science is knowledge arranged as principles, laws, or rules of action Perfect art is the true application of these principles to a practical end. The arts can never be brought to perfection, until all their processes are laid open, and explained in conformity with the causes which govern them This is the business of science, which, by thus tracing effects to causes, enables the artist to produce always the same results, by bringing into action the same causes, under the same circumstances.

It is a great, but a very common error of the uneducated to suppose, that science renders a subject obscure, or at least difficult to learn. This may be truly said of *art*, but the reverse is true of *science* In a rude stage of society, men are forced to pursue, without science, the arts immediately necessary to life They adopt the business of the chase, or the art of fishing, and, like the Indians, may plant, in a rough way, a few hills of corn. By and by, as civilization goes on, agriculture is more attended to, and other arts are introduced, which by successive observations are gradually improved But these arts, founded upon experiments, and wrapped up in technicalities and mysterious processes, which can be carried on only by the artist himself, and the principles of which he himself does not understand, and consequently cannot explain, are wholly beyond the reach of others. It is the natural tendency of *mere art* to bury itself in mystery, to veil its ignorance in unmeaning terms, and keep its operations secret for the purpose of private emolument. But the very reverse of this is the case with science. Its object is to make every thing plain; to lay itself open to inquiry; to untold secrets, and to put every one in possession of the principles through which the art may be practised and perfected. Science is not satisfied until it has formed a broad and beaten track, and rendered the art accessible to all, by explaining its processes and establishing the whole upon rational principles—forming thus what may be termed *scientific art*.

Now this is precisely what has to be done for our agriculture before it can be in the slightest degree elevated or improved. It consists at present of a few simple processes, founded upon experience and observation, but the reasons of which are unknown to the greater part of those who employ them. Experience has taught them that it is necessary to loosen the soil with the plough to prepare it for the reception of the seed must be covered to a certain depth, &c, but they are unable to give the true reasons for these things, or to explain why it is that the seed should vegetate under these circumstances, or whether the young plant derives its nourishment from the earth, the air, or the water, or from the whole of them together They cannot tell what or how much the soil contributes to it. They know not of what elements the soil consists, or how they may increase its fertility with economy and certainty They have learned, indeed, by observation, that manure will render vegetation vigourous, but there are few who properly appreciate its value, and still fewer who can explain the manner in which it acts They have heard that the application of lime will increase fertility, a fact which they owe to science, but they cannot, without the further aid of science, explain its action, or determine to what kind of soil it should be applied. In short, our agriculture is merely a confused medley of ancient customs, rash experiments, and vague conjectures, without system, without correct knowledge, without fixed principles, other than the simple rules adopted from common observation or tradition.

I would by no means be understood to undervalue experience and observation. These are the very materials out of which science is constructed Without them there would be no science. Experience, observation, facts;—these are the stones, the bricks, the timbers of the building,—but they are the rude materials, which, when thrown confusedly in heaps, fitly represent art without science. Science is the finished building, in which these same materials are built together, and cemented each in its appropriate place, so that the uses of all can be seen and understood. What is wanted then is, that the agriculturists of our region should suffer their experience, facts and observations, increased and enlarged by those of others, to be framed into the noble edifice—the SCIENCE OF AGRICULTURE.

In order that this important point may be properly impressed upon the farming community, it will be necessary to appeal to their own observation, and to facts with which they are familiar. For instance, it is perfectly well known to all, that as the workman is known by his work, so is the nature of the soil by what it produces. If a farmer wishes to purchase a piece of land, he endeavours to judge of the strength or *fertility* of the soil, by the size of the timber upon it, or the vigour and perfection of the plants which grow upon it. Observation, also, has taught him to gather some information from the colour of the soil, its mechanical properties of friability, porosity, tenacity, &c., and he can even ascertain its composition, so far as this can be detected by the eye, as being clayey, sandy, gravelly, &c. But when he wishes to form a more accurate idea of the suitableness of the soil for particular crops, he looks not to the *size* of its products, but to their *kind*. If he be in the wheat growing region or latitude, he looks to the timber now to see if it be pine and cedar, or if it be white oak, beech, or hickory, or if it consist chiefly of maple, ash, black locust or walnut. He looks, also, to the herbage upon the cleared land, to see if it consists chiefly of sedge, or of white clover and blue grass; he observes if the iron weed, the ground ivy, and the alder are abundant. After he has made his observations, he judges with much accuracy, for the dear school of experience has taught the lesson, that the pine district will not do for wheat; but that he may raise it with certainty upon the land where he finds the white oak, the hickory, and the blue grass; while the sugar tree, the maple, the locust, the walnut, the alder, lead him to anticipate in imagination the rich and luxuriant fields of Indian-corn.

He learns these particular truths,—but he has learned much more. He has learned some of the great general truths of the science of agriculture:—*That soils differ greatly in the qualities or composition*, and that *each soil best produces that class of plants to which its peculiar composition is adapted*. For why one soil, in the same latitude and circumstances, should grow pines, and another white-oaks, he cannot explain, except upon the principle, that the one contains something which the other does not; that they differ in their composition, and that this certain something, which they contain, fits them respectively, not only for the growth of these different kinds of timber, which are found to overgrow and put out almost any other kind in these regions, but also for different kinds of grasses and of grains. From the general truth thus reduced, the important practical rule immediately occurs: *That each kind of grain, or other product of the soil, should be grown upon that particular soil best adapted to it.* For experience and observation have already taught that *the nature of the plant cannot be changed*—that a plant cannot be made to flourish, and scarce even to grow, in a soil that does not suit. The farmer then, with those facts before him, finding that he cannot make the plant, say wheat, grow where he pleases, is obliged to content himself with raising it in those places where the soil is adapted to its growth. He clears up the white oak lands, therefore, and devotes himself, we will suppose, year after year, to the raising of wheat. Experience, after a while, makes him acquainted with another fact; that the soil, which at first produced a large crop, brings less and less every year, until at last he can scarcely raise any wheat at all upon it. He concludes now, very justly, that the composition of the soil must be changed from what it was at first, and that *that certain something* which originally fitted the land for wheat has become gradually exhausted by the successive crops. But what *that certain something is*, he cannot tell, and of course, he does not know how to supply it, with any degree of certainty or success. Is it lime that the soil needs? He cannot tell Is it manure? probably: but what kind of manure? and in what state? or what substance or principle is it in the manure that gives it power to fertilize? Will land regain this certain something by rest? or can it be restored by a crop of a different kind? To such questions, the mere agriculturist can give no definite reply, and yet they are the very questions to which his interest require an immediate answer, and which, if left unanswered, leave him to the chances of uncertain