

**THE MANURES MOST
ADVANTAGEOUSLY APPLICABLE TO THE
VARIOUS SORTS OF SOILS, AND THE
CAUSES OF THEIR BENEFICIAL EFFECT IN
EACH PARTICULAR INSTANCE**

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The Manures Most Advantageously Applicable to the Various Sorts of Soils, and the Causes of Their Beneficial Effect in Each Particular Instance by Richard Kirwan

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— Idoneus Patriæ, sit Utilis Agris.
Jun. Sæc. 14.

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WHAT ARE THE MANURES MOST ADVANTAGEOUSLY APPLICABLE TO THE VARIOUS SORTS OF SOILS;

AND,

WHAT ARE THE CAUSES OF THEIR BENEFICIAL EFFECT IN EACH PARTICULAR INSTANCE.

..... *Idoneus Patrie, sit Utilis Agris.*

JUVEN. SAT. 14.



AGRICULTURE is the art of making the earth produce the largest crop of useful vegetables at the smallest expense. It has often been remarked, that amidst the various improvements which most of the practical arts have derived from the progress lately made in natural philosophy and chemistry, none have fallen to the share of agriculture, but that it remains nearly in the same state in which it existed two thousand years ago. I am far from allowing the truth of this observation, taken

in its totality; to refute it, we need only compare the writings of Cato, Columella, or Pliny, with many modern tracts, or still better, with the modern practice of our best farmers. It must be granted, however, that vague and fortuitous experience has contributed much more to the present flourishing state of this art than any general principles deduced from our late acquired knowledge, either of the process of vegetation, or of the nature of soils; but the skill thus fortuitously acquired is necessarily partial, and generally local; the very terms employed by the persons who most eminently possess it, are generally of a vague and uncertain signification. Thus Mr. Young, to whose labours the world is more indebted for the diffusion of agricultural knowledge than to any writer who has as yet appeared, remarks, That in some parts of England, where husbandry is successfully practised, any loose clay is called marl*; in others, marl is called chalk†; and, in others, clay is called loam‡. Philosophic researches have been made, not yet sufficiently

* First Eastern Tour, 178.

† ‡ Bath Mem. 192, 220 ‡ ‡ Bath Mem. 137.

noticed: much information may be derived from Monsieur Du Hamel, and much more from the well-directed experiments of Mr. Tillet*. Immense strides have been made in this career, by the illustrious Bergman; Dr. Priestley's experiments have thrown a new light on this, as well as on every other object of natural philosophy. Mr. Lavoisier's new theory explains many circumstances, before inexplicable; discoveries of great importance have been made by Mr. Senebier and Dr. Ingenhouz: even Mr. Young has not always confined his attention to the mere practical part, but sometimes happily extended it to objects of a more general and speculative nature; but the fullest light, perhaps, has been thrown on this subject by the late discoveries of Mr. Hassenfranz†.

If the exact connexion of effects, with their causes, has not been so fully and so extensively traced in this as in other subjects, we must attribute it to the peculiar difficulties of the investigation. In other subjects, exposed to the joint operation of many causes, the effect of

* Mem. Par. 1772. † Annales Chymiques, Vol. 13, 14.

de l'école des Mines

each, singly and exclusively taken, may be particularly examined; the experimenter may work in his laboratory with the object always in his view; but the secret processes of vegetation take place in the dark, exposed to the various and indeterminable influences of the atmosphere, and require, at least, half a year for their completion. Hence the difficulty of determining on what peculiar circumstance success or failure depends; the diversified experience of many years can alone afford a rational foundation for solid specific conclusions. It cannot, therefore, be expected, that new, decisive, and direct experiments should be laid before the Academy within the time prescribed for answering this question. The resolution of the first part must be deduced from a statement of facts long established by multiplied experience; and that of the second, by the application of more general principles to the explanation of those facts.—But before we proceed to either branch of this question, the distinctions and denominations, both of soils and manures, must be exactly settled and accurately defined.

CHAP. I.

OF SOILS AND MANURES.

SECTION I.

OF SOILS.

LAND, considered as the basis of vegetation, is called *soil*.

Soils consist of different combinations of two or more of the four primitive earths, namely, the calcareous (which I sometimes call mild calx) magnesia, argill, and the silicious. For a more accurate description of these I must refer to books of mineralogy; and shall only remark, that by calcareous earths are meant chalk, and all stones that burn to lime. They are easily distinguished by their property of effervescing with acids.

Magnesia is never found alone; its distinguishing character consists in affording a bitter salt, generally called Epsom Salt, when combined with the vitriolic acid.

Argill is that part of clay to which this owes its property of feeling soft and unctuous, and of hardening in fire; it is difficultly soluble in acids, and scarce ever effervesces with them. When combined with the vitriolic acid, it forms alum.

Silicious Earth is often found in a stony form, such as flint or quartz; and still more frequently in that of a very fine sand, such as that whereof glass is made. It does not effervesce, nor is it soluble in any of the common acids.

To these we may add Iron, in that imperfect state in which it exists when reduced to rust, and commonly called Calx of Iron.

The soils most frequently met with, and which deserve a distinct consideration, are clay, chalk, sand, and gravel, clayey loam, chalky loam, sandy loam, gravelly loam, ferruginous loam, boggy soil, and heathy soil, or mountain, as it is often called.

Clay is of various colours; for we meet with white, grey, brownish red, brownish black, yellow or bluish clays; it feels smooth, and somewhat unctuous: if moist, it adheres to the fingers, and if sufficiently so, it becomes tough