

AGRICULTURAL CHEMISTRY

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Agricultural Chemistry by George Cox

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GEORGE COX

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BY GEORGE COX,

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M DCCC XLIV.

PREFACE.

IN introducing the following pages to aid and assist in the attempts to render Agriculture more deserving the attention and pursuit of enquiring minds, by shewing that the successful cultivation of the soil is dependent upon a higher and better standard of education, the Author is only endeavouring to fill up, at least to a certain extent, a void which has for some time existed. The book may properly be divided into two parts: the first, treats of the properties of those bodies which either enter into the composition of a plant, or affect its condition. In this portion of the work will be found many original practical hints and suggestions for the manufacture and application of manures. The great consumption of soluble silica by the cereals and grasses must render any process which will procure a cheap and abundant supply of that great essential, a valuable addition to agricultural information. Under the head Silica, that information will be found; but it must be borne in mind that it is essentially necessary to employ sand of as

fine a grain as can be obtained. This fertilizer will be found an invaluable agent on those soils which yield a deficiency of straw. The fact that gypsum converts the very soluble carbonate of potash into the nearly insoluble sulphate of potash, will prove a truth worth knowing by those farmers who are in the habit of using wood ashes. The article headed Potash also contains some hints on the application of liquid manure to the land, which it may be worth while to consider before an expense is incurred in purchasing the apparatus necessary for its distribution. It is repeated here, with an increased conviction of its truth, that rain water and irrigation are the best and only necessary forms of applying liquid manure to the land. The nitrogenous phosphate manure mentioned at page 20, is cheap in its manufacture, and an efficient mode of employing urine in a convenient manner. A compost, consisting of equal parts, by weight, of burnt gypsum and putrified urine, well mixed with a third part of bone-dust, made some months ago, has retained all the ammonia of the urine, and is in a state exceedingly well adapted for drill or broadcast. In the chapter on Lime, will also be found some suggestions for the solidification of night-soil, well worthy of immediate attention. The application of night-soil to the land, in a proper form, would doubtless prove a great source of national

wealth. Let a trial be made by the enlightened and intelligent farmer, and a fair and impartial verdict be given. Almost all journals are open for communications of this nature, so that doubt need not exist any longer on the subject. It may be said that there is *no doubt*, as such manure has long been employed with advantage to the speculator, and its efficacy fully established. The answer is, that if its efficacy were admitted, and understood, it would be more generally employed. Now is a good time to give it the trial it demands; and a ton of it, sufficient for six or seven acres of land, can be manufactured at an inconsiderable cost. A hundred weight of gypsum is capable of rendering friable a hundred weight of mixed excrements. When the constitution of other manures is placed by the side of this, the economy of its application must be at once acknowledged. Nearly all the quotations made have been taken from Liebig's celebrated work, entitled "The Chemistry of Agriculture;" and, indeed, it was found impossible to write on the subject at all without going very frequently, and always with profit and satisfaction, to that fountain head.

The second part of the work treats entirely on analysis, and the mode of detecting the various simple and compound bodies which are found in soils, manures, and the ashes of plants. These analyses are

given with entire confidence, as most of the facts are taken from authors of known precision. Mr. Parnell's work, "On Chemical Analyses," is recommended as a great assistance to those who have not sufficient confidence in themselves. A person unacquainted with the first principles of chemistry, cannot, of course, expect to be in a condition to follow out the plans laid down for investigations of this kind. To such an one is recommended the immediate and attentive perusal of some elementary treatise on the subject, and a vigorous effort to make himself perfect in the various modes of manipulation necessary in chemical research. Where great nicety is not required, a chemical analysis is by no means so difficult a matter as many imagine; but, to succeed to any great extent in chemical investigations, great care and caution is always requisite. Earnest endeavours have been made to render "The Agricultural Test Chest," complete for the purpose intended, viz., that of enabling its possessor to successfully undertake analytical investigation connected with agriculture. The only exceptions to its being entirely complete, are the omission of a platinum crucible, a silver crucible, an agate mortar, and a Rose's Argand spirit lamp. Now, the latter would have increased the bulk of the chest too much to render it conveniently portable; and it fortunately happens that it may now be displaced by a smaller lamp,

since the announcement made by Liebig, that fluoride of ammonium is a more valuable and correct agent in disintegrating siliceous minerals, and for calculating the quantity of silica present, than the old method usually adopted. In the *Lancet* of September 7th, the following occurs in one of Liebig's lectures on organic chemistry. "A useful application of fluoride of ammonium has recently been discovered in mineral analysis. Fluoride of ammonium is easily obtained by saturating silico fluoric acid with carbonate of ammonia; and boiling; the hydrated silicic acid separates, and fluoride of ammonium remains in solution. This solution, when in a state of concentration, etches glass, in the same manner as fluoric acid. The fluorine goes off with the silica of the glass as fluoride of silicon. I need scarcely tell you, gentlemen, that such a solution ought not to be evaporated in glass or porcelain vessels, but in evaporating dishes made of lead, silver, or platinum. Fluoride of ammonium is of particular value as a means of rendering minerals containing silica soluble. The usual methods of fluxing are laborious; and, after all, uncertain. By adding dilute sulphuric acid and fluoride of ammonium to the mineral, all the silica is made to separate, and to go off as fluoride of silicon, whilst all the other constituents are obtained in solution, combined with the sulphuric acid."

The other articles omitted, were left out on account of the price, which would necessarily have made the chest at least two guineas higher; and, as they are not necessary in all operations, it was thought better to give the price merely, and then they can be included, if desired by the purchaser. A serviceable platinum crucible is worth from a guinea to 25s. The price of an agate mortar of sufficient size is about 14s., whilst a silver crucible or dish can be had for 10s. If the purchaser of the "Agricultural Test Chest" should not be sufficiently informed of the distinctive character and properties of those bodies most likely to come under his more frequent observation, he had better study the chapter on Qualitative Analysis, before he undertakes a complicated investigation. For instance, let the student precipitate a mixed solution of phosphate of soda and sulphate of soda, with a solution of chloride of barium. If the precipitate be washed and digested in dilute nitric acid, he will find that a portion of it is taken up, and a portion left untouched. He will learn by this that phosphate of baryta is soluble, and sulphate of baryta insoluble in nitric acid. These are the characteristics by which one body is distinguished from another; and, of course, it requires some little acquaintance with these characteristics, to enable an operator, to proclaim, with anything like certainty, what the nature and