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By M. MACLEAN.

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AGRICULTURAL.

From the Western Farmer and Gardener.

AN ESSAY ON THE IMPORTANCE OF LIME IN SOILS.—NO. I.

BY DARIUS LAPHAM, CIVIL ENGINEER.

The farm on which my father resides, in Champaign county, in this State, lies in one of those beautiful glades branching off northwardly from the main valley of King's Creek, a large tributary of Mad river. We came into possession of a part of the present farm in 1830. Previous to that time this part had been "cropt" for many years with corn, wheat, &c., without any regard to a rotation of crops, or the addition of manure, until the soil had become almost exhausted, or worn out, by this constant drain upon its resources. Since it has been in our possession it has been divided into rectangular fields, of nearly equal area, and the "four crop" system has been pursued in the cultivation throughout, until each field has had at least one crop of clover ploughed into the soil, and several of them have had two crops of clover. Very little stable manure has been used; but whatever else the farm afforded, such as refuse straw, cornstalks, weeds, &c., have been added to the soil as manure. Some few experiments have been made with gypsum, and also with leached ashes, but to no great extent—sufficient, however, to show the benefit which clover derives from the application of these substances. The experiment was likewise made of the application of gypsum to Indian corn, by putting a small quantity in each hill at the time of planting, without producing any sensible effect on the corn;—but two years afterwards, when the same field had been laid down in clover, the places where the gypsum had been applied to the corn, became very conspicuous by the greater luxuriance and increased height of the clover at those places.

Although by this system of management there has been an evident improvement in the fertility of the soil, on this part of the farm, since we have occupied it, still it cannot be called fertile, as it will not raise good wheat, and corn crops are below an average both in quantity and quality. Oats and barley seem to do better than corn or wheat; but it is necessary that the soil should be rendered still more productive before we can expect to realize much profit from it. Despairing therefore of restoring fertility by the means heretofore pursued, it has been an object of constant enquiry and research with me to ascertain the best mode of increasing the productiveness and fertility of this part of the farm.—The first step in the improvement of any soil, is to obtain an accurate analysis of its component ingredients. Accordingly I sent a specimen of the soil, taken from the middle of a cultivated field, to my friend, Dr. J. L. Riddell, whilst he was employed in making a geological survey of the northwestern part of the State; and by a careful analysis he found that 100 grains contained the following substances:

Water, - - -	6 grains.
Organic matter, - -	3 "
Silicious " - -	80 "
Aluminous " - -	8 "
Per-oxide of iron, -	3 "
Total,	100 "

He likewise observes, that *lime* could not be detected in this soil; and the amount of saline matters was inappreciably small. He further states that the soil seems to be a sediment from turbid water. It has usually a dark brown, or reddish brown color, consists of rather fine particles, and exhibits to the naked eye numberless glimmering grains of sand.*

Having procured the foregoing analysis, the next step in this inquiry was to ascertain which of the component parts of the soil required to be increased or diminished, or whether any other substances were required to be added in order to increase the fertility of the soil. The prosecution of this inquiry led me into the extensive and almost inexhaustible subject of agricultural chemistry; and the pages of Davy, Chaptal, Ruffin, and professors Hitchcock, Dana, Jackson, Lieb ig, and several others, have been consulted during my investigations.

All fertile soils throughout the known world, are composed essentially of the following ingredients:—

Water, by absorption.

Humus, decomposed animal and vegetable matter.

Silicious matter, or sand.

Aluminous matter, or clay.

Calcareous matter, or lime.

Magnesia, manganese, and oxide of iron, are likewise frequently found in soils; but they are not deemed essential to fertility; and in certain states of combination with other substances, may be either injurious or beneficial to the growth of plants.

The greatest degree of fertility which it is possible for any soil to attain, may be produced by a proper admixture in certain proportions of the five substances above named; but the proportions of the various ingredients may be infinitely varied (avoiding extremes in any one substance,) and still the soil may be deemed fertile; but, nevertheless, there is a limit beyond which the fertility of a soil cannot be carried. What the exact proportions are, and what degree of admixture and combination of the particles are requisite, to obtain the greatest productiveness, has never yet been precisely ascertained; and in order to form some idea of this point, it is useful to have recourse to the analysis of soils of acknowledged fertility and productiveness.

Professor Charles T. Jackson, in his report on the Geological survey of Rhode Island, has given the analysis of ninety-four different cultivated soils, taken from various localities in nearly all parts of the state, and in eighty-nine of them, *lime* was present as one of the ingredients. Selecting, promiscuously, the results of ten different soils, from the tables in the geological report, and making an average, we find that the proportions of the five essential ingredients composing the soils, are, in 100 grains, as follows:

Water, - - - -	2.0 grains.
Humus, - - - -	5.0 "
Silicious matter, (soluble,) -	3.5 "
Silicious matter, (insoluble,)	85.0 "
Aluminous matter and iron,	3.5 "
Calcareous " (salts of lime,)	1.0 "
Total,	100.0 "

A cultivated alluvial soil, taken from the banks of the Mississippi, 100 miles above New Orleans, gave the following results by analysis of 100 grains:

Water, - - - -	3.9 grs.
Humus, - - - -	3.6 "
Silicious matter, - -	81.4 "
Aluminous matter and iron,	7.0 "
Calcareous " [salts of lime,]	2.8 "
Total,	98.7 "

The analysis of 100 grains of dried soil from the banks of the Nile in Egypt, a soil celebrated from the remotest antiquity for its luxuriant vegetation, afforded the following results.

Water, - - -	0.00
Humus, - - -	6.90
Silicious matter - -	47.39
Aluminous " - -	32.10
Calcareous " - -	2.02
Iron - - -	11.20
Total,	99.61

The following is an analysis of a very rich soil from Batavia. The analysis was made by Mr. Henry Sumner, of Boston, under the direction of Prof. Jackson.—100 grains of this soil yielded,

Water of absorption, -	7.8 grs.
Humus, - - - -	24.9 "
Silicious matter, - -	43.0 "
Aluminous " - -	14.8 "
Calcareous " [phos. and crc-	
nate of lime,] - -	2.0 "
Per-oxide of iron, - -	7.9 "
Magnesia, - - -	0.3 "
Total,	100.7 "

The foregoing analysis of some of the most fertile soils of the world, will serve to instruct us as to the nature and amount of different matters that ought to be introduced into a given soil, in order to render it more fertile. It is not expected that this will be done at a single operation; but it is important that we should know the proper course of improvements, and then we can gradually effect them, according to our means.†

By making a comparison between the results of the foregoing analyses of cultivated soils remarkable for their great fertility, and the constituent parts of our soil in Champaign county, we at once discover a striking difference in the *total absence of lime* in our soil, as well as a deficiency in the proportion of humus, or organic matter. The sum of the silicious and aluminous matters in each being very nearly the same. It is, therefore, highly probable that an artificial addition of the requisite proportion of lime and organic matter to our soil, will restore its fertility, and render it equal to the general average of the soils above noted. But there are other considerations which render it still more probable that the deficiency of lime and organic matter is the principal, if not the sole cause of the unproductiveness of our soil.—These considerations I shall proceed to notice.

If there is any one principle settled in agriculture, it is that some *convertible salt of lime* is essential to the fertility of soils, and that certain crops cannot be raised upon a soil destitute of lime.—When we consider the most favored grain regions of the earth, it cannot fail to be remarked, that the soils are invariably charged with a notable proportion of lime. On the other hand, we note that where the soil is deficient in this respect, such crops are invariably meagre, blighted, and unprofitable. A soil destitute of lime, may produce straw, but it can never yield grain!

It is an important question, at present much discussed, whether salts of lime are essential to the nourishment of certain cereal grains, and whether the amount of calcareous matter is diminished in a soil by raising upon it successive crops. It is evident, *since all vegetables contain lime* in their constitution, that if they are raised on and removed from the soil after their growth, a certain proportion of the *salts of lime* must be abstracted. No one, I presume, will in modern times contend that plants create any elementary substance. If they contain lime they must have drawn it from the soil, or from the manures that have been spread upon it.

One hundred grains of the ashes of the grain of wheat were analyzed by Sir H. Davy, and he obtained 44.5 *per cent. of the earthy phosphates*, chiefly *phosphate of lime*. The ashes of the straw of wheat contain *six per cent. of the phosphate, and one per cent. of the carbonate of lime;* Indian corn contains the *phosphate of lime*, its ashes yielding no less than thirty-six per cent. Clover contains the *sulphate of lime;* and *nearly all the plants known, contain a small proportion of calcareous matter.*‡

It is therefore proven beyond all doubt, *that* LIME, *in some of its various forms, is an essential ingredient in all fertile soils:—first*, from the fact that it is almost universally present in the most productive soils throughout the world;—*second*, from the fact that all known plants contain more or less calcareous matter in some form as an essential constituent.

It is likewise proven that lime, in some of its forms, must be continually abstracted from the soil, by the constant growth and removal of those plants which contain in their constitution any notable proportion of the salts of lime; and hence it may be inferred, that by constant cropping, the lime contained in the soil will in time become exhausted; and unless it be again added artificially to the soil, it will become incapable of producing those plants which contain any considerable proportion of lime. This fact is likewise proven by universal experience, in the cultivation of wheat, Indian corn, clover, and other plants containing in their constitution, lime in large proportions.

Until very recently, it had not been suspected that any soil was wholly destitute of calcareous matter; and more especially soils resting immediately on lime stone formations. Indeed, most of the writers on agricultural chemistry, by the manner in which they have treated of soils, and their constituent parts, would induce their readers to infer the general presence, in very large proportions, of this ingredient, *in all soils.* Mr. Edmund Ruffin, of Virginia, was perhaps the first to discover the general absence of this substance in all soils which are naturally unproductive. He states that in 1817, when first attempting to analyze soils, it was with surprise and some degree of distrust, that he found *most specimens destitute of calcareous earth.* And after repeated trials, made with great care and accuracy, he concludes that no naturally poor soil [below the falls of the rivers in Lower Virginia] *contains the smallest proportion of carbonate of lime.* After having made extensive experiments, on both rich and poor soils, from various parts of the country, Mr. Ruffin arrives at the following conclusions:

"That all calcareous soils are naturally fertile and durable in a very high degree."—And,

"That all soils, naturally poor, are entirely destitute of calcareous earth."

It, then, can scarcely be denied, [continues Mr. Ruffin,] that calcareous earth must be the cause of fertility of the one class of soils, and the want of it produces the poverty of the other. Qualities that always thus accompany each other cannot be otherwise than *cause* and *effect.*§

But however deficient the soils in some parts of Virginia may be in calcareous matter, many persons will be surprised to learn, *that a large proportion of the soils of Ohio are likewise destitute of this essential ingredient.*

In the second Geological Report of Ohio, Dr. Locke states that the soil formed by the disintegration of the underlying limestone formations, in the south-western parts of the state, *does not contain at the surface so much lime as we should anticipate;* and *rarely*, if *ever*, where undisturbed, does it *effervesce or foam with acids.* On the tops of the hills around Cincinnatti, the *loam* lies seven to nine feet deep, before any stones are mingled with it, *and this loam is not effervescent with acids.*

The vegetable acids, (observes Dr. Locke,) which exist in the natural juices of plants, become saturated with lime as they pass through it, and form soluble salts, which are washed away by the rains. These causes, operating for ages, have evidently bleached the surface, especially on the table lands, till, in my opinion, *there is an absolute want of calcareous matter.* If this is the fact, the clay-marl, found every where between the layers of rocks, would be a beneficial manure; and burnt slaked lime would be still more useful, and would undoubtedly renovate the wheat and grass lands, *which on the table lands, are to some extent worn out.*

In a previous Geological Report of Ohio, Dr. Riddell says, the bottom lands near the mouth of the Big Miami, are in some places *destitute of carbonate of lime.* The diluvial soils of the extensive plains of Champaign and Logan counties, as I learned from frequently repeated experiments, *are usually destitute of carbonate of lime.* I have often noticed, by repeated observation, while travelling north in Ohio, that the inner tracts of all large plains, whether the margins are bounded by hills of limestone or not, present a soil *in which carbnoate of lime cannot be detected.* Between Clarksville and Springfield, the soil does not often contain any *appreciable amount of carbonate of lime.* Near Upper Sandusky I tried with acids, portions of the upland soil from several places, *but no carbonate of lime was indicated.* Neither would the *black mould effervesce*, when submitted to the same experiment. The soil about Monroe, in Huron county, *does not effervesce with acids;* and would probably admit of improvement by the application of calcareous manure.‖

Farmers of the West! We beg of you to reflect upon these facts. Is it *true*, that your farms contain little or no lime or calcareous earth? A fip's worth of nitric acid, poured upon the soil, will inform you. Is it also *true*, that the presence of lime in some of its forms, is *essential* to the proper growth and perfection of nearly every vegetable known, and more especially of those that are cultivated and used as food for man and animals? If you should not be convinced of this fact, from the brief considerations above given, read the invaluable works of Davy, Chaptal, and many others, on agricultural chemistry. And should you succeed in convincing yourselves of these important truths as I have done, you will naturally inquire, What is to be done to remedy this defect in our soils? In the next number, I propose to aid you in your researches for the proper remedy, as well as to offer some further and more important facts and reasons upon the *necessity* of the application of calcareous earth to poor and exhausted soils.

[*To be continued.*]

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* See Riddell's Geological Report to the Gen. Assembly of Ohio.

† Jackson's Report on Rhode Island.

‡ Jackson's Report.

§ Ruffin's Essay.

‖ Riddell's Geological Report.

THE PROPER CULTIVATION OF, AND ANNUAL CROPS FOR PEACH ORCHARDS.

To the Editor of the Farmers' Register.

During the last twenty some odd years, a communication has been almost annually going the rounds of agricultural papers, the production of a worthy man and a zealous, enterprising agriculturist of Pennsylvania, a Mr. Colter, on the subject of cultivating the *peach tree.*

Many years ago I determined on the cultivation of that fruit, with a view to distillation and the fabrication of brandy; but, before my orchard had become productive, as the result of observation and much serious reflection, I determined that, next to original sin, ardent spirits was the greatest curse on earth; and, therefore, determined to find some other outlet for my little portion of industry and enterprise, less objectionable. Passing through Virginia and North Carolina about the same time, I found to my agreeable surprise that, as an article in the production of *animal food*, the peach, if judiciously selected, and managed, was not excelled, when every thing was taken into view. I found, however, that the method suggested by Mr. Colter was opposed to a judicious and economical management of both fruit and soil.

About the last of July, I found my little orchard cultivated on this gentleman's plan perfectly prostrated—the trees lapped—it was painful to go through it—and the load of fruit lying on the ground, part among the grass and weeds. For, to give the soil that degree of cultivation necessary to keep it clean, was impossible.

I became still further satisfied, from facts before me, that the ground amongst fruit trees can not be kept too loose, or too clear of grass and weeds. I determined, therefore, that some ameliorating crop must be found and annually cultivated among my fruit trees to insure good fruit, and abundant crops, as also lasting trees. In selecting this crop to carry out my plan, which was to raise the peach for the production of pork, I found that some of the pea tribe, after the trees arrive at the bearing state, and the potato, previously, were the only plants unobjectionable; and I found in this section of the Union varieties of both, fully answering my views, coming to full maturity, as the peaches began to ripen in June. I found a pea that produced admirably, and even under the trees, running up their bodies, spreading through the limbs and bearing well—and uninjured by the winter rains. And here I will add, as the result of no slight experience, that, notwithstanding the peach tree is so highly benefitted by stirring the earth around its roots, to produce the best effect it must be done only in the fall, winter, and in the spring after the blossom is off. And, to settle this part of the subject, as far as regards my practice, I will state, that as soon as the vines of the potato or pea cultivated in the orchard, are sufficiently rotten to turn under with the bar-share, the first ploughing takes place, the next previous to planting, and the last on the cultivation of the crop.—I am fully satisfied that the roots of the tree require to be kept cool and at rest (when the tree is in the bearing state) the balance of the summer, for which the only two crops I can admit are admirably calculated. The little bunch potato comes to maturity with us in June, and produces admirably. The vine hardly runs, but covers the earth with a mass of leaf and short vine. Not wishing to take up too much of your valuable columns, I will continue the subject in other numbers.

CULTIVATOR.

Alabama, 1st Sept. 1840.

DRY MEASURES OF CAPACITY.

To the Editor of the Farmers' Register.

Very few things are more useful in house-keeping than such articles. Yet, I believe, it may truly be said, that very few if any families are provided with more than one or two of them; say, a half-bushel, which rarely agrees with the standard, and something called a quart-can, together, perhaps, with one which is supposed to contain a pint. These last, however, are always of the wine measure size. Consequently, every one who receives any article measured by them—meal or flour, for instance—loses very nearly ten cubic inches in every quart which he purchases, there being that difference between the wet and the dry measure quart. But this is not the worst of it; for I believe that almost all, probably all the measures we make for ourselves, (if indeed we make any,) of a smaller size than the half-bushel, such as the peck and half-peck measures used in our mills, are graduated from the tin quart-cans which we purchase from the tin-shops, and never think of examining so as to ascertain what they contain. I know not what is the cause of this carelessness and neglect, unless it be that most house-keepers are either too lazy, or too ignorant of common arithmetic to direct the making of their own measures, especially in a round form, and so leave themselves entirely without any. But be this as it may, I have thought that I might perhaps render an acceptable service to some of our agricultural brethren, as well as to others, by furnishing them with the dimensions of boxes nearly square, which would contain the following quantities: a bushel, half-bushel, peck, half-peck or gallon, half-gallon, and quart—barrel (of 5 bushels) and half-barrel. All these can easily be made by any common carpenter, who can use the ordinary tools of his vocation, and can procure a small quantity of very well seasoned plank of some wood which is least liable to shrink or to swell.

You, my good sir, and many others know, that no measure of capacity can be made with absolute accuracy, for reasons with which it is needless here to trouble your readers in general, and I shall therefore omit them. But the fractions in the measures here given, are quite near enough for all common purposes, as all of them come within a very few parts of a cubic inch of containing the exact quantities which each is designed to contain. None are in use of greater accuracy.

Dimensions.

A box 16 in. by 16.8-tenths and 8 in. deep will contain a standard bushel, or 2150 cub. inches 4 tenths.*

A box 12 in. by 11 2-tenths and 8 in. deep will contain a half-bushel, or 1075 cub. inch 2 tenths.

A box 8 in. by 8.4 tenths and 8 in. deep will contain one peck, or 537.6 cub. in.

A box 8 in. by 8 and 4.2 tenths deep will contain half a peck, or 268 cub. in. 8 tenths.

A box 5 in. by 5.6 tenths and 4 in. deep will contain half a gallon, or 134 cub. in. 4 tenths.

A box 4 in. by 4 and 4 2-tenths in. deep will contain one quart, or 67 cub. in. 2-tenths.

A box 24 in. by 16 and 28 in. deep will contain a barrel, or 10752 cub. in.

A box 24 in. by 17 and 14 deep will contain half a barrel, or 5376 cub. in.

If those who may wish to use the foregoing measures, which are not to be found in any book that I have ever seen, will only copy them in their pocket-books, (should their memories be too short to retain them,) they may always be prepared with plain directions for making them, without the trouble of referring to your Register. I venture to give this admonition, because I know, by long experience, that many of us will rather go without any information we may want, than walk a few steps after a book in which we are certain it can be found. Such is the *vis inertiæ*—the highly culpable mental torpor of thousands among us, who will make no effort to correct this shameful fault, although daily sensible of its existence, and very frequently suffering, not only inconvenience, but considerable injury from its influence.—But I must forbear to moralize farther on such a subject, lest some of your critical readers may accuse me of "travelling out of the record" farther than need be. I will therefore conclude with renewed assurances that I shall ever remain yours,

Very sincerely,

JAMES M. GARNETT.

* These calculations are for a bushel of 32 quarts. The S. Car. & N. Car. bushel is nearly 40 quarts.

REPORT ON THE FINANCES.

Letter from the Secretary of the Treasury on the state of the Finances.

TREASURY DEPARTMENT, Dec. 15, 1842.

SIR: In obedience to the direction of the act of Congress of the 10th May, 1800, entitled "An act supplementary to the act entitled 'An act to establish the Treasury Department,'" and an act entitled "An act to establish the fiscal year," &c. approved the 26th August, 1842, the Secretary of the Treasury respectfully submits the following report:

I.—Of the public revenue and expenditure.

The balance in the Treasury on the 1st Jan'y, 1842, (exclusive of the amount deposited with the states, trust funds, and indemnities.) was		$230,483 68
The receipts into the Treasury during the first three quarters of the present year amount to		$26,616,593 78
Viz:—		
From customs	$14,260,830 35	
From lands	1,091,638 95	
From miscellaneous & incid'l sources	112,967 17	
From Tr'y notes per act Feb. 15, 1481	1,060,206 05	
From do. do. per act Jan. 31, 1842	7,794,821 59	
From loan of 1841 and 1842	2,296,129 87	
The receipts of the fourth quarter, it is estimated, will amount to		$7,886,000 00
Viz:—		
From customs	4,000,000 00	
From lands	366,000 00	
From miscellaneous & incid'l sources	20,000 00	
From Treas'y notes	2,500,000 00	
From loan	1,000,000 00	
Making the total estimated receipts for the year		$34,302,593 78
And with the balance in the Treasury on the first of January last, an aggregate of		$34,733,077 46
The expenditure for the first three quarters of the present year have amounted to		$26,264,882 20
Viz:—		
Civil list, foreign intercourse, & miscellaneous	$4,371,933 93	
Army-fortifications, pensions, fulfilment of Indian treatics, suppressing Indian hostilities, &c.	7,065,035 95	
Naval service	6,717,084 17	
Treasury notes redeemed, including interest	7,856,400 35	
Public debt, including interest on loss	254,427 80	
The expenditures for the fourth quarter, are estimated from data furnished by the respective departments		8,238,278 15
Viz:—		
Civil, foreign intercourse, and miscellaneous, [including the amounts due to states for distribution of the sales of public lands, & amounts due to Mississippi & Alabama, under act of Sept. 4, 1841,]	2,144,013 97	
Army, fortifications, pensions, fufilment of Indian treaties, suppressing Indian hostilities, &c.	3,710,436 45	
Naval service	1,828,385, 15	
Interest on loan	152.442, 58	
Unclaimed dividends	3,000 00	
Principal and interest on Treasury notes	400,000 00	
To which add outstanding warrants issued prior to Jan. 1, 1842,		805,474 03
Making		$35,308,660 38
Leaving a deficiency in the Treasury on 31st Dec., 1842, of		$3575,556 92