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Agriculture.

SOMETHING OF THE PHILOSOPHY OF SOIL MANAGEMENT AND PLANT GROWTH.

Correspondence of The Progressive Farmer.

The ash of plants is made up of mineral matter derived from the soil, chiefly lime, sillica, potash, phosphorus and very small quantities of other minerals. That part of the plant which is driven off by heat when it is dried is water, that part which disappears in the form of gas and smoke when the dried plant is burned, is called its organic matter.

Nearly all of the organic matter of plants consists of carbon, hydrogen, oxygen and nitrogen. Water is composed of oxygen and hydrogen, and air also contains large quantities of oxygen, carbon and nitrogen. Hence it is known that plants obtain their oxygen, hydrogen and most of their carbon from the air and water and this is 95 pounds of every 100 pounds in weight.

But although four-fifths of the air is composed of nitrogen, only one family of plants is known to be capable of using the nitrogen of the air. Botanists call this family of plants the leguminosæ, or legumes. They all bear seed pods of some kind. They include the clovers, vetches, peas, beans and several kinds of weeds and some trees. All other plants must derive their nitrogen solely from the soil.

It has recently been discovered that the legumes are enabled to take nitrogen from the air by means of bacteria that operate upon their roots. It is true that as falling rain descends through the air it absorbs some atmospheric nitrogen, which it carries to the soil in a form ready for the use of plants, but the quantity is small—from 2 to 4 pounds per acre in a year.

Much nitrogen exists in most soils in the form of rotted and rotting vegetable matter, called humus. This quantity varies from 7,000 to 28,000 pounds per acre in the first three feet in depth of the soil.

But before plants can take up and use this organic nitrogen already in the soil or that which may be supplied in the form of manures and commercial fertilizers, it must be broken down and converted into ammonia and then into nitric acid by the agency of these soil bacteria.

We thus find that in all cases plants are dependent upon soil bacteria for their necessary supplies of nitrogen. Let us see how it is with their necessary mineral food to form ash.

Originally the earth's crust was composed of rocks. Ages of exposure to wind, rain, sun, air and frost caused the surfaces of rocks to disintegrate and crumble into dust and upon this layer of dust some plants grew and animals appeared, and the decay of the dead plants and animals added organic matter and thus the soil was formed.

Now, one of the most potent agencies in converting rock into soil is the carbonic acid gas generated by soil bacteria.

The rocks being the basis of soils, the character of soil depends largely upon the kind of rock from which it was derived. The most fertile soils are derived from granite and limestone. Sandstone soils are inferior.

In the surface soil of cultivated fields there are from 30,000 to 1,500,000 bacteria in each gram of the soil (about half a thimbleful). The street dust of Naples was found to contain from 10,000,000 to 1,000,000,000 bacteria per gram.

It has also been found that the number of germs in desert and forest soils is much smaller than in cultivated soils and fewer in sandy soils than in clay soils. In cultivated soils the more active and frequent the cultivation the more bacteria. Soils rich in humus are also rich in bacteria. The number of soil bacteria is much greater in summer than in winter. There are more bacteria in the soil of hoed crops, like potatoes, than in the soil of grain crops like wheat. We thus find that in truth cultivation may take the place of manure. But we must remember that cultivation only enables the soil bacteria to render the manure already in the soil available to the growing plants; hence continuous cultivation without adding manure or growing a crop of legumes would in time exhaust the soil of its plant food.

But soils too rich in humus become sour and this checks the operations of soil baceria. This is seen in muck soils.

Nitrification can only take place in a feebly alkaline medium. In an acid condition of the soil, said acidity must be overcome by the use of lime before nitrification can actively begin.

A heavy dose of lime by unduly increasing the alkalimity of the soil, may at first check or suspend nitrification until said lime has been converted into carbonate. This, however, takes place rapidly, diminishing in turn its strong alkaline properties and permitting nitrification to commence more actively than before.

The nitrifying ferments grow only in the presence of air. The effect of stirring and pulverizing the soil is to aid nitrification, bringing the oxygen of the air into more immediate contact with the nitrifying organisms.

Exact experiments have furthermore demonstrated an important law, i. e., that the effect of cultivation is to markedly increase nitrification, and in a ratio proportionate to its thoroughness and frequency.

Bacteria of all kinds, including the nitrifying organism, grow only in the presence of moisture. In a dry soil nitrification cannot take place, hence in periods of drouth where the superficial layers of the soil for a depth of several inches become dry nitrification is suspended; on the other hand, an excess of water prevents nitrification by excluding air; hence waterlogged soils must first be drained before they become proper nitrifying beds. In a wet soil not only is nitrification inactive or entirely suspended, but the opposite process of dentrifications take place, with the loss of nitrogen in the free gaseous condition.

The function of underdrains is thus not only to withdraw the excess of subsoil water, but also by the downward movement of the same to draw air into the soil and thus supply oxygen to the nitrifying bacteria.

Nitrates are very soluble and are easily leached out of soils by rains. This loss is greater in sandy soils than in heavier kinds; it is greater from fallow land than from lands covered by vegetation; hence if we would prevent nitrates from being leached out of soils, it is important to keep the ground covered with some crop throughout the year, summer and winter.

In view of the rapid disappearance of nitrates from the soil, nitrate of soda as a fertilizer should be applied in small quantities while the crop is growing. The custom therefore of introducing nitrate of soda with the seed is a most wasteful operation.

The amount of nitrates lost from an unmanured field at Rothamsted, kept fallow and free from weeds, was an average of three successive years 38 pounds per acre per annum; the corresponding loss from wheat land, an average of 19 years, was 10½ pounds per acre per annum, or less than one-third the loss from fallow land.

The effect of sed, as compared with wheat, in still further preventing losses of nitrates from the soil, is still more marked, as shown by the experiments at Rothamsted and elsewhere.

The nitrifying organism cannot multiply except in the presence among other elements of phosphoric acid and potash. Nitrification is accordingly aided by applications of mineral fertilizers.

Furthermore, the ability of a crop to utilize the nitrates of the soil is considerably diminished when there is a deficiency of available mineral constituents, especially of potash and phosphoric acid. Experiments at Rothamsted, England, have shown that the quantity of nitrates which passed out of the soil in the drainage was considerably diminished as a result of the application of mineral fertilizers.

The losses of nitrates from soils are greatest from wheat harvest to spring sowing, and least during the summer months. This fact teaches a most important principle, that is, that ground should be kept in some crop as much of the time as possible, especially during the fall and winter.

Corn land should never be left fallow through the winter. The same is equally true of tomato and trucking land. Either these crops should be followed by wheat, or some cover crop put in to conserve nitrates.

A growth of crimson clozer, cow peas, vetch, bur clover, rye or even weeds left on the land during the winter will save much nitrogen. The living crops like crimson or bur clover, rye, wheat or winter vetch are more efficient than a dead crop of pea vines or weeds.

Then we find that besides supplying nitrogen to the soils in the form of manures or legumes turned under we may utilize the great stores (7,000 to 28,000 pounds per acre) already there by encouraging the multiplication of soil bacteria in three ways—underdraining, deep plowing and frequent cultivation. It is estimated that every cultivation of a crop is equal to a dressing of nitrate of soda, and is much cheaper. It pays to cultivate often, though there be no weeds nor crust. Such intensive culture will in time exhaust the soil unless legumes be frequently grown in rotation with the crops that receive clean culture.

J. L. LADD.

Bay City, Tex.

MAKING GERMAN SAUERK-RAUT.

Correspondence of The Progressive Farmer.

A great many items of interest to farmers come from our consuls in different parts of the world to the State Department here. Last spring I sent The Progressive Farmer a description of Chinese farming, and a little later an insight into Belgian poultry raising. And now as it is about time for sauer-kraut making in the Old North State, I think the following letter recently received by the State Department from Consul Murphy, of Madgeburg Germany, regarding the far-famed German sauer-kraut, will interest your readers. Consul Murphy writes:

"The best German sauer-kraut is made in Madgeburg; but when a consular officer attempts to ascertain how it is made, he encounters the usual insuperable obstacle—business secrets. The manufacturer politely replies to all inquiries, 'My recipe is what makes my business profitable. If I gave it to you, you could make the same sauer-kraut in Washington. The fame of Magdeburg would thus be dimmed, and what would become of the orders which mean so much to me?'

"The process of manufacture, omitting business secrets, is about as follows:

"Take a number of heads of white cabbage, as fresh as possible, and cut them into fine, long shreds. Place in layers in barrels, or kegs, strewing salt over each layer, using one-half a pound of salt for each twenty-five cabbages. Press the mass down with clean feet, wooden shoes, or a heavy stamper. Place a cover on the barrel, and upon this lay a heavy stone. This presses the sauer-kraut more and conserves it better. The sauer-kraut must then be allowed to ferment in a cellar for from three to eight days, according to the temperature of the room. The barrel should then be tightly closed and kept in a cool place, preferably in a cellar.

"Fancy grades of sauer-kraut are produced by pouring white wine into the barrels after they are filled. Apples chopped very fine are also sometimes mixed with the cabbage.

"After the barrel is closed the sauer-kraut will be ready for use in about a week. As soon as some is used, the barrel should be covered and a stone again placed on top.

"In preparing and keeping sauer-kraut, sunshine and extremes of heat and cold should be avoided."

With best wishes for The Progressive Farmer. B.

Washington, D. C.

GROWING WHEAT.

Prof. Jas. B. Hunnicutt, of Georgia, who contributed an interesting article on alfalfa to our last issue, writes the following interesting article on wheat to a recent issue of one of our exchanges. This is a subject of unusual interest just at this time and we are glad to copy Prof. Hunnicutt's letter as follows:

This is the greatest of all the bread crops. We should study its nature and adaptations so that we can address ourselves to wheat growing intelligently. Wheat generally means winter wheat. Spring wheat is only adapted to limited localities. Winter wheat is a biennial plant. It requires part of two years in reaching full maturity. It needs the fall of one year for root development, and the spring of another year for seed development. As root development must come first, this is the most important part for us too look after. If this is perfect, then there may be a full seed crop. But if from any cause the root development is incomplete, the grain will be cut short.

SOWING THE GRAIN.

We now see that the manner of sowing the grain is very important. The roots must have time and room and food, or they will not reach full growth. The time should be about six months, and hence should begin as early as practicable in fall, so as to reach the greatest possible growth before mid-winter checks them. September in most of this country would be the best time, all things considered. But local conditions often change this. The Hessian fly must be considered. If we sow too early this fly may cause great damage and sometimes complete ruin. They are much worse where there is grass upon the land, and much less troublesome after any crop that has required clean culture. Henco it is often a matter of great importance what crop to follow. Cotton gives the best possible preparation for wheat. But the cotton crop does not mature early enough, hence many prefer to follow corn. Peas are better. They leave the soil in excellent condition mechanically, and store away ammonia for the use of the wheat. A clover sod is the best of all rotations.

PREPARATION OF SOIL BEDS.

Wheat roots desire to go down four and one-half to five feet in the earth, seeking water and food. This they will do if the hardpan is broken thoroughly. Deep plowing and subsoiling and repeated harrowings will all pay. The cultivation must be done before sowing the seed. A deep mellow root bed is of prime importance. If the soil bed is perfect the danger from rust is almost entirely avoided. If to this deep and thorough preparation we add a liberal use of acid phosphate and potash we have an ideal seed bed. Various experiments show that this is a vital point in successful wheat growing. In a bed thus prepared the roots of wheat sown in September and early part of October reach such a wonderful development that there is little danger of winter killing. The roots are so numerous, deep and strong that they will resist successfully the power of frost. Again, the top will be so far advanced as to furnish a good covering over the soil. This green covering keeps the soil warm.

Wheat thus sown will have four times the root development of wheat sown in November. For the South this is a matter of first importance.

SELECTING SEED.

There is a great difference in the yielding power of different varieties of wheat. Rust is the great enemy. Hence, a rust proof variety should be secured if possible. The further South we go, the greater danger from rust. At presont the "Red Amber" and "Turkish Red" seem to be leaders along this line.

Too much care cannot be given to this point. When ready to sow, the seed should be washed in very hot water, or in a solution of bluestone, so as to destroy smut, spores or germs.

Sowing with drills seems to be growing in favor. This helps to protect the young plants against frost. But we rather think the chief advantage comes from the better preparation of soil secured by this plan, together with greater uniformity of depth of covering of the seed.

FERTILIZING.

The manuring should be done broadcast and thoroughly incorporated with the soil by harrowing. The chief point is to secure as great solubility as possible, so as to render prompt aid to the roots. Ammonia is needed for promoting healthy growth. This can generally be secured from peas or clover, or thorough culture and barnyard manures. Acid phosphate is needed to insure heavy grain in the heads, plump and full. Potash gives strength to the stems and helps to resist rust. It gives a healthy tone to the entire plant, and this is of prime importance.

RESULTS.

If good seed be selected, soil preparation thorough, fertilizing properly proportioned and seed sown early, the wheat crop will be sure and profitable. Carelessness, slipshod methods and general inattention have made many farmers flour buyers, who should be wheat sellers. From thirty to forty bushels should be the average yield from intelligent sowing. Wheat growing is not limited by climate or soil, but by intelligent sowing. Hence we say to every Southern farmer,

"Sow plenty of good wheat
Have home-grown bread to eat!"

JAMES B. HUNNICUTT.

BOOKS FOR FARMERS.

A young farmer of Adair county, Iowa, writes Wallace's Farmer as follows:

"Can a young man with a common school education study out the scientific part of farming without going to college? I cannot leave home and have only evenings to study. Is it too deep to study out alone? There are three or four studies which I would like to master; live stock judging, feeding, elements of the soil, and farm management. Are there any books treating on these subjects?"

To this inquiry Dr. Wallace replies as follows:

While nothing can fully take the place of a practical college education, our young friend may get a fair working knowledge of scientific agriculture by home study and close observation. Live stock judging is something that can be thoroughly mastered only by constant practice. We are in great need of a text-book on this subject and it is to be hoped that some of our expert judges will furnish it before long.

Farm management is a matter of executive ability and experience. Our correspondent can, however, get a good working knowledge of practical farming if he will begin with "The Principles of Agriculture" by Prof. Bailey, and "The Soil" by Prof. King, both volumes of the Rural Science Series published by The MacMillian Company, New York. If he will thoroughly master these, which he can do in the course of a year, he will have taken a long stride toward being an up-to-date in fact, will be surprised himself at the pay in the course of the year in dollars he will receive from this course of study.

The best time to slaughter hogs for farm or family purposes, is when the weather is dry, cool and frosty. After the hogs are nicely butchered let them dry and cool out nicely before you commence cutting up. After they are nicely cut into shoulders, middlings and hams, salt with nice salt, a little saltpetre mixed with it, on a platform. After it has remained in salt about six weeks, hang the meat up in close, dark smoke-house, and as soon as hung up smoke the meat with green hickory wood until it is a nice brown color. The preservative power of the smoke is owing to the small amount of creosote it contains. After it is properly smoked and dried, flies nor bugs must not be allowed access to it. To prevent this put the hams and shoulders into thick paper sacks, securely bound up and hang up. If the sides are not put in paper sacks, they can be put in a box with layers of shelled corn between the sides and the box covered.—Robt. C. Allison, Glade Springs, Va.

TWO WAYS OF FARMING.

A correspondent in the Ohio Farmer in comparing the difference between intelligent and thrifty farming and slipshod methods too common in all sections, says:

"By looking carefully over a rural community we aee that not all farmers and their families are abridged in needed leisure and time for social pleasure. This is because there are two general agricultural classes living side by side. One represents the man who drives his work, has little to complain of, and the other, one who lets his work drive him and who is always bitterly complaining. The farmer who does not "get along" belongs to the latter class. He makes many unnecessary trips to town, and golden hours flit by while he lounges. He does not start to hoe the corn and potatoes till the weeds are choking them, and the grass in his meadows is past its prime before it is cut. His work is proverbially ten days behind hand from seeding time till harvest and his crops suffer in consequence. This man takes his leisure at the wrong time, right at critical periods in the cultivation and harvesting of his crops. In other words he fails in management.

"His more wise and consequently more successful agricultural brother pursues an opposite course. He meets half way nature's efforts to help him, and keeps his work well in hand and under his control. The care of his crops and stock always receives first consideration, because they represent his living—his bank account. While his negligent brother is making those unnecessary and prolonged visits to town he is improving the golden moments by a brisk, industrious and alert policy, which will keep the cultivation of his farm so thoroughly in hand that he will have besides plenty of lesure for sufficient social enjoyment with his family and friends, time to read the best journals. and also to indulge with his family in occasional days of recreation. Thus a farmer, by proper management, may enjoy as much or more leisure than a man in any other line of business, and at the same time reap substantial profits—provided his hours or days of leisure are chosen at the right time.

We have urged this practice of following the plow with the harrow in the spring of the year in order to prevent the formation of clods as to conserve the moisture. While there is little danger of clod formation now, there is even more necessity for following with the harrow in order to conserve moisture than there was last spring. When the time comes to sow wheat, it is all-important that there be sufficient moisture in the ground to secure vigorous and prompt germination. There is little enough time under the best conditions to allow the wheat to take firm root, to stool out well, and be ready for the winter. To secure this vigorous growth, moisture is all-important; therefore, conserve it by using the harrow while you can. It is just as easy to harrow the ground immediately after plowing as it is after it has become lumpy, in case the land is plowed a little wet, and parted with its moisture and thus unfit to sprout the grain. It is the prompt attention to some of these seemingly unimportant things that marks the difference between a good farmer and a poor one, or between success and failure.—Henry Wallace.

RAPE FOR HAY.

Correspondence of The Progressive Farmer.

I have never grown any rape, but would like to know if it can be used dry or as hay. S. E. M.

Union Co., N. C.

Rape cannot under any circumstances be used for hay. It is exclusively a soiling crop, and must be fed green, like cabbage.

A good Allianceman keeps the principles and purposes of the Order before his neighbors, so that they may become familiar with them and learn to adopt them.