

Why We Should Fertilize the Soil

by BURT E. POWELL

MAN'S best friend is his mother—the earth. All she asks is the opportunity and she will yield him the wealth of an account that has been growing for ages. And he has treated her as he usually treats his best friends. He has taken all she had to give, bought an automobile and a house in town and then hid his address from his relatives of the soil for fear they would bring their earthy smell into his new residence.

With quiet indifference old Mother Earth endures this ingratitude, but the time comes when she has nothing for his greed. What happens then? Look to India for one answer. Ten million of our own Aryan blood starve there in a single famine year—starve upon a soil that once was, and still could be, almost inconceivably fertile. Russia offers another reply, where with stomachs empty men enter a world that never fills them. Yet another answer, centuries old, may be found in the Tigris-Euphrates valley, which, once marvelously fertile, now scorches uselessly in the tropic sun. The necessity of man forged a weapon that brought him plenty; but the greed of man forged a weapon that brought him penury. For do you think there can be prosperity when the earth no longer yields? Do not forget that the shame of Rome was coincident with the time when one bushel of seed returned but four in the harvest. When the soil exploited, that is when it is so farmed that the essential elements are taken out in crops and nothing returned to build it up, the result

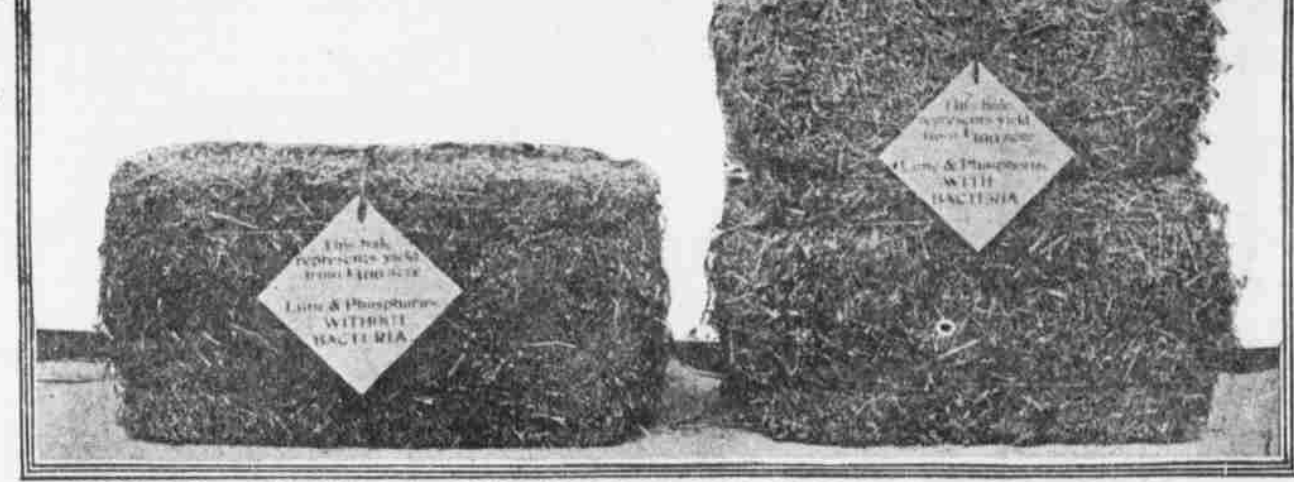


TWO FIELDS OF CLOVER IN SOUTHERN ILLINOIS SHOWING EFFECT OF USING LIME, STONE, ROCK PHOSPHATE IN ADDITION TO MANURE.



CORNFIELD IN URBANA FLAT, 3 YEAR ROTATION, NO TREATMENT

is exactly the same as when men are exploited in workshops and nothing returned to build up their bodies. You cannot haul phosphorus and nitrogen in oats and wheat and corn from your farms year after year and maintain the fertility of the soil, if you give back no phosphorus and nitrogen in return. Twelve thousand abandoned farms in the state of New York alone testify to this. After sixty years of cultivation the lands of the corn belt are beginning to hint at the same thing.



ALFALFA—SHOWING ADVANTAGE OF HAVING THE SOIL INOCULATED WITH BACTERIA

We all feel the results; and it is not the man with the hayseed in his hair who feels it first but the man with the pen behind his ear. Month by month the price of each separate commodity puts a little large puncture in his salary, until by the end of the year his savings, which began hopefully, as an unknown quantity, have ended as "X=nothing." He it is who knows the cold dread of middle age; for unless the land can be induced to yield abundantly prices will not settle down to the point where the man on a moderate salary can live free from fear. Farmer and clerk alike, we are all vitally concerned in this problem of maintaining and increasing the fertility of the soil that is fertile, and of restoring soils that have been cruelly exploited.

Fortunately they can be restored. Intelligence is more potent than avarice and can undo the evil it has wrought. Even those soils that have been exploited to the point of apparent ruin can be nursed back to health. Dr. Cyril Hopkins, head of the agronomy department of the University of Illinois, a soil specialist of national reputation and the author of numerous pamphlets and a book entitled "Soil Fertility and Permanent Agriculture," is one of the most enthusiastic workers along this line. He is a man of hard facts and loves pretty theories even as the devil loves holy water. Every fact that he gives out must prove itself over and over again in tests upon his own farms, or those belonging to the university or upon one of the various experimental plots. There are about thirty of these plots scattered through the state of Illinois, where the soils are carefully examined and then cropped according to their needs. I could tell you tales of what Mother Earth has done in the way of corn, wheat, oats, or clover when she has received proper treatment that would set you to building castles in the air upon an earthly foundation. The corn yield upon one of the university farms in 1909 was 87 bushels to the acre, due to treatments with limestone and phosphorus. But before we go farther

let us consider a few fundamentals of crop growing. First, there are six positive, absolutely essential factors. They are: (1) the seed, (2) the plant home, (3) the food of which the plant is made, (4) moisture, (5) heat, (6) light. Now, except in the case of the seed and plant food these factors are largely beyond the farmer's control. Dame Nature can, however, be trusted to attend to them satisfactorily. How, then, has the farmer made use of his ability to control the two factors? By exercising judgment and care in the selection of seed and by ignoring the matter of plant food entirely. The result? When the land was worn out and had no plant food to give the good seed the agriculturist arose irately in farmers' institute and told what he thought of the seed seller. The trouble all the time was not with the seed but with the soil, which had had the elements of plant food removed in previous crops, and as a consequence could not respond to the call of the seed.

What are these elements? There are ten in the list, but eight are provided abundantly. Three—oxygen, hydrogen and carbon—come directly from the air and water. Most normal soils contain enough potassium, magnesium, iron, calcium and sulphur, although sometimes the first must be supplied. The problem of plant food, therefore, narrows itself, in most cases, to maintaining and increasing the phosphorus and nitrogen. Now nitrogen is as easy to catch as the measles if one knows how. The air contains it in inconceivable amounts. Dr. Hopkins has estimated that the air above an acre of ground contains about \$10,000,000 worth, if sold over the counter at ordinary commercial rates. In order to induce this nitrogen to enter the earth, where it may reappear as food for man, all that is necessary is to plant clover, alfalfa, peas or any legume. By means of the bacteria upon the roots these legumes draw the nitrogen into the soil. How necessary the element

of nitrogen is may be seen from the fact that a 100-bushel crop of corn takes from the soil almost 100 pounds of nitrogen in the corn and about 48 pounds in the stalks. Rich, well-balanced land in the corn belt contains about 8,000 pounds of nitrogen. Therefore, if the process of subtraction of nitrogen goes on year after year with never an addition, it can be seen clearly that the farmer's finances cannot multiply. Rotation plans for grain farmers always should include a crop of legumes. Wheat, corn, oats and clover is a satisfactory rotation; also wheat, corn and cow peas; also cotton, corn and oats and cow peas. The first of these rotations should include a catch crop of clover seeded the first year and plowed under for corn as late as practicable the second year. The other two should include catch crops of legumes whenever possible. Legumes when plowed under perform valuable services besides supplying the soil with nitrogen—as they decay they supply organic matter to the soil which helps other elements of plant food to free themselves from the earth and into the farmer's bank account.

Now that the question of nitrogen has been outlined, suppose we turn to the problem of phosphorus, the only element of plant food we ever shall have to buy. As to the importance of the use of phosphorus upon the common soils of the United States, Dr. Hopkins has this to say: "Phosphorus is the key to permanent agriculture on these lands. To maintain or increase the amount of phosphorus in the soil makes possible the growth of clover or other legumes and the consequent addition of nitrogen in the residues of clover and other crops and in manure, made in large part from clover, hay and pasture, and from the larger crops of corn and other grains which clover helps to produce comes the possibility of liberating from the immense supplies in the soil sufficient

potassium, magnesium and other essential abundant elements supplemented by the amounts returned in manure and crop residues for the production of large crops at least for thousands of years; whereas if the supply of phosphorus in the soil is steadily decreased in the future in accordance with the past and present most common farm practices, then poverty is the only future for the people who till the common agricultural lands of the United States."

Phosphorus may be applied in liberal amounts—as much as 1,000 pounds to the acre every three or four years—and it costs about \$7 a ton.

After the problem of returning the elements to the soil has been solved the farmer may find another condition of the soil which must be corrected before his farm will produce as it should. This is the tendency of certain soils to acidity. Clover, alfalfa and other valuable legumes cannot thrive upon soil that is sour. Sometimes on acid soils when applications of farm manure are made, the legumes will seem to grow well, but examination reveals the fact that the nitrogen gathering bacteria fail to develop properly. Hence the most valuable contribution the legumes have to make to the soil is largely lost. Upon certain fields belonging to one of the most famous agricultural stations in the world, that of Rothamstead, England, applications of natural limestone were made a century ago. They are still moderately productive, although other fields near by, which have never received the application, are extremely unproductive.

Care should be taken that limestone is used for the one and only purpose of correcting soil acidity.

And while we are upon this subject of soil stimulation, have you ever thought that most of our improvements have that in view and irrigation, even crop rotation, all are means for extracting from the soil the richness that is in it not for returning any of the food elements of grain building. All of these food elements of stimulation are excellent in their way, if used in connection with methods of returning the elements of plant food; but if used without them they are means of hastening the impoverishment of the soil.

To return to the question of limestone, one ton to the acre finely ground will correct the acid condition of most soils. It is, however, in the end cheaper and easier to apply more and to apply it less often. As much as ten tons to the acre was applied to the soil of one of the experiment fields in southern Illinois and the crop yields there have been greater than upon any other fields in that district.

A question that has been given much attention lately is the question of crop rotation. Undoubtedly it is absolutely essential for successful grain farming, but it is not the universal panacea some would have us believe. For instance, a group of theorists have declared that fertilization is unnecessary, that crop rotation will keep the soils in perfect condition. The idea is that plants do not injure the soil because they use its plant food elements but because they throw off poisonous excreta as animals do. Therefore a so-called "worn-out" soil simply has become saturated with this excreta. Plant a crop which will neutralize the poison of the last crop and the soil will be sweetened and the breasts of Mother Earth kept dripping with plenty forever. This is very attractive—as a theory. It has, however, no foundation in fact. As Dr. Hopkins has said, the rotation of crops has just the same effect upon wealth in the soil as the rotation of the check book among the members of the family has upon the wealth in the bank. Plant food elements cannot be used up and not returned without resulting in impoverishment of the soil.

The American Home

WILLIAM A. RADFORD Editor

Mr. William A. Radford will answer questions and give advice FREE OF COST on all subjects pertaining to the subject of building for the readers of this paper. On account of his wide experience as Editor, Author and Manufacturer, he is, without doubt, the highest authority on all these subjects. Address all inquiries to William A. Radford, No. 194 Fifth Ave., Chicago, Ill., and only enclose two-cent stamp for reply.

warm-air furnace, steam or hot-water systems very good results can be had with this house. Being rectangular in outline, there are no exposed portions. The solid porch at the front will be found a great protection, as it will blanket to a certain extent the broad exposed side of the living room.

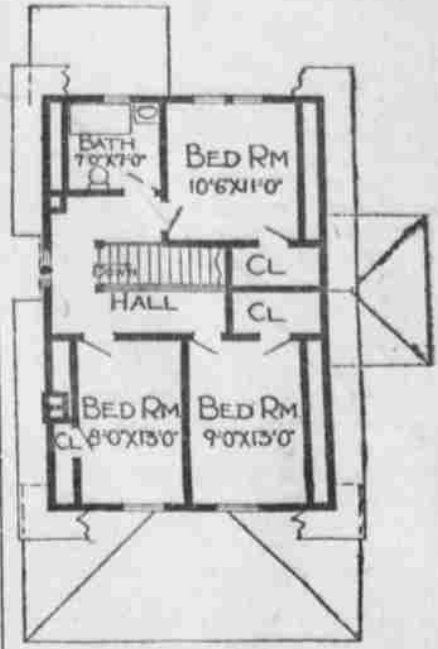
With the approach of cold weather there is one feature of home building that comes into new prominence. We hear the question asked, "How is the house heated?" or, more often, "Is this a warm house?" These are important questions; not more important now, it is true, than in the hot summer weather, for even then the wise home builder looks forward to the wintry days and provides against them by proper construction; but now that cold weather is upon us the question of adequate heating seems to be more present and absorbing.

With modern heating equipment there is probably no form of dwelling that cannot be adequately heated. Some, however, are very difficult to heat and require a much larger heating plant and much more coal than they should. This is due sometimes to faulty construction, sometimes to unwise design.

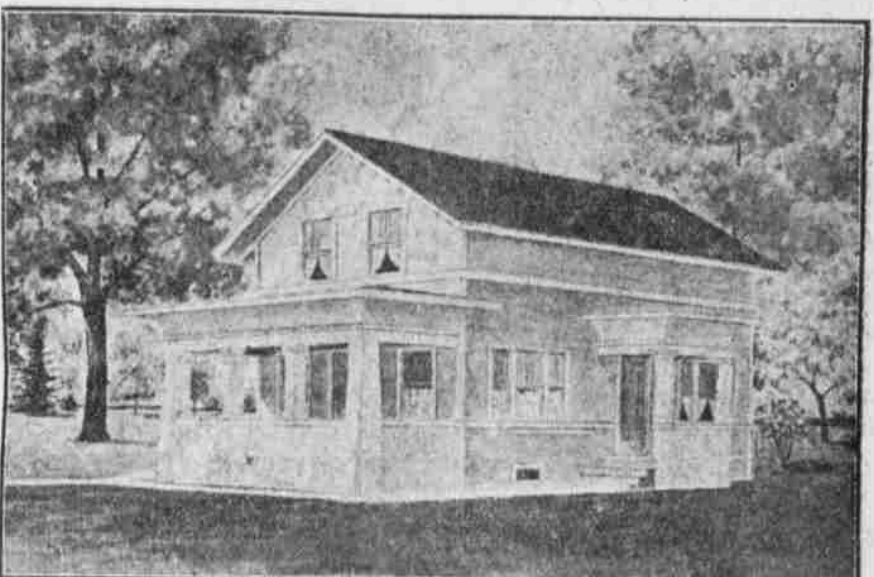
In the first place every home builder or should know that there is no money so well spent as that put into insulating felts and high grade sheathing papers, which, combined with thorough construction in other ways, will go very far toward making a residence frost proof. A house so made can be kept thoroughly warm with from one-third to one-half the amount of coal required to heat the same structure if not properly insulated and put together.

Insulating paper does not cost very much and it should be used freely. The entire exterior walls should be covered between the rough sheathing and the clapboards and care should be

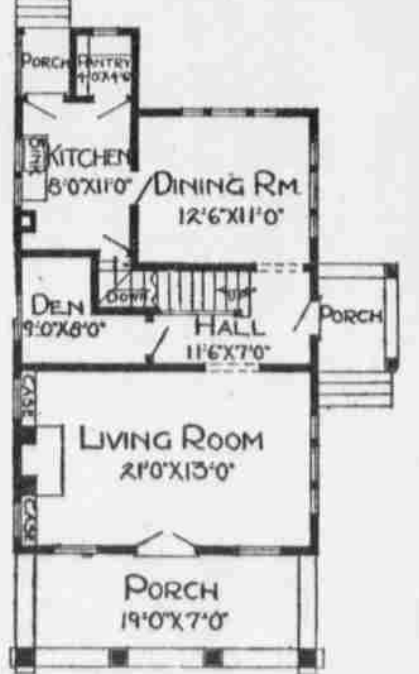
taken to see that the paper is fitted snugly around all openings, both doors and windows. The workmen are sometimes careless in this regard and it is well to keep pretty close watch of what they are doing when it comes to this part of the work. Good oil paper should also be used in the flooring between the rough and finished floors. This serves a double purpose, as it not only makes the house warmer, but shuts out all furnace dust from the cellar, or dampness if there should be any. The building paper used be-



Second Floor Plan. The present time and this is a good example of the possibilities of this kind of arrangement. The living room extends clear across the front of the house, the reception room and stair hall occupy the middle of the side and at the rear are the dining-room



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First Floor Plan. Between the floors should be turned up six inches behind all the base boards. Another trivial expense while building that proves a very great economy in the long run is to have the basement lathed and plastered. Twenty-five or thirty dollars will do this on the average job, while the satisfaction and comfort resulting will be worth many times that amount in after years.

Restoring Garden of Eden. Though theologians and geologists may disagree as to the exact location of the garden of Eden, the average historian recognizes that Mesopotamia, between the River Euphrates and the River Tigris was once a garden spot. It is quite probable that the ancient Babylonians, and Persians, and Chaldeans, and even their ancestors, utilized the principles of irrigation to make their country blossom like the rose. But it is certain that Mesopotamia, for a number of centuries, has been a barren, desertlike land.

An Englishman is now engaged in the task of carrying the gospel of irrigation into Mesopotamia under the auspices of the Turkish government, which provided \$750,000 for the preliminary work in the 1910 budget. Sir William Willcocks is the man. In 1908 he was asked by the Turkish government to make a report on the subject of irrigating Mesopotamia, and then engaged for five years as adviser and instructor to carry out the necessary surveys, etc. Sir William reported that 2,200,000 acres of desert land could be turned into garden by the expenditure of \$27,500,000 on twelve projects. In his investigations Sir William has discovered certain depressions in the country which he believes to be the site of ancient irrigation systems and that can be utilized in the modern way. He expects to be able to complete the work to irrigate more than 2,000,000 acres in three years.

Lightening One's Load. If your load is heavy don't waste energy in whining about it! Expend your strength in carrying it! Lift it to your shoulders, and, though it hurts, carry it with a smile on your face to the end of the way.

On Hell-Fer-Sartan Creek

I had been to Hell-Fer-Sartan, and I had heard preaching there. If I went back now the way I had come I should save six long weary miles. It was tired, as was old Faithful, but I had not been to the mouth of Hell-Fer-Sartan and I had not seen the church here, and while my curiosity was satisfied, my conscience wasn't, and so from sheer stubbornness I added Old Faithful and rode on down Hell-Fer-

Sartan through an avenue of enormous trees. Never had I seen so many cucumber trees in my life as were on that one rocky road, and had they only been starred with their great creamy blossoms they would have been compensation for the whole toll some trip. Disappointment awaited me at the mouth of the creek. The church there was closed, and above its doors was not the picturesque title

of the stream, but some fernlike name that was easily traceable to some shocked feminine taste from the outer world. Half a mile on I got a dinner of cold beans and cold cornbread, and joined by a 20-year-old school teacher on a big black mule, turned my face toward Jackson. This young school teacher was making money in his native mountains in order to study law outside; he had gone to school in the Bluegrass and he knew my books. Just then he was electioneering for a county office and he shouted his slogan to some native playing baseball up the creek, to the porches of the houses as we passed, and when we met a voter in the road he stopped, while I rode discreetly on, and he never failed to overtake me with a wink of success. I'd like to wager that the brother won. Hell-Fer-Sartan Creek had once deserved its name, he said, for there had been a "heap of devilment" done up there. There had been several fights in the schoolhouse where where I had heard preaching,

but everything had quieted down there, as it was quieting down all through the mountains, except over toward Jackson. Yes, the good old times were gone!—John Fox, Jr., in Scribner. First and Foremost. "My wife has a great deal to say to me about her first husband." "Nonsense; your wife was never married before." "I know it. That's what makes her reflections so painful."—Puck.

Another trivial expense while building that proves a very great economy in the long run is to have the basement lathed and plastered. Twenty-five or thirty dollars will do this on the average job, while the satisfaction and comfort resulting will be worth many times that amount in after years. Also great care should be taken that what are called the rough sheathing boards for the exterior walls should be good matched lumber. Ship-lap is very good for this and costs very little more than the ordinary unmatched boarding. Very often large knotholes in such boarding are allowed to go unnoticed; but this is a grave mistake. Much cold can find its way in through even one large knothole. They should all be hunted out and carefully plugged before the sheathing paper is nailed on. And in addition to thorough construction much can be accomplished in the way of easy heating by having the house properly designed. A long, rambling structure is much more difficult to heat than a square, compact house. The accompanying design is a good example of a residence that is very easily heated. With either a