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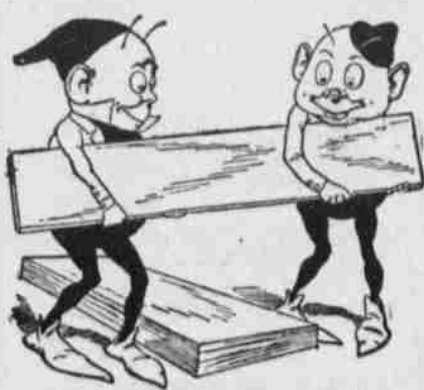
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D. CLEM DEEVER,  
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## Making Money On the Farm

### II.—Maintaining Fertility

By C. V. GREGORY,  
Author of "Home Course in Modern Agriculture"  
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NOT all lands need tile drainage, but there are none on which the problem of maintaining fertility is not an important one. Fertility of the land in its broadest sense means its ability to produce large crops.

One of the important factors influencing fertility is the amount of plant food in the soil. Ten elements, carbon, hydrogen, oxygen, calcium, magnesium, iron, sulphur, nitrogen, potassium and phosphorus, are necessary to the growth of plants. From 90 to 95 per cent of the dry matter of plants is made up of carbon, oxygen and hydrogen, which are obtained from air and water. Of the others only three, nitrogen, phosphorus and potassium, are used in such large quantities that the supply in the soil is likely to become exhausted. These three are usually spoken of as the essential plant foods.

#### Amount of Plant Food in Soils.

These plant foods are present in varying amounts in all soils. In many cases it is necessary to increase the supply by the use of commercial fertilizers. The real need of most soils, however, is not the addition of more of these materials, but the judicious use of those already there. It is estimated that there is enough phosphorus in the upper seven inches of soil in the Mississippi valley to raise a hundred bushels of corn to the acre every year for sixty years and enough potassium to last 600 years at the same rate. Much of this phosphorus and potassium is combined with other materials in such a form that it is unavailable for the use of the plants. One of the principal problems of the farmer, then, is to make this stored fertility available.

One of the most effective means of doing this is by keeping the soil plentifully supplied with humus. Humus is the name given to decaying organic matter in the soil. It is the humus that gives the dark, rich color to soils. It leaves that "brown streak in the furrow" that farmers have long regarded as an indication of fertility. Humus gives the soil a spongy texture and greatly increases its water holding capacity. It also makes the soil lighter and warmer. Soils which contain large amounts of humus do not bake or become cloddy easily. They are mellow and respond readily to cultivation. Humus contains considerable nitrogen and furnishes a home for bacteria, which aid in making plant food available. Certain acids are also formed in the decaying of humus that aid in making the phosphorus and potassium available. It might almost be said that the chief problem of maintaining fertility is the problem of keeping the soil supplied with humus.

#### Maintaining the Humus Supply.

Probably the best way of maintaining this humus supply is by the liberal use of barnyard manure. The surplus straw should be used for bedding, so as to save all the liquid portion and add to the bulk of the manure. Shredded fodder is also good for this purpose. The manure should be hauled



FIG. III—ACCUMULATION OF MANURE.

to the land as fast as formed. When it is allowed to decay in the barnyard much of the nitrogen is lost, and rains falling upon it also wash out other elements. The manure spreader is an implement that should be found in every barnyard. The manure can be loaded direct from the stables to the spreader at almost all seasons of the year and spread in an even layer upon the field. With a spreader the manure can be made to cover twice as much ground, so that the whole farm can be gone over oftener.

While barnyard manure is undoubtedly one of the best means of maintaining fertility, it cannot always be had. Many farmers, because of their location near markets which demand certain crops, find it more profitable to supply those crops than to raise live stock. Others prefer grain farming because it is less confining. Such farmers must have some method of maintaining fertility which does not depend primarily upon manure.

#### The Value of Clover.

The best substitute for manure is clover. Clover supplies an abundance of nitrogen, the most rapidly used of

the three essential elements. Three-fourths of the air is made up of nitrogen. Clover and other leguminous crops are able to get nitrogen from this source by means of bacteria which live on their roots. These bacteria change the nitrogen of the air into nitrates, a form in which it can be used by the plants. Fully one-third of the nitrogen collected by the clover plant is left in the soil in the roots and stubble. One crop of clover in a four year rotation will furnish nearly enough nitrogen for the remaining three crops in the rotation.

This is a much cheaper form of obtaining nitrogen than by purchasing it in commercial fertilizers at 10 to 15 cents a pound. It is much more profitable to keep the nitrogen supply fairly constant by the continued use of a rotation with legumes than to add a large amount at one time. Nitrogen in the form of nitrates is readily soluble, and every rain washes some of it out of the soil. This is not true of the other essential elements to any marked extent. Too liberal a supply of nitrogen at one time tends also to promote too rapid leaf growth at the expense of fruit or grain.

The stubble and roots of the clover, together with the cornstalks and other rubbish, will do a great deal to keep up the humus supply. In addition to



FIG. IV—LOADING MANURE SPREADER.

this, if no manure at all is available, some humus may have to be supplied from some other source. This is especially true if the soil is naturally poor in humus. One of the simplest ways to supply this is by green manuring. This means the turning under of a green crop, such as clover, cowpeas or some other legume. This supplies both humus and nitrogen. The best time to plow under such a crop is in the fall, so that it will have time to decay before spring. A large mass of undecayed material plowed under in the spring checks the upward movement of moisture and is liable to make the land sour.

Another method of adding to the humus supply is by mowing a crop of clover about haying time and letting it lie on the ground. The second crop can be cut in the same way or used for fall feed or for seed.

#### "Clover Sick" Soil.

After clover has been grown for a considerable length of time, especially if much has been plowed under for green manure, the land is liable to become "clover sick." This is caused by an excess of acid in the soil. This acid can be neutralized by the application of ground limestone. Caustic or quicklime is not so good as limestone, since it burns up large quantities of humus and in general is too violent in its action. Lime has another advantage on clay soils in that it causes the particles to adhere together in larger masses, thus making the soil more porous. The usual rate of application is from twenty to forty bushels to the acre. With the application of lime, as well as with the adoption of any other new method, it is best to try it on a small scale first. Then if it proves profitable its use can be extended.

The judicious use of clover or some other legume will effectively solve the humus and nitrogen problems. There remains the question of the potassium and phosphorus supply. Clover also aids with these. The humus formed from it helps to dissolve the unavailable materials and prepare them for the use of the plant. As stated before, there is enough potassium in the upper seven inches of the average prairie soil to last 600 years under the most intensive culture and enough phosphorus for fifty years. Clover increases this seven inches into twice as many feet. Clover roots go down ten or a dozen feet or farther. Alfalfa roots go down twenty feet or more. These deep roots bring up minerals from the lower layers of soil and leave them where the shallower rooted grain crops can get them.

#### Making Fertility Available.

Gypsum, or land plaster, has a considerable effect in making potassium and phosphorus available. Applied at the rate of 500 or 600 pounds per acre, it will often increase crop yields considerably. It also has a beneficial effect on alkali soils. Use one or two bushels to the acre.

Probably the most effective way of making phosphorus, potassium or other plant foods available is by tillage. Frequent and thorough cultivation, keeping the soil fine and mellow, favors the chemical processes by which locked up plant food is made available.

It must be remembered, however, that the faster these materials are liberated the sooner will the supply become exhausted. When rotation with legumes, tillage and the application of lime and gypsum no longer produce satisfactory results it is a sign that there is a lack of potassium or phosphorus, or both, in the soil. Phosphorus is more liable to become scanty in amount since the supply is smaller. Bone meal and ground phosphate rock are the best forms in which to apply this material. The former is quicker in its action, but considerably more expensive. Potassium is usually bought in the form of muriate or sulphate.

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