SOIL AMENDMENTS.

A radio talk by C. C. Fletcher, Bureau of Chemistry & Soils, delivered through WRC and 39 other radio stations associated with the National Broadcasting Company, January 22, 1931.

The term soil amendment is not very generally understood. It simply means any material, other than commercial fertilizers, which may be used to improve or maintain soil fertility.

The soil must be kept in good condition and high in fertility to get the best results from it. The farmer with a large acreage and the city man with a small garden both have this problem to consider. Fertilizer elements most likely to be needed are readily supplied by commercial fertilizers. Dr. Schreiner has recently told you over this Station how our scientists have found that some of the rarer elements, such as manganese, copper, boron, etc., are lacking in some soils and must now be supplied.

But, to get the best results from commercial fertilizers the soil must be in good mechanical condition and for many crops it must not be too acid. It must be what the practical man calls in "good heart." This condition as a rule may best be reached by providing adequate drainage, by the use of lime and by the addition of organic matter to the soil. In the eastern part of the United States the use of lime brings favorable results over large soil areas. Lime is abundant; it is cheap; it improves most Eastern soils and is especially useful on very acid soils and heavy clays.

There are several forms of lime, all good. Limestone is calcium carbonate. Limestones containing magnesium as well as calcium are called dolomitic. Marble, marl and oyster and clam shells also contain calcium carbonate. Limestone or shells may be finely ground or pulverized and used in this form. Or, they may be burned in a kiln and turned into the oxide of calcium called also quick lime or burned lime. When the oxide of lime is treated with water it slakes and a powder called calcium hydroxide or hydrated lime is formed. Under differing conditions all these forms of lime are useful. Ground limestone is often the cheapest form, burned lime is the most concentrated, and hydrated lime, which is put up in 50 lb. paper bags, is often the most convenient for the small gardener. In many localities waste products are available which may be had for a low price and supply lime more economically than standard materials. Examples are the residues from carbide plants, gas works, beet sugar factories, and powdered slag from iron works.

If your soil is in poor mechanical condition, is strongly acid, or trouble is experienced in growing clover or alfalfa, the use of lime on the soil is often beneficial and should always be considered. It is usually a simple thing to find out whether your soil is acid or not. Poorly drained or swampy soils are

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acid. Soils which do not grow clover or alfalfa well are likely to be in this class. A simple test formerly used was to use litmus paper which can be purchased at your drug store. Blue litmus paper placed in a damp ball of soil will change color to red if the soil is strongly acid. Recently, however, several simple sets have been put on the market which rely on the property of solutions of certain dyes to give changes of color with differing degrees of acidity. These methods are quick, simple and accurate enough for practical purposes. They are used by the soil surveyors of the Bureau of Chemistry and Soils in the field. They are simple to work and cheap enough so that the farmer or gardener can afford to own one. Where extremely accurate results are necessary the work must be done in a well equipped laboratory. In many cases your county agent is able to make these acidity tests for you.

The amount of lime to apply to an acid soil will depend much on the crops grown as well as on the condition of the soil. It might be necessary to apply heavy applications of lime for alfalfa to a soil which would grow satisfactory crops of corn or rye without liming. Applications of burned lime recommended are usually from one-half a ton per acre upwards or one ton or more of ground limestone. The present tendency is to use light applications of lime at more frequent intervals rather than large amounts at longer intervals.

The farmer has to add in some way humus to his soil. This is in part taken care of by plowing under stubble or crop residues, but, where available, manure is probably the most satisfactory soil amendment for this purpose. Where there is not enough manure, special crops may be grown to turn under -- green manure crops. Legume crops high in nitrogen, such as clover, cowpeas, or soybeans, are especially useful. Composts are useful but in this country they are too expensive for the average general farm because of the labor involved. The low money returns from each acre in general farm crops limits the amount which can be spent to advantage for fertilizers and soil amendments.

The market gardener, fruit grower, greenhouse men, florist and other specialists growing crops of high acre value, can economically spend more time and money improving their soil. Composts may well be considered under these conditions. Peat and humus may be added to the soil when manure is not available. Dried animal manures are on the market and work well. On a small area almost all soils may be built up with the use of peat, dried manures, commercial fertilizers and lime into productive soils. It must always be kept in mind, however, that water is essential and too much is about as bad as too little. Drainage is necessary for wet soils and irrigation pays almost every season even in the humid East on crops of high money value.

The small city gardener on heavy clay soils has a means of improving the mechanical condition of the soil permanently, which is too seldom tried. He can use sifted coal ashes or buy ordinary building sand at a low cost from sand and gravel companies and often a few tons of sand will transform his heavy clay garden to a beautiful sandy loam which is easy to work, dries out more quickly after a rain and on which gardening is a pleasure rather than a task. Of course,

the sand contains very little plant food but this lack can easily be supplied by commercial fertilizers, peat, manure and composts. Wood ashes, where available in an unleached condition, contain from 3 to 10 per cent of potash and over 30 per cent of lime compounds. We often overlook the value of soot which is a standby with English gardeners. Soot averages about 3 per cent nitrogen. Its black color helps the soil absorb heat and raises the temperature of the top soil. It lightens heavy clay soils and is considered to have insecticidal value.

Mention might be made here of activated sewage sludge. In many of our cities the city sewage is a grave problem and getting more so yearly as an ever increasing amount is turned into our streams or lakes. The city of Milwaukee has put in a plant which handles its sewage in such a manner that the sewage is made into a fine organic fertilizer material, in the manufacture of which sanitary requirements are adequately provided for. In the future many cities will probably use this or some similar process to stop water pollution and at the same time provide a valuable soil amendment which not only adds organic matter to the soil but also fertilizer elements. Changes in factory and business methods are constantly bringing forth new materials which may be considered for use on the soil. While agriculture is both an art and a business, science provides much help and information. Soil fertility is dependent on many things but is often the deciding factor in the success or failure of any given farm enterprise. While there are marked natural differences in soils, some rich and some less so, even rich soils have to be carefully tended to keep them up to their standard. And, some of the so-called poor soils, when understood and cared for, produce profitable crops year after year.

If you want publications or information on the different fertilizers and soil amendments, write in to us and we will be glad to try to be helpful. I would especially call to your attention our bulletin on lime which gives full information on this very important soil amendment. Lime was known favorably and used in ancient times and is still one of our main standbys in soil fertility. If you have a product which you consider may have value for use on the soil ask about it. You may have something right at hand which will be just what your soil requires. Also, write to your State Experiment Station and consult your County Agent.
