

quality results from the adequate disposal of excess soil water. The basic importance of ample drainage is indicated by the fundamental nature of the changes outlined.

Even under the best systems of farming there frequently arise conditions in the chemical nature of soils that diminish or even inhibit the growth of certain of our staple crops. An acid or sour condition frequently occurs caused by the absence of sufficient basic material to neutralize the products of certain soil reactions attending the presence of a large amount of organic material. This condition while not injurious to all plants is likely to depress the yields of most of our important crops. In general calcium carbonate is the most economical form in which bases can be applied to neutralize this acidity.

Other advantages also attend the existence in the soil of an abundance of lime. The physical condition of both clays and sands is improved, facilitating desirable bacterial activity in the former and improving the water holding capacity of the latter. No soil can reach its maximum utility nor can any farming system attain its greatest efficiency unless the soil contains an adequate supply of lime.

Considerable plant food is lost annually from the soils in humid sections through leaching. Large amounts of nitrogen and lime and sometimes magnesium and potassium pass off in the drainage water. It is impossible under any system of farming to totally prevent this loss of plant food especially nitrogen. The most effective and practical method of reducing this waste, however, is to use growing crops to absorb the soluble plant food as soon as it is made. These may be returned to the soil as organic matter which, on decaying, render the plant

food again available. Rape or rye seeded in the fall, to be plowed down in the spring, on land that would otherwise lie bare during the autumn, winter and early spring, would conserve much plant food that would otherwise be lost by leaching.

I come now to a point, the importance of which, to fertility is extremely great—I refer to the maintenance of soil humus. The productiveness of all soils is more closely related to their supply of organic matter than to any other single factor. Its beneficial effects are numerous. The better tilth induced facilitates drainage and aeration. It enhances the water holding power of soils. Energy is furnished to the bacterial life and the slow but continuous evolution of carbon dioxide raises the solvent capacity of the soil water, increasing the supply of available mineral elements. And when we consider that the bulk of the soil nitrogen is held in the humus we must conclude that the general effect of its presence is very considerable. The plowing-under of such crops as peas, beans, vetches or clovers is the most desirable method of supplying this material. In employing legumes for this purpose, advantage is taken of the unique property of these plants' ability to appropriate the atmospheric nitrogen,—a factor of great significance. "Of all farm crops, legumes alone enrich rather than impoverish the soil." The incorporation into the soil then of clovers and related crops, is in accordance with the best soil management. An American authority has said "Any system of agriculture that tends to permanently lower the organic matter of the soil, is impracticable and improvident, as well as unscientific."

The brief space of time that is yet at my disposal, will allow me to dis-