

# ON THE LAND

## LIME AND ITS USES.

Lime manures are usually called natural manures to distinguish them from all other manures, which are classed as either general manures or special manures. General manures contain all the ingredients that are required to promote the healthy growth of plants, farm-yard and green crop manures being examples; special manures, also called artificial manures or fertilisers, contain one or more of the ingredients that plants require for food, and are prepared by the manufacturer before they are placed on the market for agricultural use. Lime has been used as a manure from the earliest times. In the form of carbonate of lime it is the chief constituent of limestone and chalk formations. It also occurs commercially as gypsum, which is the sulphate, and as we have already stated, as phosphate of lime; these two latter products are used as manures chiefly for the sulphur and phosphorus they contain rather than for the lime itself. Lime for application to the land is obtained from the carbonate, which is found in great abundance throughout the world. As limestone or chalk it is not suitable for manures, as the hard lumps take too long to break up and produce the important chemical changes necessary to benefit the soil. When placed in a limekiln and exposed to the action of heat quicklime is obtained, which is so called from the quick or active manner in which it acts on the land. Quicklime is a very different substance from the carbonate; when water is poured on chalk or limestone no chemical change takes place, but when water is added to quicklime it becomes very hot and breaks up into a fine powder to form the hydrate, which is called slaked lime. Without the direct application of water quicklime, when exposed to the atmosphere, will be slowly changed back into the carbonate, but in the form of a fine powder, which can be thoroughly mixed with the soil.

**The Effect of Lime.**—Lime is one of the four most valuable forms of plant food in the soil, and it is used in considerable quantities by most plants: a moderate crop of turnips will absorb as much as 70lb of lime per acre, while a crop of clover will use as much as 85lb. If the soil is deficient in lime it will therefore be found that its application will be of great benefit. In most of our soils there is a sufficiency of lime for plant use, but it has a distinct and beneficial effect on the soil, and acts in three ways—chemically, biologically, and mechanically. Chemically, it helps to set free desirable food supplies which are of more benefit to the crops than the lime itself, and this is perhaps the chief use of lime in the soil. Biologically, it increases the number of ferments, so that the land is rendered less acid. When organic matter is decomposed in the soil various acids are produced, some of which are injurious to vegetation; when these acids are present in any quantity, only the coarse kinds of herbage will grow and the land is termed sour; the action of lime is to neutralise these organic acids, and its application will sweeten the land, causing it to grow richer, better, and healthier crops. The nitrifying bacteria and other ferments in the soil carry on a most important work for the farmer, and these organisms cannot live in a sour soil, so that the sweetening action of the lime is most important in promoting their growth. Mechanically, lime helps to open up and lighten heavy clay soils, thus allowing water and air to penetrate and fertilise the soil, which thus makes it easier for cultivation. It also consolidates or makes firmer lighter lands, and so assists them to retain their warmth and moisture. Lime has a tendency to sink deep into the soil, and as it is of greater benefit to plants near the surface it is preferable to harrow it into the soil rather than plough it in.

**How to Use it.**—A generation ago it was the practice in agriculture to apply very heavy dressings of lime, even as much as nine tons to the acre being then used. This was not only extravagant, but showed a want of knowledge. Nor should lime be applied continuously to soils unless farm-yard manure or some other organic substance be applied to them after the lime has been added. With lime it is far better to apply much less in several dressings, because so

long as land could be heavily dressed with farmyard manure it would not be unprofitable to apply these heavy dressings, but under ordinary conditions these heavy dressings of lime tend to draw the organic matter out of the land and so spoil it. There is an old rhyme which is worth remembering—

"The use of lime without manure  
Will make both farm and farmer poor."

This means that lime is only a stimulant and does not add to the fertility of the soil, but enables the land to yield up the fertility of the soil, with the consequence that ordinarily it must only be used in conjunction with manure. Some soils, however, such as peats and mosses, contain so much organic matter that the application of lime to them cannot but be beneficial, and there is little fear of any considerable diminution of plant food from its use.

According to the best practice we do not apply two tons to the acre of lime as slaked lime, as is frequently recommended, but it is in the form of ground quicklime that it is now applied, being sown in small quantities with the drill with every crop, and from 5 to 10cwts are thus applied, giving the best results. This small quantity seems to give the necessary stimulus to the soil bacteria without killing them from an overdose. The soils which are principally benefited by the application of lime are stiff clays, and such soils as peats and mosses, which contain a superabundance of humus. It is now some years since dressings of quicklime were largely used in South and Central Otago, entirely altering the appearance and value of the light land there.

**Action on the Land.**—1. Lime makes the land work more freely and increases the granulation. 2. On clay lands it opens up the soil, making them less retentive of water. 3. On light or sandy soils it binds the particles together and makes them more retentive. 4. Lime unites with felspar or clay, setting free potash and other alkalies, and helps to bring them into a soluble state available for the growth of crops. 5. It acts on vegetable matter, setting free ammonia, water, nitric acid, and carbon dioxide, which it unites with to form nitrate of lime, and some of the lime is exchanged for the potash in the soil, forming the valuable manure nitrate of potash (saltpetre), which tends to destroy excess of humus. 6. It neutralises acidity of the soil, thus sweetening the land, and decomposes excess of sulphate of iron. 7. It takes up the nitric acid formed by nitrifying bacteria and changes it to nitrate of lime. 8. Lime is a plant food for itself. 9. It oxidises certain injurious substances, such as iron pyrites, rendering their effect less harmful. 10. Land dressed with lime cracks less freely, and it helps to break down stiff clods, so that a tilth can be obtained without it setting too hard.

**Practical Uses.**—1. Lime is frequently of great benefit used as a top-dressing for grasses, when the character of the vegetation is improved and the pasture rendered more healthy. Applied to grasses it is necessary that it should be thoroughly well slaked before application. Cart the lime to the head of the paddock in a heap, allow it to slake, and then apply or drill it with an old drill modified for the purpose. This is best done in autumn, during winter, or it may be applied in the early spring. 2. Lime helps to lessen the grubs. 3. In a turnip crop grown on limed land there is an absence of that destructive disease known as "finger and toe." Where it is already present it will be reduced by lime. The fungus is left in the ground in the diseased shells and remains in the ground till the next time turnips are grown, when it attacks them afresh. To escape this effect it will be necessary in this case to dress the land with two tons of lime to the acre, which tends to kill the fungus, rendering the land clean. 4. If regularly used, 5 to 7cwt with the different crops is the best method of application, so that the land gets frequent dressings, the best effects being obtained by applying ground quicklime every year. It goes through with the seed in the drill, or may be broadcasted on the land and harrowed in. It is better to apply lime after the seed-bed is nearly prepared and not before ploughing, because lime tends to sink in the soil, being carried down in the form of a soluble bicarbonate, when it changes to the carbonate again, and so is gradually washed lower and deposited in the lower layers of the soil.—The *N.Z. Dairyman*.

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