CHAPTER XVI

LIME AND THE SOIL

Lime—Its Mechanical Function—Its Chemical Functions—The Form of Lime to Use—When and How to Use Lime—Testing for Lime—Humus—Soils—Sand—Clay—Chalk—Loam—Gravel—Marl—Peat—Measurements of Soil Particles—Conclusions—Why Wet Soils are Cold.

Lime

Chalk and limestone are different forms of the same substance, carbonate of lime or calcium carbonate. Quick lime is simply chalk or limestone burnt in a kiln, and is sold under the following names : chalk or grey lime and quick lime.

Quick lime when brought into contact with moisture fizzes, bubbles, generates intense heat, and consequently is destructive to growing plants until it is slaked and rendered harmless by exposure to air and moisture.

Gypsum, plaster of Paris or sulphate of lime is simply chalk in another form.

Gas lime is a by-product of gas works, and when it is fresh it contains such a large quantity of poisonous compounds that if applied to the soil too freely it may result in the prevention of all plant growth for a year or more. It is chiefly used as an insecticide, and is doubtless valuable to the farmer and the gardener, but in my opinion it is too dangerous to use on sports grounds.

The Mechanical Function of Lime

Lime coagulates the clay and other inert matter which goes to form clay soils, and so renders it more porous, conversely it coagulates with sand and renders it less porous, and so tends to conserve moisture. Whilst it may not be absolutely necessary from a chemical point of view to extremes of soils such as clay and sand, it is undoubtedly economical to use it for its mechanical action alone.

The Chemical Functions of Lime

Lime is not a plant food, but it is absolutely necessary for the fertility of all soil, and it is just as hopeless to attempt

to grow perfect turf on soil devoid of lime as it would be to attempt to grow it without water.

It counteracts sourness, and is necessary for the preparation of the available plant foods of the soil, and practically no form of manure can feed turf satisfactorily without the co-operation of lime.

Soil cannot retain ammonia or potash, or prevent them being washed away, unless it contains sufficient lime to turn them into carbonates of ammonia and potash.

The Form of Lime to Use

As I am not dealing with arable land, but permanent turf, I am going to dismiss from my mind all forms of lime with the exception of pulverised chalk and gypsum, the reasons being that quick limes can only be used in the preparation of soil some months before it is sown down, slaked lime is difficult to get or prepare, and gas lime too uncertain and dangerous.

When and How to Use Lime

Pulverised chalk should be applied in the winter at the rate of 1 lb. per square yard or two tons per acre. It is delivered in the form of a fine powder, and in consequence can be applied quickly and evenly by machinery.

It should not be used for mixing with fertilisers or in the preparation of compost, for fear that it will liberate the ammonia and give it off as gas.

Gypsum, on the other hand, can be used with safety in the preparation of compost, as it fixes and preserves ammonia.

Testing for Lime

To ascertain in a rough and ready manner whether the soil is sour or deficient in lime is very simple indeed if you use Carters Lime Testing Outfit, see Supplement. It does not require any skill, patience or hard work, and can be done successfully by anyone who can follow the simple directions.

Humus

Humus is the organic matter in the soil and is composed of decomposed animal and vegetable matter. It holds water and keeps the soil moister than it would otherwise be. It consolidates light soils and makes heavy soils more

porous, and while it serves to retain and preserve the potash and ammonia in the soil, its slow decay produces carbonic acid gas which corrodes particles of rock and mineral, and sets free potash and phosphates, which would otherwise be unavailable to the plant.

Soils

This is a big subject presented in tabloid form. Fertile soils are chiefly composed of sand, clay, chalk, and humus in varying proportions. An ideal soil would be a judicious blend of the four, but in most cases one predominates, and thus we get sandy, clayey, chalky and peaty soils.

Sands

Sand can only be described as disintegrated rock, it nearly always contains a certain amount of minerals which slowly decompose and produce nourishment for plants.

Clay

Clay consists of fine particles of sand and other inert materials cemented together with a small proportion of a sticky substance composed of silica, alumina, and water, technically it is known as hydrated silicate of alumina.

Chalk

Soil overlying chalk may be termed chalk soil, but it does not follow that it contains chalk in an available form. Chalk dissolves to an extent in rain water, and the decaying vegetable matter in the soil also helps to render it soluble. It follows, therefore, that a constant waste of chalk takes place, and the actual top spit may contain but the residue of chalk in fine flinty particles.

Loam

Loam is a desirable blend of clay and sand well supplied with humus.

The class, however, ranges from almost pure sand to heavy clay, with all the intervening variations.

Gravel

Gravel is composed of stones, sand and a certain amount of clay, and the quantity of the latter determines whether it is open or binding. It is usually deficient in lime, and generally requires sifting before it can be adapted to the requirements of a lawn.

Marl

Marl is clay and chalk mixed in varying proportions. There is a particular bed in Nottingham, which is largely used for dressing cricket pitches and lawn tennis courts in order to give them a hard, fast, durable surface.

Peat

This is almost entirely composed of decaying vegetable matter, and is usually found in marshes. It is nearly always deficient in lime, and generally sour from acids produced by the decaying vegetation, consequently liming and draining are very necessary.

Measurements of Soil Particles

Stones.—Large fragments of rock, rough or worn smooth by water.

Gravel.—Small stones measuring over 1/25 inch in diameter.

Coarse sand—measuring 1/25 to 1/50 inch in diameter.

Medium sand—measuring 1/50 to 1/100 inch in diameter.

Fine sand—measuring 1/100 to 1/200 inch in diameter.

Very fine sand—measuring 1/200 to 1/500 inch in diameter.

Silt—measuring 1/500 to 1/5000 inch in diameter.

Clay—measuring 1/5000 to 1/250,000 inch in diameter.

Conclusions

As explained, soils are all more or less composed of the same ingredients, one usually predominating.

With this knowledge before us, it should not be very difficult to know how to treat any given soil to get any determined result.

For the production of high-class turf with a true, accurate and durable surface, it is necessary for the soil to be rich, porous, and at the same time holding. It therefore follows that sandy soils must be built up by the addition of lime and humus. Peaty soils must be broken up by the use of lime, sand or light soil, and clay soils broken down in accordance with the requirements of the game with lime, if necessary, sand, charcoal or clean screened breeze, in fact anything of a porous nature that will prevent the close, binding action of the hydrated silicate of alumina.

Pause and think furiously—what does clay consist of, but very fine particles of rock or minerals with perhaps 1½ per cent. of H.S.A., the particles measuring between 1/5000th and 1/125,000th part of an inch in diameter. If the grains could be increased in diameter the soil would open up automatically, and with each magnification of the grains the H.S.A. would be subordinated in ratio. Such an occurrence is, of course, impossible, but the addition of large fragments of charcoal, breeze or other porous material will not only neutralise and swamp the H.S.A., but by so doing will automatically make the soil porous, a bag of fertiliser will give the food, and lo and behold! we have got what we aimed at, a rich porous soil.

The process of making a porous soil out of heavy, wet clay is not easy, but it can be done with time and patience.

Why Wet Soils are Cold

It is not generally understood why wet soils are cold, backward, and carry weak mossy turf; so a short explanation may not here be out of place.

When the rain falls on ground that is able to absorb and readily pass it through to the subsoil or drains, the heat of the sun is also absorbed by the soil for the benefit of the plants. If, however, the percolation of the water is slow or it remains stagnant, the soil becomes sour and the heat of the sun is destroyed or used up in evaporating the water. So instead of warming the soil it actually chills it, just in the same way as a sweating man chills if he stands in a draught. The more rapid the evaporation the more the soil gets chilled, and it parches and cracks at the same time. It is, therefore, plainly indicated that an effort should be made to improve the porosity of heavy clay soils, and so allow the surface water to percolate through it quickly, if it is to be kept sweet and the turf strong and healthy. This can only be done by mixing with the clay sufficient charcoal, fine breeze, cinders, or other porous materials that will act as channels, to lead the surplus water from the surface to the cinder foundation, and thence to the drains.