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FARMING HORIZONS

Liming to limit acidity in soils

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There is evidence to support the notion that application of lime to agricultural lands has been in practice since the year 45 BC. The practice had been recorded for the first time only in 1825. Any substance added to agricultural soils to reduce the acidity is identified as lime. Wood ash, limestones, lime ash and dolomite are examples of liming materials. In agriculture the commonly used substances for liming are quicklime (calcium oxide) and limestone chips (calcium carbonate).

Agricultural soils become acidic due to various reasons. The most important one's being the leaching out of alkaline ions; use of ammoniacal fertilizers; and the presence of sulphurous ions and plant roots in the soil. The resultant acidity can cause adverse effects on the growth of most crops, but some crops like melons, potatoes and pineapples thrive in acidic soils.

Highly acidic soils are detrimental to susceptible crop varieties due to aluminium, manganese and iron toxicities and deficiencies in calcium, magnesium, and molybdenum. Acidic soils also retard the decomposing of organic matter which in temperate countries is deposited as peat in boggy acidic soils. Liming reduces the acidity which causes the iron and manganese compounds to become insoluble hydroxides.

Liming also provides the important plant nutrient; calcium to the soil in abundance. When liming reduces the solubility of iron, aluminium and manganese compounds by converting them to their hydroxide forms, phosphorus availability increases. In the presence of lime, plants absorb more calcium ions than potassium ions, and the nitrogen availability increases due to the rapid decomposing of organic matter.

The most popular liming substance in Sri Lanka at present is quicklime or calcium oxide. However, there are instances where calcium carbonate, calcium hydroxide (slaked lime) and dolomite are being used. The time taken by soils to respond to liming depends on the solubility of the liming material. More soluble materials produce results sooner, quicklime is more soluble than calcium carbonate (limestones) which in turn is more soluble than dolomite. The particle size of the liming material also determines its solubility as smaller particles are more soluble.

The pH value (hydrogen ion concentration) is a factor indicating the amount of lime that has to be added to a soil for its amelioration. Out of the essential plant nutrients, nitrogen, phosphorus, potassium, sulphur, calcium and magnesium availability is highest when the pH value ranges from 5.5 - 6.5. Likewise the availability of micronutrients such as molybdenum, copper and boron is also highest in this range; however, the availability of iron, manganese, chlorine and zinc decreases.

Crops like barley, bean, cotton, soya bean, beet and sunflower require heavy liming while groundnuts, sweet potatoes and tobacco require moderate liming; potatoes, rice and strawberries require less liming and blue berries and pineapples do not require any liming at all.

It is desirable to apply lime when the soil pH becomes less than 5.0 Nuwara Eliya farmers invariably apply lime to their lands before every season of cultivation, but experiments done in Nuwara Eliya and Sita Eliya soils have shown that even when the pH is as low as 4.9, liming does not improve potato yields by significant amounts. Therefore, the liming practice in Nuwara Eliya region has to be reviewed in the light of the cropping patterns. The liming requirements also depend on the climatic conditions and the soil physical components. Soils in warm climates with less amounts of organic matter require less amounts of lime than soils in temperate climates with more organic matter.

A number of days elapse before liming becomes effective, for instance, in the Nuwara Eliya region it takes about a month before soil amendments become apparent.

Liming at least about 2 weeks before establishing crops is normally recommended. For optimum benefits, the liming material has to be incorporated thoroughly into the soil.

It is essential to add the correct amounts of liming materials to a particular soil. Adding less amounts does not produce the expected yields and adding more ensues more expenses, and can also result in reduced availability of other important plant nutrient elements.

The effectiveness of lime applications can decrease due to inherent acidity produced by some fertilizers, decomposing organic matter, leaching with soil water, removal by plants as nutrients, acidic rain and physical removal during soil erosion.

Depending on the crop proposed to be grown, yearly or two yearly liming is normally recommended after soil analysis to determine the pH values.