



Liming – Improves Soil Health and Sugarcane Production

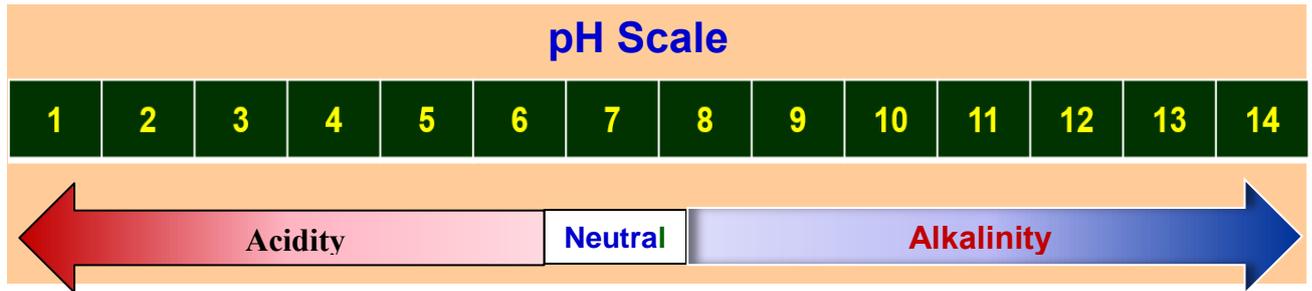
Liming is a pre-requisite for sugarcane farming in Fiji as it helps to improve soil health and thus enhance sugarcane production”, says Professor Santiago Mahimairaja, the CEO of Sugar Research Institute of Fiji.

Soils are the beautiful and precious gift from God. They are not inert materials, but living substance. Sugarcane is grown under wide variety of soils in Fiji. The soils are highly diverse in their characteristics, and include, *Alluvium, Nigrescent, Humic Latosols, Ferruginous latosols, Red Yellow Podzolic and Gley*. These soils are sandy, loamy or clay loam in texture.

Soil health is very important for sustaining sugarcane production. Soils of sugarcane growing areas in Fiji are mostly, naturally acidic, where, the pH ranges from 3.2 to 8.0. Due to monocropping for a long-time the basic cation like calcium, magnesium, potassium and sodium etc., are leached down from soil. These cations are replaced by the acidic cations like hydrogen, aluminium, manganese and iron etc., and further lower the pHs. Therefore, it is likely that these elements may be present in high concentration in acid soils, whereas, the basic cations may be present in low concentrations.

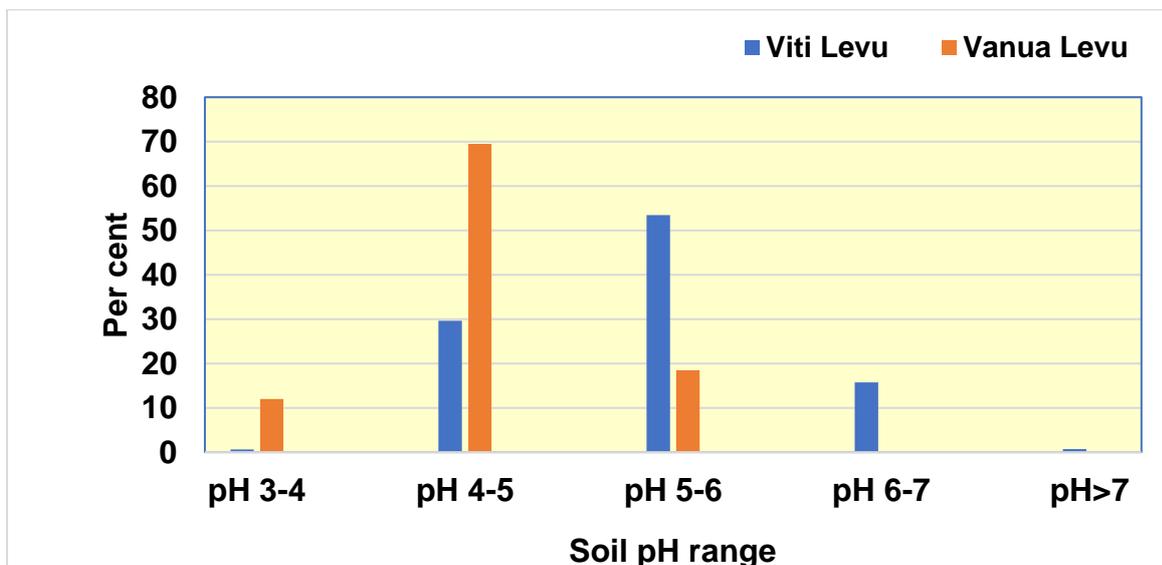
The acidity (soil reaction) and the alkalinity are measured by using a pH Scale which ranges from 0 to 14. Soils with pH <6 are considered acidic and pH > 8 are considered alkaline.

pH Scale



As the pH decreases from 6 the intensity of acidity increases towards left, whereas, with the increase in pH from 7 the intensity of alkalinity increases towards right. It has been observed that in Viti Levu about 83 per cent of soils under sugarcane are acidic (pH <6), whereas, more than 95 per cent of soils in Vanua Levu are acidic (Fig 2).

Distribution of Acid Soils



Soil pH is one of the important parameters that determines soil health. It plays a major role on nutrients availability and thus crop growth. It affects the activities of most of microorganism (like bacteria, fungus, actinomycetes etc.) and macroorganism (Earthworms) present in soil. These microorganisms are responsible for organic matter decomposition, bio-transformation and availability of nutrients in soil. Earthworms are also sensitive to acidity and prefer a pH range of 6.5 to 7.5.

In acid soils a high concentration of soluble iron and manganese can reduce the growth of sugarcane directly or through their antagonistic effect on the availability of other nutrients especially phosphorus. In acid soils, due to high solubility, the concentration

of iron, manganese, zinc, copper may be higher and some of them can be present at levels which are toxic to crops and microorganisms.

Fertilizer use efficiency or the crop response to fertilizer nutrients is very low in acid soils. For example, nitrogen availability is very low in acid soils due to low microbial activities and less microbial processes responsible for nitrogen transformations. Phosphorus availability is also affected in acid soils as it forms precipitates due to high levels of iron, aluminium and manganese. Deficiency of molybdenum and selenium are most common in acid soils.

The soil pH also affects the biochemical processes of sugar formation and thus the quality of sugar produced in sugarcane.

The optimum growth of most crops occurs in the pH range 6 to 7. If soil pH is below this range the excess acidity needs to be neutralized and the pH should be raised. This can be achieved through a procedure called “Liming”.

Liming involves application of optimum rate of calcium carbonate (lime stone) or other calcium containing compounds (like burnt lime, slaked lime etc.,) to neutralize the soil acidity. The rate of application of lime materials varies depending upon soil pH value. It is preferable to broadcast the lime materials on soil surface and incorporate at an optimum moisture condition to a depth of 15 cm. A minimum period of two to three weeks should be given after liming before planting canes.

Liming helps to retain nutrients by soil and enhance the activities of beneficial microorganism. Nutrients availability will be improved as a result of increase in fertilizer use efficiency.

Liming helps to alleviate the toxicity of aluminium, manganese and iron. Molybdenum, selenium and boron is least available in acid soils. Liming was found to increase the molybdenum availability and thus help in nitrogen fixation.

Powdered form of limestone (CaCO_3) is the most commonly used liming material. Quick lime (CaO) or slaked lime (Ca(OH)_2) is also used. The effectiveness of agriculture lime varies depending on its source. The effectiveness depends on particle size: finer the particle size the faster the lime dissolves and is then able to increase the soil pH.

Green manuring – growing green manure crops like urdi is recommended to improve the soil health of sugarcane fields. To get full benefit out of green manuring liming is needed.

“Therefore, cane farmers are advised to test their soil (free of cost at SRIF) and apply lime as per the recommendation of SRIF. This will improve the soil health and helps to enhance sugarcane production”, says Professor Mahimairaja.