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PROVINCE OF KWAZULU-NATAL

SOIL ACIDITY AND LIMING IN KWAZULU-NATAL

Alan Manson

Soil acidity and crop growth

Acid soils are very common in KwaZulu-Natal and are a major cause of poor yields of crops and vegetables. Soil acidity limits plant growth by stunting root development and thereby decreasing the uptake of water and nutrients. Mixing lime into the topsoil is the only effective way of dealing with soil acidity problems.

There are differences between the various vegetables and crops with respect to their abilities to grow on acid soils. In general, vegetables are very sensitive to acidity, and therefore, more lime is required to grow vegetables than row crops. Of the row crops, maize is more sensitive to acidity than dry beans and cowpeas. Recent research conducted by Dr Mart Farina of the Grain Crops Institute reveals that cowpeas are able to produce high yields on very acid soils. As indicated in the photograph, Dr Farina compared the growth of maize, cowpeas, dry beans and soyabeans on a very acid soil in the Geluksburg area of the North-West Region of KwaZulu-Natal.

Growth of (from left) maize, soyabeans, cowpeas, dry beans and cowpeas on an extremely acid soil

It is noteworthy that the growth of maize and dry beans was very poor, while that of the cowpeas was outstanding. A comparison of the yields of dry beans and cowpeas in two different treatments (both very acidic) in this experiment is shown in Table 1.

Table 1. Yields of dry beans (Mkuzi) and cowpeas (PAN 311) in a liming trial on an acidic soil at Geluksburg

Lime rate (t/ha)	Soil acid sat (%)	Yield (kg/ha)	
		Dry beans	Cowpeas
0	78	415	2946
2	45	2501	2010

In the soil with an acid saturation of 45% (which would be too acidic for the production of maize or vegetables), both cowpeas and dry beans produced excellent yields. However, at an acid saturation of 78%, the dry bean yield was poor, whereas that of cowpeas was outstanding. These research findings are of tremendous importance to farmers, because they present exciting alternatives for crop production on acids soils where capital is not available for purchasing lime.

Considerations in using lime

Research has shown that liming acid sils is one of the most inportant aspects of crop production. Although a bag of lime costs much less than a bag of fertilizer, often very large quantities of lime are required to neutralize the soil acidity. For example, for good yields a 100 m^2 plot (10 m x 10 m) may need one or two bags (50 or 100 kg) of lime, but only 2 kg of fertilizer. This means that liming involves the costs of the lime itself, as well as the costs of transport, spreading and incorporation, making the whole liming operation particularly problematic for farmers with limited capital. However, liming is absolutely essential for improving yields on acidic soils. Use of fertilizer alone will not improve yields where soil acidity is severe.

An important consideration is that lime is not required every season. After application of the correct amount of lime, no further lime is required for 3 to 5 years. Where there is farmer resistance to using lime, a simple demonstration can prove most rewarding from an extension point of view. A farmer may be persuaded to purchase just one bag of lime, and this is applied at the recommended rate to the poorest part of the land. The resultant benefit in crop growth from the limited area should encourage the farmer (and his neighbours) to invest in lime in subsequent seasons.

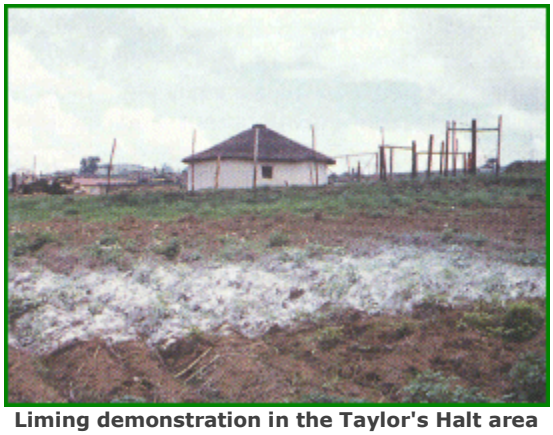
Determination of lime requirement

A characteristic of the soils of KwaZulu-Natal is that their properties often vary greatly over short distances. Thus it is not possible to give a general lime recommendation for a particular area.

Table 2. Area covered by a bag (50 kg) of lime at different application rates

Lime recommendation (from soil test)	Area covered by 50 kg lime
2 t/ha	250 m^2 (16m x 15.6m)
4 t/ha	125 m^2 (11m x 11.4m)
6 t/ha	83 m^2 (9m x 9.2m)
8 t/ha	63 m^2 (8m x 8m)
10 t/ha	50 m^2 (7m x 7m)
15 t/ha	33 m^2 (6m x 5.5m)
20 t/ha	25 m^2 (5m x 5m)

Such a practice would lead to some farmers applying too little lime and others spending money on lime when their lands do not require it. The only satisfactory method of determining lime requirement is by soil testing. Soil samples must be taken from individual lands or plots, and the extension officer must convert the ime recommendation to the amount required for the farmer's field. Useful conversions relating to the application of one bag of lime are presented in Table 2.



Liming demonstration in the Taylor's Halt area

Spreading and incorporating lime

To be effective, lime must be spread evenly over the soil surface and then incorporated into the soil. Incorporation should be preferably be by discing and ploughing; however, where a disc is not available, ploughing only will suffice. On very acidic lands, the lime should ideally be incorporated several months before planting to allow time for the neutralization of the acidity to take place.