7. NUTRITION

7.7 Recommendations for phosphogypsum and gypsum

Use of gypsum

Gypsum is a relatively common mineral that is widely available in South Africa and has a number of specialised agronomic uses. Principally it is a source of calcium and sulphur, and it is also used in the amelioration of sodic soils and the treatment of soil crusting. Recent research with crops such as maize, coffee and soyabeans has suggested that gypsum may also help to alleviate the effects of soil acidity.

Sources and forms of gypsum

Two common forms of gypsum ($CaSO_4.2H_2O$) are geological sedimentary deposits which are mined in the Cape, and extensive non-geological sources of phosphogypsum produced as a by-product in the manufacture of phosphoric acid at Richards Bay.

Composition of gypsum and phosphogypsum

Component	Mined gypsum (G)	Phosphogypsum (PG)
	(Dry mass basis %)	
Calcium (as CaO)	31 to 35	27 to 33
Sulphur (as SO_3)	43 to 47	32 to 42
Phosphorus (as P_2O_5)	<0,3	0,5 to 3,7
Fluoride (as F)	not determined	0,2 to 0,8
Water (H_2O gravimetric)	<2	30 to 35

Gypsum recommendations for sugarcane

Where calcium only is deficient in the topsoil, one to two tons per hectare of gypsum (or PG) broadcast on the soil surface would be as effective as calcitic lime, both being somewhat more soluble. Cost should be the criterion when choosing to use lime, gypsum or PG.

Where sulphur is deficient in the topsoil, one ton per hectare gypsum (or PG) applied to the soil surface should provide sufficient sulphur for a plant crop and four succeeding ratoons.

Aluminium toxicity

Using gypsum or phosphogypsum alone

To date four trials have been established in the Natal Midlands on soils with toxic levels of aluminium (Al). As yet there is insufficient evidence to justify the use of gypsum or PG alone as a substitute for lime in alleviating Al toxicity in plant or ratoon cane. Possible reasons are as follows:

- Soil pH is not increased.
- Aluminium levels in the topsoil are not adequately reduced.
- Not as effective as lime in lowering Al. Two to three times the quantity of gypsum is required to achieve the same short term effect on aluminium in the topsoil.
- Severe reduction of magnesium in the topsoil, together with some leaching of potassium.
- The high moisture content of PG makes it difficult to spread and increases the per unit transportation costs relative to gypsum.
- Whereas soil measurements have confirmed that gypsum or PG can reduce Al levels in the subsoil, to date there has been no experimental evidence of increased cane yields or improvement in rooting depth following amelioration of subsoil acidity.

- Lack of a reliable soil test. There is at present no method of establishing gypsum requirement, although the Al:S ratio in different soils is being evaluated.

Combining gypsum with dolomitic lime use

There was evidence from a PG x lime x supers trial conducted on a Kranskop for soil, of significant residual response to lime/PG treatment combinations.

The treatment combinations producing the highest sucrose yields in the first ratoon crop were either 5 t/ha PG + 6 t/ha lime or 10 t/ha PG + 3 t/ha lime.

For a normal plant recommendation it is possible that up to a third of the lime recommendation could be substituted by gypsum. However, cost should be the criterion when choosing to supplement part of the dolomitic limestone with gypsum.

August 1993