

Information Sheet



7. NUTRITION

7.13 Fertiliser recommendations for cane in the northern irrigated areas

Fertiliser advice

Fertiliser may comprise up to 30% of the variable costs of sugarcane production. Cost effective fertiliser advice is offered by the SASRI Fertiliser Advisory Service (FAS).

Rather than estimating fertiliser requirements, which could be an expensive mistake, aim to get your entire farm soil sampled, and let the FAS plan your fertiliser programme.

A knowledge of soils and the use of soil testing can assist you in selecting the best fertiliser strategies in terms of how much to apply, when to apply and where to place the fertiliser.

Whole crop fertiliser advice is based on the complementary use of soil and leaf analyses. A pre-plant soil sample test will provide you with fertiliser recommendations for a plant crop and four ratoons. Leaf analysis during each ratoon is used to adjust the original recommendations if necessary.

The amounts of fertiliser recommended are based on threshold values established from a large number of fertiliser trials conducted on a wide range of soils throughout the industry.

Amounts of nutrients used by sugarcane

Sugarcane consists essentially of water and organic material. The structural elements such as carbon, hydrogen and oxygen comprise about 95% of the fresh mass of the plant. The remaining 5% includes the six macro elements: nitrogen, phosphorus, potassium, calcium, magnesium and sulphur; and the six micro elements: zinc, boron, copper, iron, manganese and molybdenum.

Cane is capable of rapidly depleting the soil of mineral elements, particularly N and K. A high yielding irrigated crop of variety N14 can remove up to 250 kg N, 30 kg P and 650 kg K, depending on crop stage and cycle (summer or winter).

The rate of nutrient accumulation by the crop depends very much on the start of the crop cycle. Summer cycle crops accumulate N rapidly and, after four months, 82%



of the final N is usually taken up in the above-ground portions of the crop. This compares with only a 12% final N uptake for crops starting in April. This differential N uptake has important implications for fertiliser management, as will be seen later.

Nitrogen

(see also Information Sheet 7.1)

The role of N in sugarcane

- one of the main building blocks of proteins.
- essential for photosynthesis and sugar production.
- associated with vigorous vegetative growth.
- too much N can cause lodging, delayed maturity and reduced sucrose levels.

Nitrogen deficiency symptoms

- growth of entire plant is affected.
- light green to yellow leaves from the base of the plant upwards, often with necrosis (death of tissue) on the tips and edges of older leaves.

| Nitrogen mineralising potential | | LOW | MEDIUM | HIGH | VERY HIGH |
|---------------------------------|-----------------------------|--|--|--|--|
| Soil type | | Grey sandy loams to clay | Dark grey to black loams to clays | Red or brown loams to clays | Humic brown Ioams |
| Parent material | | Granite Middle Ecca Light alluvium | Middle Ecca shale Cave sandstone | Swazi Basic Dolerite Basalt Heavy alluvium | Peat Old marsh areas |
| Soil form | | Glenrosa Cartref Kroonstad Mispah Escourt Katspruit Dundee | Oakleaf (grey) Swartland Glenrosa (> 20% clay) Arcadia Mayo Rensburg Bonheim (non-red) | Hutton Shortlands Bonheim (red) Oakleaf (red) | Champagne All category 3 soils with filtercake usage (OM>4%) |
| Organic matter | | <2% | 2-4% | 2-4% | >4% |
| N advice: Plant (kg/ha) | | 140 | 120 | 80 | 60 |
| Ratoons | All varieties except N14 | 180 | 160 | 120* 140** | 100 |
| | N14 | 200 | 180 | 140** 160** | 120 |

Table 1. Estimation of N mineralisation potential.

• thin, stunted stalks and reduced stooling.

Soil nitrogen supply and N recommendations

The response of cane to applied N is strongly influenced by the potential of different soils to mineralise N, especially in the plant crop.

The potential of different soils to mineralise N is in turn dependent on the soil diagnostic horizon and organic matter content. In general, the potential for N release declines in the order: humic > red orthic > vertic > melanic > grey orthic. In terms of organic matter, soils with high, medium and low N release were associated with <2%, 2-4% and >4% organic matter.

Ratoon cane is also dependent on soil N supply, but generally the amount released by mineralisation tends to diminish with succeeding ratoons. There is a need to increase N fertiliser applications to older ratoons.

NB. Where specific limiting factors are identified, N recommendations within the various soil categories should be reduced by 20 to 30 kg N/ha. These factors include the following:

- soils are shallow (<450 mm).
- on sandy soils where nematodes are not controlled.
- salinity/sodicity problems exist.
- eldana is known to be a serious problem.
- during water restrictions/drought.

• the price of cane is likely to be lower than usual, or restrictions are to be enforced.

Nitrogen management

Sources of N (see also Information Sheet 7.12)

Sulphate of ammonia (21% N)

- Use where pH is greater than 7.
- Use on S deficient soils.

Urea (46% N)

- Apply prior to an irrigation cycle.
- Incorporate where irrigation may be delayed.

Anhydrous ammonia (82% N)

- Not recommended where soil texture makes closing the tine furrow difficult, i.e. on Arcadia, Rensburg or light sandy grey soils (Dundee, Fernwood, Cartref).
- Best applied to a moist soil and sealed immediately.

Limestone ammonium nitrate (LAN) (28% N)

• Use on all except high pH and sandy soils.

Placement

Plant cane

• One third of N lightly covered in the furrow and topdress balance 10 weeks later.

Ratoon cane

- Top-dressing may be banded on or adjacent to the row. Covering or incorporating has not proven necessary unless irrigation is delayed or a trash blanket is present.
- For surface irrigated cane, bury the N in a band on each side of the row.

Timing

Plant cane

• Not too critical - see placement.

Ratoon cane

- Summer harvest: top-dress all N within a week or two of harvesting previous crop.
- Winter harvest: usually within two to three weeks of harvest. No significant benefits have been obtained from splitting N, except during very cold winters when regrowth is very slow and N uptake is inefficient (see below).

Splitting

Under certain conditions, splitting may be beneficial on soils with restricted drainage and sandy soils. Use a six to eight week split according to the harvesting season:

- May-June harvest: apply one third initial, two thirds top-dressed.
- July-August harvest: apply half initial, half topdressed.
- September onwards: all initial.

Phosphorus

P is inherently low in many of the red soils of the Shortlands and Hutton forms, and some red and black clays show a tendency to fix P, thus making it unavailable to the plant.

Role of P in sugarcane

- important in cell division and plant proteins.
- promotes vigorous tillering.
- promotes early root formation and growth.
- plays a role in photosynthesis.

P deficiency symptoms

- poor tillering and thin, short stalks with short internodes.
- leaf blades are dark green to blue-green, often with red or purple tips and margins.
- leaves may stand abnormally upright.

P recommendations

- By correlating soil test P values based on the Truog method (0,02 N H₂SO₄) with yield response to applied P in a number of trials, threshold values of 31 ppm and 13 ppm were obtained for plant and ratoon cane respectively.
- Sufficient P fertiliser is applied in the furrow to meet the P requirements of at least the plant and first ratoon crops.

P carriers

At planting, an in-furrow application of single superphosphate, ammoniated supers, mono ammonium phosphate (MAP) and di-ammonium phosphate (DAP) is commonly recommended, as well as mixtures such as 2.3.4 or 2.3.2.

Alternatively, filtercake can be used at planting. Filtercake from the Malelane factory has a particularly high P content (2%).

Potassium

The red and black clays of the lowveld generally have moderate to high K reserves, but many of them contain 2:1 lattice clay minerals that can fix large amounts of K under wet conditions during winter.

Role of K

- ensures prolonged cell life.
- essential for plant growth and photosynthesis.
- controls starch formation in the stalk and translocation of sugars and proteins.

K deficiency symptoms

- older leaves show firing or yellowing from the tip downwards.
- scorching of outer edges, also red discolouration of midrib.
- growth is depressed.

K recommendations

Refer to Information Sheet 7.3 for specific advice.

Updated by Neil Miles (Soil Scientist) June 2008

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