

NUTRIENT MANAGEMENT GUIDELINES FOR SUGARCANE IN THE BURDEKIN DISTRICT

Ameliorants

Table 1 – Lime guidelines based on exchangeable soil calcium (Ca)

| Soil calcium (meq/100g) | Lime application (tonnes/ha) |
|-------------------------|------------------------------|
| < 0.2 | 3 |
| 0.2 – 0.4 | 2.5 |
| 0.4 – 0.6 | 2 |
| 0.6 – 0.8 | 1.5 |
| 0.8 – 1.1 | 1 |
| 1.1 – 1.5 | 0.5 |

Table 2 – Magnesium (Mg) guidelines based on exchangeable Mg

| Soil Mg (amm-acet) meq/100g | < 0.05 | 0.06 – 0.10 | 0.11 – 0.15 | 0.16 – 0.20 | 0.21 – 0.25 | > 0.25 |
|-----------------------------|--------|-------------|-------------|-------------|-------------|--------|
| Mg rate (kg/ha) | 150 | 125 | 100 | 75 | 50 | 0 |

Table 3 – Gypsum guidelines for sodic soils

| ESP (%) | Gypsum rate (tonnes/ha) |
|---------|-------------------------|
| < 5 | 0 |
| 5 - 10 | 5 |
| 10 - 15 | 7.5 |
| > 15 | 10 |

Table 4 – Silicate guidelines based on reserves and available soil silicon (Si)

| | Si (BSES/sulphuric acid) | | Si (CaCl) | Suggested application rate |
|------------|--------------------------|-----|-----------|----------------------------|
| Si (mg/kg) | < 70 | and | < 10 | Mud/ash at 200 wet t/ha |

Table 5 – Modifications to ameliorant application rates where mill by-products have been applied

| Product | Application rate | Reduce the next lime application by: | Magnesium (Mg) |
|-----------------|-------------------|--------------------------------------|----------------------------------|
| Mill ash | 200 wet tonnes/ha | 2.5 t/ha | Sufficient Mg for one crop cycle |
| Mill mud | 200 wet tonnes/ha | 2.5 t/ha | Sufficient Mg for one crop cycle |
| Mud/ash mixture | 200 wet tonnes/ha | 2.5 t/ha | Sufficient Mg for one crop cycle |

Nitrogen (N)

Table 6 – Nitrogen (N) fertiliser guidelines

| District Yield Potential | Crop | Organic C (%) range, N mineralisation index and N application rate (kg/ha) | | | | | | |
|--------------------------|-------------------------|--|-------------|-------------|-------------|-------------|-------------|--------|
| | | < 0.40 | 0.41 – 0.80 | 0.81 – 1.20 | 1.21 – 1.60 | 1.61 – 2.00 | 2.01 – 2.40 | > 2.40 |
| | | VL | L | ML | M | MH | H | VH |
| 150 tc/ha | Plant after bare fallow | 150 | 140 | 130 | 120 | 110 | 100 | 90 |
| | Replant and ratoon | 190 | 180 | 170 | 160 | 150 | 140 | 130 |
| 180 tc/ha | Plant after bare fallow | 180 | 170 | 160 | 150 | 140 | 130 | 120 |
| | Replant and ratoon | 220 | 210 | 200 | 190 | 180 | 170 | 160 |

Table 7 – Calculation of Nitrogen (N) rate discount following a legume crop

| Legume crop | N% | Crop dry mass (t/ha) | N discount if cover crop (kg/ha) | N discount if grain harvested (kg/ha) |
|-------------|-----|----------------------|----------------------------------|---------------------------------------|
| Soybean | 3.5 | 8 | 360 | 120 |
| | | 6 | 270 | 90 |
| | | 4 | 180 | 60 |
| | | 2 | 90 | 30 |
| Peanut | 3.0 | 8 | N/A | 125 |
| | | 6 | | 100 |
| | | 4 | | 65 |
| | | 2 | | 25 |
| Cowpea | 2.8 | 8 | 290 | 100 |
| | | 6 | 220 | 75 |
| | | 4 | 145 | 50 |
| | | 2 | 70 | 25 |
| Lablab | 2.3 | 8 | 240 | 80 |
| | | 6 | 180 | 60 |
| | | 4 | 120 | 40 |
| | | 2 | 60 | 20 |

Table 8 – Modifications to nitrogen (N) rate where mill by-products have been applied

| Product | Application rate | To be subtracted from the appropriate N application rate | | |
|-----------------|-------------------|--|------------|------------|
| | | Year 1 | Year 2 | Year 3 |
| Mill ash | 200 wet tonnes/ha | Nil | Nil | Nil |
| Mill mud | 200 wet tonnes/ha | 100 kg N/ha | 50 kg N/ha | 25 kg N/ha |
| Mud/ash mixture | 200 wet tonnes/ha | 60 kg N/ha | 30 kg N/ha | 15 kg N/ha |

Note: Modifications to N rate are recommended where blocks of cane are irrigated with ground and tail water which may contain substantial amounts of nitrate. The N application needs to be reduced to take this source of N into account.

Notes for determining appropriate N application rate

- Determine baseline N rate from Table 6 by firstly selecting appropriate DYP, then use the Organic C (%) to determine N mineralisation index and N requirement for crop.
- Calculate N rate discount for sugarcane crops that follow a legume crop, using Table 7.
- If mill by-products were applied prior to planting, use Table 8 to determine N rate discount for the N contribution from mill mud and mud/ash mixture.

Example 1.

The Organic C value is 0.8%, the N mineralisation index is low (L), a crop of soybeans was grown with an estimated 6 t/ha dry mass that was harvested for grain. The calculation for the N requirement for a plant crop using the **replant** rate to establish baseline N: 210 – 90 = 120 kg N/ha

Example 2.

The Organic C value is 0.8%, the N mineralisation index is low (L) and a mud/ash mixture was applied to the fallow block at 200 wet tonnes/ha.

N requirement for year 1: 170 – 60 = 80 kg N/ha

N requirement for year 2: 210 – 30 = 180 kg N/ha

N requirement for year 3: 210 – 15 = 195 kg N/ha

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Phosphorus (P)

Table 9 – Phosphorus (P) fertiliser guidelines

| PBI | P sorption class | Crop | BSES P (mg/kg) range and P application rate kg/ha | | | | | | | | |
|-----------|------------------|--------------------|---|--------|---------|---------|---------|---------|---------|----------|-------|
| | | | < 5 | 5 - 10 | 10 - 20 | 20 - 30 | 30 - 40 | 40 - 50 | 50 - 60 | 60 - 120 | > 120 |
| > 420 | Very high | Plant | 80 | 50 | 40 | 30 | 30 | 30 | 30 | 30 | 0 |
| | | Replant and ratoon | 40 | 40 | 30 | 25 | 20 | 20 | 20 | 20 | 0 |
| 281 - 420 | High | Plant | 80 | 50 | 40 | 30 | 20 | 20 | 0 | 0 | 0 |
| | | Replant and ratoon | 40 | 40 | 30 | 25 | 20 | 10 | 0 | 0 | 0 |
| 140 - 280 | Moderate | Plant | 60 | 40 | 30 | 20 | 20 | 20 | 0 | 0 | 0 |
| | | Replant and ratoon | 30 | 30 | 20 | 20 | 15 | 5 | 0 | 0 | 0 |
| < 140 | Low | Plant | 40 | 30 | 30 | 20 | 20 | 20 | 0 | 0 | 0 |
| | | Replant and ratoon | 20 | 20 | 15 | 10 | 10 | 0 | 0 | 0 | 0 |

Table 10 – Modifications to phosphorus (P) application rate where mill by-products have been applied

| Product | Application rate | P contribution |
|-----------------|-------------------|--|
| Mill ash | 200 wet tonnes/ha | Sufficient P for a plant crop and one ratoon |
| Mill mud | 200 wet tonnes/ha | Sufficient P for two crop cycles |
| Mud/ash mixture | 200 wet tonnes/ha | Sufficient P for two crop cycles |

Potassium (K)

Table 11 – Potassium (K) fertiliser guidelines

| Nitric K (meq/100g) | Texture | Crop | Exchangeable K (meq/100g) | | | | | |
|---------------------|---------|---------------------------|---------------------------|-------------|-------------|-------------|-------------|--------|
| | | | < 0.20 | 0.20 – 0.25 | 0.26 – 0.30 | 0.31 – 0.35 | 0.36 – 0.40 | > 0.41 |
| < 0.70 | Sand | Plant, replant and ratoon | 100 | 80 | 50 | 50 | 0 | 0 |
| | Loam | Plant, replant and ratoon | 120 | 100 | 80 | 50 | 0 | 0 |
| | Clay | Plant, replant and ratoon | 120 | 120 | 100 | 80 | 50 | 0 |
| > 0.70 | Sand | Plant, replant and ratoon | 80 | 50 | 0 | 0 | 0 | 0 |
| | Loam | Plant, replant and ratoon | 100 | 80 | 50 | 0 | 0 | 0 |
| | Clay | Plant, replant and ratoon | 100 | 100 | 80 | 50 | 0 | 0 |

Table 12 – Modifications to potassium (K) application rate where mill by-products have been applied

| Product | Application rate | To be subtracted from the appropriate K application rate | | |
|-----------------|-------------------|--|------------|------------|
| | | Year 1 | Year 2 | Year 3 |
| Mill ash | 200 wet tonnes/ha | 120kg K/ha | 120kg K/ha | 120kg K/ha |
| Mill mud | 200 wet tonnes/ha | 50 kg K/ha | 0 | 0 |
| Mud/ash mixture | 200 wet tonnes/ha | 120kg K/ha | 120kg K/ha | 0 |

Note: Modifications to K rate are recommended where blocks of cane are irrigated with ground water which may contain substantial amounts of potassium. The K application needs to be reduced to take this source of K into account.

Sulphur (S)

Table 13 – Sulphur fertiliser guidelines (kg/ha) for plant and ratoon crops

| Sulphate S (mg/kg) | N mineralisation index | | |
|--------------------|------------------------|--------|---------|
| | VL - L | ML - M | MH - VH |
| < 5 | 25 | 20 | 15 |
| 5 - 10 | 15 | 10 | 5 |
| 11 - 15 | 10 | 5 | 0 |
| > 15 | 0 | 0 | 0 |

Table 14 – Modifications to sulphur (S) application rate where mill by-products have been applied

| Product | Application rate | To be subtracted from the appropriate S application rate | | |
|-----------------|-------------------|--|-----------|-----------|
| | | Year 1 | Year 2 | Year 3 |
| Mill ash | 200 wet tonnes/ha | 0 | 0 | 0 |
| Mill mud | 200 wet tonnes/ha | 15kg S/ha | 15kg S/ha | 15kg S/ha |
| Mud/ash mixture | 200 wet tonnes/ha | 15kg S/ha | 15kg S/ha | 0 |

Note: Modifications to S rate are recommended where blocks of cane are irrigated with ground water which may contain substantial amounts of sulphate. The S application needs to be reduced to take this source of S into account.

Micronutrients

Table 15 – Copper (Cu) fertiliser guidelines

| Copper (DTPA) | Application rate |
|----------------|---------------------------------|
| < 0.2 mg Cu/kg | 10 kg Cu/ha once per crop cycle |

Table 16 – Zinc (Zn) fertiliser guidelines

| Zinc (HCL) | Application rate |
|----------------|---------------------------------|
| < 0.6 mg Zn/kg | 10 kg Zn/ha once per crop cycle |
| Zinc (DTPA) | Application rate |
| < 0.3 mg Zn/kg | 10 kg Zn/ha once per crop cycle |

When interpreting soil test values for zinc, soil pH is used to determine the appropriate laboratory test to use.

- If soil pH < 6.5 use Zinc (HCL) guideline.
- If soil pH > 6.5 use Zinc (DTPA) guideline.

These guidelines are a summary of the tables that are included in the workbook:

- *Accelerating the Adoption of Best-practice Nutrient Management – Burdekin District* (Bernard Schroeder, SRA Ltd; Andrew Wood, Consultant and John Panitz, SRA Ltd).