NORTH COAST EXTENSION NEWS

SUSTAINABLE SUGARCANE PRODUCTION

Key considerations when growing sustainable sugarcane are:

1. Effective rooting depth.
2. Soil health - a doorway to good root health.
3. Fertiliser management – The required amount and timing of placement.
4. Implementing Best Management Practices
5. Environmental sustainability (no harm to the environment)

1. Effective rooting depth

Effective rooting depth is mostly determined by the position of a field within the landscape as well as the type of soil found within the landscape. In most cases, there is little that can be done to change what you have, so it is important to adopt practices best suited to your soil and avoid those that can artificially limit the available depth (such as compaction or subsoil acidity). Most sugarcane roots are found in the top 40cm of the soil; hence this is the main depth range to manage. Where you do have deeper soils, encouraging roots to exploit the deeper zones will offer protection against short-term drought stress, ensure better use of nutrients that have leached to depth, and, in some instances, reduce incidence of stool tipping.

2. Soil Health

Soil health refers to the ability of the soil to support crop growth sustainably. Healthy soils are usually associated with healthy roots, which are better able to support and sustain crop growth by enhancing the crops' ability to take up water and nutrients and to use resources more efficiently.

Organic Matter (OM) plays an important role in top-soil management by:

- Improving soil structure and tilth.
- Increasing soil aeration and water infiltration and retention.
- Improving workability of the soil.
- Supplying most of the required nutrients, including Nitrogen (N).
- Allowing nutrients to be stored and slowly released, reducing losses due to leaching or denitrification.

Soil Organic Matter can be managed/improved by:

- ✓ Reduced tillage.
- ✓ Use of green cane harvesting and the supply of a mulch blanket, or, where burning is necessary, by retaining tops after harvest. Never burn tops!
- ✓ Growing fallow crops, especially legumes.
- ✓ Preventing erosion by keeping the soil covered as much as possible and managing water flows through proper field layout.
- ✓ Addition of organic amendments such as bagasse, mill ash, compost or manures.
- ✓ Ensuring healthy sugarcane growth as cane stools also provide soil cover, soil stability and OM through their root systems.

Soil pH, Acidity or Alkalinity:

Most North Coast soils are found to be acidic and should be treated accordingly. Soil acidification is a natural process that increases with agricultural practices. Ammonium is converted to nitrate and hydrogen ions in the soil. Furthermore, if nitrates are not utilised by plants, it can be leached from the soil along with Calcium (Ca) and Magnesium (Mg), leaving behind the hydrogen ions, further increasing soil acidity.

Depending on the severity of acidity, acidic soils can/will lower the availability of some plant nutrients (like phosphorus (P)), cause some to become toxic (like Manganese (Mn) and Boron (B)) and reduce soil microbial activity that is essential for nutrient cycling in the soil (most notably N). Aluminium toxicity may occur in very acidic soils resulting in retarded root growth.

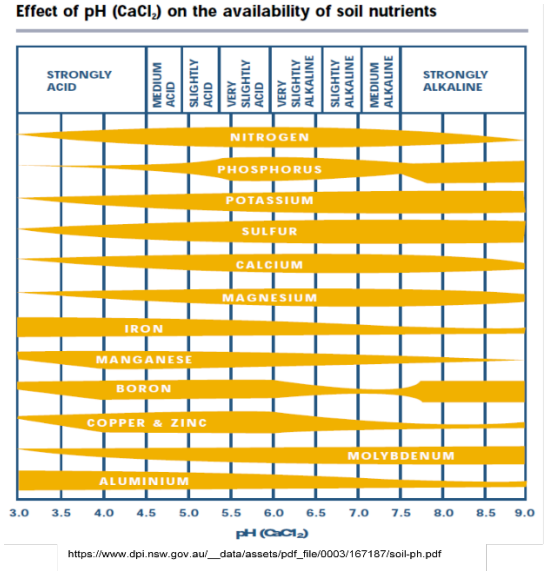
Major causes of soil acidity:

- Soil parent material. Some are more acidic than others when they break down to produce soil.
- Rainfall and subsequent leaching of nutrients from soil.
- Organic material decay.
- Harvesting of crop and removal of base cations in that process leading to mining of nutrients.
- Use of N-fertilisers, with an exaggeration of the acidification where N is over-applied and poorly managed.

Soil pH and availability of nutrients:

Desired pH range for nutrient availability is pH 4.5 – 6.5. Soils with a pH ($CaCl_2$) of 5.5 are most desirable for optimum crop production in most crops. This is due to the concentration of Aluminium, which is more soluble at low pH and is more toxic to plants. Aluminium toxicity is minimised above pH 5.5. Increased acidity (low pH) causes reduced availability of N, Potassium (K), Ca, Mg, P and Sulphur (S) while micronutrients such as Zinc (Zn) and Copper (Cu) become more available (though uptake may be reduced due to poor root health).

Conversely, over-liming to very high pH can lead to reduced availability of many nutrients (mainly P and micronutrients) and increase risk of urea volatilisation. Under acidic conditions, Aluminium (Al) is present in its soluble form and is toxic to crops, hence the regular application of lime products to correct growing conditions.



https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/167187/soil-ph.pdf

3. Fertiliser Management

What happens when fertiliser is applied to the soil?

Many factors, such as soil type, crop management, weather conditions, fertiliser application and placement play a crucial role in affecting the fertiliser that is applied. This results in:

- Mining – This is when the nutrient uptake from the crop exceeds the nutrients applied to the soil.
- Nutrient pooling – Fertilisers react with organic matter and soil minerals and become part of the soil reservoir for possible future use.
- Gaseous losses – Nutrients can be lost to the atmosphere as a gas due to volatilisation or denitrification.
- Run-off losses – Fertiliser lost with sediment run-off, erosion after heavy rainfall.
- Leaching – Leaching of nutrients beyond the root zone due to excessive rainfall or irrigation.

Basic principles of sustainable fertiliser/nutrient management applicable to both ratoon and plant cane:

- Apply fertiliser when it is needed – the correct time.
- Apply only the required amount of fertiliser as per soil/leaf sample results.
- Use the right type of fertiliser for your conditions to minimise losses and improve uptake by the crop.
- Apply the fertilisers where they are needed for optimal root access.
- Do NOT apply nutrients already available in the soil.
- Do not apply one nutrient at the expense of another, do not over-apply on one and under-apply on another – Practice balanced nutrition.
- The deficient nutrient will be the limiting factor for crop growth.
- Base fertiliser applications on sound principles, soil and harvest results, yield trends and responses.
- Be sceptical of gimmicks that over-promise – i.e. snake oils. Ask for expert guidance if you want to run on-farm tests for yourself so you can be sure you are comparing apples with apples!

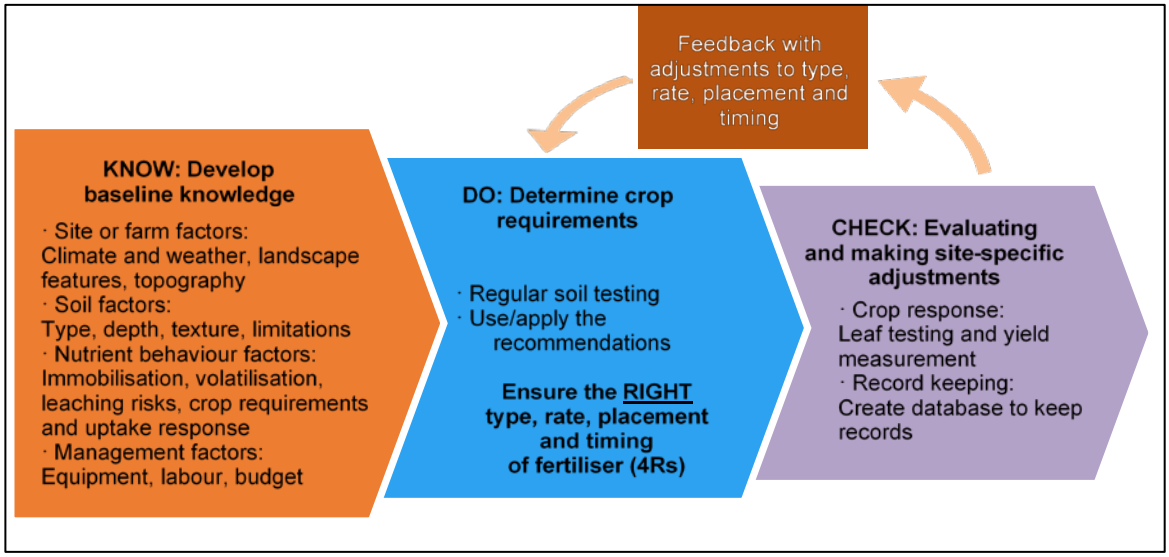
A combination of soil testing, leaf analysis and crop assessment/response are the best way to assess which nutrients and the quantity of each needed to maintain soil fertility, achieve balanced nutrition, avoid build-up of luxury amounts and still produce profitable yields.

Balanced nutrition is of utmost importance. All essential plant nutrients need to be present and in balanced concentrations to enable optimum crop growth and yields. Cane and sugar yields will be reduced if any one of the essential nutrients or Silicon (Si) is in short supply. Plant growth will be limited by and to the maximum growth possible by the single nutrient in short supply.

4. Adoption of Better Management Practices (BMP's)

A simple three-step system called Know-Do-Check form the core foundation of a good fertiliser management programme:

i) Gathering baseline knowledge about your soils and farming situation (**Know**)
ii) Determining crop requirements and applying these (along with any other corrective actions required) (**Do**); and
iii) Evaluating and making site-specific adjustments (**Check**).



This requires that you:

- Know and understand your soils and crop requirements.
- Perform regular soil and leaf testing.
- Manage and understand fertiliser applications and losses.
- Adopt soil and yield specific fertiliser management programmes/guidelines (e.g. correct rate and type of fertiliser, optimal placement, and timing); and
- Monitor responses and modify nutrient inputs where and when necessary and keep records.

5. Environmental Sustainability (No harm to the Environment)

When following calculated and well thought through farming practices, farming becomes sustainable and more environmentally friendly.

- Follow correct land preparation methods – chemically (to correct soil deficiencies) and mechanically (to avoid unnecessary run-off and eventual loss of valuable top-soil due to erosion).
- Apply the correct amount of fertiliser to avoid losses due to leaching and run-off causing pollution of rivers and estuaries.
- Apply fertiliser at the correct time, to an actively growing crop, avoiding unnecessary over-application and financial losses.
- Farm realistically - towards achievable yields, not "bank manager pleasing yields".
- Plan carefully, execute correctly and reap rewards.

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