



Information Sheet

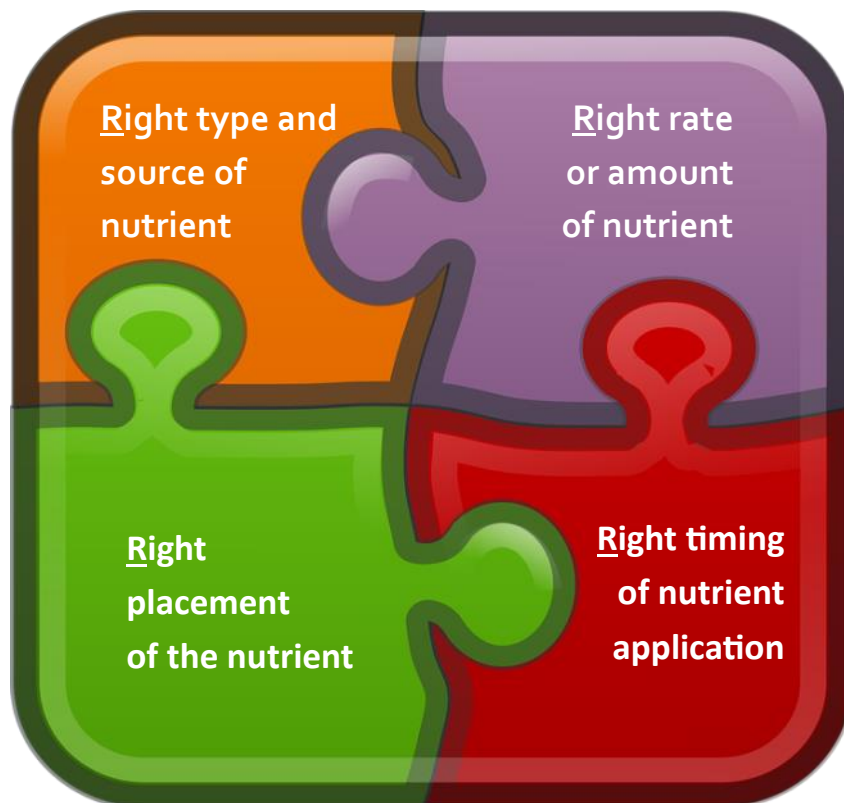
7.1 Developing a nutrient management programme



Sugarcane is considered a high nutrient use crop and a sound nutrition programme is necessary for optimal and sustainable production. However, crop nutrient and fertiliser management is a complex subject with numerous interacting factors affecting how effectively the crop uses the nutrients. Fertiliser application is also one of the more expensive aspects of establishing and maintaining a sugarcane crop. Thus, to ensure growers are getting the best from their fertiliser investment through improved nutrient use efficiency, it is essential that a robust nutrient management programme be developed.

Key principles

The International Plant Nutrition Institute (www.IPNI.net) have developed four key concepts that need to be managed for optimal fertiliser management called the four RIGHTS (4Rs) of crop nutrition (page 2).



▲ The four RIGHTS of nutrient management

The 4Rs of Nutrient Management

1 The Right type and source of nutrient

This means selecting the most suitable type of fertiliser to apply by considering the following:

- Does my choice of fertiliser supply the right combination of nutrients in a readily available form suitable for uptake by the plant (will it cause imbalances)?
- Does the product suit my soil type and characteristics (will nutrients be held in plant unavailable forms in the soil (lock-up) or undergo permanent losses, how will the soil pH be affected, etc.)?
- What else am I getting in my fertiliser (non-nutritive components, fillers or toxins)?
- What operational farming systems do I have in place to deal with different fertilisers types (granules, liquids and placement issues, equipment availability)?

2 The Right rate or amount of nutrient

The crop requires certain amounts of plant available nutrients to grow and give good yields. Key considerations in establishing the correct rate include:

- What nutrients are already in your soil (soil testing)?
- What nutrients are coming from other sources you may be adding (like manures, compost or CMS)?
- How much of each nutrient does your crop require (dependent on soil nutrient content and crop requirement for a given yield)?
- Is the form of the nutrient subject or prone to losses or lock-up?

3 The Right timing of nutrient application

The amount of nutrient a crop requires is dependent on the growth stage of the crop (size and growth rate), while prevailing weather conditions may affect efficiency of the nutrients. To ensure proper timing of application you must consider:

- The dynamics of soil nutrient supply (lock-up and release by soil minerals and organic matter).
- Changes in crop demand and uptake as it grows (nutrient uptake curves).
- Weather conditions that influence nutrient availability or losses and crop growth.
- Practical constraints related to the application of the nutrient.

4 The Right placement of the nutrient

For most nutrients, the best way for the crop to take them up is through the root system. For this to happen most effectively, the sugarcane must have a healthy root system with the nutrients in close proximity to those roots. The main considerations are:

- The nature of the root growth of your crop (how vigorous is the root growth and are there any root growth limitations?).
- Soil-fertiliser interactions that influence the nutrient availability for crop uptake.
- Equipment and capacity to undertake different placement practices.
- Spatial variation in nutrient distribution that may require different rates in different places.
- Risk of losses for different types of nutrient, methods of application and soil types.

Developing a nutrient management programme

To optimise fertiliser use requires a management approach that regularly evaluates the current soil and crop status then adapts to changes and requirements. There are three main steps in developing your nutrient management programme.

Step 1: Developing baseline knowledge

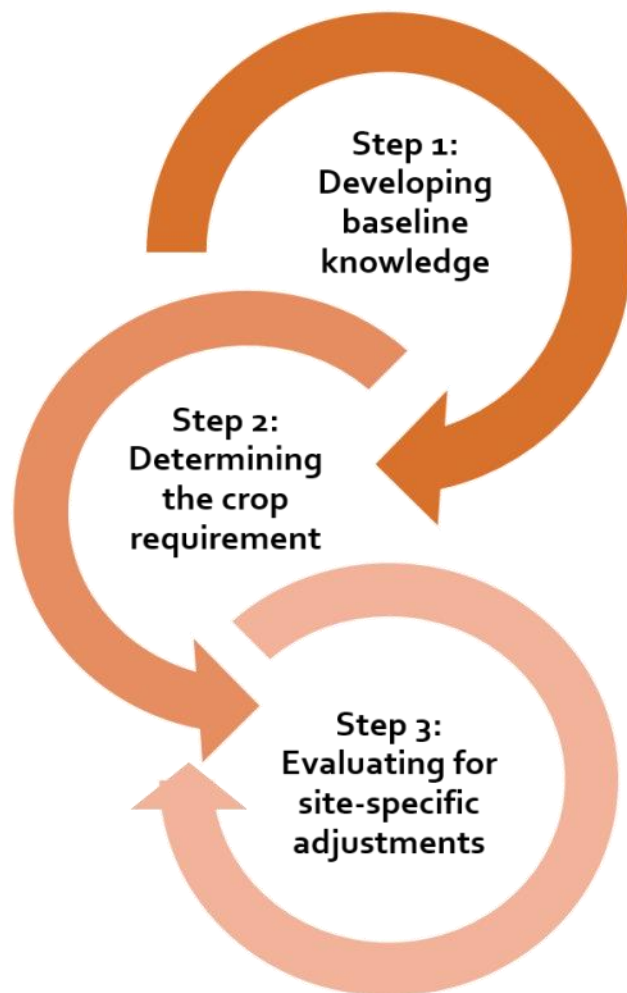
Knowledge of your soil is the cornerstone to managing nutrient supply. Knowledge of soils in different areas across your farm will enable you to adapt your management to best suit the characteristics of those soils. Some understanding of how nutrients behave in soil goes hand-in-hand with understanding your soil. Certain conditions will affect whether a nutrient is plant-available, whether it can be converted to non-available forms, or worse, be permanently lost from the rooting zone. Consideration of climate and weather are also useful, as this affects your cropping cycles and the best time to apply nutrients. Recognising the impact of your landscape (e.g. slopes, valleys) on equipment access, risk of erosion or waterlogging also impacts your decision on the 4Rs of nutrient management.

Step 2: Determining the crop requirement

Soil testing is critical in determining nutrient applications as nutrient levels change over time. This is due to uptake by the crop, the amount and type of fertiliser and other ameliorants you have applied, rainfall and soil processes - all of which can affect the amount and availability of a nutrient in the soil. Regular soil sampling (if done correctly) and analysis by a reputable laboratory, are essential steps for optimal nutrient management. After soil sampling, it is important to follow the nutrient application recommendations that have been advised, as these are based on many years of research to develop optimal practices and strategies. It is important to remember that under-application of nutrients can lead to yield and quality losses, thus lowering net returns. On the other hand, over-application increases fertiliser expense without any advantage in yield and can sometimes lead to a crop quality decline and also contribute to environmental pollution. Ensure that application takes into account the right type, rate, timing and placement of nutrients.

Step 3: Evaluating for site-specific adjustments

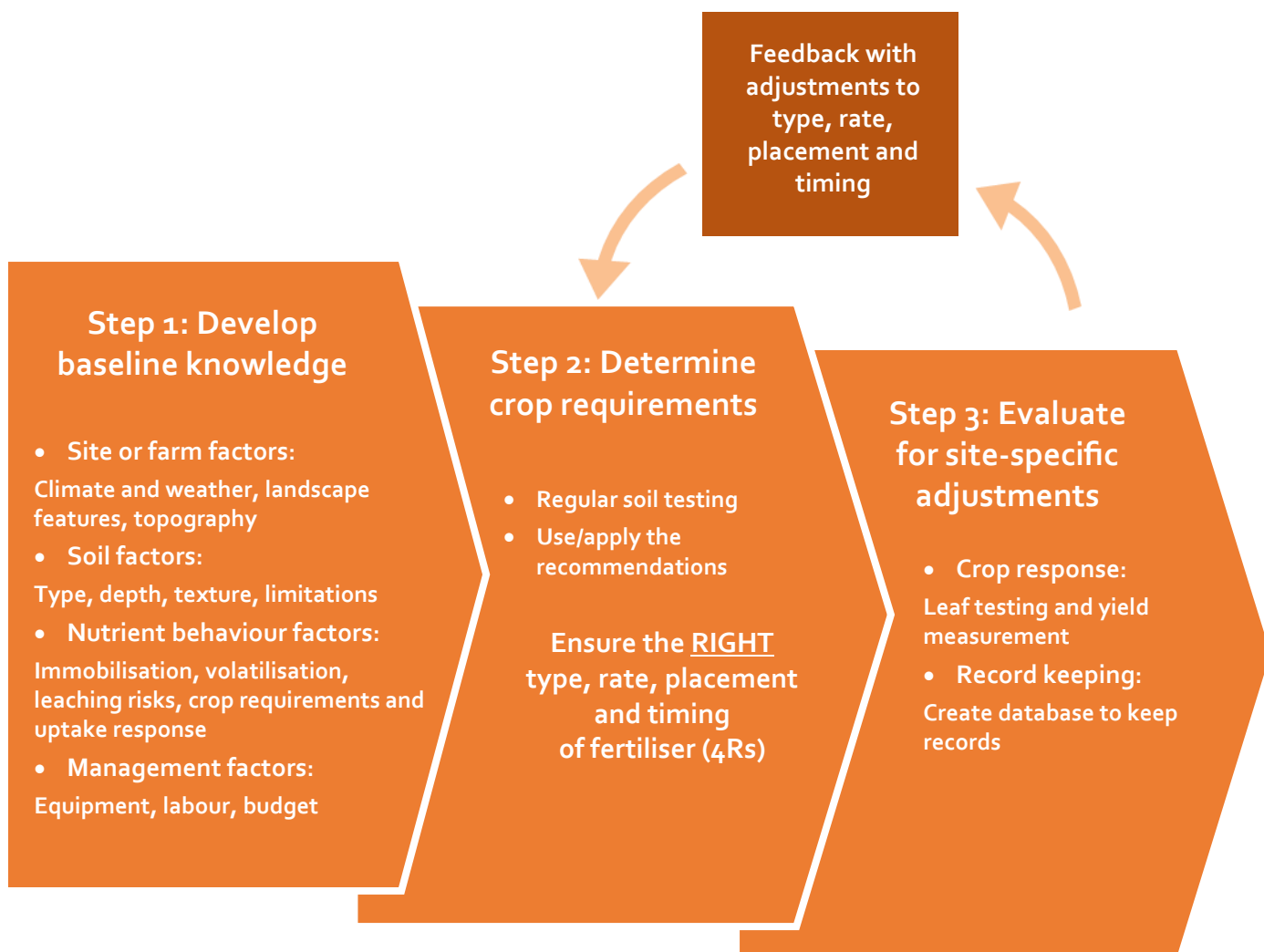
The soil environment is dynamic so it's impossible to guarantee that your crop will take up the nutrients applied. The best way to check that the crop is adequately supplied with nutrients is to assess the crop, most typically by leaf analysis. In the longer term, to properly adjust and adapt your nutrient management programme to crop uptake and yield response, it is essential that you maintain good records of soil and leaf analyses per field. It is also necessary to record the fertiliser and other management inputs and crop yields. Records of climate should also be kept, especially given the importance of crop water supply. Over time, these records will help identify site-specific adjustments to your nutrient applications so you get the best from your fertiliser investment.



▲ Three steps to develop your nutrient management plan

Putting it all together

Below summarises the key steps to develop your nutrient management programme, highlighting where considerations from the 4Rs will be applied to optimise the nutrient applications. By adopting an informed, methodical approach to choosing fertilisers you will be able to optimise nutrient application for a field and across the whole farm, thus reducing wastage and unnecessary cost. Additional benefits will include reduced environmental pollution from over-use of fertilisers and protection of water sources from excess nutrients.



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