

ReefWise Farming

Reef Protection Package

The method for soil sampling and analysis for sugarcane properties regulated under the *Environmental Protection Act 1994*

For a simple online nutrient calculator tool go to the Reef Wise Farming website at www.reefwisefarming.qld.gov.au or call 137468 (13QGOV) for more help.

Toward 2 Tomorrow's Queensland

Queensland Government

Prepared by:
Department of Environment and Resource Management

December 2009

Contents

1.0 Introduction

In October 2009, new reef protection measures were added to the *Environmental Protection Act 1994*. In part, these measures require that a person must not apply more than the optimum amount of nitrogen and phosphorus when carrying out commercial sugarcane growing in the catchments of the Wet Tropics, Burdekin Dry Tropics and Mackay-Whitsunday.

Soil testing prior to the plant cane crop is required to calculate the optimum amount. The method in this document provides the techniques to be used for taking soil samples, and the methods to be specified when having soil samples analysed.

Soil testing provides a guide to nutrient concentrations in the soil. By soil testing you can fine-tune your property management, and apply nutrients at rates that meet the needs of the plants on a particular block of sugarcane. This approach reduces the risk and cost of over-fertilising. By optimising nutrient application, there is less chance of wasted nutrients ending up in waterways, where they harm the environment.

To guide nutrient management, representative surface soil samples (0–20 cm) are needed to determine the phosphorus (P) and organic carbon (OC) status of the blocks being planted to cane each season.

Soil phosphorus status is used to define phosphorus fertiliser requirements according to the Six Easy Steps guideline developed by the BSES Limited*, and takes into account past management practices, including application of mill by-products such as mill mud and/or mill ash that can represent a significant contribution of phosphorus to the soil.

The organic carbon status of the soil is used to define the potential nitrogen available in the soil which is then deducted from the total amount of nitrogen necessary to produce the potential cane yield for a block. A companion document, "*The method for calculating the optimum amount of nitrogen and phosphorus to be applied to sugarcane properties regulated under the Environmental Protection Act 1994*" provides details about how these calculations are made.

The intent of this document is to help growers decide on the number of soil samples they require to adequately assess the fertility status of blocks being planted to cane.

Rather than sampling every plant cane block (a cane farm may have many small blocks), this document describes how to choose particular blocks to represent the fertility status of a number of plant cane blocks of the same soil type.

A single block can also represent the fertility status of a number of plant cane blocks belonging to the same soil grouping, as identified in the Six Easy Steps 'Soil Reference Booklet' for the particular district.

Blocks that received applications of mill by-products in previous cane cycles potentially have a higher soil phosphorus status than blocks not receiving any by-products. To take account of this, separate soil samples should be taken from blocks considered to represent those that have (a) received and (b) not received previous applications of mill by-products.

By keeping good records of soil tests and management practices, the operator can monitor trends in soil fertility over time, especially the organic carbon and phosphorus status of the soil that can assist in accurate nutrient management, improved soil health and cost savings.

*BSES Limited is the organisation formerly known as the Bureau of Sugar Experimental Stations.

1.1 Purpose

To provide information on the requirements for soil testing and analysis under the reef protection measures in the *Environmental Protection Act 1994* (the Act).

- To provide guidance on factors that should be considered when designing a soil sampling plan and collecting soil samples.
- To specify the soil tests required to be conducted by a laboratory.
- To identify the records and primary documents to be kept to meet requirements of the Act.

2.0 Requirements for soil testing

What needs to be tested?

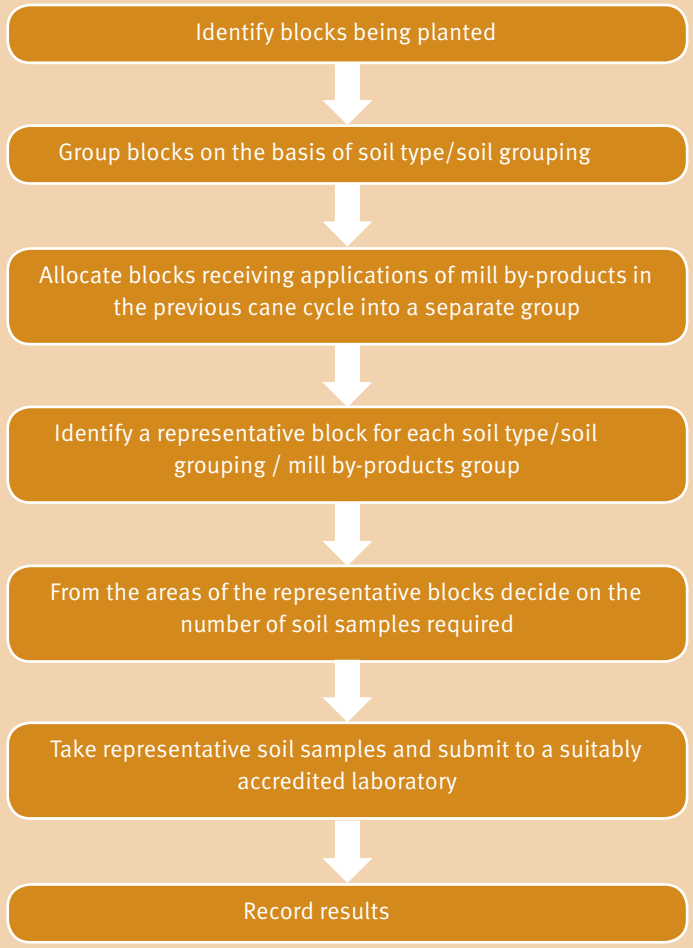
Under the Act, the soil must be analysed prior to applying fertiliser on plant crops to determine the content of:

- organic carbon, and
- extractable phosphorus, which is an indication of the phosphorus available to the sugarcane.

Details of the tests and methods that must be applied are provided under Stage 3, Step 8 in this document.

How often do soil tests need to be taken?

Soil needs to be sampled and tested, as a minimum, within the 12 months prior to the commencement of a new plant cane crop.



Source: Flow diagram by Phil Moody, Department of Environment and Resource Management (2009 unpublished).

Figure 1. Flow diagram for taking representative samples to assess soil fertility.

2.1 Soil sampling guidelines

There are four important stages in the process of soil testing:

Stage 1. Development of a soil-sampling plan.

Stage 2. Collecting soil samples.

Stage 3. Sample analysis by laboratories (using methods/standards for analysis).

Stage 4. Interpretation of results and calculating nutrient inputs.

Stage 1 – Development of a soil sampling plan

It is important to plan where and when samples will be taken on your property, taking into account:

- the stage in the cropping cycle
- the different soil types on the property
- the various nutrient management regimes that may occur across the property
- the size of the property.

Proper design of a soil sampling plan involves selecting an area for soil sampling that represents the fertility status of the blocks being planted to cane. Supported by a map that identifies soil-sampling locations and blocks, and with proper identification of soil samples for record keeping, you can monitor trends in soil fertility over time, particularly the amount of extractable soil phosphorus and the organic carbon status. Figure 1 outlines the process involved in soil sampling, from identifying the blocks for testing through to recording soil test results.

Step 1

Identify blocks being planted to sugarcane.

Soil sampling must occur within 12 months prior to the commencement of a new plant cane crop. The most effective time to sample is just after harvest of the last ratoon of the previous crop cycle. Soil sampling can also be done in late crop cycle ratoons where fallow legumes are to be planted. Soil testing at this time would alert growers to problems such as sub-optimal soil pH which provides an opportunity to correct issues, for example, by applying an ameliorant prior to establishing a fallow legume.

Step 2

With reference to a soil map of your property, identify the soil types of the blocks that are to be planted in the coming season.

Step 3

Identify the blocks that have the same soil types and similar nutrient management regimes and group them together.

If blocks are made up of more than one soil type, group the blocks that have the same combination of soils together.

Blocks that have had mill by-products, such as mill mud, applied should be sampled separately to blocks that have not.

Step 4

Identify representative blocks from each group from which soil samples will be collected, taking the following conditions into account:

- If blocks have the same soil types, go to Step 4a
- If blocks have different soil types, go to Step 4b.

Step 4a

For blocks with the same soil types or soil groupings and that are farmed the same way (in relation to fertiliser application, mill by-products application, irrigation, cropping and yields for the last 10 years):

Select a block of average productivity that you consider is representative of the rest of the blocks in the group. Is the area of the representative block greater than five hectares?

Yes, go to 4a (i)

No, go to 4a (ii)

Step 4a (i)

For a representative block greater than 5 hectares:

- Select a 5-hectare area that best represents the block (see Figure 2).
- For each hectare, select five sites (see Figure 3) from which to take core samples (= 25 cores).

Step 4a (ii)

For a representative block less than 5 hectares:

Select five sites per hectare to take core samples of soil. For example: for a 3-hectare block, you will need to select five sites from each hectare and take core samples. The 15 cores are then mixed together to form the composite sample.

At least 10 core soil samples need to be taken and mixed together to form the composite sample sent for testing. Therefore, if the block is one hectare, at least 10 core sites should be selected for the composite sample.

> Note that the greater the number of cores taken to form a composite sample, the more reliable the analytical results for that sample will be.

Step 4b

For blocks with more than one soil type, identify the dominant soil type and collect samples from this section of the block. Go back to steps 4a(i) and 4a(ii) to determine the number of cores to be taken.

> By continuing to sample from the same representative blocks over time, growers are able to identify trends in the fertility status of those blocks.

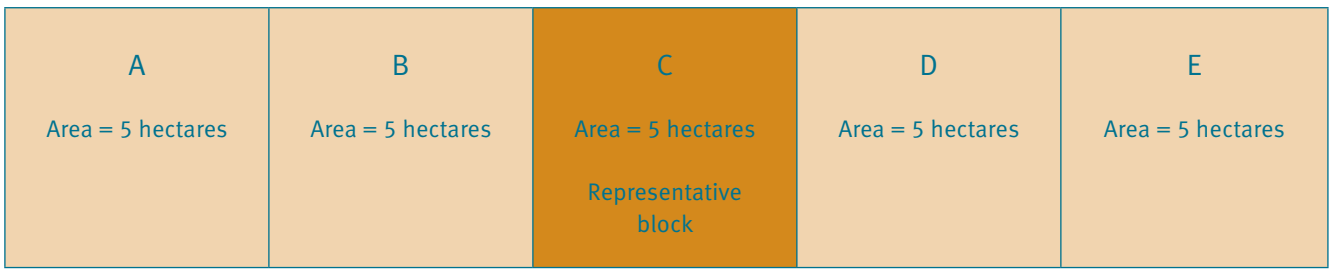


Figure 2. Illustrating that Area C has been chosen as the representative area to sample out of this 25 ha representative block.

Step 5

Document your soil sampling plan on a map, including the location of the representative blocks and the date and location of sampling.

Stage 2 – Soil sample collection

Take soil cores with an auger or soil tube from the surface of the soil to a depth of 20 cm. Remove leaf litter and organic matter from the surface before taking soil cores. Provide a composite sample of 500 g and submit without delay to a soil testing laboratory.

To take soil samples the following materials are required:

- a sampling tool such as:
  - a shallow probe,
  - a thin-walled deep soil probe,
  - a hydraulic/motor driven probe/auger,
  - an auger (either a turning auger or a soil tube).
- new plastic bags
- a clean plastic bucket for mixing cores
- labels
- a marker for labelling samples
- a record sheet (the form at Attachment 1 can be used).

Step 6

Collect soil samples.

Cores of soil should be taken from the shoulder of the cane row, about midway between the centre of the cane row and the centre of the inter-row. Avoid sampling headlands, poorly drained sections and areas where large amounts of mill by-products or other ameliorants have been deposited.

Take cores of soil from the surface down to a depth of 20 cm, preferably with either a turning auger or a soil tube. Avoid collecting material such as leaf or organic matter from the surface. If using a soil tube, the tube should not be lubricated or galvanised because this can cause errors in the soil test results.

Collect all cores in a clean plastic bucket to form a composite sample.

After collection, mix the cores together thoroughly to form a composite sample (breaking large clods apart by hand) and put the soil into a new plastic bag. If the composite sample is too large, a portion (between 500 g and 1 kg) should be selected and bagged.

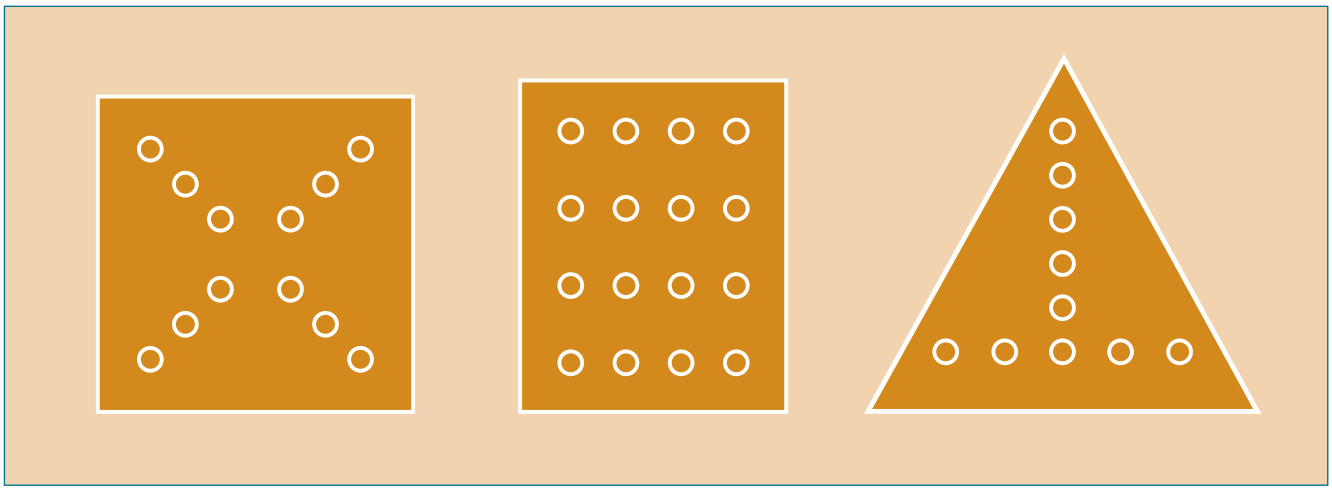


Figure 3. Some suggested sampling patterns within cane blocks of different shapes.
Source: Schroeder, B.L., Wood, A.W., Panitz, J.H. (2007-2009), 'Nutrient management series', *Australian Canegrower*.

Step 7

Using a permanent ink marker, label the composite sample with the date and block sampled and your farm/ contact details and submit to an accredited laboratory for testing.

A form is provided at Attachment 1 for recording the above information for submitting with the soil sample to the testing laboratory. A copy of this form can also be kept for your records, however it is not mandatory.

The following information will help you calculate the optimum amount of nitrogen and phosphorus to apply. If this calculation is being done by a professional fertiliser industry advisor not familiar with your property, that person will need to understand management practices that you have undertaken on your property with respect to the application of mill by-products and fallowing.

Mill by-products: Did you apply mill by-products to the block? State what type, when they were applied and how much.

Fallow management: Did you have a fallow before planting cane? Was it bare ground, grass or a legume crop, how was it managed?

Other crops: Were there other horticultural crops planted between cane cycles?

Attachment 2 provides a form to assist you to provide this information; however it is a tool to assist you and is not a mandatory record keeping form.

Stage 3 – Soil analysis in the laboratory

Step 8

Identify a suitable laboratory to undertake the following analysis using the methods specified below. It is important that these methods are used as they are calibrated to the Six Easy Steps program for nutrient management in the sugarcane industry.

1. OC uncorrected Walkley Black (Method 6A1).
2. BSES (acid) extractable P (Method 9G2 or 9G1).*
3. P buffer index (PBI) without correction by Colwell or Olsen extractable P (Method 9I2).

Specifically, methods (1) and (2), can be found in the 1992 *Australian Laboratory Handbook of Soil and Water Chemical Methods – Australian Soil and Land Survey Handbook* by Rayment, G.E. and Higginson, F.R., published by Inkata Press, Melbourne & Sydney. Method (3), the phosphorus buffer index can be found at the www.derm.qld.gov.au or www.reefwisefarming.qld.gov.au

In future all three methods will be available in an updated publication currently in preparation for printing called *Soil Chemical Methods* by Rayment G.E. and Lyons D.J., which is expected to be produced by CSIRO publishing in the first half of 2010.

Other tests, such as pH, may also be useful for assessing the overall fertility status of the soil.

* Note that while the BSES (acid) extractable phosphorus soil test has been found to be well-suited to estimating plant available phosphorus in the acidic soils that occur in much of the Queensland sugarcane industry, investigation has found that it may over-estimate available phosphorus in neutral to alkaline soils typically found in the Burdekin catchment.

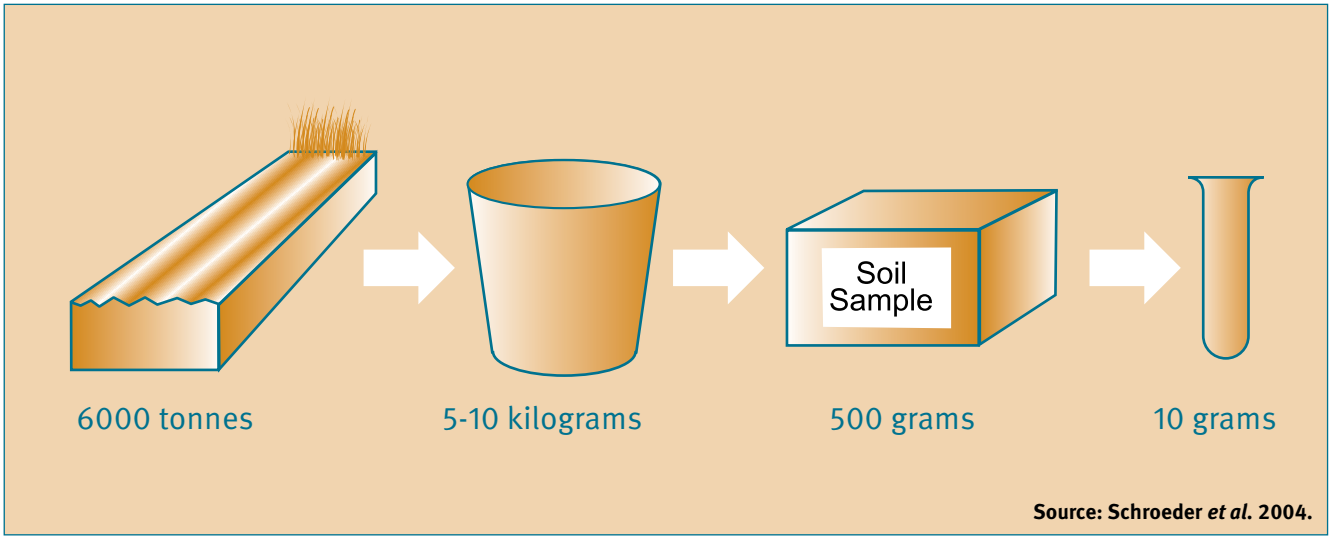


Figure 5. Soil (10 g) analysed in the laboratory is a sub-sample of the sample collected in the field.

It is recommended that growers with such soils seek professional advice in relation to the phosphorus application on their sugarcane block/property following their soil test results.

Suitable laboratories performing the chemical analysis of soil samples must be able to demonstrate that their operations comply with the Australian Standard AS ISO/IEC 17025-2005 'General requirements for the competence of testing and calibration laboratories' and have the technical expertise for the specified methods. The National Association of Testing Authorities (NATA) accreditation would provide evidence of compliance to this standard and is recommended.

Laboratories are required to participate in Australasian Soil and Plant Analysis Council (ASPAC) proficiency trials and maintain certification for the nominated methods where available. The ASPAC website is www.aspac-australasia.com.au

Step 9

Send composite samples to a suitable laboratory for nutrient analysis.

If also using a **professional fertiliser industry advisor** to make recommendations on how much nutrient to apply, ensure that person produces recommendations consistent with the document "*The method for calculating the optimum amount of nitrogen and phosphorus to be applied to sugarcane properties regulated under the Environmental Protection Act 1994*". This document is available from the Department of Environment and Resource Management office, Level 3, 400 George Street, Brisbane, from www.derm.qld.gov.au and www.reefwisefarming.qld.gov.au or from the department's regional offices.

A professional advisor is an individual who meets the following national competency standards:

i) RTE 5527A – Conduct environment and food safety risk assessment of plant nutrition and soil fertility programs.

ii) RTE 3504B – Collect samples for a rural production and horticulture monitoring program.

iii) RTE 4004A – Develop a plant nutrition program.

Fertcare accredited advisors meet these standards.

Step 10

Record keeping

A series of records must be kept of activities relating to the application of fertilisers and chemicals on your sugarcane property. A fact sheet on record keeping and a series of approved forms are available from www.derm.qld.gov.au and www.reefwisefarming.qld.gov.au or DERM regional offices. However, the following documents relating to soil testing must be kept as records on the property for five years:

- a map identifying the blocks grown under cane, to reference the written records of where soil sampling and analysis has been undertaken
- the soil testing results/report from a suitable accreditation laboratory/accredited advisor.

Stage 4 – Interpretation of results

Soil test reports contain the analytical data from soil analysis conducted in a laboratory using specific methodologies. Most laboratories offer packages of soil tests, however it is important to ensure that the package chosen includes the analysis methods outlined above in Step 8.

Attachment 3 shows an example of a commercial soil test report for organic carbon (% C), extractable P and the phosphorus buffer index.

Once you have obtained your soil test results, you should calculate the optimum nutrient requirements for your crop, using the document called "*The method for calculating the optimum amount of nitrogen and phosphorus to be applied to sugarcane properties regulated under the Environmental Protection Act 1994*".

This document is available from www.derm.qld.gov.au and www.reefwisefarming.qld.gov.au or from DERM regional offices.

An alternative option to calculating the optimum amount of nutrients to apply to a crop is to engage a professional fertiliser advisor who can calculate the optimum nutrient requirements for you according the method outlined in the document referred to above. You can find an advisor by contacting Productivity Services at BSES Limited or fertiliser re-sellers. Attachment 4 shows an example report from such an advisor.

Acknowledgements

The efforts of the members of the Reef Protection Program Technical Task Group, comprising Queensland Government and industry organisations, and the Technical Working Group, drawn from Queensland Primary Industries and Fisheries (QPIF), Department of Employment, Economic Development and Innovation, and the Department of Environment and Resource Management are recognised for their valuable contributions in development of this document. Additionally, the significant contributions of the individuals who developed the 'Six Easy Steps' nutrient management system, are also acknowledged.

References

Incitec Pivot (2002), *A qualitative guide to soil sampling*, Version 3 October 2002.

Rayment, G.E. and Higginson, F.R. (1992), 'Australian laboratory handbook of soil and water chemical methods' Inkata Press, Melbourne.

Schroeder, Bernard; Wood, Andrew; Hurney, Alan and Panitz, John (2004), BSES, *Accelerating the adoption of best practice nutrient management: Herbert District*.

Schroeder, B.L.; Wood, A.W.; Panitz, J.H. (2007-2009), 'Nutrient management series', *Australian Canegrower*.

Attachments

Attachment 1.
Form for recording details about soil sample information

- *You may fill out this form for each soil sample that you submit to a laboratory for testing. Note this is not a mandatory record keeping form, however you may also choose to keep a copy for your records.*

Grower name

Property address

Farm ID number

Block sampled (specify below)

Block name

Area of block (ha)

Soil type (if more than one soil type sampled from representative block)

Names of all blocks that this soil test represents

Date of soil sampling __ / __ / __

Attachment 2.
Form on farm management to assist an advisor to calculate your fertiliser requirements.

- *You may fill out this form for each soil sample that you submit to a laboratory for testing. Note this is not a mandatory record keeping form, however you may also choose to keep a copy for your records.*

Block management: Block name:

Date soil sampled __ / __ / __

Mill by-products: Did you apply mill by-products to the block? If so, specify the type by ticking the box below:

☐ mill mud

☐ mill/ash mixture

☐ ash only

Date of last application __ / __ / __

Rate of last application (kg/ha)

Fallow management

☐ Did you have a fallow before planting cane?

If so, what type of fallow did you have?

☐ Bare/ grass

☐ Legume If so, what legume crop

- Did you harvest the seed? Yes ☐ or No ☐
- Was it a poor legume crop or a good legume crop? Poor/ good
- Did you leave the crop standing? Yes ☐ or No ☐
- Were residues left on the surface of the soil or did you plough in?
- Surface/ploughed in?

☐ Other crop If so, what crop?

Attachment 3.
Example: commercial laboratory report – soil nutrient analysis

Nutrient Report

X X XXX
X XXXXXXXXXXXXXXXX

INNISFAIL
QLD 4860

Agent/Dealer:
Advisor/Contact: Innisfail
Phone: XXXXXXXX
Report Print Date: 19/08/2009

Sample No Test Code	**0209**xxxxx A43			
Lab Report No. Lab Report Date Paddock Name Sample Name Sample Type Sample Depth (cm) Sampling Date	 01/06/2009 XXX STREET Soil 0 - 25 22/05/2009			

Assay	Unit	Value			
pH (1:5 Water)		5.00			
pH (1:5 CaCl2)		4.20			
Organic Carbon (OC)	%	1.70			
Nitrate Nitrogen (NO3)	mg/kg	5.4			
Phosphorus (Colwell)	mg/kg	49			
Phosphorus (BSES)	mg/kg	23			
Phosphorus Buffer Index (PBI-Col)		790			
Potassium (Nitric K)	meq/100g	2.3			
Sulfate Sulfur (MCP)	mg/kg	41.0			
Zinc (HCl)	mg/kg	1.30			
Zinc (DTPA)	mg/kg	0.56			
Copper (DTPA)	mg/kg	0.49			
Iron (DTPA)	mg/kg	68.0			
Manganese (DTPA)	mg/kg	4.60			
Chloride	mg/kg	10.0			
Electrical Conductivity	dS/m	0.04			
Electrical Conductivity (Saturated Extract)	dS/m	0.20			
Cation Exchange Capacity	meq/100g	5.75			
Aluminium (KCl)	mg/kg	330.00			
Aluminium (KCl)	meq/100g	3.70			
Aluminium Saturation	%	64.0			
Calcium (Amm-acet.)	meq/100g	1.20			

Nutrient Report

Grower Name :	X XXXXXXX	**Advisor/Contact:**	XXXXXXXXX - Innisfail
Report Print Date:	19/08/2009	**Phone:**	XXXXXXXXX

Sample No	**0209XXXXX**
Test Code	A43
Lab Report No.	
Lab Report Date	01/06/2009
Paddock Name	XXX STREET
Sample Name	
Sample Type	Soil
Sample Depth (cm)	0 - 25
Sampling Date	22/05/2009

Assay	**Unit**	**Value**
Calcium (Amm-acet.)	%	21.00
Magnesium (Amm-acet.)	meq/100g	0.50
Magnesium (Amm-acet.)	%	8.70
Sodium (Amm-acet.)	meq/100g	0.02
Sodium % of Cations (ESP)	%	0.4
Potassium (Amm-acet.)	meq/100g	0.33
Potassium (Amm-acet.)	%	5.70
Calcium/Magnesium Ratio		2.4
Silicon (BSES)	mg/kg	220
Silicon (CaCl2)	mg/kg	35.0
Soil Texture		Clay
Soil Colour		Orange/Yellow
Liming Estimate t/ha pH 5.5	t/ha	3.7

Attachment 4.
Example commercial nutrient report including recommendations for nutrient application rates.

Nutrient Recommendation Report

XXXXX
XXXXXXXX

INNISFAIL
QLD 4860

Agent/Dealer:
Advisor/Contact: XXXXXX - Innisfail
Phone: XXXXXXX
Report Print Date: 19/08/2009
Sample No: 0209XXXXX
Test Code: A43
Paddock Name: XXX STREET
Sample Name:
Sample Type: Soil
Sample Depth (cm) 0 **To** 25

Assay	Unit	Value	Very Low	Marginal	Adequate	High	Excess	Optimal
pH (1:5 Water)		5.00	Moderately Acidic					5.5-8.0
pH (1:5 CaCl2)		4.20	Not Chart Referenced					
Organic Carbon (OC)	%	1.70			###			
Nitrate Nitrogen (NO3)	mg/kg	5.4			###			
Phosphorus (Colwell)	mg/kg	49	Not Chart Referenced					
Phosphorus (BSES)	mg/kg	23		##				40-60
Phosphorus Buffer Index (PBI-Col)		790	Extremely High					140-280
Potassium (Nitric K)	meq/100g	2.3			###			>0.70
Sulfate Sulfur (MCP)	mg/kg	41.0			###			>10->15
Zinc (HCl)	mg/kg	1.30			###			>0.6
Zinc (DTPA)	mg/kg	0.56	Not Chart Referenced					
Copper (DTPA)	mg/kg	0.49			###			>0.2
Iron (DTPA)	mg/kg	68.0			###			2-100
Manganese (DTPA)	mg/kg	4.60			###			4-100
Chloride	mg/kg	10.0			###			<300
Electrical Conductivity	dS/m	0.04	Not Chart Referenced					
Electrical Conductivity (Saturated Extract)	dS/m	0.20			###			<1.0
Cation Exchange Capacity	meq/100g	5.75			###			>4
Aluminium (KCl)	mg/kg	330.00	Not Chart Referenced					
Aluminium (KCl)	meq/100g	3.70	Not Chart Referenced					
Aluminium Saturation	%	64.0				##		<50
Calcium (Amm-acet.)	meq/100g	1.20		##				>1.25meq
Calcium (Amm-acet.)	%	21.00	Not Chart Referenced					
Magnesium (Amm-acet.)	meq/100g	0.50			###			>0.25meq
Magnesium (Amm-acet.)	%	8.70	Not Chart Referenced					
Sodium (Amm-acet.)	meq/100g	0.02	Not Chart Referenced					
Sodium % of Cations (ESP)	%	0.4			###			<5.0
Potassium (Amm-acet.)	meq/100g	0.33			###			0.25-0.5meq

Attachment 4 continued

Nutrient Recommendation Report

Grower Name:	XXXXX	**Nearest Town:**	INNISFAIL
Sample No:	0209XXXXX	**Test Code:**	A43
Paddock Name:	XXX STREET	**Sample Type:**	Soil
Sample Name:		**Sampling Date:**	22/05/2009

Assay	Unit	Value	Very Low	Marginal	Adequate	High	Excess	Optimal
Potassium (Amm-acet.)	%	5.70	Not Chart Referenced					
Calcium/Magnesium Ratio		2.4			###			>2.0
Silicon (BSES)	mg/kg	220			###			>70
Silicon (CaCl2)	mg/kg	35.0			###			>10
Soil Texture		Clay						
Soil Colour		Orange/Yellow						
Liming Estimate t/ha pH 5.5	t/ha	3.7						

Nutrient Recommendation Report

Grower Name:	XXXXX	**Nearest Town:**	INNISFAIL
Sample No:	0209XXXXX	**Test Code:**	**A43**
Paddock Name:	XXX STREET	**Sample Type:**	Soil
Sample Name:		**Sampling Date:**	22/05/2009

Sample Details:

Crop Class:	Plant (Fallow)	**District Yield Potential:**	120.00 t/ha
Fallow Legume Crop:		**Fallow Management:**	
Irrigation:	Non Irrigated	**Method of Fertiliser Application:**	
Sample Depth (cm) From:	0	**To:**	25

Recommendations

Product Recommendation	Application Rate (kg/ha) (Unless Stated)	Timing	Application Method	N kg/ha	P kg/ha	K kg/ha	S kg/ha
Lime (t/ha)	5.00	Pre-plant	B/cast & I	0.0	0.0	0.0	0.0
CK 55	200.00	Planting	Band & Inc	27.0	30.0	25.0	2.4
GREENTOP K	225.00	Side Dress	Band & Inc	73.8	0.0	24.8	6.5
Total Nutrient				**100.8**	**30.0**	**49.8**	**8.9**

This Recommendation has been done by : Rob Dwyer (23)

Other Elements in recommendation	Ca kg/ha	Mg kg/ha	Cu kg/ha	Zn kg/ha	Mo gm/ha	Co gm/ha	B kg/ha	Fe kg/ha	Mn kg/ha	Si kg/ha
Lime (t/ha)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CK 55	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GREENTOP K	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Nutrient	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Legends:

N : Nitrogen	P : Phosphorus	K : Potassium	S : Sulfur	Ca : Calcium
Mg : Magnesium	Cu : Copper	Zn : Zinc	Mo : Molybdenum	Co : Cobalt
B : Boron	Fe : Iron	Mn : Manganese	Si : Silicon	

Attachment 4 continued

Nutrient Recommendation Report

Grower Name:	XXXXX	**Nearest Town:**	INNISFAIL
Sample No:	0209XXXXX	**Test Code:**	A43
Paddock Name:	XXX STREET	**Sample Type:**	Soil
Sample Name:		**Sampling Date:**	22/05/2009

Comments

NUTRIENT REQUIREMENT (Summary):
From the information provided, coupled with the soil test results - the crop nutrient requirement is:

N	P	K	S	Ca	(kg/ha)
100	30	50	0	Lime	

POINTS FOR CONSIDERATION, CONCERNING THIS SAMPLE:
(No action is required for those analytes, not listed below):

NOTE: This recommendation follows the new Six Easy Steps - Soil Specific Nutrient Management Guidelines for Sugarcane Production.

Apply the ameliorant/s listed in the 'Recommendation' section, by broadcasting and incorporating to 20cm.

The 'pH adjusting' ameliorant rate listed in the 'Recommendation' section, has been capped to an upper limit as determined in the 'Six Easy Steps' nutrition guidelines.

Apply the planting fertiliser, by banding & incorporating 5 cm below & to the side of the sett.

Apply the side-dress fertiliser, by banding and incorporating into the hill, at hill-up.

Organic Carbon %:
Organic Carbon is a measure of the soil organic matter. The organic matter is an important reserve of nutrients such as nitrogen. The higher the organic carbon, the greater the amount of nitrogen that will be released during the growing season. The recommended nitrogen rate has been adjusted to reflect the nitrogen contribution from the soil organic carbon.

Nitrogen:
Apply nitrogen @ the kgN/ha rate as listed in the 'NUTRIENT REQUIREMENT (Summary)'.

Phosphorus:
Apply phosphorus @ the kgP/ha rate as listed in the 'NUTRIENT REQUIREMENT (Summary)'.

Phosphorus Buffer Index:
The Phosphorus Buffer Index (PBI) measures the phosphorus fixation capacity of the soil. At a given soil test level for phosphorus, soil's with a high PBI need more phosphorus, those with a low PBI need less. PBI values of 280, & above, are regarded as "high" whilst values less than 140 are "low". The recommended phosphorus rate (above) has been adjusted accordingly.

Potassium:
Apply potassium @ the kgK/ha rate as listed in the 'NUTRIENT REQUIREMENT (Summary)'.

Sulfur:
Apply sulfur @ the kgS/ha rate as listed in the 'NUTRIENT REQUIREMENT (Summary)'.

Aluminium Saturation Percentage (Al Sat%) - >Optimum:
Generally sugarcane is highly tolerant of soil acidity, and associated disorders, such as high exchangeable aluminium, but it likely to be sensitive in this 'Al Sat' percentage range. Raising the soil pH, as recommended, will assist to improve the Aluminium Saturation Percentage & limit its detrimental affect on yield.

Further Information

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