Sugar Research Australia

Information Sheet

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NutriCalc

A web-based nutrient management decision support system using the SIX EASY STEPS approach

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BSES Limited and the National Centre for Engineering in Agriculture (NCEA) have developed an on-line nutrient management tool for sugarcane called 'NutriCalc'. It is part of the SRA SIX EASY STEPS nutrient management package. It is designed to assist growers and/or their advisors to:

- Determine nutrient requirements for particular blocks of cane based on soil test reports.
- Keep records of on-farm nutrient management (recommended inputs, details of actual fertiliser inputs, costs, etc).
- Benchmark nutrient inputs and yields against district and industry averages.
- View nutrient trend data to better understand crop nutrient requirements and potential off-farm losses under a range of environmental and climatic conditions.

This information is important for developing nutrient management plans for use on-farm. However, the urgency of determining appropriate nutrient inputs (particularly N and P), keeping good records and having the ability to provide records in summary form increased considerably with the introduction of the Queensland Governments' Reef Regulations in 2009. It is worth noting that NutriCalc is not linked to any Government systems. Security and confidentiality of data is ensured through the use of 'passwords' / PINs. Individual grower data can only be accessed by the grower or his/her nominated advisor(s).

BSES chose NCEA as the collaborating organisation to develop the web-based package because it is a leading provider of online data record management, performance auditing and economic tools for the agricultural sector.

NutriCalc will be accessible to all growers and/or their advisors via a secure login page on the SRA website (Figure 1).

The following is a summary of how NutriCalc works and what it contains:

Grower's details and block information can be entered into the system using a user-friendly interactive process.

Once the location details are entered, the area in which the farm is located will be shown on a Google Map (Figure 2).

Rainfall data can also be accessed at this point. Field data can be entered by clicking on the 'Add New Field/Block' or by using the Google Map facility.

The latter option enables block boundaries to be drawn and the block size will be automatically calculated. This information is then shown on the 'Summary' page (Figure 2).

The example shown here relates to a hypothetical grower (Mr Joe Smith) who owns an imaginary farm (Danielle's Hideaway) in the Tully district.

The 'Edit' mode needs to be selected to enter data or make modifications for all blocks. Once a 'block' has been identified within the system, the appropriate 'block number' will appear under 'Fields/Block'. Having selected a particular 'block', four separate sections become available in a scroll-down format (Figure 3):

- 'General Details'
- 'Crop'
- 'Lab Analysis'
- 'Record of amendments, ameliorants and fertilisers'

Figure 1: SRA SIX EASY STEPS NutriCalc login page.

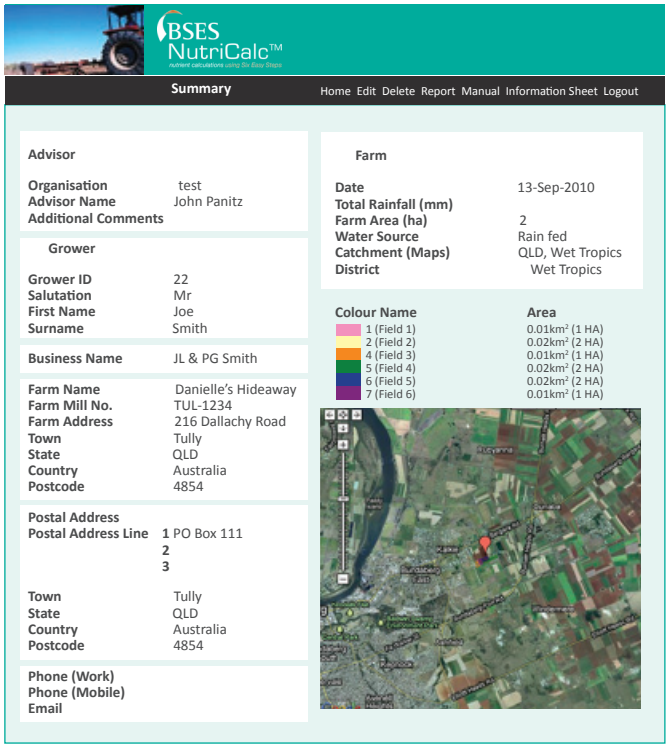


Figure 2: Grower, farm and block information in NutriCalc.

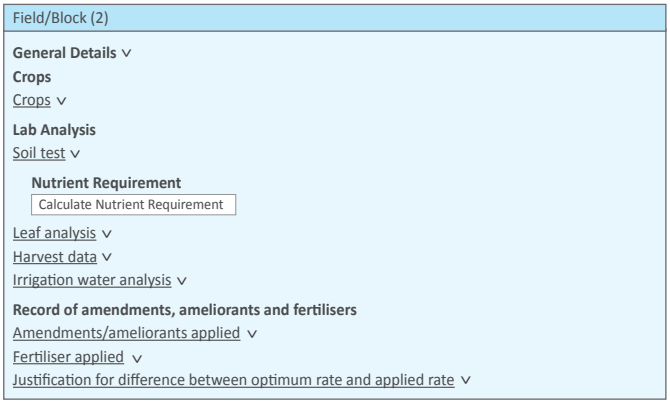
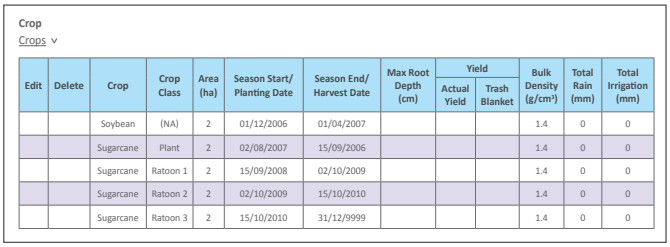


Figure 3: 'Field/block' page of NutriCalc showing four separate sections.



Crop

Crops

Edit	Delete	Crop	Crop Class	Area (ha)	Season Start/ Planting Date	Season End/ Harvest Date	Max Root Depth (cm)	Yield		Bulk Density (g/cm³)	Total Rain (mm)	Total Irrigation (mm)
								Actual Yield	Trash Blanket			
		Soybean	(NA)	2	01/12/2006	01/04/2007				1.4	0	0
		Sugarcane	Plant	2	02/08/2007	15/09/2006				1.4	0	0
		Sugarcane	Ratoon 1	2	15/09/2008	02/10/2009				1.4	0	0
		Sugarcane	Ratoon 2	2	02/10/2009	15/10/2010				1.4	0	0
		Sugarcane	Ratoon 3	2	15/10/2010	31/12/9999				1.4	0	0

The 'Crop' section includes 'annual' information covering crop, crop class, block area, start/plant date, harvest date, yields, rainfall figures, etc (Figure 4). Several subsections occur within the 'Lab Analysis' section (Figure 3). These include soil analysis, leaf analysis, harvest data and irrigation water analysis.

The soil analysis section covers both the soil test data (Figure 5) and the facility to calculate the nutrient requirements based on the soil test values (Figure 6). The cost of the nutrients (based on up-to-date unit prices) is supplied to enable growers to compare prices supplied by fertiliser re-sellers.

A 'full' report is possible for both the soil test data and the nutrient requitements (Figures 7 and 8 respectively).

NutriCalc also enables appropriate fertilisers to be selected to meet the identified nutrient requirements and to record actual fertiliser inputs for the individual blocks (and subsequently for the whole farm). The 'Record of amendments, ameliorants and fertiliser' section enables choices of products, dates, placement strategies to be made from drop-down menus (Figure 9), and for actual inputs to be recorded. An example of the fertilisers applied to a particular block is shown in Figure 10.

As indicated previously, NutriCalc has the ability to generate reports of nutrient management per block that conform to the requirements of the Queensland Government's Reef Regulations. An example is shown in Figure 11. Another reporting format that is available within the system enables 'snap-shots' of historical and current nutrient usage on-farm.

A facility to record yield data (tc/ha, ccs and ts/ha) allows farm productivity to be reviewed and for nutrient management strategies to be re-evaluated and revised if necessary. This can also be used to bench-mark nutrient levels and usage against district trends.

Figure 4 (left): 'Crop' details within NutriCalc.

Lab Analysis Soil test

Edit	Crop	Sample No	Sample Date	Sample Depth	pH 1:5 Water	pH 1:5 CaCl2	Cation Exch. Cap. Meq/100g	Organic Carbon (%)	P - BSES mg/kg	K Nitric K Meq/100g	K Amm-acet. Meq/100g	Ca Amm-acet. Meq/100g	Mg Amm-acet. Meq/100g
	Soybean Dec-06	021099626	01/11/06	20	5.2	4.3	4.17	2	16	3.1	0.13	1.2	0.4
	Sugarcane 07	021099626	01/11/06	20	5.2	4.3	4.17	2	16	3.1	0.13	1.2	0.4
	Sugarcane 08	021099626	01/11/06	20	5.2	4.3	4.17	2	16	3.1	0.13	1.2	0.4
	Sugarcane 09	021099626	01/11/06	20	5.2	4.3	4.17	2	16	3.1	0.13	1.2	0.4
	Sugarcane 10	021099626	01/11/06	20	5.2	4.3	4.17	2	16	3.1	0.13	1.2	0.4

Figure 5: Summary of soil test values for a block of cane in NutriCalc.

Sugarcane, 08 Farm: Danielle's Hideaway Field: 2

	Water (ml/ha)	N (kg/ha)*	P (kg/ha)*	K (kg/ha)*	$ (kg/ha)	Ca (kg/ha)	Mg (kg/ha)	Cu (g/ha)	Zinc (g/ha)
Avg Fertiliser Application for catchment (n=0)		0	0	0	0	0	0	0	0
Required		120	30	100			0		
Estimate $ cost		126	123.6	138	Total: $387.6		Date of $ cost as of: 20-Jul-2010		
Exported		78.2	8.7	127.9	18.1	14.1	10.1	41.9	258.1

** N supplied as Urea, P supplied as DAP, K supplied as Muriate of Potash (MOP)*

Figure 6: Summary of calculated nutrient requirement.

SOIL TEST (All Elements)
Farm: Danielle's Hideaway Field: 2

Crop Name	Soybean, Dec-06	Sugarcane, 07	Sugarcane, 08	Sugarcane, 09	Sugarcane, 10
Sample No.	21099826	21099626	21099626	21099626	21099626
Lab Name	Incitec Pivot	Incitec Pivot	Incitec Pivot	Incitec Pivot	Incitec Pivot
Sample Date	01/11/2008	01/11/2008	01/11/2008	01/11/2008	01/11/2008
Sample Depth	20	20	20	20	20
Colour	Grey	Grey	Grey	Grey	Grey
Texture	Loam	Loam	Loam	Loam	Loam
pH (1:5 Water)	5.2	5.2	5.2	5.2	5.2
pH (1:5 CaCl2)	4.3	4.3	4.3	4.3	4.3
Organic Carbon (%)	2	2	2	2	2
Nitrate Nitrogren (mg/kg)					
Sulfate Sulfur - MCP (mg/kg)	17	17	17	17	17
Phosphorus - BSES (mg/kg)	16	16	16	16	16
Phosphorus - Colvell (mg/lg)	14	14	14	14	14
Potassium - Amm-acet. (Meq/100g)	0.13	0.13	0.13	0.13	0.13
Potassium - Nitric K (Meq/100g)	3.1	3.1	3.1	3.1	3.1
Calcium - Amm-acet. (Meq/100g)	1.2	1.2	1.2	1.2	1.2
Magnesium - Amm-acet. (Meq/100g)	0.4	0.4	0.4	0.4	0.4
Aluminium - KCl (Meq/100g)	2.4	2.4	2.4	2.4	2.4
Sodium - Amm-acet. (Meq/100g)	0.04	0.04	0.04	0.04	0.04
Chloride (mg/kg)					
Elec. Conductivity (dS/m)	0.03	0.03	0.03	0.03	0.03
Copper - DTPA (mg/kg)	0.27	0.27	0.27	0.27	0.27
Zinc - DTPA (mg/kg)					
Zinc - BSES (mg/kg)	0.96	0.96	0.96	0.96	0.96
Manganese - DTPA (mg/kg)					
Iron - DTPA (mg/kg)	100	100	100	100	100
Silicon - BSES (mg/kg)	190	190	190	190	190
Silicon - CaCl2 (mg/kg)	23	23	23	23	23
Ammonium Nitrogen - KCl (mg/kg)					

Figure 7: Full soil test report within NutriCalc.

Required Nutrient (All Elements)
Farm: Danielle's Hideaway Field: 2

	Avg Fertiliser Application for catchment (n=0)	Required	Exported
Nitrogen (kg/ha)	0	120	78.2
N mineralisation index		Moderate High	
Phosphorus (kg/ha)	0	30	8.7
P sorption class		Very high	
Potassium (kg/ha)	0	100	127.9
Texture class		Loam	
Sulphur (kg/ha)	0		18.1
Calcium (kg/ha)	0		14.1
Magnesium (kg/ha)	0	0	10.1
Copper (g/ha)	0		41.9
Iron (g/ha)	0	0	3300
Manganese (g/ha)	0	0	2421.8
Zinc (g/ha)	0		258.1
Boron (g/ha)	0	0	0
Molybdenum (g/ha)	0	0	0
Lime (tonnes/ha)		4	
Gypsum (tonnes/ha)		0	

Figure 8: Full nutrient requirement report per block. Average applications and average crop removal information is supplied.

Edit Fertiliser Recording
Crop Soybean, Dec-06

Product	Period	Date	Fertiliser (kg/ha)	Placement	Name of person who authorised application	Edit	Delete	Select
CK Pashley Mix	At	01/12/2000	200	Subsurface (type, coulter and knife)	Joe Smith	Edit	Delete	
	Pre			(NA)				Add

Delete Selected Row
Save Modification Add Custom Blend

Figure 9: The Fertiliser Recording tool which allows access to drop-down menus covering products, period, dates, rates, placement strategies, etc.

Fertiliser applied

Edit	Crop	NITROGEN			PHOSPHORUS			POTASSIUM			SULPHUR			COPPER			ZINC		
		Pre	At	SD	Pre	At	SD	Pre	At	SD	Pre	At	SD	Pre	At	SD	Pre	At	SD
	Soybean, Dec-06		16			7			57			12							
	Sugarcane, 07		36			40			99										
	Sugarcane, 08			114			27			108									
	Sugarcane, 09			114			27			108									
	Sugarcane, 10			114			27			108									

** Pre = Pre-planting, At = At Planting, SD = Side-Dress N, P, K, S, Ca, Mg in kg/ha, Cu, Fe, Mn, Zn, B, Mo in g/ha*

Figure 10: Example of records of nutrients applied to crops.

NutriCalc™

Records for amendments, ameliorants and fertilisers applied 17-Dec-2012 to 10-Dec-2013

Property and contact details
Contact person: Mr Joe Smith
Property address
PO Box 111,
Tully, 4854
QLD Australia

Company name: JL & PG Smith
Farm identification number
Danielle's Hideaway (TUL-1234)
216 Dallachy Road
Tully, 4854
QLD Australia

1. Block (sub-block)	2
2. Crop	
Crop name	Sugarcane, Ratoon 3
Season start date	20-June-2012
Area (ha)	2
3. Nutrient management - calculation of optimal rates	
Soil test sample number	021099626
Sample date	01-Nov-2011
Calculated optimum rate of nitrogen (N) (kg/ha)	120
Calculated optimum rate of phosphorus (P) (kg/ha)	30
4. Amendments/ameliorants applied	
No amendment/ameliorant applied	
5. Fertiliser(s) applied	
Product trade name	JPI (Incitec Pivot)
Nutrient content	N: 19(%) P: 4.5 (%)
Application rate (kg/ha, L/ha)	600
Application methods	Subsurface (type, coulter and knife)
Nitrogen (N) applied (kg/ha, L/ha)	114
Phosphorus (P) applied (kg/ha, L/ha)	27
Name of person who authorised application	Joe Smith
Date of application	01-Nov-2010
6. Justification for difference between optimum rate and applied rate	
No justification given	
7. Total nitrogen (N) applied (kg/ha)	114
8. Total phosphorus (P) applied (kg/ha)	27

NutriCalc has been developed specifically for sugarcane growers and it is hoped that it will simplify the on-farm management of nutrients and fertilisers. It brings together the SIX EASY STEPS guidelines, a mapping interface and a record-keeping system into a powerful web-based nutrient management tool for determining appropriate nutrient management strategies for particular blocks and farms.

Importantly, it also has the ability to incorporate other crops that may be part of a grower's farming system, and has enough versatility to enable further developments and add-on improvements.

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