SOIL SAMPLING

IMPORTANCE OF CORRECT SAMPLING POSITION

Sugar Research Australia

INTRODUCTION

Collecting soil samples from the correct position on the sugarcane row is essential to obtain meaningful results. Sampling position is influenced by fertiliser placement in the previous crop. When fertiliser is stool split, soil samples need to be collected from the shoulder of the cane row which is approximately halfway between the centre of the cane row and centre of the interrow. If fertiliser is applied to either side of the sugarcane row (side-dress) samples should still be collected on the shoulder but closer to the cane row. Sampling in the wrong location may result in nutrient requirements being under or over estimated.

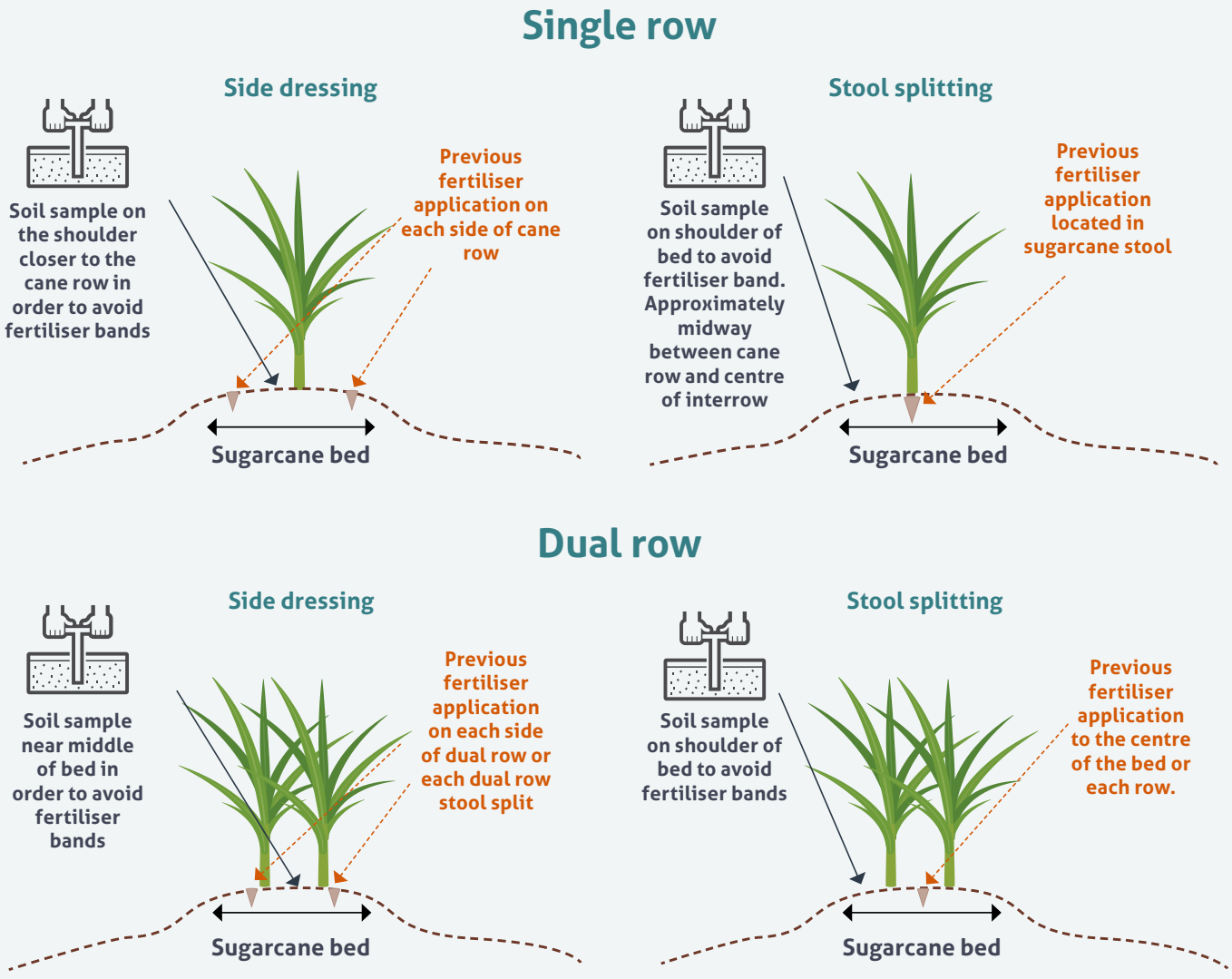

Figure 1: *Correct soil sampling position for single row (top) and dual row (bottom) configurations where fertiliser has been applied with a side dresser (left) or stool splitter (right).*

Why is correct soil sampling important?

To demonstrate the importance of sampling position, soil samples were collected from three different positions across the sugarcane row at two sites with different soil types. In these blocks, fertiliser was applied to all ratoon crops using a stool splitter.

The three tested sampling positions were in the centre of the sugarcane row, on the shoulder of the row and in the centre of the interrow. A composite soil sample was formed for each sampling position and a subsample sent to a commercial laboratory for analysis. The soil test results for each sampling position are reported in Table 1.

At both sites plant available phosphorus (P) and Potassium (K) decreased as the sampling position moved away from the stool. This is due to the fact that fertiliser is always applied to the centre of the sugarcane row and P being relatively immobile in the soil. However, **exchangeable soil calcium (Ca) and magnesium (Mg) were highest in the interrow.** This is likely due to less root activity in the interrow resulting in reduced crop removal of these nutrients. This is also reflected in higher soil pH values in the interrow.

Table 1: Results of soil samples collected from two different blocks and three different sampling positions across the sugarcane row

ANALYTE	UNIT	BLOCK 1 - HEWITT SERIES SOIL			BLOCK 2 - TULLY SERIES SOIL		
		CENTRE	SHOULDER	INTERROW	CENTRE	SHOULDER	INTERROW
pH (1:5 Water)		4.9	5.7	5.8	5.2	5.4	5.6
Organic Carbon (W&B)	%	4.34	3.94	3.85	1.06	1.01	1.03
Phosphorus (BSES)	mg/kg	530	96	91	48	35	10
Phosphorus Buffer Index (PBI)		1600	1300	1400	190	180	190
Sulphur (MCP)	mg/kg	27	11	9	13	12	14
Cation Exchange Capacity (CEC)	cmol(+)/kg	4.4	3.13	3.34	3.05	3.09	3.17
Calcium (Amm-acet.)	meq/100g	0.19	1.10	1.60	0.68	1.20	1.60
Magnesium (Amm-acet.)	meq/100g	0.09	0.16	0.30	0.22	0.29	0.38
Calcium/Magnesium Ratio		2.1	6.9	5.3	3.1	4.1	4.2
Exchangeable Sodium (ESP)	%	0.72	2.20	1.60	<1.0	0.84	0.85
Potassium (Amm-acet.)	meq/100g	0.19	0.09	0.10	0.26	0.13	0.13
Potassium (Nitric K)		3.2	2.9	3.0	4.0	3.8	4.2
Exchangeable Al (KCL)	meq/100g	3.9	1.7	1.3	1.9	1.4	1.0
Aluminium Saturation	%	89	55	39	62	47	32
Zinc (BSES-HCl)	mg/kg	2.1	1.1	0.9	1.0	1.0	1.1
Copper (DTPA)	mg/kg	0.19	0.18	0.2	0.29	0.27	0.44
Silicon (BSES)	mg/kg	1800	2000	2100	140	160	170
Silicon ($CaCl_2$)	mg/kg	24	17	16	16	13	26

Nutrient requirements for each sampling position were determined using the SIX EASY STEPS™ guidelines for the Wet Tropics to interpret soil test results. Nutrient requirements for the correct sampling location (shoulder) are shaded in teal colour.

Table 2: Plant cane nutrient requirements (kg/ha)

Block 1 – Hewitt series soil

Sampling position	Nitrogen	Phosphorus	Potassium	Sulphur	Calcium	Magnesium	Copper	Zinc	Silicon
Centre	100	0	100	0	1540	125	10	0	0
Shoulder	100	0	100	0	770	75	10	0	0
Interrow	100	0	100	5	578	0	0	0	0

Block 2 – Tully series soil

Sampling position	Nitrogen	Phosphorus	Potassium	Sulphur	Calcium	Magnesium	Copper	Zinc	Silicon
Centre	140	5	100	0	963	50	0	0	0
Shoulder	140	15	100	0	770	0	0	0	0
Interrow	140	30	100	0	578	0	0	0	0

Results for Block 1 – Hewitt series soil:

- Sampling the center of the row would result in overapplying Ca (double the requirement) and Mg.
- Sampling the interrow would result in underapplying Ca, Mg and Cu, and overapplying S.
- The nitrogen (N), P and K requirements did not differ with sampling position as soil test values fell into the same category for all sampling positions (refer to Table 1).

Results for Block 2 – Tully series soil:

- Sampling the center of the row would result in overapplying Ca and Mg, and underapplying P.
- Sampling the interrow would result in underapplying Ca and overapplying P (double the requirement).
- The N, K, S and Cu requirements did not differ with sampling position as test values fell into the same category for all sampling positions (refer to Table 1).

These results confirm the importance of selecting the correct soil sampling position to reliably determine nutrient requirements. Following the guidance contained within the SIX EASY STEPS program will ensure balanced nutrition is achieved for sustainable sugarcane production.

Acknowledgement:

This information sheet was developed by Sugar Research Australia and the University of Southern Queensland through funding from the Australian Government's National Landcare Program and the Cassowary Coast Reef Smart Farming project funded by the partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation.