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Side-dressing plant cane after a legume fallow in the wet tropics

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'Are you sure I don't have to put any more nitrogen on my plant cane?' is a question often asked by growers who have had a green manure legume fallow. Most growers are already aware of the benefits a legume fallow has on breaking the sugarcane monoculture and improving soil health, but are sometimes reluctant to take full advantage of the nitrogen supplied. This led to the establishment of two plant cane nitrogen rate demonstrations in the Tully region. Although soybeans were used in these demonstrations, growers are reminded that the outcomes can also be applied to average and good cowpea or lablab green manure crops. In this article Danielle Skocaj, BSES Limited Tully and Derek Sparkes, Department of Employment, Economic Development and Innovation Cairns highlight the establishment and demonstration trial results.

Demonstration 1 – Nitrogen rates following an AVERAGE soybean fallow

This demonstration was on the BSES Tully Research Station in the Lower Tully district of the Tully Mill area. Soybeans were direct drilled at 50 kg/ha into a fallow block in November 2006 before floodwaters killed the crop in February 2007. This resulted in a 3-month soybean fallow that was considered to be an average crop. Q200(D) was planted in July 2007 and the following nitrogen rates were applied:

- Treatment 1: 0 kg nitrogen/ha (rely on nitrogen fixed by soybeans over the fallow);
- Treatment 2: 52 kg nitrogen/ha at planting;
- Treatment 3: 52 kg nitrogen/ha at planting and 53 kg nitrogen/ha as side-dressing.

Each nitrogen treatment was replicated twice and received approximately 50 kg phosphorus/ha and 90 kg potassium/ha, as per the BSES Six Easy Steps Nutrient Management Guidelines. Calcium and magnesium (Blend 5) was applied pre-fallow.

Results: A commercial contractor harvested the demonstration. The cane yield, CCS, sugar yield and net return of each treatment are shown in Table 1.

A sugar price of $260/t and the Tully cane price formula at the time (cane price = 0.009 x sugar price x (CCS - 4) + 0.578) was used to calculate the $/t figure before harvesting and fees of $7.16/t were deducted. The average cane yield was used to determine the $/ha figure for each treatment. The cost of nitrogen fertiliser (urea @ $1332/t) was then deducted from the $/ha figure for each treatment to calculate the net return.

Outcome: The nitrogen supplied from an average soybean fallow in combination with the nitrogen applied at planting is sufficient to grow a plant cane crop. Applying additional nitrogen fertiliser at side-dressing is of no extra benefit as higher yields were not evident.

Below: Demonstration 1 plant cane nitrogen rate comparison (0 kg nitrogen/ha strip on the left and 50 kg nitrogen/ha strip on the right).

Below: Demonstration 1 'average' soybean fallow crop post flooding.

Table 1: Demonstration 1 plant cane nitrogen rate trial productivity and profitability.

Nitrogen treatment	Productivity			Profitability		
	Cane yield (t/ha)	CCS	Sugar yield (t/ha)	$/t	$/ha	$/ha less N cost
0 kg N/ha	98	16.31	15.97	29.65	2906	2906
52 kg N/ha	114	16.47	18.78	30.12	3434	3287
52 + 53 kg N/ha	114	16.31	18.77	29.65	3380	3087

Please note CCS results were determined using an NIR small mill.

Demonstration 2 – Nitrogen rates following a GOOD soybean fallow

This FutureCane-established demonstration was located on a farm in the Murray district of the Tully Mill area. Soybeans were direct-drilled at 50 kg/ha into a fallow block with 1.9 m preformed beds in December 2006. With dry matter yields of approximately 6 t/ha this soybean crop was considered to be a good crop, capable of supplying about 250–300 kg nitrogen/ha. In July 2007, Q200$^{\phi}$ was planted in dual rows through standing soybean stubble using a double-disc opener billet planter. The following nitrogen rates were applied:

- Treatment 1: 0 kg nitrogen/ha (rely on nitrogen fixed by soybeans over the fallow);
- Treatment 2: 25 kg nitrogen/ha immediately post planting;
- Treatment 3: 40 kg nitrogen/ha immediately post planting;
- Treatment 4: 40 kg nitrogen/ha immediately post planting and 70 kg nitrogen/ha as side-dressing.

Each nitrogen treatment (approximately 2 ha) was replicated twice. Similar rates of phosphorus and potassium were applied to each treatment according to the BSES Six Easy Steps Nutrient Management Guidelines. Calcium (lime) was applied pre-fallow.

Results: A commercial contractor harvested this demonstration. The cane yield, CCS, sugar yield and net return of each treatment are shown in Table 2.

Outcome: The nitrogen supplied from a good soybean fallow is sufficient to grow a plant cane crop. This makes legume nitrogen an attractive option, as nitrogen fertiliser is not required at planting or side-dressing following a good soybean fallow. The application of additional nitrogen fertiliser did not result in higher productivity or profitability.

Part of this demonstration was carried over into the first ratoon crop. One of the zero nitrogen plant cane blocks was split into three and the divisions fertilised with 0, 90 and 125 kg nitrogen/ha repectively. The 0 kg nitrogen/ha strip was the lowest yielding. From this information it can be inferred that the nitrogen fixed by the soybean fallow crop was not sufficient to grow the first ratoon crop to its maximum yield potential.

Nitrogen treatment	Productivity			Profitability		
	Cane yield (t/ha)	CCS	Sugar yield (t/ha)	$/t	$/ha	$/ha less N cost
0 kg N/ha	134	12.6	16.8	13.54	1814	1814
25 kg N/ha	124	12.7	15.8	13.78	1709	1676
40 kg N/ha	113	12.7	14.4	13.78	1557	1504
110 kg N/ha	111	12.7	14.1	13.78	1530	1384

Table 2: Demonstration 2 plant cane nitrogen rate trial productivity and profitability. Profitability figures were determined using the method described for Demonstration 1.

Above: Planting demonstration 2 with a double-disc opener billet planter through standing soybean residue.

Below: Harvesting demonstration 2 with the use of an elevator extension.

Below: Demonstration 2 'good' soybean fallow crop.