

OPPORTUNITY TO REFINE NITROGEN RATES WHEN APPLYING EEFS

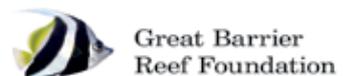




Image 1 (page 1): Harvesting a trial site.
Image 2 (above): Harvesting a trial site.

This case study presents findings from an Aloomba trial site in the Wet Tropics where the grower explored applying Enhanced Efficiency Fertiliser (EEF) at low nitrogen rates to Q253[Ⓛ].

The Aloomba trial site was one of 74 trials undertaken in the EEF60 project, which evaluated the production and profitability implications for commercial farms applying EEF's in place of conventional urea fertiliser. EEF's are reported to reduce nitrogen (N) losses by temporarily stabilising N in the ammonium form and better matching N supply to crop demand. In this project EEF's were generally tested at N rates 20% below the SIX EASY STEPS guidelines.

At a site located in the Aloomba area of the Cairns region a grower with a block of Q253[Ⓛ] decided to further reduce N rates to 33% below SIX EASY STEPS guidelines to identify if this would maintain cane yield, increase CCS and improve profitability. Historically, he found that when growing this variety cane yield was good however CCS and sugar yield were disappointing.

SITE CHARACTERISTICS

Farm location Aloomba	Total area of trial block 5.2 ha
Soil name Innisfail	Soil Texture Loam
Soil organic carbon 0.90%	Soil moisture supplied by Rainfall

SITE OVERVIEW

The trial site was managed according to best management principles, the crop had few gaps and weed management was good over the three seasons. Good farm management combined with reasonable soil fertility and soil moisture allowed this grower to attain consistently high cane yields over the duration of the trial.

METHOD

The trial examined three different fertiliser combinations including:

1. Urea applied at the SIX EASY STEPS rate (150kg N/ha).
2. Urea applied at 33% less than the SIX EASY STEPS rate (100kg N/ha).
3. DMPP* treated urea (EEF) applied at 33% less than the SIX EASY STEPS rate (100 kg N/ha).

* DMPP (or 3,4-Dimethylpyrazole phosphate) is a type of EEF that inhibits nitrification.

Each fertiliser treatment was replicated and randomised with production data monitored during harvest and collected from the mill. Net revenue (profitability) was calculated for each replicate by using the cane payment formula to calculate grower revenue and subtracting the costs that varied including fertiliser costs, harvesting costs and levies. Crop N content and post-harvest soil N were also measured.

RESULTS

Average yield, CCS and net revenue results over three ratoons are listed in Table 1. No differences in cane yield associated with the type or rate of fertiliser were detected.

However, statistical differences were identified for CCS with DMPP treated urea producing significantly better CCS than both urea applied at SIX EASY STEPS recommended rate and urea

applied at 33% less than the SIX EASY STEPS rate (by 0.54 and 0.26 units respectively).

When comparing the profitability of the different fertiliser combinations, both the DMPP treated urea and the urea applied at 33% less than SIX EASY STEPS generated significantly better net revenue than urea applied at SIX EASY STEPS.

Table 1: Mean yield, CCS and net revenue results over three ratoon crops (2019-2021).

TREATMENT (KG N/HA)	AVERAGE CROP YIELD OVER THREE RATOONS			NET REVENUE
	YIELD (TCH)	CCS	SUGAR YIELD (TSH)	\$/HA
Urea at the SIX EASY STEPS rate (150)	113	10.64 c	12.2	\$1,442 b
Urea at 33% less than the SIX EASY STEPS rate (100)	115	10.90 b	12.7	\$1,651 a
DMPP treated urea at 33% less than SIX EASY STEPS rate (100)	110	11.18 a	12.5	\$1,670 a

Average results followed by a common letter are not significantly different at a 5% significance level ($P < 0.05$).

CROP N CONTENT AND POST-HARVEST SOIL N

At nine months crop biomass samples were collected from each treatment and analysed for N content. Total crop N accumulated in above ground biomass (kg N/ha) were calculated across treatments and over the three years of monitoring. Mean treatment outcomes are presented in Figure 1.

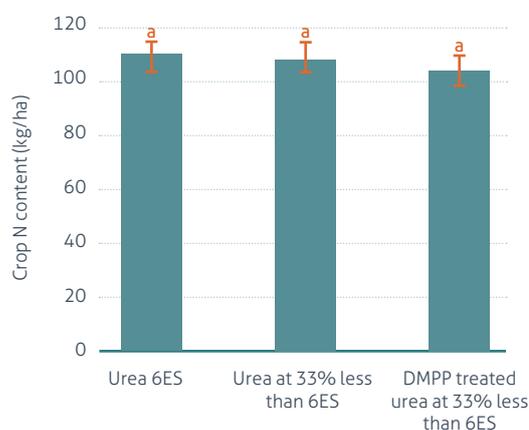


Figure 1: Mean crop N content (kg/ha) in above ground biomass for each treatment over three seasons. Error bars indicate the average 95% confidence interval.

The analyses did not identify any significant differences in crop N content due to a treatment effect.

Following harvest, soil samples were collected from each treatment. Soil N (kg/ha) was calculated for the top 20cm of the soil profile with average values for the three seasons presented in Figure 2.

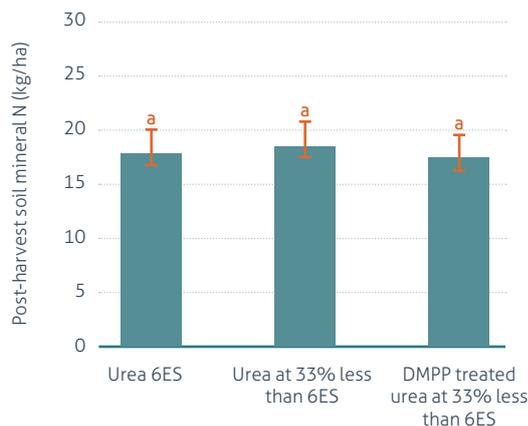


Figure 2: Mean post-harvest soil mineral N (kg/ha) in the top 20cm of the soil profile for each treatment over three seasons. Error bars indicate the average 95% confidence interval.

The trial demonstrated that under the environmental conditions at this site Q253[Ⓟ] produced higher CCS and net revenue when N rates were reduced by 33% in comparison to urea applied at the SIX EASY STEPS recommended N application rate. DMPP treated urea produced significantly better CCS than both urea treatments and generated the higher net revenue than urea applied at SIX EASY STEPS.

The amount of N accumulated in the above ground biomass was similar across all treatments indicating that the crop had access to similar amounts of soil N. No differences in the amount of N in the top 20cm of the soil profile post-harvest were identified.



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