Answering the key questions on enhanced efficiency fertilisers

RESEARCH IS UNDERWAY TO HELP PROVIDE SHARPER INFORMATION FOR CANE GROWERS ON WHEN AND WHERE ENHANCED EFFICIENCY FERTILISERS COULD PROVIDE A BENEFIT TO PRODUCTIVITY AND SUSTAINABILITY.

There has been a strong interest in recent years in finding the best fit for enhanced efficiency fertilisers (EEFs) for the Australian sugarcane industry.

However, with several different EEF products on the market, along with considering the weather patterns and farming conditions, the decision on when and where to use an EEF product can be confusing. Growers still often have the question: will the EEF provide a benefit for me?

These products cost more than conventional fertiliser, which heightens the need for growers to understand the best fit for these products.

Research is underway to provide the industry with sharper information to help them make decisions, examining an array of scenarios.

Through a project called EEF60, SRA and CANEGROWERS are working on 60 field trials over three years (creating 180 trial-years of data) from sites from Childers to Mossman.

Separate to this, but in parallel, CSIRO Researcher Dr Kirsten Verburg and her research team from CSIRO, HCPSL and JCU are working on a project that is using an innovative method to examine a broad range of scenarios for EEFs.

The project has created thousands of virtual trials using an agricultural simulator called APSIM. This tool allowed the research team to mimic field trials across diverse conditions, allowing them to better understand the huge variability facing these products, and therefore gain a better understanding of scenarios that affect EEF efficiency.

"We have seen in the past some experiments with EEFs in the field not obtaining statistically significant differences between treatments," Dr Verburg said. "A combination of soil, rainfall pattern, crop growth and stage all influence whether the EEF provides a benefit."

"With the range of products available and different farming and weather situations, it is understandable that it can be confusing for growers to work out which product to use and when."

Through the virtual trials, they simulated 273,360 different treatments, looking at parameters such as soil type, harvest date, fertiliser date, fertiliser type, irrigation, and a range of weather patterns.

"In field trials, you get results based on what is happening that year with the weather, and the other factors at the trial site. With virtual trials you can sample a range of conditions, and while we rely on the model's representation of reality, it helps build a lot of verification around what is happening," she explained.
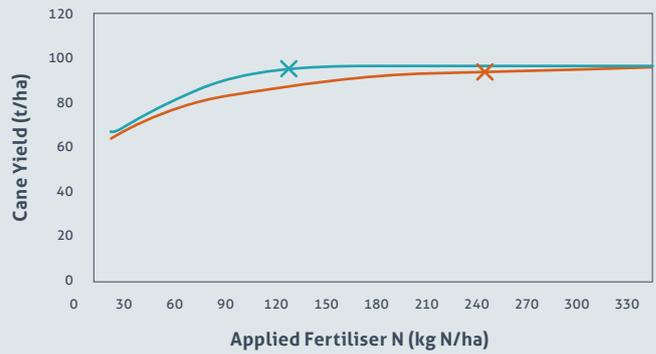
Based on the simulations, the research team identified four main categories of seasonal/situational responses to EEFs – some of which provided a benefit for yield and nitrogen loss, and others where there was none.
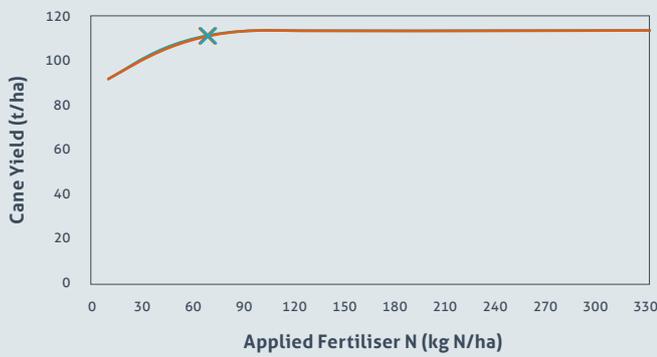
Type A
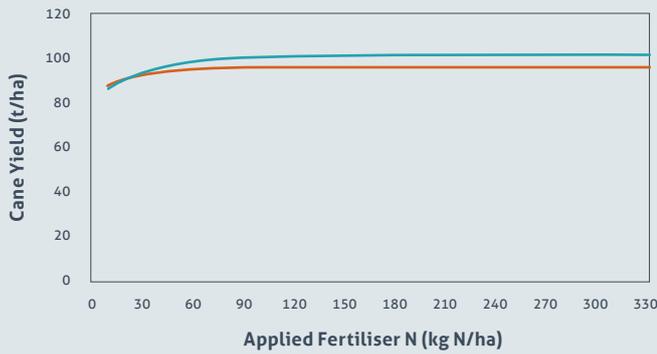
EEF protects some N in an early season large N loss event that loses most fertiliser N resulting in a yield benefit.
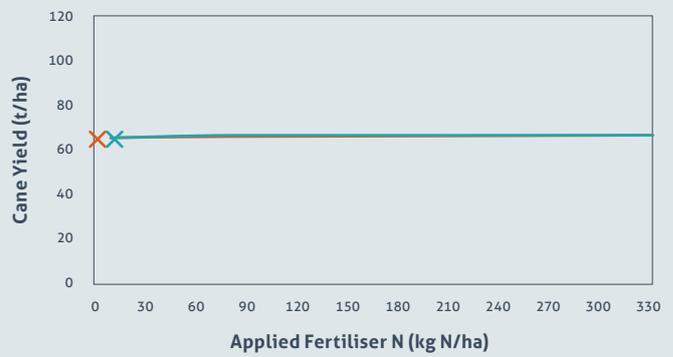
Type B

EEF reduces N loss; the 'saved' N results in a reduction in optimum N, allowing N rate to be reduced.

Type C1

No benefit from EEF due to lack of N loss during the early season period before crop uptake when EEF protects the N.

Type C2

No benefit from EEF due to lack of N response caused by other stresses (e.g. waterlogging); crop not able to respond to the 'saved' N.

The research team broadly categorised four different situations.

Type A responses represent years where there is a massive rainfall event that causes almost all fertiliser nitrogen to be lost, except for the amount still protected by the EEF. This results in additional yield (see graphs). These years were relatively rare.

Type B responses are years where the EEF reduces the nitrogen loss allowing a lower rate of the EEF to achieve the optimum yield. These are typically the type of years where EEFs are considered ideal.

The other types of situations (C1 and C2) saw no yield response for the EEF. In C1, this could be due to little N being lost from the conventional urea at a time when the EEF is protecting its nitrogen (N).

In C2, this could be situations where the soil can supply all the N required by the crop, such as with plant crops after legumes. Other factors that reduce yield – regardless of the fertiliser type and rate – such as waterlogging could also cause this effect.

This project has worked in the Herbert as a pilot region for testing the potential for developing a decision support tool around the use of EEFs, working closely with Herbert Cane Productivity Services Limited (HCPSL) and Manager Lawrence Di Bella. It is building on the work of HCPSL's existing decision support tree.

The next steps are to refine this information further for growers and to integrate it with climate forecasting information. The aim is to use information on soil type, the seasonal conditions, and crop start date to understand the likelihood of different scenarios occurring. Having this understanding of what may occur could be useful in deciding what product to use.

Dr Verburg said it was important to note that modelling does not replace the need for in-field experiments, but in this case it helped to build the understanding around the many possible outcomes of EEF use.

"Models are built on experiments, and experiments are also important to verify results from modelling," she said.

She said there was potential to combine the results from the virtual trials with the results from the EEF60 project, and this could enhance the industry's understanding of these products. ■

(Over page) With a range of enhanced efficiency fertiliser products on the market, and a myriad of farming and weather possibilities that can occur each season, research is underway to provide growers with information on where and when these products could provide a benefit. – Photo by Lawrence Di Bella. (Above) Virtual yield N response curves for urea (orange) and EEF (blue), with the x indicating the agronomic optimum.