FARMACIST NEWS

AUTUMN 2024

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Meet Maisie!

Maisie has moved over from England to join our Burdekin team - and we're so happy she's here! Maisie has a BSc (Hons) Agricultural Science from Harper Adams University, UK, and her focus is on machinery, technology and precision ag. She has been eagerly learning all about sugarcane and the Burdekin, so if you see her around the paddocks make sure you say 'ello!

Check out these new videos highlighting precision ag!

This month's cover features Zoe in a Mackay block of soybeans where she created a great video case study for POD talking about how mill mud can be a worthwhile addition to some crops.

In this video, Burdekin sugarcane grower Andrew takes us through the history of one of his blocks and how he decided that applying variable rate mill ash would assist with managing his soil constraints.

Smarter, Stronger Ag Through Farm Data

Bill Moffatt, Zoe Eagger and Jess Bennett had the pleasure of talking about how a collection of good spatial data can enhance growers' decision making at the Smarter, Stronger Ag Through Farm Data event hosted by the Central Highlands Development corporation.

One example of work done by Bill and Jess highlighted how utilisation of ground truthed NDVI yield estimations in a sorghum crop allowed the grower to have the confidence to forward-sell more of their crop, resulting in roughly an additional $240k in the growers pocket.

For more information about how datasets can be used to assist in making decisions for your farming practices, check out Farmacist's precision agronomy work on our website at https://www.farmacist.com.au.

N&P budgets for sugarcane

It is compulsory to have a nitrogen (N) and phosphorus (P) budget for the 2024 season before applying any fertiliser to sugarcane. Budgets need to be updated annually and before any fertiliser is applied.

Things to know!

- If you apply mill mud or mill mud/ash mixtures at 100t/ha or higher, you must take this into account when calculating your N and P application amounts for that paddock.
- District Yield Potential: If you are in the Burdekin where there is more than one DYP (150t/ha and 180t/ha), you need to have historical yields showing three blocks that have yielded above 150t/ha in the last 15 years to use the 180t/ha DYP N rates.
- Soil samples must be taken prior to applying planting fertiliser and are valid for 12 months after the sampling date. For more information, please see the following: https://www.qld.gov.au/environment/agriculture/sustainable-farming/reef/reef-regulations/producers/sugarcane

To read the full article as it appeared in the Autumn 2023 issue of Farmacist News, scan this QR code:

Mark Congreve spraying workshops 2024

By Maisie Wildgoose

Between January and February Farmacist facilitated five spraying workshops, presented by Mark Congreve. Mark is a senior consultant with ICAN (Independent Consultants Across Australia), who specialise in understanding and facilitating change within Australia cropping industries.

Throughout the course, Mark referred to the most commonly used chemicals in sugar cane, and welcomed any questions specific to the farm or farming area. This made the day both informative and interactive.

In these herbicide workshops, with reference to the chemicals used in sugarcane, Mark covered:

- Herbicide groups, subgroups and how they all work
- Leaf surface biology affecting efficacy of hydrophilic and lipophilic herbicides
- When to spray which chemicals, and Delta T
- Impact of droplet size on each commonly used chemical
- His 10 Adjuvant Rules of Thumb
- What to consider when choosing a surfactant
- Tank mixes, which chemicals to mix and filling order
- Other factors affecting herbicide efficacy: residual chemicals, environmental interactions, green material / stubble / trash, herbicide mobility.
- Environmental concerns

Key takeaways from the workshop

1) *There are three cane herbicide points of attack:*

- Light activation of reactive oxygen species.
  - Groups: 5, 6, 14, 22, 10, 27, 34.
  - Includes: Paraquat, Acifluorfen, Isoxaflutole, Diuron…
  - Application help: Spray in the daytime so the chemical is taken in before its broken down (with the exception of Paraquat). Coverage is key especially at the growing point.
- Cellular metabolism
  - Groups: 2, 9, 1, 15, 18
  - Includes: Imazapic, Haloxyfop, Glyphosate, Asulam…
  - Application help: These chemicals are most active on growing points and young weeds, and less effective on flowering plants. Symptoms are slow to show – do not apply additional chemicals as they may reduce translocation around plant and reduce efficacy.
- Cell division and growth
  - Groups: 3, 4
  - Includes: Pendimethalin, 2-4D, Fluroxypyr…
  - Application help: Consider water quality, especially with Stomp where organic matter in the water can affect efficacy.

2) *Leaf surface biology:*

Amount of chemical entering the plant is affected by: leaf surface, formulation dissociation, time on leaf and droplet size. Droplet size, spray conditions and water volume must be considered for each chemical.

Lipophilic (wax / fat loving) chemicals enter the leaf quickly but travel slower when inside, while hydrophilic (water loving) chemicals enter much slower but once in the plant they translocate quicker. Paraquat and and Diquat are exceptions due to their positive charges.

3) *Tank mixes:*

Check the label, it will show what's already been included and what should/can be mixed in. Mixing order is important, and there should be full mixes between each addition to the tank. Tank should be filled 60-75% water before adding anything else.

Test water quality: If water is medium/ hard consider adding ammonium sulfate when using it for glyphosate application. Paraquat efficacy is reduced by dirty water. Acidity can affect chemicals – e.g. Asulam can't have pH <6.

4) *Adjuvants and water conditioning agents:*
Consider:

- Is the herbicide hydrophilic (water loving) or lipophilic (fat / wax loving)?
- Which chemicals are being mixed?
- Water quality - test and use other water sources if it's not clean.
- Spreading / sticking / penetrating / reducing evaporation and drift control.
- Environmental stresses.
- Leaf surface: waxiness, size.

5) *Application:*
Time of day: Depending on chemical group, some herbicides need to be applied during daylight hours (Diuron). Consider whether the crop can handle the chemical at the time of day you're wanting to spray. Refer to the Delta T before spraying, between two and eight is optimal.

For residual products, 15-20% of the chemical is intercepted by green leaf material. If you have green material considering increasing nozzle size to increase shattering. Herbicide mobility should also be considered, especially if there is stubble.

6) *Resistance:*
Time of day: Depending on chemical group, some herbicides need to be applied during daylight hours (Diuron). Consider whether the crop can handle the chemical at the time of day you're wanting to spray. Refer to the Delta T before spraying, between two and eight is optimal.

For residual products, 15-20% of the chemical is intercepted by green leaf material. If you have green material considering increasing nozzle size to increase shattering. Herbicide mobility should also be considered, especially if there is stubble.

Growers and agronomists both benefitted from attending the workshops. If you missed out but would like more information about herbicides, there are resources from ICAN that you can access from here: https://icanrural.com.au/resources.html.

Keep an eye out for our other workshops!

Project Bluewater is funded by the partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation, and Farmacist.

P2D & Observant demo night

The Farmacist Research Farm in the Burdekin has provided many opportunities for growers to come together with Farmacist for project updates, information sessions, and on-farm automation demonstrations.

On a warm night in January, Farmacist held a small grower update for P2D participants to discuss how EM mapping and soil sampling are useful tools for planting, and the requirements of regular soil testing. The presentation included:

- EM mapping uses:
  - G-Dot installation locations to cover different soil types/zones
  - Planting method according to soil type
  - Levelling
- A demonstration of soil cores from different zones of EM map from the research farm.

This also provided a timely opportunity for Evan to talk about the upcoming planting season and topics that should be considered, including:

- Good plant selection:
  - As close to hot water as possible
  - No proud eyes
  - No piping of the stick
  - Not getting hung up on t/ha - a better indicator is 10 sound eyes per metre of row.
- Good coverage of the billets with fungicide
- Keep insecticide and fungicide separate
- Have a plan for weed control and grub control in plant cane.

This get together also gave Chris a great opportunity to showcase the fully operational automated irrigation system installed on our research farm, with market-leading equipment from Observant. Growers were able to ask questions about the system, as well as about the On-Farm Connectivity Program currently on offer by the Australian Government, of which Farmacist is an approval supplier. This, along with our partnership with Observant, gives growers the chance to automate parts of their farm and we think this is a really great opportunity! For more information, contact your nearest Farmacist office, or jump on our website.

Precision To Decision is funded by the partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation, and Farmacist.

Chemical use assessments for graziers

by Mandy Jeppesen

A number of graziers have recently received notice that their agricultural enterprise will be assessed to ensure they are meeting their obligations under the Chemical Usage (Agricultural and Veterinary) Control Act 1988 and the Chemical Usage (Agricultural and Veterinary) Control Regulations 2017.

This assessment usually involves a visit or phone conversation with an authorized officer with the aim of reviewing current chemical records and chemical use on the property. The authorized officer is appointed by the Department of Agriculture and Fisheries who are the Queensland Government's regulator for this legislation.

What do you do if you receive a notice of assessment?

Firstly, DON'T PANIC!

Read your letter and supporting documents carefully. The letter you receive from the Department will include a checklist of information they require from you. This will include, but is not limited to application records, chemical invoices, maps and photographs of equipment and chemical storage and mixing locations. Having all of these documents on hand is the first step.

Secondly, be aware of what your obligations are under both the Chemical Usage (Agricultural and Veterinary) Control Act 1988 and the Chemical Usage (Agricultural and Veterinary) Control Regulations 2017.

A copy of these documents can be found at *https://www.legislation.qld.gov.au/view/pdf/inforce/current/act-1988-103* (current as at 1 March 2023) and *https://www.legislation.qld.gov.au/view/pdf/inforce/current/sl-2017-0136* (current as at 8 May 2022).

What exactly is an agricultural chemical?

The official definition of an agricultural chemical is a substance or mixture of substances which are declared by regulation to be an agricultural chemical, including pesticides (e.g. herbicides, insecticides, fungicides, wetting agents), and pest baits[1]. Generally, they can be considered any type of chemical that can improve the health of crops by controlling weeds, preventing pest infestations and attack, and modifying the plant or pest to suit the required agricultural application.

ALWAYS read the product label and use the product according to the label recommendations. Off-label use is illegal and can carry penalties. Only use chemicals that are registered or covered under a permit or regulation.

You can check if a chemical is registered by searching the Australian Pesticide and Veterinary Medicines Authority (APVMA) search engine PubCris (https://www.apvma.gov.au/about/agvet-chemical-regulation/pubcris-and-permits-databases).

Image 1: Farmacist has Chemical Record Books specific to grazing available for purchase ($40 + GST). Contact your nearest Farmacist officer for further information.

What chemical application records must you keep?

All agricultural chemical users are responsible for ensuring that records of each chemical application are made. For grazing this can include activities such as spot spraying and boom spraying weeds in paddocks, spraying along fence lines and around infrastructure.

The information you need to record can be divided into two groups:

- Things that are consistent and rarely change;
- Things that change on the day.

The majority of graziers tend to use the same application equipment at the same settings for all of their chemical applications. In addition, there are usually only 2-3 different spray mixes used consistently across the property. In this situation, it would be possible to record this information at the front of the record book, including the name and contact details of the person undertaking the spraying, and this would be sufficient to meet requirements. This reduces repetition and makes the amount of information you need to record on the actual day of application more manageable.

On the day a chemical is applied, you would record weather details (such as wind speed and direction, temperature, and relative humidity) at the start, middle and at the end of the application, the location of the area treated, the target pest and what chemical mix was used (referring to the information recorded at the front of the record book).[2]

These records must be made within 2 days of the chemical application and kept for a period of 2 years, however, always check the product label to see if there are any alternative or additional requirements. A fact sheet prepared by DAF "Agriculture chemical recordkeeping requirements" (see below) goes into further details of what is required.

Reef Regulations regarding agricultural ERA products

There are additional record keeping and use requirements for certain chemicals applied within Reef catchments. An agricultural Environmentally Relevant Activity (ERA) is defined in the Environment Protection Act 1994 as cattle grazing, horticulture or cultivation of another crop on a commercial basis on land in the Great Barrier Reef catchment. ERAs are those activities that will or may cause the release of a contaminant into the environment when carried out that will or may cause environmental harm or adversely affect an environmental value of the marine environment. [3]

A number of agricultural chemicals have been declared ERA products under the Reef Regulations. For grazing activities, this includes Tebuthiuron. In addition to application requirements and limitations, this chemical has the following additional record keeping requirements:

- A record of application for the specified chemical must be made within 3 days after the product is used
- These records must be kept for 6 years
- Proof of purchase (invoices, receipts).

Farmacist currently have Chemical Record Books in stock that are specific to both sugarcane and grazing for $40 plus GST, which is cheap insurance for ensuring your records are correct.

Storage of chemicals

Every chemical rated as hazardous will have an SDS or Safety Data Sheet. An SDS provides information on the chemical and its ingredients, any health, physical or environmental hazards associated with its use, physical properties of the chemical, safe handling and storage procedures, how to treat a spill and first aid information. You must have a copy of the relevant SDS for each chemical you have in your possession.

The SDS will tell you if the chemical is classed a Dangerous Good and what group it belongs to which will assist you in determining your storage, PPE, spill kit and signage requirements. In general, best practice guidelines for safe storage of chemicals can include: [4]

- Keeping pesticides in labelled, compliant containers.
- Ensuring the storage area is well-ventilated and has an impermeable floor.
- Making sure that the storage is designed with capacity to contain spills of chemicals on hand.
- Making sure the storage area is lockable.
- Ensuring storage cabinets and containers have the correct Dangerous Goods signage, safety signage and are labelled as Chemical Storage Areas for easy identification.
- Keeping a copy of relevant SDS in a safe space close to the storage for easy access.
- Ensuring an emergency spill kit is close by and suitable for the chemicals being stored (decontamination requirements can be found on the chemical SDS).
- Ensuring staff are trained in the safe handling and storage of chemicals and have access to all required PPE (Personal Protective Equipment).

You will only be assessed for compliance with the basic storage requirements outlined on the labels and SDS of the chemicals you have stored. If you were interested in investigating further, full details outlining storage and handling requirements for pesticides and agricultural chemicals in Australia can be found in AS 2507:1998, Australian Standard -The storage and handling of agricultural and veterinary chemicals and AS 1940:2004, Australian Standard – The Storage and Handling of Flammable and Combustible Liquids.

Workplace health and safety requirements

A first aid kit, PPE such as masks, eye protection, overalls and gloves, a spill kit and suitable firefighting equipment should be readily available near the chemical storage area. Check the chemical SDS to determine what is required to be on-hand for use, handling, and emergencies. Additional information on workplace health and safety can be found on the Worksafe website (https://www.worksafe.qld.gov.au /your-industry/agriculture,-forestry-and-fishing).

Education and awareness are the goals

The goal of an assessment is to increase landholder knowledge and awareness of what they need to do to remain compliant with relevant legislation. Once you have received your letter, make contact with the Department by calling the number listed in the contact details, let them know you've received your notice and discuss any concerns you may have. Having direct contact with an authorised officer enables you to have any questions answered or concerns addressed.

At the end of the day, it is about keeping yourself, your family, and your workers safe without causing damage to the environment or your property.

References:
1.Storemasta, Pesticide and Agricultural Chemical Requirements (Part 1): Minor Storage, March 15 2023, https://blog.storemasta.com.au/pesticide-agricultural-chemical-requirements-minor-storage, accessed 05/02/2024

2.Queensland Government – Business Queensland, Making and Keeping Records of Agricultural Chemical Applications, November 2 2020, https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/sustainable/chemical/use/record, accessed 05/02/2024

3.Queensland Government, Division 3: Prescribed agricultural ERA products and conditions for use for agricultural ERAs, Chemical Usage (Agricultural and Veterinary) Control Regulation 2017, https://www.legislation.qld.gov.au/view/whole/html/inforce/2018-07-01/sl-2017-0136, access 05/02/2024

4.Storemasta, How to store and Handle Agricultural and Veterinary Chemicals: A Complete Guide, March 15 2023, https://blog.storemasta.com.au/how-to-store-and-handle-agricultural-and-veterinary-chemicals-a-complete-guide, accessed 05/02/2024

Agricultural chemical recordkeeping requirements

Keeping records is critical to any business and in agricultural farming it can provide a range of information in relation to productivity, economics, farm operations, marketing opportunities and environmental responsibilities.

Below is a checklist that highlights the legal requirements for recordkeeping for chemicals based on the products that you are using. There are:

1) Product label records – If these are on the product's label then this is all that you need to keep.

2) Legislation records - If there are no specific product label record requirements then the *Chemical Usage (Agricultural and Veterinary) Control Regulation 2017* outlines recordkeeping requirements.

1. Label Requirements e.g. Diuron 900 DF, Amitron 700WG	Notes
Refer to individual labels for exact requirements	Each product may vary their record requirements
☐ Records to be made as per label time or ASAP	
☐ Records required for 2 years	
☐ Date of application	
☐ Time – start and finish times	
☐ Location address and paddock sprayed	
☐ Full name of product applied	
☐ Rate per hectare (L/Ha, Kg/Ha) and area applied to (Ha)	Use farm map to assist
☐ Crop growth stage and target weeds	Plantcane, ratoons, spike stage, final hill-up etc. Grasses, broadleaf, guinea grass
☐ Wind speed and direction during application	At the application site – not a weather station.
☐ Air Temperature & humidity OR Delta T during application	Hand held weather station can provide this
☐ Nozzle brand, type and size, spray angle, pressure	e.g. TeeJet AI110002 @ 3 Bar
☐ Name and address of person applying	
☐ other label requirements i.e. Height of spray boom	Height above canopy of target

1. Label Requirements e.g. Amicide advance 700	Notes
Refer to individual labels for exact requirements	Each product may vary their record requirements
☐ Records to be made as per label time or ASAP	
☐ Records required for 2 years	
☐ Records taken prior to and directly after application	
☐ Temperature	
☐ Relative humidity	
☐ Delta T	
☐ Wind Speed	
☐ Is there a temperature inversion	

2. **Legislation records** for products without label records Chemical usage (Agricultural and Veterinary) Control Regulation 2017 (Subdivision 2 section 33)	Notes: For all products with no label record requirements
☐ Complete records - 3 Days ERA products 2 days others	
☐ A copy of qualifications or other relevant qualification	Units of competency or licences (ERA products)
☐ Keep purchase receipts	
☐ The product user must give records to responsible person ASAP up to 5 days after the record is made.	Maximum of 8 days after application.
☐ Keep records – 6 years Tebuthiuron, 2 years ERA products, 2 years – Non- ERA products	Tebuthiuron, Diuron, Atrazine, Hexazinone, Ametryn, all products
☐ A. Full trade name of product OR Product Number OR Combination	
☐ B. Enough information to identify the approved label	May have as part of (A) above
☐ C.i. Name and address of person applying the product	
☐ C.ii. The owner occupier of the land where product applied	
☐ C.iii. The Responsible person	person overseeing application/ manager
☐ D. Qualifications of user, responsible person, supervisor	
☐ E. situation used	Crop and growth stage
☐ F. Date of application	
☐ G. Place where product was used	Farm and paddock details
☐ H. Equipment and method – Boom, Irvin legs, banded, Nozzle brand, type and size, spray angle, pressure	Boom, Spot, Banded, Irvin legs, hooded, operating pressure, E.g. TeeJet AI110002 @ 3 bar
☐ I. Time of weather conditions before, during and after	Start time, during time, finish time
☐ I.a. Air temperature	Before, during and after application
☐ I.b. Relative humidity or Delta T	Before, during and after application
☐ I.c. Wind Speed and Wind direction	Before, during and after application
☐ I.d. Extent of cloud cover, if any	½, ¼, 7/8, cloud cover
☐ I.e. Rain, if any and amount.	At time of spraying
☐ Quantity of product used	
☐ J. Rate of product applied	May include Amount, concentration, area, equipment setup.

Legislation is not descriptive as to how to keep records only what records to keep. It is up to you as an individual to choose the most suitable methods of keeping records for your business.

There are a range of electronic devices, GPS systems, automatic rate controllers, phone APPS, computer programs and books. Any of these or a combination of these can be used as long as they contain the appropriate details and can be provided when required.

Supplied by Department of Agriculture and Fisheries

Changes to Flupropanate label

By Mandy Jeppesen

If you have Giant Rat's Tail grass on your property, then you are probably aware of the chemical active Flupropanate. Trade names of products containing this active include TussockTM Herbicide, GP Flupropanate, and AC Thwack®.

There have recently been changes made to the Flupropanate label to provide extra clarity regarding the interpretation of withholding periods following application. The following is taken from the AC Thwack® label as an example of the new wording.

There are TWO withholding periods which apply consecutively for this chemical and both conditions must be observed.

1. *Grazing and Cutting Withholding Period*

Spot spraying (direct hand spraying of individual plants in an area with no spraying of any surrounding areas):

- **DO NOT** graze or cut for stock feed areas which have received spot treatment for at least 14 days after spraying.
- **DO NOT** graze stock in treated areas for at least 14 days prior to slaughter.

Blanket treatment (treatment other than spot spraying):

- **DO NOT** graze treated areas or cut for stockfeed for 4 months after application.
- **DO NOT** graze stock in treated areas for at least 14 days prior to slaughter.
- Lactating animals producing milk for human consumption **MUST NOT** be grazed in treated areas.

Image 1: Giant rats tail grass (Sporobolus R.Br.)
(Credit: Weeds Australia https://weeds.org.au/profiles/giant-rats-tail/)

2. *Stock Withholding Period:*

Stock which have been grazed in treated areas **AFTER** the grazing and cutting withholding period has passed must then be moved to untreated areas or fed clean feed for at least 14 days before slaughter. This applies to all treated areas, whether spot sprayed, or blanket sprayed in some way.

In summary, following the application of flupropanate, **DO NOT** graze stock or cut for stockfeed for the time period specified for the application method used. Following this exclusion period, **DO NOT** allow stock to continue grazing previously treated areas for 14 days prior to slaughter irrelevant of the application method used. All animals that graze previously treated areas following the exclusion period must be moved to an untreated area or fed clean feed for at least 14 days.

In every situation when using agricultural chemicals, read the label of the product you are using carefully and always follow label instructions. Ensure accurate and up-to-date records are kept so all relevant withholding periods are adhered to.

The best residual herbicide for plant cane

By Evan Shannon

For the Burdekin district, planting time is fast approaching and growers need to be thinking of their plans for optimum weed control in their plant cane crops. Weed competition is one of the biggest issues facing young sugarcane plants and a reliable robust residual herbicide such as Pendimethalin is the best option in most instances.

The most common trade name for Pendimethalin is Stomp® Xtra, although there are a number of generic products available. This herbicide attaches quickly to soil particles and organic matter, and is very effective on grasses such as Wild Sorghum and Guinea Grasses. It also has virtually no runoff potential in Burdekin soils, although it needs incorporation (usually through irrigation) within 10 days post application.

Pendimethalin, as a residual herbicide, acts as a root shoot inhibitor and so the soil needs to be weed free before its application. The most common time to apply Pendimethalin in the Burdekin is just before the 2nd irrigation (after the initial weed flush has been controlled by a paraquat spray).

However, if rain is likely before weed and crop emergence, an application of Pendimethalin alone is good insurance to enable a weed free crop without the need for post emergent activities. Rainfall incorporation of the product is usually more effective than furrow irrigation.

For more information about Pendimethalin and its' usefulness as a residual herbicide in plant cane contact your local Farmacist agronomist.

Making informed decisions for pesticide success

By Daniel New

The phrase 'pick your poison' can be used to describe our insecticide choices in soybeans. Mishandling the use of chemicals, such as using the same actives repeatedly and failing to provide adequate coverage, can result in resistance in some of our major pests while killing beneficial insects that would have contributed to pest control. Fortunately, there are ways to control pests in soybeans in an environmentally sensitive way.

Monitoring
Monitoring is an important tool in deciding what control method to use in your soybean crop. By visually inspecting the crop, we can see:

- what pests are present
- the growth stages of the pests
- how close their numbers are to economic theshold
- what beneficial insects are present
- how damaged the crops are
- what growth stage the crop is at
- and many more factors that will influence our decision making.

The best decision is the most informed one. With soybeans, we can beat sheet check crops at least once a week to monitor all these aspects[1].

Biological Control
An example of biological control used in soybeans is the biopesticide Nuclear Polyhedrosis Virus (NPV) found in ViVUS Max® and Gemstar® LC used for control of *Helicoverpa* a major pest of crops. This virus controls the population of *Helicoverpa* by infecting them and killing them off without harming other beneficial biological lifeforms. It also has the benefit of legally being able to be applied through overhead irrigation, a practice not available for other insecticides.

Beneficial insects help control pest populations naturally, saving you money and time from not having to spray. By applying certain chemicals, you run the risk of killing off these beneficials, paving the way for resistant pests to survive and thrive with the lack of predators and putting your crop in greater risk.[2]

Cesar Australia has developed a table showing which chemical active ingredients can impact beneficial insects in Australian grain crops (Table 1).

Cultural Control
Cultural control is a practice utilised to prevent pests impacting on crops rather than treating infestations. Some of these simple practices can include crop rotation, sanitation/biosecurity, variety selection and management of crop growth through strategic use of water or fertiliser. Weed suppression reduces potential host plants for the pest to live on, breaking their life cycle.

Avoiding successive plantings of the same crop can also help break the pest's lifecycle. If the plant has good soil

moisture and growing conditions, then large, vigorous plants suffer less defoliation and less risk of terminal damage from major pests that results in significant yield loss.[3]

Chemical Control
Chemical application is the most common form of pest control in soybeans but can be easily misused. Time, target pest population and money are the major deciding factors when it comes to spraying, however important details such as spray windows (Table 2), what the target is and the impact on other environmental factors also need to be taken into consideration.

Utilising economic thresholds to decide when to spray can allow time for the beneficial insects to do their job. The young pest larvae can have up to an 80% mortality rate just from natural selection, predation and environmental factors. Once pest numbers reach the point of causing economic damage, spray application can occur leading to improved control and reduced costs.

Soft Chemistry
The term 'Soft Chemistry' is used in agronomy to describe the targeting of a specific pest with chemicals that have little impact on the environment and other insect species. This entails applying a chemical that directly controls the pest while having a lower impact on beneficial populations. These chemicals can be applied in different situations giving growers greater flexibility. With 'soft' chemistry, beneficials are typically not harmed meaning they are free to control any new pest outbreak, saving time and money.[4]

Conclusion
By integrating some of the methods outlined here, we can make pest control more efficient without the need for using more chemicals. There are many tools in a toolbox; don't dull one. By utilising other practices, using 'soft 'chemistry first, we don't run the risk of losing our most effective poisons against some of our major pests.

Sources:
[1] Beatsheet, Considerations when choosing chemical control options, 2023) (https://thebeatsheet.com.au/key-pests/considerations-when-choosing-chemical-control-options/, accessed 26/01/24)

[2] (Source: Beatsheet, Unnecessary spraying not good for your crop your industry or your bank balance, Hugh Brier, 14 Oct 2019, https://thebeatsheet.com.au/unnecessary-spraying-not-good-for-your-crop-your-industry-or-your-bank-balance/, accessed 26/01/2024)

[3] (Source: GRDC, Soybean Grownotes northern, March 2016, https://grdc.com.au/__data/assets/pdf_file/0035/364877/grdc-grownotes-soybeans-northern.pdf, accessed 26/01/2024)

[4] (Source: Vine Magazine, Chemical Use Soft in Nature, Not on Results, May 2022, https://issuu.com/vine-magazine/docs/18_2_vinemag_fin2_digital/s /15789648, accessed 30/01/2024)

Active ingredient	Mode of Action 1	Rate (g ai/ha) 2	Ladybird beetles 3	Rove beetles 4	Hoverflies 5	Aphid parasitoids 6	Lepidopteran larval parasitoids 7	Egg parasitoids 8	Predatory bugs 9	Lacewings 10	Predatory mites 11	Spiders 12
Nucleopolyhedrovirus 13	31	100	L	L	-	L	L	L	L	L	L	-
Bacillus thuringiensis 13	11A	3286	L	L	-	L	L	L	L	L	L	L
Chlorantraniliprole	28	24.5	L	L	L	L	L	L	L	L	L	L
Flonicamid	29	50	L	L	L	L	L	M	L	L	L	L
Afidopyropen	9D	5	L-H	L	L	L	L	L	L	L	L-M	L
Pirimicarb Low 14	1A	75	L	L	L	VH	L	VH	L	L	L-M	L
Paraffinic oil	-	1584	M	L	-	L-VH	L	L	L-M	L	L	-
Indoxacarb	22A	60	M-H	L	L	L-VH	VH	L	L-M	L	L	-
Emamectin benzoate	6	5.1	L	L	L	M-H	VH	VH	M	L	M	-
Abamectin	6	5.4	M-H	L	-	M-H	L	VH	M-H	M	M	L
Pirimicarb High 14	1A	500	L-M	L	L	VH	M-VH	VH	M	L	M	-
Spinetoram	5	36	L-M	L	-	H-VH	VH	H	L-M	M	L-H	-
Gamma-cyhalothrin 15	3A	4.5	VH	L	L	L-M	VH	VH	VH	VH	L-VH	L
Diafenthiuron	12A	300	M-VH	L	L	M-VH	VH	L	VH	L	M-VH	-
Sulfoxaflor	4C	50	L	L	-	H-VH	VH	VH	VH	L	L	-
Thiodicarb	1A	281.25	H-VH	L	-	M-VH	M	VH	M	L	H	L
Synthetic Pyrethroids (excl. Gamma-cyhalothrin) 16	3A	Variable	H-VH	M	H	L-VH	VH	VH	H-VH	VH	L-VH	VH
Methomyl	1A	450	VH	VH	-	VH	M	VH	H-VH	VH	VH	-
Organophosphates 17	1B	Variable	H-VH	M-VH	L-H	VH	VH	VH	VH	VH	L-VH	H-VH

Cesar Australia

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GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

Mortality								
L	<30%	M	30-79%	H	80-99%	VH	>99%	-	Data not yet available

Table 1: Impact of Insecticides on Beneficial Insects in Australian Grain Crops

(Source: Cesar Australia, Impact of insecticide on beneficial insects in Australia grain crops, Version 2, Published May 2023, https://cesaraustralia.com/wp-content/uploads/2022/05/Cesar-Beneficials-Chemical-Toxicity-Table-v2.0.pdf, accessed 26/01/2024)

Northern region: Belyando, Central Highlands, Dawson & Callide

Insecticide	June				July				Aug				Sept				Oct				Nov				Dec				Jan				Feb				Mar				April				May			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Increasing SELECTIVITY Decreasing																																														
Bacillus thuringiensis (Bt)																																														
Helicoverpa viruses																																														
Paraffinic oil Note 1																																													
Chlorantraniliprole Note 2,3																																														
Indoxacarb Note 4																																														
Spinetoram Note 2,4,5																																													
Emamectin benzoate Note 2,4,5																																													
Carbamates Note 2,4,6																																													
Pyrethroids Note 2,4,7																																													

Table 2: Best Practice Product Windows and Use Restrictions to Manage Insecticidal Resistance in H. armigera in the Northern Region.

(Source: Resistance Management Strategy for Helicoverpa Armigera in Australian Grains, GRDC, April 2018, https://ipmguidelinesforgrains.com.au/important/uploads/GRDC_RMS_Helicoverpa-Armigera.pdf, accessed 26/01/2024)

Trialling nitrogen top-dressing rates after a legume crop

By Belinda Billing

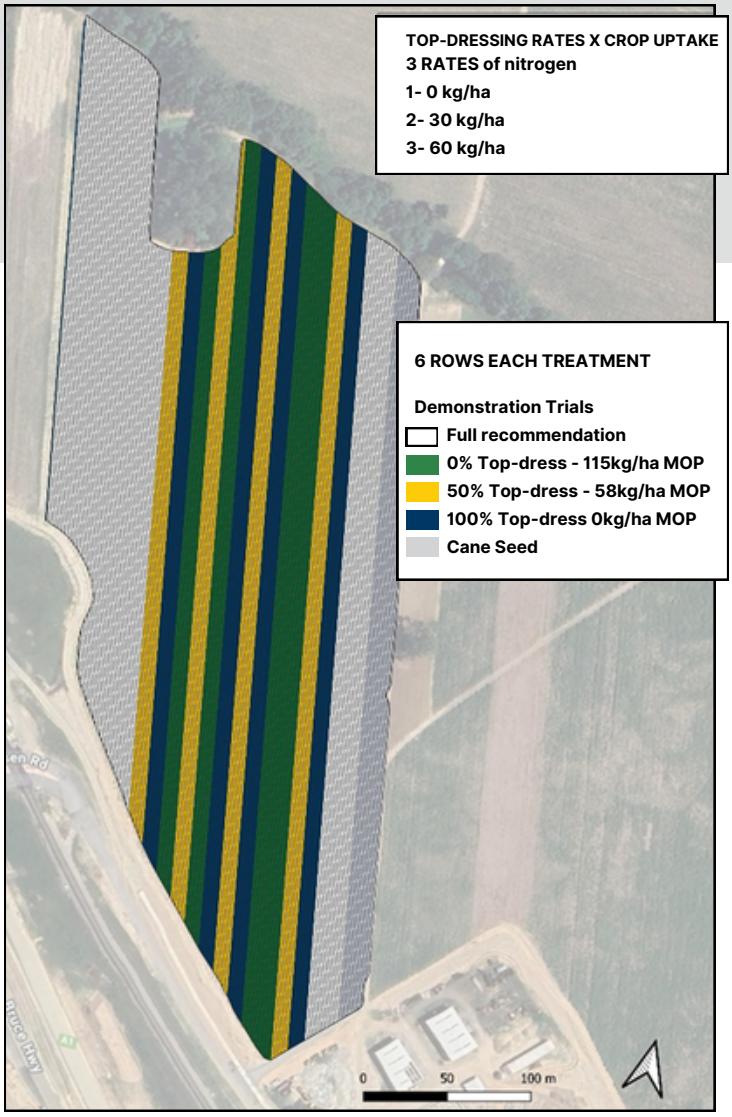


Figure 1. Trial rates for nitrogen top-dress after legume fallow crop.

Grower:	**Doug Hardwick**
Location:	**Edmonton, Mulgrave QLD**
Crop	**Plant Cane - Rep 1: Mixed varieties;**
Class/Variety:	**Reps 2, 3, 4: SRA15**
Soils:	**Edmonton**
Project Officer:	**Eduardo de Lima Reis**
Collaborator:	**Jordan Villaruz**
Year/s:	**2022-23**

Treatments

- **T1: 0kg of N on top-dress**
- **T2: 30kg of N on top-dress**
- **T3: 60kg of N on top-dress**
- **All treatments received full rate of potassium at 100kg/ha.**

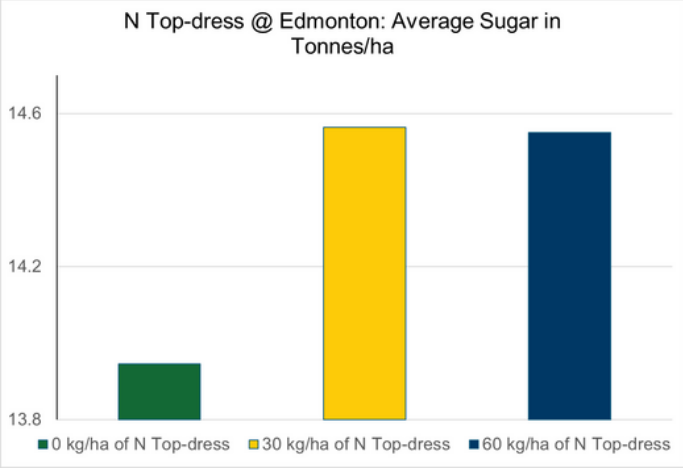
Summary

The integration of legume crops into sugarcane cultivation is known to be beneficial to the subsequent sugarcane crop. Legumes, with their nitrogen-fixing abilities, not only contribute to soil fertility but also provide a natural means of replenishing essential nutrients. However, the success of this rotational approach hinges on meticulous management, especially when it comes to fertilisation.

Tailoring fertiliser rates to the specific needs of sugarcane post-legume cultivation is vital to maximising yield, preserving soil health, and ensuring long-term viability of the agroecosystem.

This demonstration investigated the contribution of a legume crop in a sugarcane crop rotation, highlighting several key benefits:

- Enhanced soil nitrogen levels
- Reduced nitrogen fertilizer dependency
- Improved crop yields
- Environmental and economic sustainability.



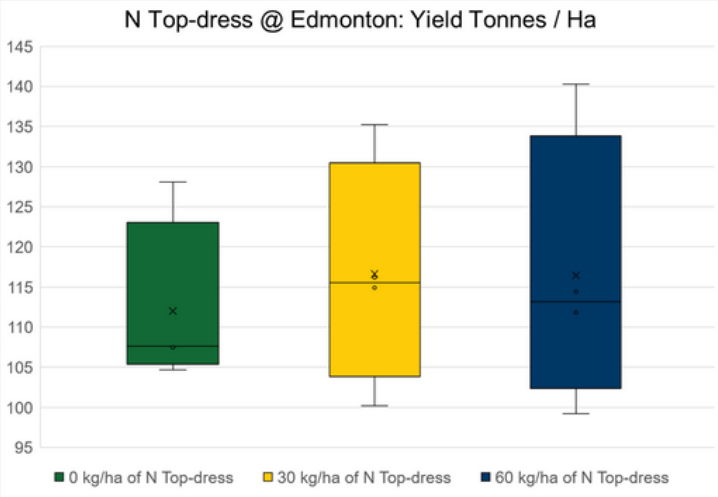


Figure 2 (above). Average sugar (tonnes/ha) for each treatment.
Figure 3 (right). Yield tonnes of cane/ha per treatment (Box and Whisker plots).

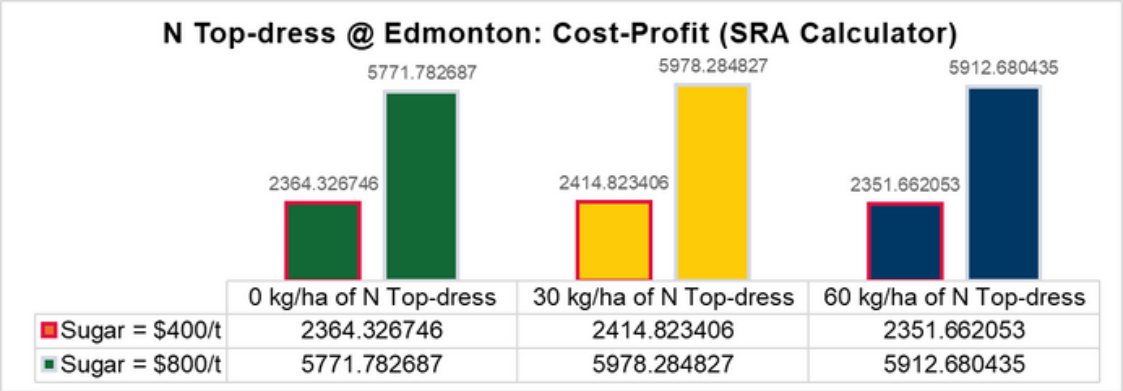


Figure 4 Cost-Profit averages for sugar price at $400 per tonne and $800 per tonne, assuming harvesting cost at $10.00 per tonne and Urea cost at $1000 per tonne.

Results

There was no statistically significant difference between treatments for CCS, yield (t/ha) and sugar per hectare.

The results were influenced by other variables than just the amount of fertiliser used such as variety and the inherent soil variability. This means that understanding the results requires considering these different factors that affected the outcome.

It was inconsistencies between replicates of each treatment that were observed and the variability in outcomes that made it challenging to determine the optimal strategy. This highlights the complexity of agricultural practices and emphasizes the importance of considering multiple factors in decision-making.

Incorporating the cost-benefit component reveals that the treatment with 30kg/ha of N demonstrates superior economic performance compared to other treatments. This is particularly pronounced in scenarios with sugar prices at $400 or $800 per tonne, harvesting cost at $10.00 per tonne, and urea at $1000 per tonne.

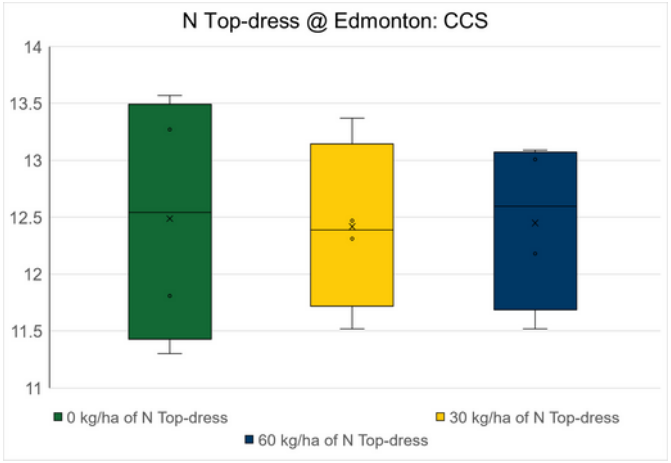


Figure 5. CCS results per treatment (Box and Whisker plots).

Demonstration design and methods

A mix of legumes was grown in the block over fallow before the cane was planted with 33kg/ha of nitrogen. Top-dress fertiliser was applied between November 10 and 18, 2022.

The treatments were distributed according to a randomised, replicated trial design. The 60kg/ha reflects the growers' standard practice on this soil type for planting.

The block was commercially harvested on September 25th and 26th, 2023. Tonnes and CCS were supplied through mill data for each replicate.

Recommendations

This experiment demonstrates the benefit of growing legume crops during fallow as part of the sugarcane cycle. Reduced nitrogen fertiliser rates did not reduce sugarcane productivity, or adversely affect the quality of the sugarcane.

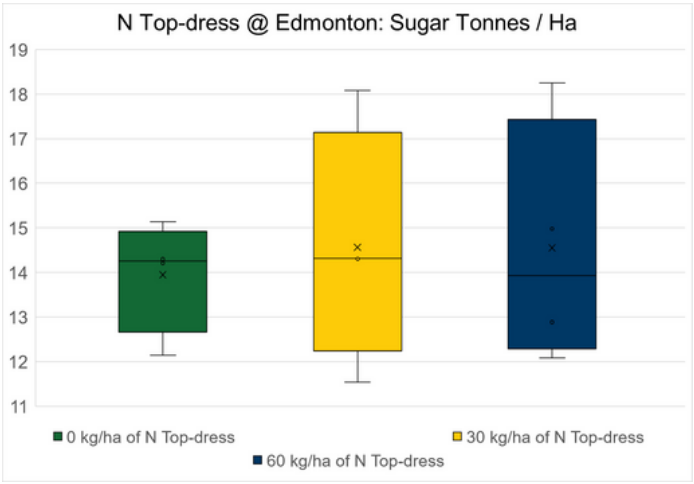


Figure 6 Tonnes of sugar/ha per treatment (Box and Whisker plots).

For more information, contact the Farmacist Office in Gordonvale on (+61) 488 980 090.

Precision to Decision is funded by the partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation and Farmacist.

Trialling Pasture N with different rates of fertiliser on alluvial soil

By Belinda Billing

Soil Type:	**Innisfail**
Location:	**Aloomba, Mulgrave QLD**
Crop:	**SRA26 1st Ratoon, sugarcane**
Grower:	**Doug Hardwick**
Project Officer:	**Eduardo de Lima Reis**
Year:	**2022-2023**
Collaborator:	**Jordan Villaruz**

Treatments:
T1: 100% 104N 0P 79K 6S/ 5 reps
T2: 100% 104N 0P 79K 6S + Pasture N / 5 reps
T3: 75% 79N 0P 76K 5S/ 5 replicates
T4: 75% 79N 0P 76K 5S + Pasture N / 5 reps
T5: 0 Fertiliser + double Pasture N/ 1 reps
T6: 0 Fertiliser / 1 rep

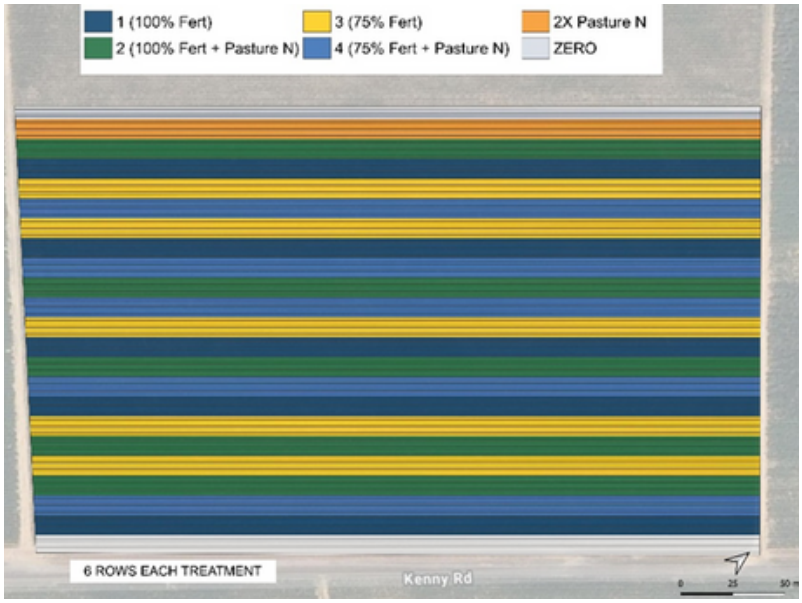


Figure 1. Pasture N - Aloomba-QLD trial layout 2022/23

Summary

This demonstration investigated the potential of microbial enhancement fertiliser product Pasture N to improve or maintain sugarcane yield with full and reduced fertiliser rates.

Pasture N is a liquid product that contains nitrogen fixing microbes, bacillus microbes and plant based amino acids. It has been used in pastures to increase biomass with reduced applications of nitrogen fertiliser. We were interested to see if we could get similar results in sugarcane.

The manufacturer explains that the applied microbes colonise the plant, the root surface and surrounding soil. They fix atmospheric nitrogen, converting it to plant available ammonium nitrogen similar to Rhizobium/legume symbiosis. Bacillus microbes promote a balanced soil microbiome and may inhibit the growth of pathogenic fungi and bacteria.

Amino acids enhance the plant uptake of nitrogen fixing microbes and can stimulate crop growth.

This site has a rich alluvial soil which has a history of producing high tonnes with relatively low CCS. The grower was interested to see whether yield could be maintained while saving money on fertiliser and hopeful that the demonstration may also improve sugar content in his crop.

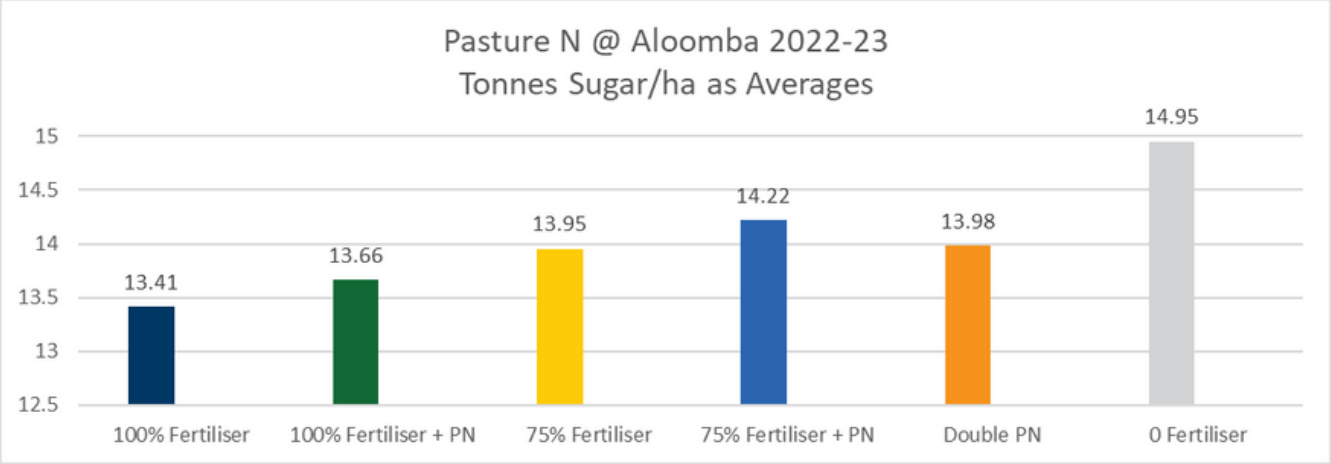


Figure 2. Tonnes of Sugar per hectare averages per treatment.

Results

There was no significant difference between treatments, including the 0 and 0 with double the rate of Pasture N applied.

This indicates that in this season fertiliser could be reduced by 25 percent with no impact on yield at this site. There was no indication that the Pasture N increased yield or sugar production.

There was minimal variation between treatments and replicates except for one outlier replicate with lower-than-average tonnes/ha in the 100% treatment. The least variation was found in the 75% fertiliser treatment. The highest variation in tonnes/cane and CCS was found in the 100% fertiliser treatment, with less variation occurring with the application of Pasture N. Variability was reduced in CCS results for both treatments where Pasture N was applied.

CCS in the zero plots were the highest with lower cane tonnage, although there is only one replicate of each of these treatments.

Demonstration design and methods

Fertiliser was applied on November 3, 2022, according to a randomised, replicated trial design. The 100 percent rate reflects the growers' standard practice on this soil type, which is a reduced nitrogen rate compared to the full rate of 140N calculated through SIX EASY STEPS.

Pasture N was applied at out of hand on February 21, 2023, using a high-rise sprayer with a water rate of 300L/ha. Prior to application the freeze-dried nitrogen fixing microbes are mixed with the Bacillus microbes and amino acid formulation. The microbial formulations all require refrigeration before use and must be applied to cane in moist conditions. Hot, dry and/or windy conditions will damage the microbes, preventing colonisation.

The block was commercially harvested over two days from October 31 to November 1st, 2023. Tonnes and CCS were supplied through mill data for each replicate.

Recommendations

This demonstration shows that high cane yields are possible on this soil with a reduced rate of nitrogen. In this instance reduction of nitrogen fertiliser and application of pasture N appeared to increase CCS and reduce variation in CCS.

Continued investigation of the potential of Pasture N over multiple years in a range of soils and climate types is recommended.

Precision To Decision is funded by the partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation, and Farmacist.

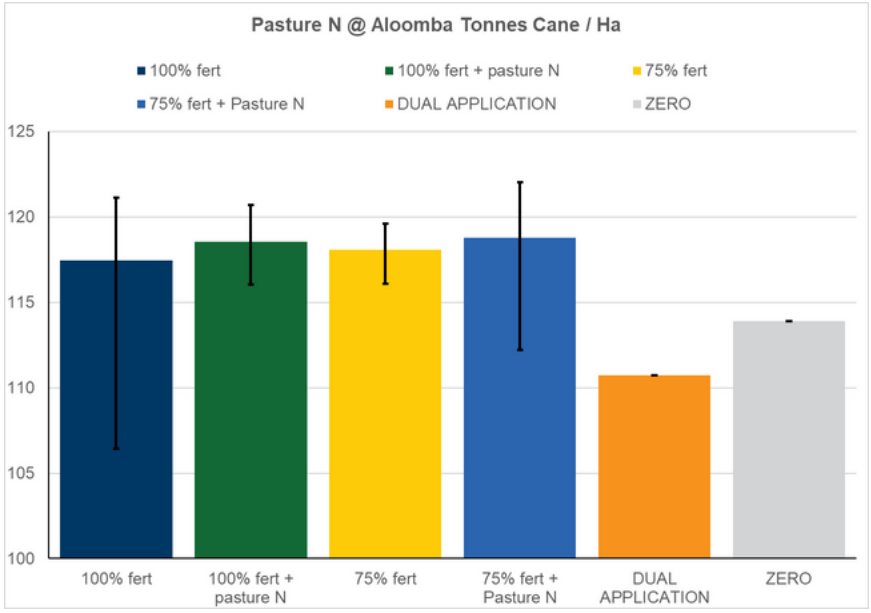


Figure 3. Tonnes of cane/ha per treatment (with max and min bars).

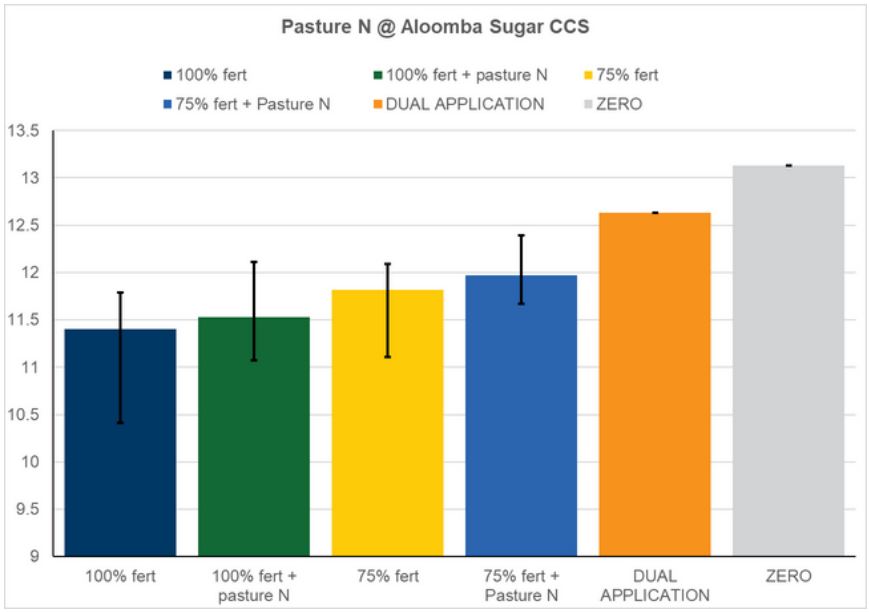


Figure 4. CCS Results per treatment (with max and min bars).

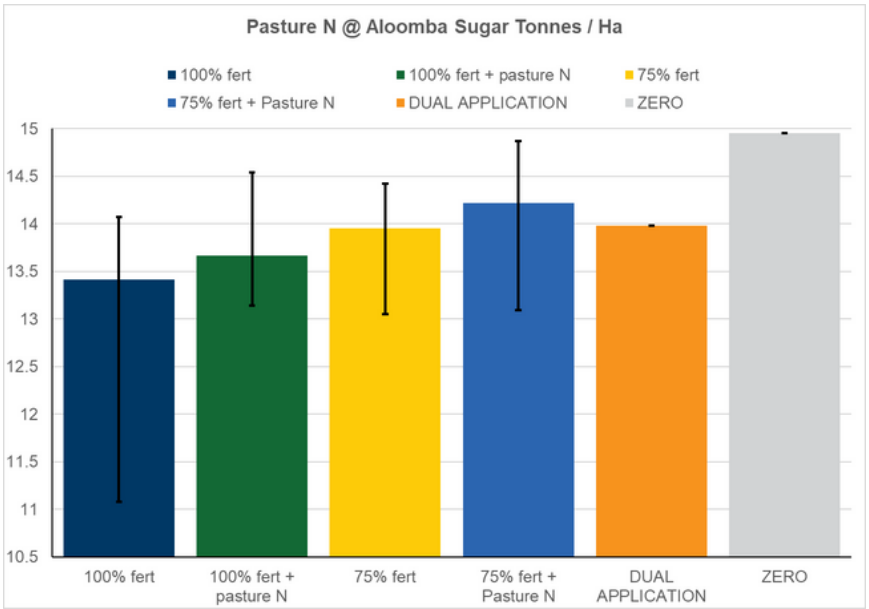


Figure 5. Tonnes of sugar/ha per treatment (with max and min bars).

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