



GROWER STORIES

IMPROVING NITROGEN USE EFFICIENCY



AUSTRALIAN COTTON SUSTAINABILITY FRAMEWORK
PLANET. PEOPLE. PADDOCK.

Save money, time, and greenhouse gases: match N to yield target

What is the practice we want to change?

- + Applying extra nitrogen (N) fertiliser 'just in case' to make sure yield is maximized.

What is the cause of the current practice?

- + N is relatively cheap
- + Unsure if plants have sufficient N.

What is the specific change needed?

- + Accurately calculate and apply fertiliser N to match plant needs for the yield target.

What is the motivation to make that change?

- + Money and time may be wasted if more N is applied than the plant needs. Excess fertiliser N does not always stay in the soil for the next crop
- + Excess N can have major negative impacts on yield, picking costs, and quality discounts
- + More than half the greenhouse gas emissions of a bale of cotton come from N fertiliser: improving NUE is essential to cut industry greenhouse emissions per bale.

AT A GLANCE: WHAT YOU NEED TO KNOW

NAME: Graham Volck. Emerald, Central Queensland.

ENTERPRISE TYPE: Irrigated cotton production.

What's being done to improve NUE?

- + Eliminated an in-crop side dressing by doing in-crop and post-season soil tests to match N to target yield.
- + *myBMP* check level: 2

Why did you make the change?

- + Keep excess N out of the farm ecosystem
- + Save money
- + Ensure consistency of N to maximise yields.

What's involved?

1. Check yield maps to look for uniformity of yield from head ditch to tail drain
2. Conduct soil test pre-planting and in-crop to determine nutrient needs
3. Decide if an in-crop application is needed
4. Validate with a post-crop soil test to see what N is in the soil.

What is the cost/benefit for you?

Cost of two nitrate soil tests (\$30 per test):
+ About \$0.60/ha for a test done every 100ha

Benefit of removing one in-crop application

- + Save \$68-\$80/ha in fertiliser and \$10-\$12/ha in application (one side-dressing)
- + No impact on yield
- + Less soil disturbance helps maintain soil structure and soil organic matter
- + Time saved
- + Reduced waste and nitrate runoff.

Is this the new normal?

Most growers know when and how to apply N for their farm. Getting the rate right is critical for improved NUE.

When the right rate of N is being applied, other constraints to yield can be identified. These include irrigation management, seasonal conditions, soil type, and soil condition. These yield-limiting issues need to be identified and managed. When they are all managed together, yield will increase – and so will NUE.



"The money saved mightn't seem much in the total cost of cotton production, but all the little costs add up. I think of it in terms of holidays. If I spend an extra \$80/ha on 500ha for a side dressing that will have no impact on yield, that's a \$40,000 family holiday I've just spent. That would have been a pretty good holiday! For about 60 cents/ha, I can save that money."

SUSTAINABILITY FAST FACTS

Nitrogen Use Efficiency

- + Reducing greenhouse gas emissions is one of the most important sustainability issues for cotton customers
- + Fertilisers contribute about 60% of the greenhouse gases to grow, gin and move to port a bale of cotton
- + About 60% of fertiliser greenhouse emissions come from the manufacturing process, and about 40% are on-farm when N in its active form (as in fertilizer, as opposed to soil N) releases N₂O through soil microbial reactions
- + NUE is a measure of efficiency: the higher the NUE, the more efficient N is being used. The current industry benchmark is for growers to have an NUE of 13–18 kg lint/kg N¹. The actual industry average for the five years to 2019 was 8 kg lint/kg N². This shows money and time may be being wasted and greenhouse gas emissions from N may be higher than they could be
- + Increasing N does not necessarily translate to an increase in yield.
- + Excess N can have major negative impacts on yield, picking costs, and quality discounts

¹Australian Cotton Production Manual 2020, p 44.

²Australian Cotton Sustainability Report 2019

RESOURCES AND MORE INFORMATION:

[myBMP: Soil health – Nutrition](#)

[CottonInfo: Crop Nutrition](#)

[Australian Cotton Production Manual](#)



GROWER STORIES: PLANET. PEOPLE. PADDOCK.

MORE DETAILS: GRAHAM VOLCK

1. Study yield maps.

"N tends to track from the head ditch to tail drain with irrigations. Yield maps show if there any differences down rows (and across the field). The aim is for uniformity of yield, rather than having an N deficiency at the head and lush growth needing defoliation at the tail end. High yield comes from having consistent N down and across the field."

2. Soil tests for nutrient budget.

"Two soil tests are done. A comprehensive pre-planting soil analysis is used for the nutrient budget to work out how much of each nutrient is needed for the target yield. An in-crop nitrate test shows if existing soil N is sufficient."

3. Interpret the in-crop test.

"Work with an adviser who understands plant nutrition to decide if N is sufficient. The more tests you do over time, the more confidence you will have in decision-making."

4. Soil test to validate the numbers.

"A post-crop soil nitrate test is done to confirm nutrition assumptions. If there is N in the soil, the assumptions were correct and yield wasn't limited by lack of N."



Lessons and top tips:

An adviser who knows plant nutrition is critical to interpret the soil test

Start small if you want. If the in-crop tests show you have sufficient N but you just don't want to risk not making that extra application, start with a portion of the crop and trial the results.

