



CottonInfo nitrogen management trials: Southern NSW

Nitrogen management for efficient cotton production in Southern NSW

Kieran O’Keeffe, CottonInfo and (the late) Dr Ian Rochester, CSIRO

The 2014–15 cotton season in southern NSW will be remembered for exceptional returns. Record breaking yields coupled with prices well over \$500/bale make it the best returning season so far.

Everything just lined up. A good early start in late September and early October, warm but not extreme temperatures through the boll fill period, good management of crops and the high potential of the relatively new CSD Bollgard II varieties 74BRF and 71BRF.

Overview

- Know the nitrogen status in your soil before planting and monitor nitrogen early in the crop.
- Getting nitrogen fertiliser rates in the right range is good for the bottom line and the environment.
- An oversupply of fertiliser nitrogen can make crops difficult to manage late in the season.
- Nitrogen management is just one factor in efficient cotton production

Nitrogen rate trials

CottonInfo Regional Development Officers (RDOs) carried out nitrogen rate trials in all the cotton growing valleys of Australia during 2014–15. The purpose of these trials was to explore the factors that influence the efficiency of the plant turning applied nitrogen fertiliser into lint, or nitrogen fertiliser use efficiency (NFUE). The results of the two southern NSW trials are presented in this article.

	Site 1	Site 2
Location	Benerembah, Griffith	Darlington Point
Irrigation layout	Zero grade stepped bankless	Furrow 1 in 2000 slope
History	Two cereal crops before landforming	5t/ha poultry manure over that last two seasons, back to back cotton
Starting soil test (kg N/ha)	Unknown	102 (0 to 90 cm)
Variety	71BRF	74BRF
Irrigation water (ML/ha)	8.2	9.0
N strategy (kg N/ha)	100 N urea 150 N side dressed	130 N gas 100 N side dressed
Average site yield (b/ha)	13.25	13.94

Table 1. Site details of cotton nitrogen trials in southern NSW

Figures 1 and 2 show the yield results for the trials at Benerembah and Darlington Point. Both trials were replicated, and statistical analysis showed no significant yield difference between the treatments.

In both trials it was surprising to see a good yield response from the low nitrogen strips. This indicates that the plants were able to source adequate nitrogen from the soil during the season and losses due to denitrification were minimised.

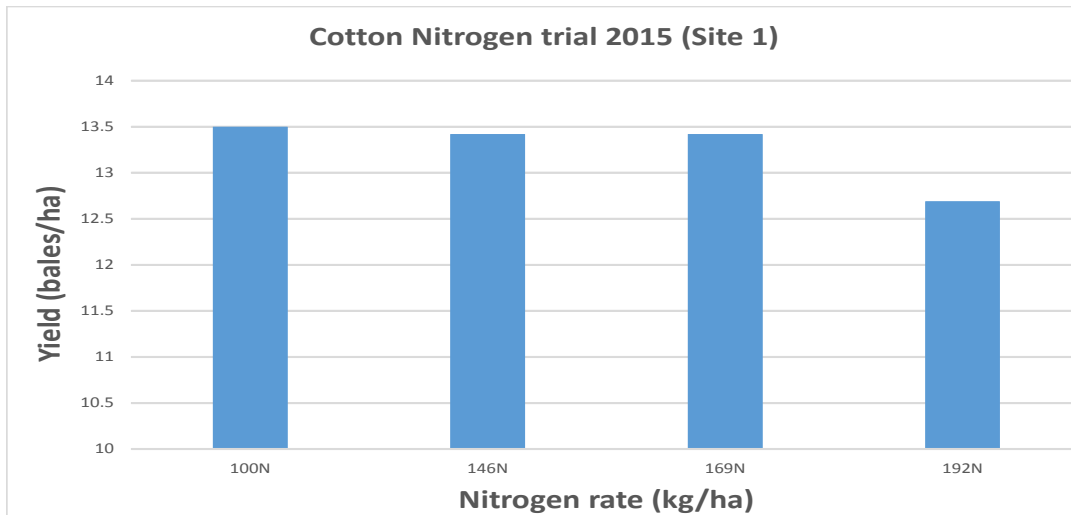


Figure 1. Yield response to different rates of nitrogen fertiliser at Site 1, Benerembah

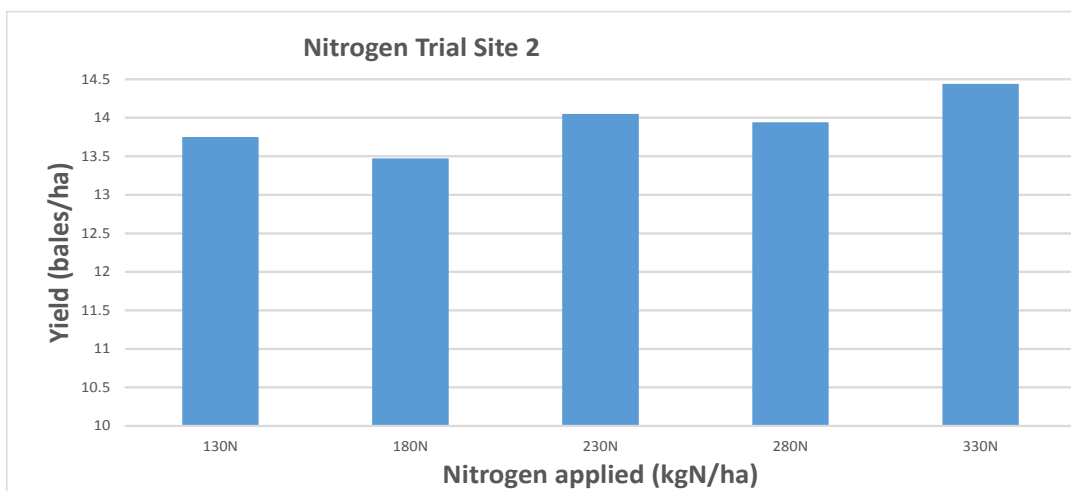


Figure 2. Yield response to different rates of nitrogen fertiliser at Site 2, Darlington Point

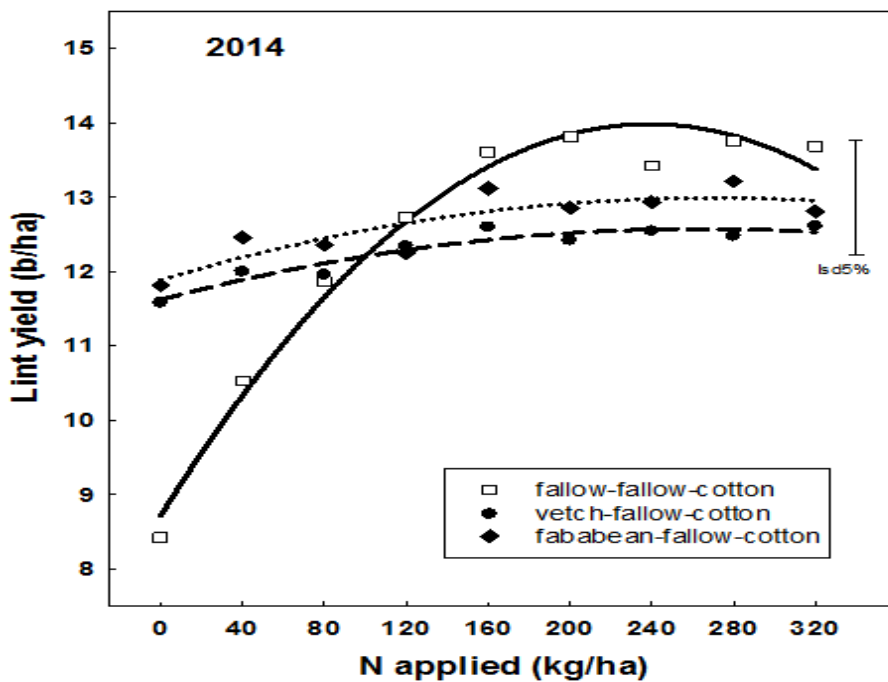


Figure 1. Lint yield as influenced by nitrogen fertiliser response experiments at ACRI Narrabri. The economic nitrogen fertiliser rates were 220, 135 and 153 kg N/ha for cotton in the fallow, vetch and faba bean rotations (Rochester 2014)

The lack of yield response also highlights that adding more nitrogen does not necessarily result in extra yield. Adding more nitrogen results in extra input costs and can lead to crop management problems with rank vegetative growth delaying maturity of the crop. A rank crop can also encourage boll rots and hamper defoliation.

Nitrogen fertiliser use efficiency (NFUE)

Growers can monitor the efficiency of their applied fertiliser with a simple calculation using yield in kg/ha of lint divided by the applied nitrogen fertiliser in kg/ha.

To achieve the economic optimum nitrogen fertiliser rate, the yield/N fertiliser index should be between 13 and 18. If the index is greater than 18, insufficient nitrogen has been applied; if the index is less than 13, too much nitrogen has been applied (Figure 2).

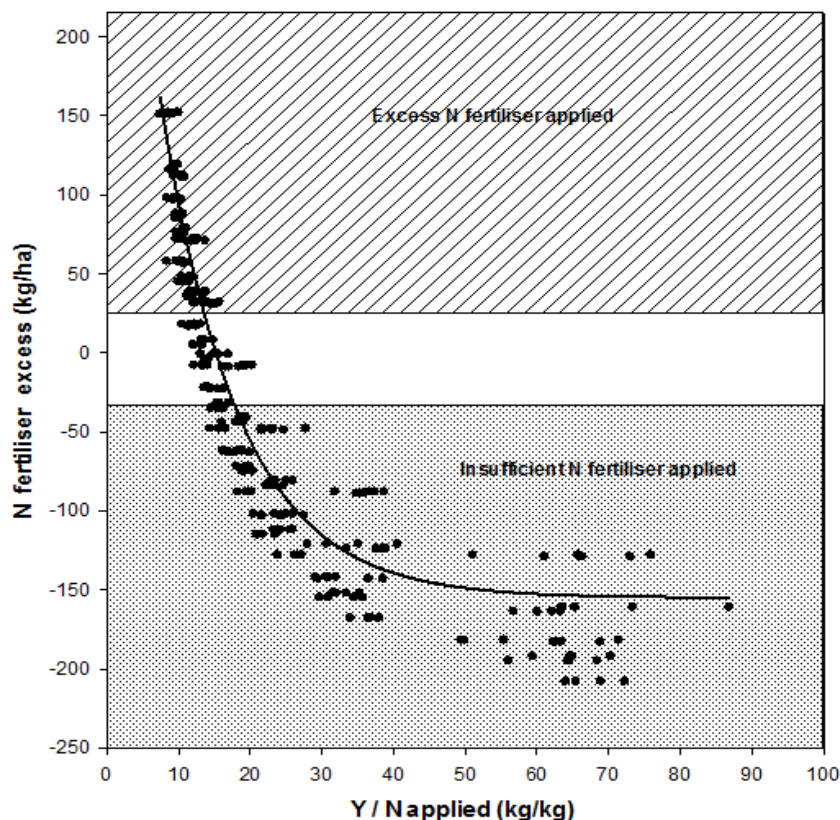


Figure 2. The relationship between excess nitrogen fertiliser application (relative to the economic optimum nitrogen fertiliser rate) and an index of nitrogen fertiliser use efficiency (lint yield /N applied) (Rochester 2014).

kg lint/ha	kg N/ha	NFUE
3065	100	30.7
3020	146	20.7
3048	169	18.0
2877	192	15.0

Table 2. Site 1 Benerembah NFUE

kg lint/ha	kg N/ha	NFUE
3108	130	23.9
3048	180	16.9
3174	230	13.8
3154	280	11.3
3269	330	9.9

Table 2. Site 2 Darlington Point NFUE

Table 2 indicates that NFUE at the Benerembah site was efficient at the 170 to 190 kg N/ha range, which was below the grower rate for the rest of the field of 250 kg N/ha. Table 2

shows good efficiency for nitrogen applied between 180 and 230 kg N/ha, which coincided with the grower rate of 230 kg N/ha for the field.

Surveys of grower practices in 2011–12 and 2012–13 indicated that the majority of growers used excess amounts of nitrogen fertiliser to achieve relatively moderate yields.

The survey of 2011–12 (189 respondents) reported average lint yields of 9.45 b/ha and 218 kg N/ha applied. The yield/N fertiliser index for this data set was 10.9, indicating an excess of 75 kg N/ha was applied on average (Figure 3).

The 2012–13 data indicated growers used 243 kg N/ha on average and produced 10.2 b/ha, indicating the yield/N fertiliser index for this data set was 9.53, indicating an excess of 110 kg N/ha was applied on average (Figure 3). Applying more nitrogen than is required to satisfy the crop's demand will not increase yield. Rather, growers need to assess their cropping system's nitrogen use efficiency and determine if other factors are limiting efficient cotton production.

Plans for next season

The main message from this work is to encourage growers and advisors to:

- have a good understanding of starting nitrogen in paddocks through deep soil nitrogen tests
- set up realistic nitrogen budgets/yield targets
- monitor nitrogen status through leaf and petiole testing early in the crop's development.

Deep soil N tests at these sites, at the end of the season, show that nitrogen levels are now very low at these sites. If cotton is to be grown back to back in these fields this low starting level needs to be factored into the nitrogen budget for next season.

The CottonInfo Regional Development Officers will be conducting more nitrogen efficiency trials this coming season. The main aim of these trials is to investigate what nitrogen losses are occurring through early irrigation events and to look at when is it best to apply nitrogen to the crop comparing all nitrogen up front with split nitrogen applications. Nil nitrogen strips will be conducted over more sites to gauge what is actually coming from mineralised soil nitrogen.

Further information

Kieran O'Keeffe

CottonInfo Regional Development Officer

M: 0427 207 406

E: kieran.okeeffe@cottoninfo.net.au