Optimising Nitrogen Application Rates for Australian Cotton

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Background Information:
Applied cotton Nitrogen rates increasing within Australia:
The Australian Cotton industry in the last decade has enjoyed extraordinary growth in cotton lint yields, increasing by 28% from 2038 kg lint/ha in 2005 to 2610 kg lint/ha in 2015. Unfortunately the growth in production has led to a trend of cotton farmers applying excessive amounts of nitrogen (N). In many situations the increase of applied N is not required by the cotton plants, resulting in greater N losses from the cotton system and a decline of nitrogen use efficiency (NUE).

Research Question:
Are Australian cotton producers able to incorporate researched optimum N application rates to improve NUE but maintain yields considered high and profitable (> 2700 kg lint/ha)? The aim of the investigation was to determine the impact of various nitrogen rates on cotton lint yield, NUE and developed an economic optimum N rate.

Results:
Yield-
Applied nitrogen rates had an affect on cotton lint yield (p<0.05), with the highest yield achieved by the 350 kg N/ha rate (2744 kg/ha)(Figure 1). While the 250 kg N/ha rate was within significant difference of the 350 kg N/ha rate, and yielded above the objective yield of 2700 kg lint/ha.

Key Findings:
Exceptional yields with greater N efficiency
250 kg N/ha was considered the optimum N rate for farmers in North Western NSW. The N rate yielded similar to the highest yielding treatment and was closest to the optimum economic N rate. Australian cotton farmers can produce exceptional lint yields, while at the same time have greater farming sustainability and better N efficiency.

Economic Optimum N rate-
Utilising methodology of Belanger (2000), the optimum economic rate of N was determined to be 237 kg N/ha (Figure 2).

Acknowledgements:
This project was supported by funding from the Cotton Research and Development Corporation and NSW Department of Primary Industries. Technical assistance from Tim Grant, Roseannah Holcombe and trial site owner Rod Smith.

Figure 1: Cotton Lint yield at varied applied N rates from Gunnedah, North Western NSW. Error bars signify N rate standard error.

Figure 2: Economic Optimum N rate (dashed line) overlaid on lint yield and Applied NUE. Error bars signify N rate standard error.