



Gross Margin risk analysis: nitrogen prices and NFUE

The [2022-23 CottonInfo gross margin budget](#), the nitrogen (N) fertilizer inputs cost was \$802/ha or 17% of total variable costs (fully irrigated), the second highest variable cost only slightly better

This was largely due to the N (urea) price which was \$1320 for the 2022-23 GM, with the potential for some growers to have paid even more (Figure 1). The high urea prices were largely driven by gas prices (a key input into product manufacturing) which had spiked due to the Russian invasion of Ukraine.

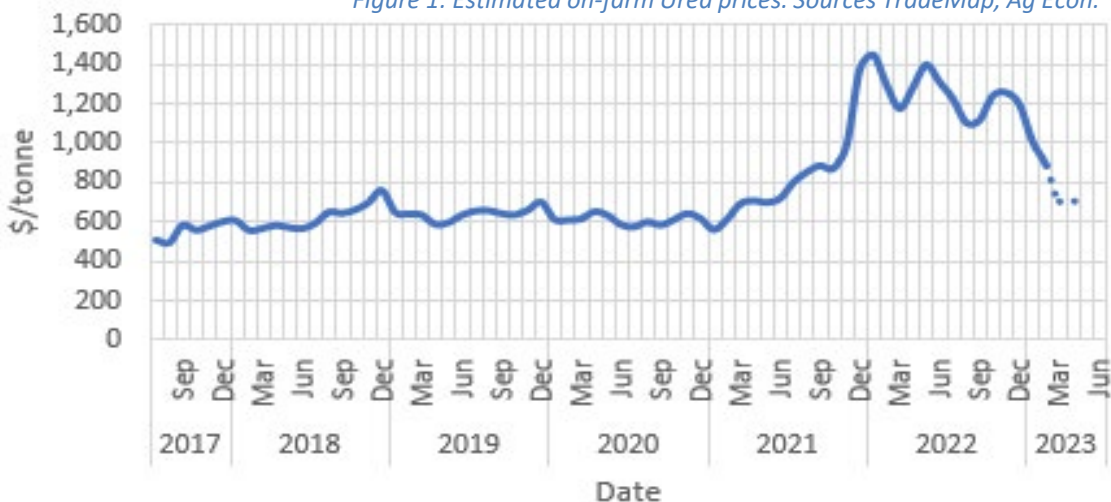
More recently N prices have come down from their lofty heights as demand and supply have adjusted to the new global conditions. Prices in Apr-May 2023 were reported around \$700/tonne on farm.

While a lower N price is good news for growers, nitrogen remains a high input cost item partly due to a low industry average nitrogen fertilizer use efficiency (NFUE).

So while there is little that can be done about the N price, growers can still manage their N input costs by looking at their NFUE. A good place to start is to use survey and benchmarking data to identify how your NFUE compares to regional and national averages. The [2022 Cotton Grower Survey](#) showed industry average NFUE was 9.5 kg lint/kg applied N.

In contrast, the current industry benchmark suggests that growers should be aiming to grow 13–18 kg lint/kg of applied N ([ACPM, 2022](#)). Put differently, this means growers should be able to achieve the same yields with 27% to 47% less N fertilizer. When compared to 2022 industry NFUE survey data, these benchmark targets equate to the top 25% and top 2% of growers respectively. **Importantly, higher NFUE was also correlated with higher yields!**

Figure 1: Estimated on-farm Urea prices. Sources TradeMap, Ag Econ.



So, what does this all mean for the cotton gross margin?

Applying the most recent N price (\$700/tonne) and NFUE (9.5 kg lint/kg N) data to the [customisable gross margin spreadsheet](#) (fully irrigated 12 bales/ha @\$600/bale), gives a gross margin of \$4134/ha (Figure 2). With N inputs making up 11% of total costs.

In comparison, the lower benchmark target of NFUE=13 (top 25% of industry) generates a gross margin of \$4250/ha, an improvement of \$116/ha (+3%), while the upper target benchmark of NFUE=18 (2% of industry) generates a gross margin of \$4338/ha, an improvement of \$205/ha (+5%). Of note, these results keep yields and all other costs constant. In practice, low NFUE has been associated with defoliation issues (increased cost) and quality downgrades (decreased income).

Example gross margin budgets for Bollgard3 [®] , Roundup Ready Flex [®]	NFUE = 9.5 =industry av.	NFUE = 13 = top 25%	NFUE = 18 = top 2%
Income	\$/ha	\$/ha	\$/ha
12 bales lint/ha @ 600/bale	7200	7200	7200
Cotton seed @ \$95/bale	1140	1140	1140
TOTAL INCOME (A)	8340	8340	8340
Variable Costs	\$/ha	\$/ha	\$/ha
Fallow management	63	63	63
Farming: Pre-planting	45	45	45
<i>NFUE (kg lint / kg applied N)</i>	<i>9.5</i>	<i>13</i>	<i>18</i>
<i>Applied N kg/ha (for 12 bales/ha)</i>	<i>286</i>	<i>210</i>	<i>151</i>
<i>N price \$/t (Urea @ \$700/t with 46% N)</i>	<i>1522</i>	<i>1522</i>	<i>1522</i>
<i>Application cost</i>	<i>48</i>	<i>48</i>	<i>48</i>
<i>Total N costs</i>	<i>483</i>	<i>367</i>	<i>278</i>
<i>Other fertilizer costs</i>	<i>314</i>	<i>314</i>	<i>314</i>
Total Nutrition cost	797	681	592
Planting & in-crop farming	141	141	141
Total irrigation costs @9.2ML/ha (C)	584	584	584
Insurance	267	267	267
Crop protection, application & licence fee	827	827	827
Defoliation	152	152	152
Picking, cartage & ginning	1223	1223	1223
Farming: Post-crop	108	108	108
TOTAL VARIABLE COSTS /HA (B)	4206	4090	4002
GROSS MARGIN /HA (=A-B)	4134	4250	4338
GROSS MARGIN /ML (=A-B)/C)	449	462	472

Figure 2. Gross Margins for the industry average NFUE, and target benchmarks (Top 25% and Top 2%).

Improved NFUE also means that there is lower GM risk from fluctuating prices (Figure 3). At the industry average NFUE=9.5 a price increase back to \$1300/t results in a gross margin reduction of \$373/ha or -9%. In comparison, the GM change for NFUE=13 is \$273/ha (-6%), and for a NFUE=18 is \$197/ha (-5%).

		N (Urea) price \$/tonne				
		500	700	900	1100	1300
NFUE	9.5	4258	4134	4009	3885	3761
	11.0	4299	4192	4084	3976	3869
	13.0	4341	4250	4159	4067	3976
	15.0	4371	4292	4213	4134	4055
	17.0	4394	4325	4255	4185	4116
	18.0	4404	4338	4272	4207	4141

Figure 3. Sensitivity of the CottonInfo gross margin (fully irrigated) to changes in N prices and NFUE.

The additional yearly input cost, and additional exposure to price risk highlight the benefits of improving cotton NFUE. To improve NFUE, CottonInfo recommends following the 4R's principal—*right product, right rate, right timing, and the right place*—with the goal of applying a lower rate while still maintaining (or increasing) yield. See [CottonInfo Crop Nutrition](#) for more information and resources for improving N management.

KEY TAKEAWAY POINTS

- While nitrogen prices have come down dramatically in the last 6 months, the 2022 and 2023 seasons highlighted the risk of nitrogen price spikes.
- Improved nitrogen fertilizer use efficiency (NFUE = kg lint / kg applied N) reduces the risk exposure to future nitrogen price increases, as well as saving nitrogen input costs and greenhouse gas emissions in the meantime.
- In 2022, the industry average NFUE was 9.5, compared to the recommended target range of 13 to 18 (kg lint / kg N).
- Given the high rate of applied N for the achieved yield, savings of \$116/ha to \$205/ha could be generated by improving NFUE in line with recommendations.

For more information on this analysis or the CottonInfo gross margins contact

Ag Econ's George Revell george@agecon.com.au