

NITROGEN SOLUTIONS FOR COTTON

A guide for managing Nitrogen
nutrition and optimising yields



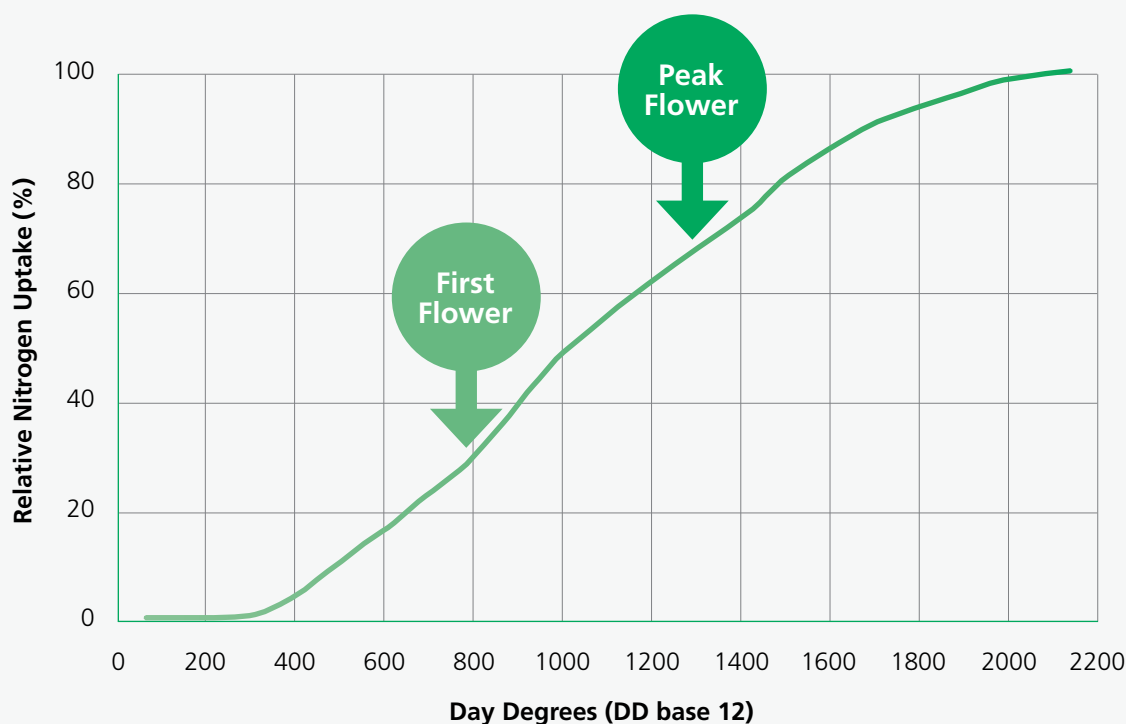


Figure 1. Relative N uptake by cotton.

Nitrogen (N) and water management are critical for optimising cotton yields and lint quality.

High yielding cotton can require between 275-400kg N per ha of applied N, and this represents the largest proportion of the fertiliser budget.

Cotton plants utilise N to develop the necessary framework to allow the growth of a suitable number of fruiting branches and fruiting sites. A crop's yield potential will be limited if N supply is not adequate, particularly during periods of rapid growth. Crop N demand varies over the life of the crop (Figure 1) and an understanding of this pattern allows effective timing of N applications.

Availability of N, from first flower to peak flowering, is critical, as 40% total N uptake occurs in this short period. Crop fertiliser programs should incorporate in-crop applications of N, as this period is a key time.

All sustainable fertiliser programs are based on the **4 R's: Right Rate, Right Product, Right Place and Right Time**. Each part needs to be considered carefully as application methods, labour availability and logistical constraints will influence how each component of the 4 R's combine when developing a fertiliser program.

1. DETERMINING N RATE – PRE-PLANT SOIL SAMPLING

Deep soil samples are generally taken from 0-80cm or 0-90cm of depth (effective rooting depth of cotton crops). These cores should be split based on the cotton production system, irrigated or dryland.

- **Irrigated cotton** – split cores into 0-30cm, 30-60cm and 60-80 or 90cm segments.
- **Dryland cotton** – split cores into 0-10cm, 10-30cm, 30-60cm and 60-80 or 90cm segments.

It is important to adhere to the specified sample depths of the first segment if you are intending to analyse and interpret results for other nutrients using NA Pro software.

When developing fertiliser programs, targeting realistic yield goals is important when calculating required N rate. Table 1 displays nutrient removal by increasing lint yields which can be used for replacement of exported nutrients.

Yield (b/ha)	N	P	K	S	Ca	Mg	B	Cu	Zn	Fe	Mn
	kg/ha						g/ha				
4	35	9	15	4	2	5	13	12	53	85	6
6	60	13	22	6	3	8	28	16	72	112	9
8	80	18	29	8	4	11	42	20	91	138	12
10	100	22	37	10	6	14	56	24	110	164	15
12	120	26	44	12	7	17	70	28	129	191	18
14	140	31	52	14	8	20	85	32	148	217	21
16	160	35	59	17	9	23	99	36	166	244	24
18	180	40	67	19	10	26	113	40	185	270	27

Table 1: Macro and micronutrient removal by cotton lint.

Source: Adapted from Rochester 2014, Bell & Griffiths

2. RIGHT PRODUCT

Pre-plant applications

Pre-plant N applications are generally applied 2-4 months before cotton planting. Australian cotton industry research has determined that significant losses of N through denitrification and leaching can occur on heavy and light textured soils respectively.

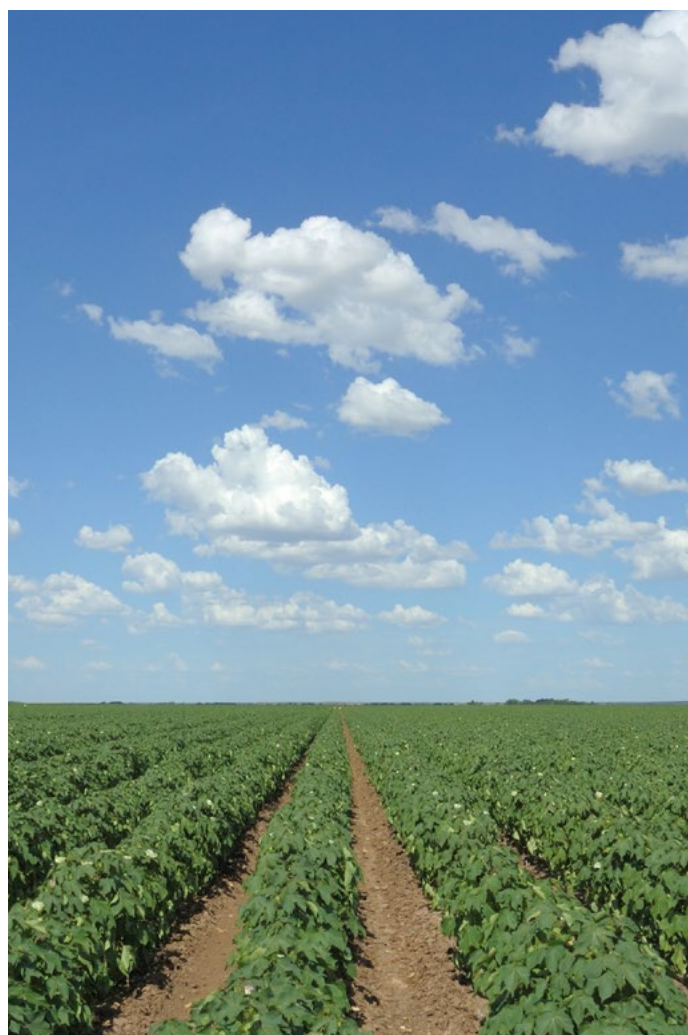
Water logging in the fallow or the first 2-3 irrigations in heavy textured clay soils generate most of the pre-plant and soil nitrate N losses.

Incitec Pivot Fertilisers (IPF) research has demonstrated that protecting pre-plant urea or **EASY N** with a nitrification inhibitor (NI) such as **eNpower®** can maintain or increase yields with current or lower N rates.

In-crop applications

Supplying part of the N fertiliser program in-crop has the added advantage of allowing N rates to be tailored to crop requirements. N is generally applied as spread urea or water run N26.

Surface applied urea can be subject to N losses from volatilisation if not incorporated within two days of application. **GREEN UREA NV™** (treated with Lockdown urease inhibitor) can protect surface applied urea (above ground) for up to 14 days and allows greater flexibility between application and incorporation timing.





3. RIGHT PLACE

Nitrate N and urea are very mobile in soils. This can be an advantage or disadvantage depending on the time of application relative to crop uptake.

Subsoil/Soil incorporated

Deep placement of pre-plant N (Figure 2) reduces N losses from early season irrigations or rainfall. When combined with eNpower, nitrification of July/August applied urea or **EASY N** will be slowed in heavy textured vertosol soils, holding N as ammonium (NH₄) for longer. Ammonium conversion to nitrate increases over time, with nitrate availability matching crop uptake requirements. The delay of ammonium nitrification is dependent on many factors such as soil temperature, soil moisture and microbial population.

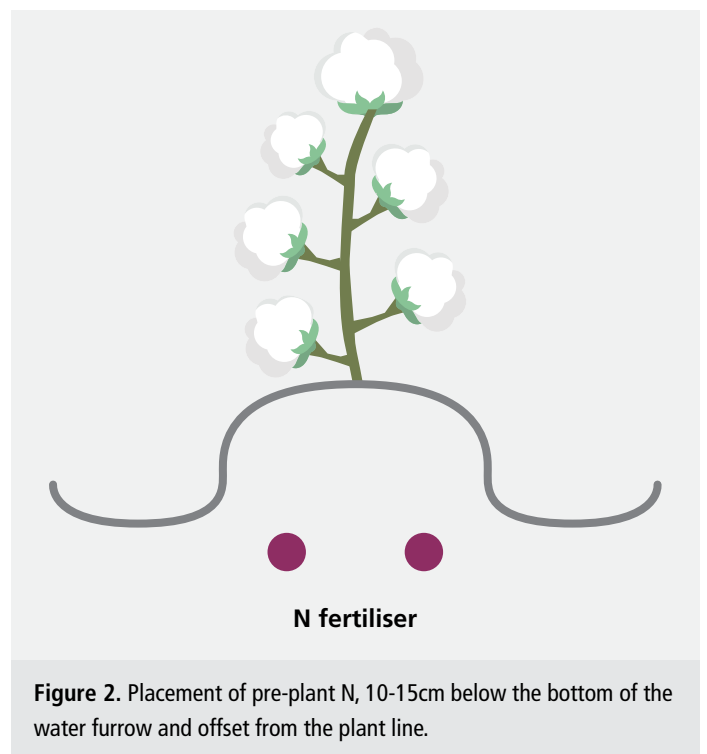
eNpower UREA and **EASY N / N42** always need to be incorporated into the soil (sub-surface). If left unincorporated, volatilisation losses can be high.

Fertigated

Fertigation is an effective, timely and practical method of supplying in-crop N. Dosing irrigation water with fertiliser allows N to be distributed throughout the field with the evenness of the irrigation water.

EASY Liquids N26 can be water run in furrow and bankless channel irrigation layouts. As N26 is urea based, the non-charged urea particle moves with the water into the crop's root zone.

EASY N and **EASY Liquids N42** are suitable for application through overhead lateral or centre pivot irrigators.



Foliar

Tactical applications of foliar N can supply temporary shortages in N supply.

Cotton leaves can absorb N through the leaf surface and rapidly transport it to areas of active growth, including bolls. This movement of N can occur within hours of application. To capture foliar nitrogen, sufficient leaf area must be present. Responses to **EASY Liquids N-FOL** and **N-FOL+TE** have been observed within days of application.

Product	Analysis
COTTON SUSTAIN	N 6.1%, P 12%, K 22.5%, S 2.2, Zn 0.6%
eNpower UREA	N 46% + DMPG nitrification inhibitor
eNpower + EASY N / eNpower + EASY Liquids N42	N 42.5% as urea, ammonium and nitrate + DMPG nitrification inhibitor
GRANULOCK Z EXTRA	N 11.6%, P 19.8%, S 5.4%, Zn 2%
GREEN UREA NV	N 46% + Lockdown urease inhibitor
EASY LIQUIDS FLOWPHOS 13Z	N 9%, P 13.5%, K 1%, Zn 0.9%
EASY GLY ZNP	N 2%, P 3%, K 7.4%, Zn 7.2%
EASY Liquids KEYPRO ZINC	K 9.2%, Zn 9%
EASY Liquids K-FLOW 12	N 4%, K 12%
EASY Liquids K-FLOW 30	P 14%, K 30%
EASY Liquids N-FOL	N 24% as urea
EASY Liquids N-FOL+TE	N 24%N as urea+ iron, zinc & copper
EASY Liquids N26	N 26% as urea
EASY Liquids P-FOL ZINC	P 18%, K 2%, Zn 14%
EASY Liquids ZN-SUL	Zn 16% as zinc sulphate

4. RIGHT TIME

The split between pre-plant and in-crop N applications will depend on soil N levels, application equipment, staff availability and time. Utilising in-crop N applications allows total N rates to be adjusted in response to changes in yield potential and results of petiole monitoring. It also can reduce N losses and improve N use efficiency through matching N supply to crop uptake.

EASY Liquids logistics

EASY Liquids logistics and tank hire system makes delivery of large amounts of in-crop N easy. Our fleet of tankers and our customer focused team provide responsive and efficient delivery of product to your field as required.

The combination of **EASY Liquids N26, N42, EASY N** and our logistics capabilities deliver a practical option for delivering in-crop N to irrigated cotton crops.

Tank monitoring

EASY Liquids are now offering tank monitoring for our fleet of hire tanks via the tank tracker app.

Users will be able to check tank volumes and monitor changes over time. This allows for improved tracking of fertiliser deliveries and use rates, permitting agronomists and irrigation managers to easily oversee application rates. It also helps the IPF team manage deliveries, ensuring enough fertiliser is available to finish the application.

MONITORING WITH EASY LIQUIDS HIRE TANKS

- Easy monitoring of volume of fertiliser remaining in tank
- Allows applications rates to be easily calculated
- Supports efficient use of N
- Tank location set using the app
- Peace of mind knowing your tanks levels are maintained as required.



NITROGEN MANAGEMENT

Determining N Rate – Pre-plant soil sampling

- **Irrigated cotton** – split cores into 0-30cm, 30-60cm and 60-80 or 90cm segments.
- **Dryland cotton** – split cores into 0-10cm, 10-60cm and 60-80 or 90cm segments.

Residual soil N and mineralised N can supply significant quantities of N and need to be considered when calculating N rates.

In-crop monitoring

Leaves and petioles should be collected from the 4th to 5th node down from the growing point.

- **Leaf sampling** – collection times are 400-800 DD, 1250-1350 DD and 1750-1850 DD.
- **Petiole sampling** – collection times are 600-1000 DD. 3-4 samples should be taken over this period.

Leaf analysis can be used to monitor all nutrients including micronutrients.

For more information, please head to the EASY Liquids website easyliquids.com.au, or contact your local IPF agronomist, IPF Regional Business manager or EASY Liquids sales agronomist.



To contact a technical agronomist, head to: smartfertilisers.com.au



IRRIGATED COTTON CROP PROGRAM

Crop Stage	Pre-plant	Planting	Emergence – 1st Squares	1st squares – 1st flowers	1st flowers – Peak Flowering	Peak flowering – Bolls open
Approximate Day Degrees (DD)			70-540	540-840	840-1300	1300-1600
Zn-SUL	20-60 L/ha incorporated into soil					
COTTON SUSTAIN	200-300 kg/ha incorporated into soil					
eNpower UREA	250-500 kg/ha incorporated into soil					
eNpower + EASY N / N42	250-500 L/ha incorporated into soil					
GRANULOCK Z EXTRA		20-25 kg/ha in seed furrow				
FLOWPHOS 13Z		20-40 L/ha in seed furrow				
KEYPRO ZINC			0.5-1 L/ha with glyphosate			
EASY GLY ZNP			2-3 L/ha with glyphosate			
GREEN UREA NV™			Spread 100-350 kg/ha and incorporate by irrigation or cultivation			
N26			Fertigate 200-600 L/ha and incorporate by irrigation or cultivation			
Crop Management Applications						
P-FOL ZINC			Band spray 3-5 L/ha (promote plant growth)			
K-FLOW 30			Spray 2-3 applications of 10 L/ha (supplement P & K in sodic soils)			
K-FLOW 12				Spray 1-2 applications of 30 L/ha, starting 7-10 days after 1st flower (supplement soil K supply)		
N-FOL + TE			Spray as required multiple applications of 30-40 L/ha (pre & post water logging)			



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