# Germinating ideas

Compiled by the
CSD Extension and Development Team

WELCOME to Germinating Ideas. In this edition we continue to discuss some of the management data coming out of CSD's Ambassador Network Program, comparing data and trends from the top 10 per cent of fields in the program, with the remaining 90 per cent of fields.

In the previous issue of Germinating Ideas, we showed the clear advantage that the top 10 per cent of Ambassador fields have, compared to the remaining 90 per cent of Ambassador fields (Table 1).

**TABLE 1: Top 10 per cent of Ambassador fields compared with the remaining 90 per cent of Ambassador fields**

| | Top 10% of Ambassador fields | Remaining 90% of Ambassador fields |
|---|---|---|
| Yield bales/ha | 13.7 | 11.1 |
| Bolls/metre | 154 | 135 |
| Boll weight g/boll | 2.4 | 2.1 |
| Retention per cent | 63 | 56 |
| Nodes 1st fruiting branch | 6 | 7 |
| Squaring nodes | 18 | 16 |
| Flowering days | 43 | 38 |
| Season length days | 158 | 165 |

The main question is: what were the management considerations that created these differences?

## Pre-plant and establishment

As we discussed in the previous article, the top 10 per cent Ambassador fields have a better field condition score. They are preparing their soils earlier and creating a good seed bed for planting.

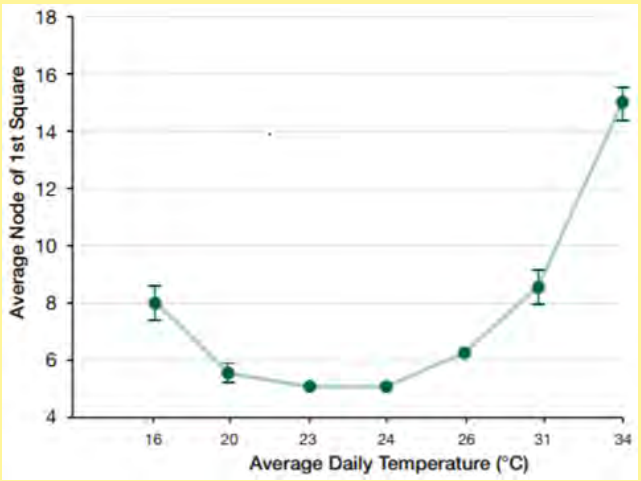
While all Ambassador fields had similar plants/m established at around 10 plants per metre, the top 10 per cent of Ambassador fields used less seed at 13kg per hectare compared to 14kg per hectare for the remaining 90 per cent of Ambassador fields. Further, the top 10 per cent of Ambassador fields were more uniform across the planter/field which suggests good planter maintenance and good planter control when planting. This takes into consideration planting speed (ideally 8km/hr), planter depth and overall planter maintenance.

Average temperature through to flowering was 1°C higher at 24.8°C compared to 23.9°C for the remaining 90 per cent of Ambassador fields. The top 10 per cent of Ambassador fields started fruiting on node six; compared with node seven for the remaining 90 per cent of Ambassador fields.

Research from Dr Michael Bange (formerly CSIRO) has shown that there are differences that exist when it comes to where a crop starts fruiting, based on average daily temperatures. This can be seen in Figure 1. If planting too early in cooler conditions, the first fruiting branch can be higher. Similarly, if planting in quite warm conditions due to a delayed plant, the first fruiting branch can also be higher. There is a sweet spot around 24°C that tends to set a lower first fruiting branch.

A good example of this is seen with dryland cotton, where typically we see a higher first fruiting branch. This is potentially caused by planting later in warmer conditions in November and December.

**FIGURE 1: Nodes to first fruiting branch by average daily temperature**



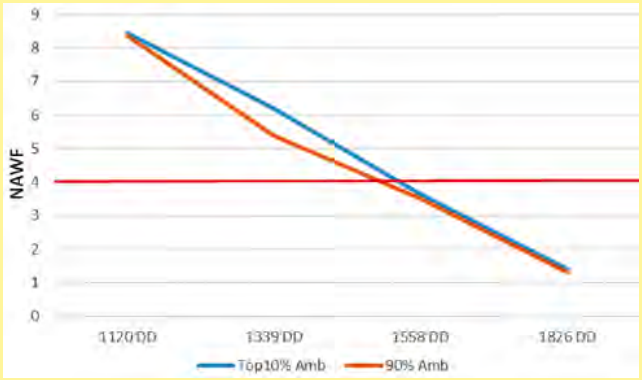

The Ambassador Network data also showed that there were four less cold shock days from planting to flowering in the top 10 per cent of Ambassador fields, which is significant as there is no attributable plant growth associated with cold shock events.

## Flowering

Through flowering, the top 10 per cent of Ambassador fields have similar NAWF to the remaining 90 per cent of Ambassador fields at first flower (around 8.3 NAWF). But the top 10 per cent demonstrated a more linear decrease through flowering with NAWF as seen in Figure 2, where the NAWF of the remaining 90 per cent of Ambassador fields tend to decline faster than the

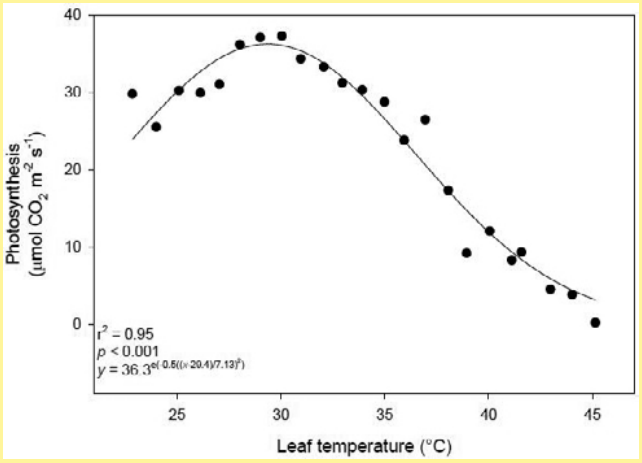
top 10 per cent. Decline in NAWF can be related to many factors including irrigation management, vegetative growth control and nutrition.

**FIGURE 2: Ambassador Network Program data – Nodes Above White Flower (NAWF)**




Even a slight delay in irrigation causes increased stress in the crop which can be seen in the form of increased canopy temperature. Research from Dr Warren Conaty, CSIRO, has shown that once a crop canopy rises over 30°C stomatal conductance is reduced which in turn slows the plants metabolism, reducing the availability of $CO_2$ entering the plant. Photosynthesis slows and the overall carbohydrate supply to the plant is impacted.

**FIGURE 3: Photosynthesis in cotton**




(Conaty, CSIRO 2019)

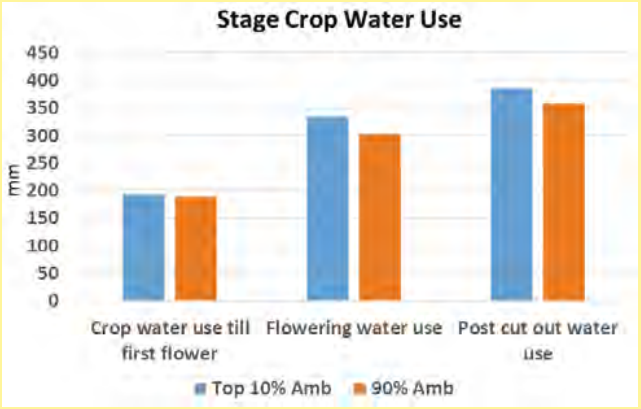
The top 10 per cent of Ambassador fields flower for 43 days, compared to 38 days for the remaining 90 per cent of Ambassador fields. Management plays a major part in determining the amount of time a crop flowers. The quicker a crop can get to first flower, potentially the longer time it can spend in flowering, producing squares, flowers and bolls. The top 10 per cent of Ambassador fields were seven days earlier to first flower compared to the remaining 90 per cent of Ambassador fields – although they reached cut-out at a similar time. The extra seven days in flowering is equivalent to an extra two to three fruiting nodes, which is significant.

## Cut-out

At cut-out, the top 10 per cent of Ambassador fields had better overall retention at 63 per cent, compared to 56 per cent for the remaining 90 per cent of fields. They had two to three more fruiting nodes and were taller with a larger plant canopy. The structure of the canopy is developed by good irrigation timing and the availability of nutrients required to supply not only an evolving boll load but also a canopy to support this evolving boll load.

While the top 10 per cent of Ambassador fields used more water on the crop, as seen in Figure 4, their WUE was better than the remaining 90 per cent of Ambassador fields. They produced 0.2 bale per megalitre or 0.7 kg lint per mm more than the remaining fields.

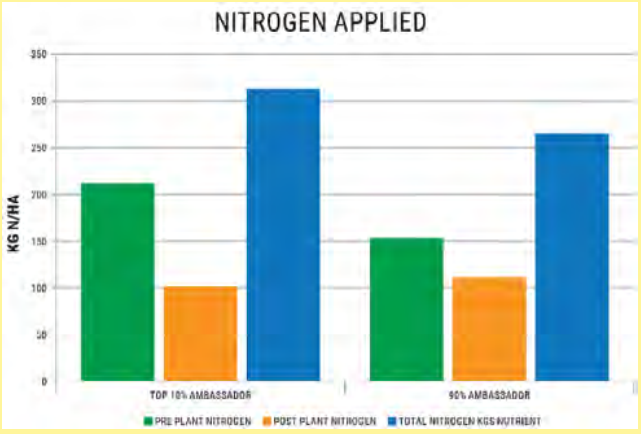
**FIGURE 4: Ambassador Network Program – crop water use**




| | Bale/applied ML WUE | Kg lint/mm |
|---|---|---|
| Top 10% Amb | 2.0 | 3.7 |
| 90% Amb | 1.8 | 3.0 |

The top 10 per cent of Ambassador fields have a well-balanced nutritional program. They tend to apply more nitrogen up front pre-season and have better nitrogen use efficiency than the remaining 90 per cent of Ambassadors fields, as seen in Figure 5.

**FIGURE 5: Ambassador Network Program – nitrogen use**

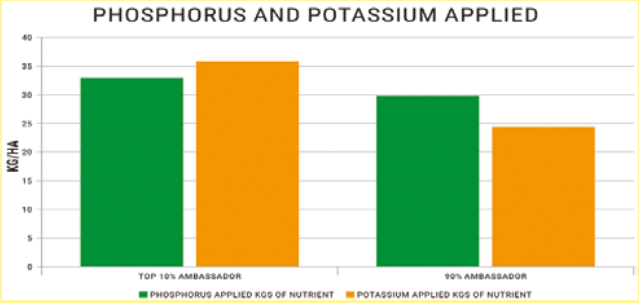



| | N fertiliser use efficiency Kg N/bale |
|---|---|
| Top 10% Amb | 12 |
| 90% Amb | 14 |

They also apply more phosphorus and potassium in their

program as seen in Figure 6. Having a well-balanced replacement nutritional program is essential in looking after soils and for sustaining yields.

**FIGURE 6: Ambassador Network Program – phosphorus and potassium use**




| | N fertiliser use efficiency Kg N/bale |
|---|---|
| Top 10% Amb | 12 |
| 90% Amb | 14 |

## Key principles of management in the Ambassador Network Program

Overall, more fruiting sites, longer time in flowering and higher fruit retentions means more bolls. The efficiencies in timing of irrigation and nutrition develop strong plants that are capable of supplying resources for high yielding crops. Further, a 'happy plant' without stress events, working at its optimum photosynthetic ability allows for the synthesis of carbohydrate into cotton fibre, creating heavier bolls. 'More bolls and heavier bolls means more yield'.

The constraints that associate with lower yield can come in different forms and can be as simple as having a poorly uniformed plant stand through poor planter maintenance or through planter operators driving too fast and creating seed depth issues.

The timing of water is critical in reducing stress events, particularly through flowering. We know from past work that for every stress event, yield is reduced. Much of this is associated with the timing of irrigation. Having a farm that is efficient in supplying water from rivers to channels to dams and to fields is very important in developing a crop with as little plant stress as possible.

Nutrition is equally important as irrigation, as the nutrients must be in an available form for the crop to utilise them. A good understanding of what is the nutritional status of the soil and what is required to produce a targeted yield is very important. It is not so much about the quantities that are put on, but more about the 'Nutritional Use Efficiency' of the crop. Is the crop utilising the nutrients efficiently in producing the targeted yield that we set?

An efficient crop does not stress, which maximises the plants biochemistry to produce high yield potential. As an example, the top 10 per cent of Ambassador fields created more bolls, heavier bolls with a season length that was seven days earlier than the remaining 90 per cent of Ambassador fields.

We continue to collect data from the Ambassador program, which is now in the sixth year. From this data, CSD is developing new tools to enhance decision making for cotton growers – stay tuned for more details on this, in the next issue of Germinating Ideas.

**For further information in relation to any of the topics mentioned in this article, please contact your local CSD Extension and Development Agronomist or visit the CSD website.**