

Germinating ideas

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Welcome to this edition of Germinating Ideas. With the Australian cotton industry facing the lowest plantings for many years because of record low water supply it is now timely to look at how returns per megalitre of water can be maximised. There are different management options for growing cotton in these dry times and decisions that can be made up front can help reduce the impacts of trying to grow too much with limited water.

The flowing information was prepared as a series of Facts on Friday information bulletins prepared by the CSD Extension and Development team.

CONSIDERATIONS PRIOR TO PLANTING

Area to plant

There are four possible scenarios when determining what area to plant:

- Grow the same area as usual;
- Grow an area on solid plant in proportion to the reduced allocation;
- Grow an area on skip row planting in proportion to the reduced allocation; and,
- Grow a dryland cotton crop.

No strategy will be correct for every season and each has associated risks. Growing



Growing wider row spacing can help reduce discounts for fibre quality.

the same area will lead to big losses in yield and fibre quality problems if you run out of water. Skip row or reduced area plantings equate to a missed opportunity if the season breaks and you cannot capitalise fully on the available water. The area planted will depend upon your attitude to risk and your geographic location. For example, growers in Dalby would expect more summer rain and milder summer temperatures than those in Dirranbandi.

HydroLOGIC, a decision support tool developed by the Cotton CRC, uses the OZCOT crop model and historical weather

data to assist growers in making decisions regarding ideal planted area.

Using this program, growers can input their own details to tailor the analysis for their situation. This includes soil type and the option to include in-season rainfall or not.

The allocations in Table 1 assume average in-season rainfall, so have lower irrigation requirements for the northern areas that have higher average summer rainfall.

Field selection

If the area is to be reduced, fields should be selected on the basis of:

- Soil type, PAWC, per cent of moisture profile full, cropping history (fallow), ease of irrigation and freedom from weeds and disease;
- Avoiding compacted or problem soils, as they will reduce the PAWC and therefore require more frequent irrigations; and,
- Proximity to water storages, as irrigation efficiency decreases if large irrigation systems are filled to service only a small number of fields.

Varietal choice

Full season varieties with inherently

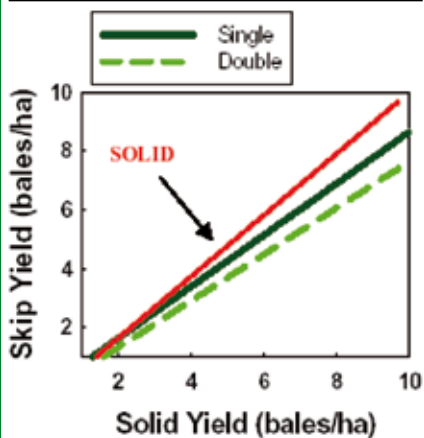
TABLE 1: Water supply required on September 1 (pre-establishment)

Region	Supply mL/ha Sept 1 to break even 9 years out of 10	Maximise returns per mL
Emerald	4.5	5
Darling Downs	5.0	5
St George	5.5	5
Border Rivers	5.2	6
Gwydir	5.3	6
Namoi	5.2	6
Macquarie	6.3	6

a) To reduce risk of failing to break even to less than one in ten.

b) The supply which maximizes returns per mL (N.B. assumes an irrigation efficiency of 75 per cent). Source: Milroy, Harris and Larsen 2002.

FIGURE 1: Average results from many experiments comparing solid and double skip in dryland systems across several seasons and several regions



Brian Hearn collated these in 1999.

longer staple length consistently perform better under dryland and limited water situations. Choosing an early maturing variety doesn't work.

The variety selection principles are the same:

- Select the best yield and fibre quality package for your area;
- Select disease resistant varieties, as diseases can be more evident in stressed situations; and
- Select technology traits which will assist with moisture conservation and management. (Roundup Ready or Liberty Link may reduce the need for cultivation).

Planting date

Delayed planting may be considered an option to increase the chance of receiving rainfall to plant on, receiving effective in season rainfall and moving the boll filling period to milder temperature regimes later in the summer.

But this option must be weighed up against the potential decrease in yield and quality from delayed planting and the increase in growing costs from producing a later maturing crop. Planting date trials suggest that yields begin to decline when

TABLE 2: The impact of one days water stress varies with the crop growth stage

	Yield loss (kg/ha/day)
Squaring	9
Peak flowering	19
Late flowering	16
Boll maturation	4

From Milroy, Goyné and Larsen (2002) Figures may be higher now due to higher varietal yield potential

planting is delayed beyond the second or third week in October, depending on locality.

Bollgard II offers growers some more flexibility in delaying planting because of the season-long helioverpa control and the potential for earlier crop maturity as a result of greater early fruit retention. In later plantings a higher proportion of developing bolls are exposed to cooler growing conditions and this can delay crop maturity and result in the production of lower quality fibres. In recent seasons, this has not been a problem as warmer than average February–March conditions have resulted in excellent micronaire values.

Skip row planting

A management option available to growers, which has been used successfully in dryland and reduced irrigation scenarios, is skip row planting. The principle is exactly the same in dryland as it is with reduced irrigations — you are increasing the volume of soil that each plant has to extract moisture from. The increase in available soil moisture per plant row will delay the time before the crop will experience detrimental moisture stress and allow full use of any rainfall events.

Knowledge of the skip row moisture status and rainfall outlook is paramount to ascertain irrigation timing. Another advantage is a more consistent fibre quality particularly fibre length, as short fibre can be common when there is moisture stress during boll fill.

Comparing skip row configurations and solid plant in dryland has suggested that under most situations, skip row will limit yield potential — double skip by 34 per cent and single skip by 19 per cent (Figure 1).

A combination of cost savings from skip row and a reduction in short fibre length discounts will lead to a better gross margin in skip row cotton in low yielding situations (less than five bales per hectare). Without fibre quality discounts, solid plant will return a better gross margin above this yield figure. Some growers decide to plant solid with the option of converting to skip row mid season by ploughing out alternate rows. Those looking to follow this strategy should decide early or not at all and consider the following:

- If the soil profile is relatively dry or the crop is in stress when the rows are removed, the roots of the remaining plants may have difficulty in accessing moisture across the skip;
- Skip row is more beneficial in heavier soils than lighter or hard setting soils, because of the ability of the roots to

TABLE 3: Average percent yield loss from increasing irrigation intervals at various crop stages

	Bollgard II	Conventional
1st flower	23%	23%
Peak flowers	24%	2%
Cut out	36%	17%
Post cut out	19%	21%*

From Yeates, Richards, Roberts and Gregory (2005–06) (*=one year's data)

move across the skip area and higher moisture holding capacity; and,

- Consideration needs to be given to the refuge requirement if removing Bollgard II cotton.

It is important to consider the cropping history of the field, as a long fallow will reduce the need for high nitrogen fertiliser rates, as would a field whose previous crop was a legume. If high rates of nitrogen are used in a situation of limited water, incorrect timing of irrigation or rainfall can cause excessive vegetative growth.

A strategy would be to conduct a pre season soil test and apply a low amount of pre-plant nitrogen, if required, considering the assumption that water stress is going to restrict yield at one time or another during the season. If extra water becomes available later in the season, additional nitrogen can be applied to match the improved yield potential.

Irrigation scheduling

The two main options available to growers are to stretch irrigation intervals or to water normally and cut water off at the end of the crop. The success of these options will depend on summer rainfall, PAWC and growing temperatures. A cotton crop's response to stress will also vary depending on the plant's growth stage. CSIRO research conducted over the past three seasons compared the effect of increasing irrigation intervals at four crop stages in both Bollgard II and conventional cotton. It reached the following conclusions:

- Increasing deficits at the start of flowering or around the time of cut out tend to have the biggest impact in both technologies.
- Differences between Bollgard II and conventional are explained by higher retention and lower levels of tipping out. The conventional was able to compensate better for water stress.
- Increase in deficit at the end of the season did not have a large impact on yield. But fibre parameters such as fibre length and micronaire may be adversely affected.