

# Germinating ideas

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In this edition we will be looking at options for growing cotton in a year where most areas are faced with limited water. There are many issues growers need to decide on to maximise production while keeping their options open if the situation improves. Returns per megalitre of water stored in the soil or applied through irrigation have never been more important.

The following information is from the 2006 CSD publication 'Options in a low water year' prepared by the CSD Extension and Development team.

## MAIN CONSIDERATIONS

### Area to plant

In seasons where there is a limited water allocation, there are a number of options in determining the area to be planted.

Any choice is a calculated risk and it is important to consider all options. When water is limiting it makes sense to maximise the returns per megalitre rather than the return per hectare of land.

Simulations using the OZCOT crop model suggests that in most seasons, starting water allocations (September 1) of five megalitres per hectare in northern areas and six megalitres per hectare in the southern areas will maximise the returns per megalitre and reduce the risk of failing to break even. This situation can then be



In low water years, it is more important to maximise returns per megalitre than yields per hectare

reviewed prior to the first irrigation (December 1) and provides a basis for making a decision on whether to reduce the area to be irrigated and leaving the balance as a rain grown crop or ploughing out.

Table 1 shows the water supply required on September 1 (before pre-watering) and re assessed prior to first crop irrigation (December 1):

- To reduce risk of failing to break even to less than one in 10; and,
- The supply which maximises returns per megalitre (assumes an irrigation efficiency of 75 per cent).

The allocations in Table 1 assume average in-season rainfall.

Decisions regarding the ideal planting area can be made using the HydroLOGIC decision support tool which uses the OZCOT crop model. Using this program, growers can input their own details to tailor the analysis for their situation.

Copies of HydroLOGIC are available from the Australian Cotton CRC Technology Resource Centre.

### Irrigation scheduling — increasing water deficits versus late season plant stress

Growers can manage a water limited season by stretching their irrigation intervals throughout the season or alternatively may cut off the water to the crop before it has finished maturing.

Slight increases (two to three days) in irrigation intervals early in the season will cause mild stress to the plant and may reduce plant vigour and fruit load. But this may be far less damaging to final crop yield than if water is cut off to the crop before the end of flowering (Table 2).

CSIRO research carried out over the 2004-05 and 2005-06 seasons compared

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TABLE 1: Water supply requirements

Region	Supply (ML/Ha) on September 1 to:		Supply (ML/Ha) on December 1 to:	
	Break even in 9 years out of 10	Maximise returns per megalitre	Break even in 9 years out of 10	Maximise returns per megalitre
Emerald	4.5	5	2.3	3
Darling Downs	5.0	5	3.2	3
St George	5.5	5	3.5	3
Border rivers	5.2	6	3.2	4
Gwydir Valley	5.3	6	3.2	4
Namoi Valley	5.2	6	3.2	4
Macquarie Valley	6.3	6	4.0	4

Source: Milroy, Harris and Larsen 2002.

the impact on yield and fibre quality (particularly staple length and micronaire) of increasing irrigation deficits at four crop stages on both Bollgard II and conventional cotton. The following conclusions could be drawn from this:

- Increasing deficits at the start of flowering or around the time of cut-out tended to have the biggest impacts on yield in both Bollgard II and conventional cotton. Both of these have a negative impact on fruit numbers.
- The differences between Bollgard II and conventional could be explained by a more rapid accumulation of yield due to higher retention and lower levels of terminal damage. This meant Bollgard II was less able to compensate for water stress, particularly during flowering and cutout. Another illustration of this was the later stress (cut-out) had more of an impact on staple length in conventional than Bollgard II.
- Increasing deficits towards the latter part of the crop or reducing the final irrigation did not have a large impact in the one trial where this was included due to some beneficial rainfall at the end of this season.
- Micronaire is a complicated measure and very difficult to predict, but water stress during the fruiting period can tend to increase micronaire.
- These results highlight the importance of monitoring crop growth and fruit load. Depending on the stage of the crop and degree of fruit load it will also help determine the best time to supplement irrigation.
- These results are highly dependent on the season and the soil type.

### Field selection

When the irrigated area is to be reduced, the following factors should be considered:

- The best fields should be selected on the basis of cropping history and ease of irrigation. These fields should be fallow, clean in terms of weeds and disease, with the least compaction and waterlogging problems.
- Compacted soils will reduce the amount of water available to the plant and therefore may require more frequent irrigations.
- Select those fields that are easiest to supply with water. Irrigation efficiency falls significantly when a channel system designed for a large area has to be filled just to water a few fields.

**TABLE 2: The impact of one day's water stress varies with the growth stage**

Growth stage	Lint yield loss (kg/ha/day)
Squaring	9
Peak flowering	19
Late flowering	16
Boll maturation	4

Note that these effects are not simply additive. (e.g. one day's stress at peak flower plus one day's stress at late flower is not necessarily 19+16=35). From Milroy, Goynne & Larsen (2002).

### Planting date

Delayed planting may be considered an option to increase the chance of receiving rainfall to plant on, thereby saving allocated water for peak crop demands, and also receiving effective in-season rainfall. But such an option must be weighed up against the potential reduction in yield from delayed planting and the increase in growing costs from producing a later maturing crop. Long term weather data and planting date trials suggest that yields begin to decline when planting is delayed beyond the second or third week in October, depending on locality.

Planting date can also impact on fibre thickening by determining climate conditions during thickening. Full season locations with a history of high micronaire should consider later sowing dates while shorter season areas should avoid this to reduce the likelihood of low micronaire.

Bollgard II offers growers extra flexibility in delaying planting because of season-long Helicoverpa control and the potential for earlier crop maturity as a result of greater early fruit retention. Plantings still must fall within the six week window chosen for the particular region as part of the RMP.

Fibre quality and possible increase in discounts resulting from delayed planting must also be considered. With late sown cotton, 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.

Varying crop planting dates across the farm is one management option which can be used to reduce the risk of total crop failure in drought years.

### Row configurations

Skip row configurations have been successfully used as a management tool in dryland and semi-irrigated cotton. Skip row works on the principles of increasing the

volume of soil that the plants have to explore, increasing the reservoir of available moisture and so increasing the time before a crop will come under moisture stress, should rainfall not be forthcoming.

For skip row to work effectively, cotton roots need to be able to move easily into the skip row areas. Anything that inhibits this will decrease the advantages of the skip concept. Considerations include soil type (lighter, hard setting soils may not be appropriate for skip row) and soil compaction.

Extensive experimental work comparing skip row configurations and solid plant in mostly dryland cotton has suggested that under most situations, skip rows will limit yield potential — double skip by 34 per cent and single skip by 19 per cent.

But the main advantage of skip row is more consistent fibre quality — particularly fibre length — as short fibre can be common where there is moisture stress during boll fill. Assuming plants are making full use of the skip row, fibre length discounts will be less common in skip row than solid plant in situations where water is limiting.

## VARIETY CHOICE

### Selecting a variety

Full season varieties with inherently longer staple length consistently perform better under dryland and limited water situations. This is equally important with Bollgard II varieties that may have a high early fruit set, and so greater demand for water earlier.

The use of Roundup Ready varieties offers a considerable advantage in water limited situations.

Despite their exceptional yield potential under 'full water' situations, the varieties in the Sicot 71 suite are not suited to limited water due to their growth habit.

### Fibre quality

The choice of variety is critical under water limited situations as fibre quality parameters become proportionally more important to profitability as the crop is placed under increasing water stress.

Varieties with inherently long fibre are good choices for water limited water situations, provided they can maintain yield. Fibre length discounts can turn even good yields into very ordinary net returns in dryland cotton.

### Disease resistance

The same rules apply for variety selection, regardless of water status. In situations where Verticilium or Fusarium wilt are present, plant resistant varieties. 