# MANAGING RISK WITH ROW CONFIGURATION AND PLANT DENSITY IN RAINGROWN COTTON

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Raingrown cotton requires a considerable financial outlay hence many farmers seek to reduce their exposure or to 'hedge their bets' by planting in skip row configurations. Skip row provides a reserve of soil moisture beside the planted rows and use of these 'side' reserves extends, by a number of days, the period that a crop can continue to photosynthesise at a certain level compared to a solid planted crop. If effective rain occurs during this extension of time, it can translate to a yield increase and possible quality improvement. A deep profile of stored moisture works in exactly the same fashion, but this deep reserve is smaller than the skip reserve - combine the two, however, and the odds for a successful crop in a dry season are markedly improved. Figure 1 shows that the extra stored moisture at planting bas a big influence on final yield, especially in a dry year. Figure 2 shows how a skip row configuration extends the time period that higher levels of soil moisture are available to the crop. The plant is able to draw moisture from a distance of at least 2 metres from the plant line, drying the soil to the same degree as immediately below the row.

**Figure 1.** Effect of starting moisture on final yieldin a dry year

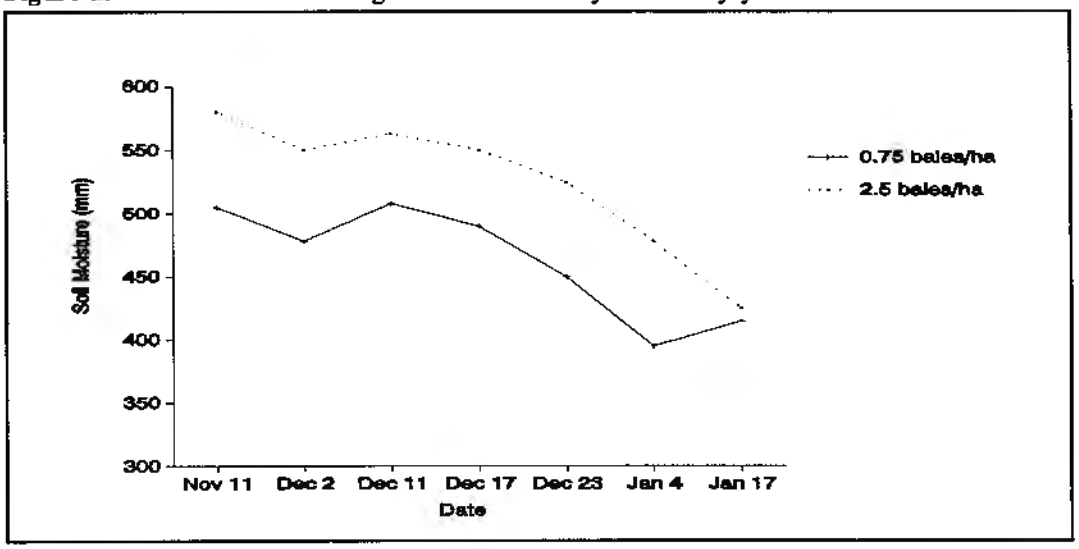
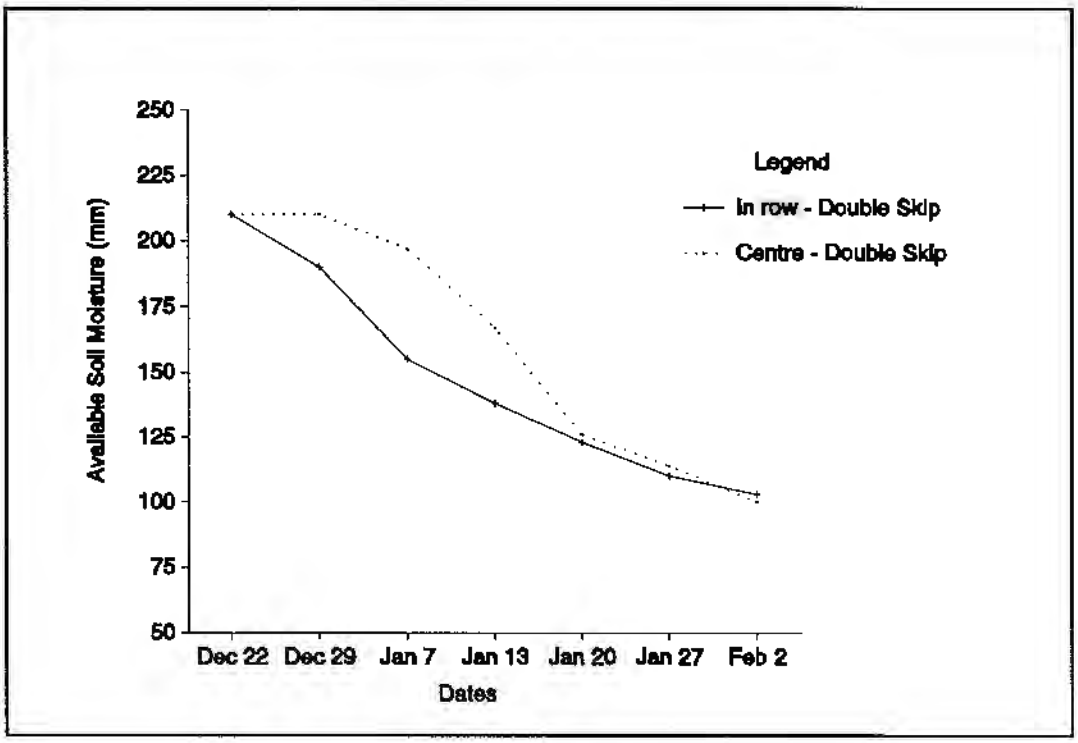


**Figure 2.** Water use pattern in double skip




Choice of a row configuration is influenced by each individual farmer's attitude to risk, as he attempts to balance what yield might be forsaken in some years, versus what costs might be saved in others. Information gained from an extensive series of trials on row spacing configuration can now be applied when a farmer chooses his row spacing configuration. *Put simply, these results can be expressed as the following 'rules of thumb'.*

- Where average yields are below 2.5 bales/ha grow **double skip** (e.g. CQ early plant, western Downs, western Namoi/Gwydir)
- Where average yields are 2.5 to 4.0 bales/ha grow **single skip** (e.g. CQ late plant, central Downs, Goondiwindi/Moree/Narrabri).
- Where average yields are above 4.0 bales/ha grow **solid** (e.g. eastern Downs, eastern Gwydir, upper Namoi).
- Best 'eachway bet' - **single skip**

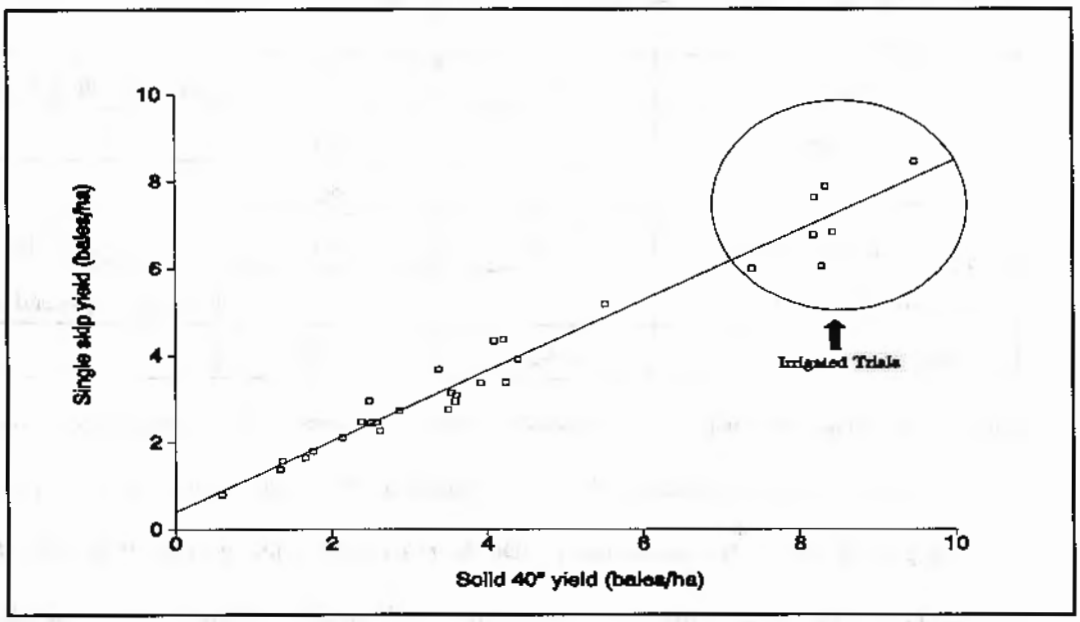
Alternatively, this paper shows how a farmer can assess row spacing for his own situation quite simply. To do this, it is important to know one's own or a neighbour's average yield over a period of time for a certain configuration. Then hy using this yield in a simple equation derived from these row spacing trials, a yield for a different configuration can be calculated and used to compare gross margins etc. Equations for the various combinations of solid, single and double skip are all simple straight lines and are given below. Figure 3 is a demonstration of one of these relationships, between single skip and solid yields. Note that the data used to develop these equations and figures were collected under conditions ranging from extreme drought to full irrigation and consequently cover most situations a raingrown producer is likely to experience for various row spacings.

Equations expressing the yield relationships between different row spacings:

*Single skip yield* = 0.40 + 0.81 *solid yield*
*Double skip yield* = 0.46 + 0.71 *Single skip yield*
*Double skip yield* = 0.79 + 0.59 *Solid yield*

*NB: All yields in bales/ha*

**Figure 3.** Comparative yield between single skip and solid plant in row spacing trials.



A farmer may choose different configurations depending on conditions. For instance, if the planting opportunity did not arrive until near the end of the planting window and stored soil moisture was high, he might opt for closer row spacing to reduce the likelihood of excessive late season growth. Alternatively, an early plant on marginal moisture would involve wider row spacings. Improvements in seasonal weather forecasting will also assist in row configuration decisions.

While yield performance is an important consideration when selecting a row spacing configuration, other factors are also important. Some of these are now considered in more detail below.

**Cost difference**

In comparison to a solid planting, the cost of a number of inputs in the production chain can be reduced when skip row planting is adopted. Table 1 gives the level of reduction.

**Table 1.** Input cost reduction with skip row plantings

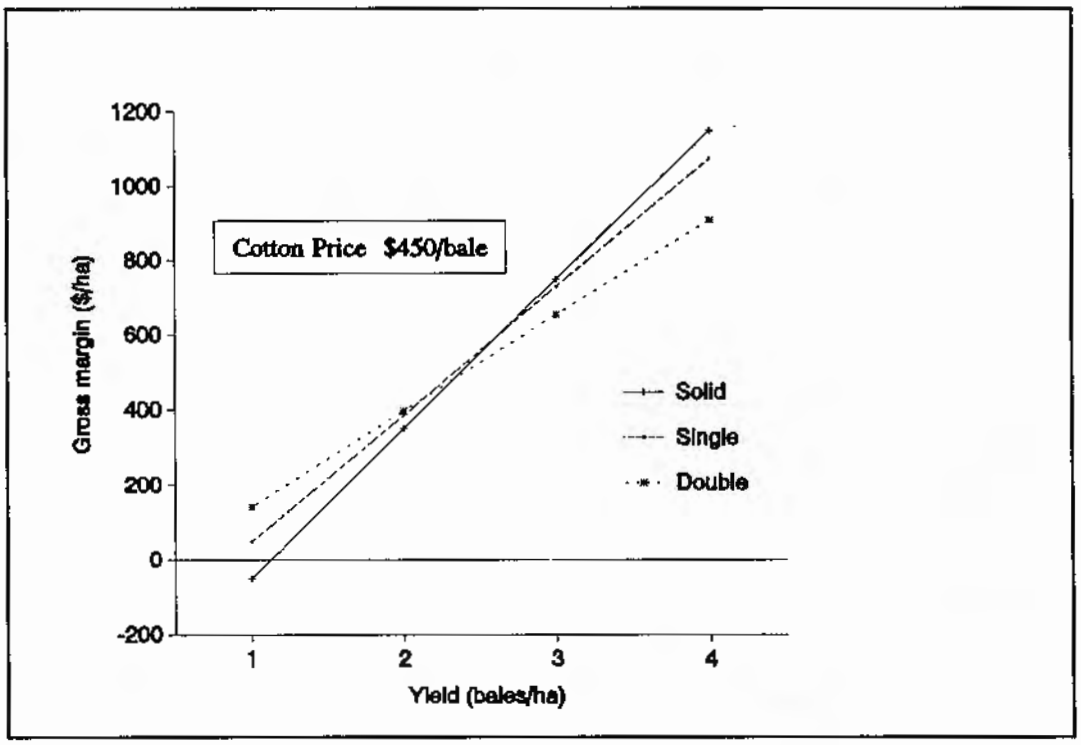
| Item | % Reduction from solid plant | | Comments |
|---|---|---|---|
| | single | double | |
| Seed | 33 | 50 | |
| Starter fertiliser | 33 | 50 | |
| Soil applied insecticide | 33 | 50 | |
| Water injection | 33 | 50 | time saved in refills |
| Banded herbicide | 33 | 50 | |
| Early insecticides | 33 | 50 | |
| Late insecticides, defoliants | 20 | 30 | bigger bush |
| Mid, late season application | | | aerial vs ground rig |
| Picking | 20-25 | 33-40 | |

The last two items obviously need additional comment. In most seasons, raingrown cotton will require at least one aerial application, due to wet conditions. This reduces the cost saving potential of using ground rigs for the entire season. On the other hand, some growers with solid stands utilise a ground rig for the entire season, accepting a small yield loss in the two rows immediately below the machine.

While the paddock area picked in double skip is only 50% of that in a solid stand, the other cost components of picking such as buggies and module building are independent of configuration.

By using the equations given above and your own cost figures it is possible to make a detailed assessment of the expected returns from any row spacing for any given yield level. Using some assumed growing costs, an example of the cost comparison is sbown in figure 4.

**Figure 4.** Relationship between yield and gross margin for row spacing configurations in raingrown cotton.




**Cost increase**

The analysis shown in figure 4 assumes that skip row configurations will reduce input costs, however, skip row planting does not reduce all costs. In some seasons, skip row configurations will require the use of more plant growth regulators to check the size of the plant for both pesticide application efficiency and picking purposes. It is also probable that skip row crops will require at least one additional late season insecticide application. Weed control in the skip row is important. This will generally require an additional interrow cultivation or herbicide spray.

**Quality**

Quality is becoming an increasingly important aspect in cotton production and the penalties for fibre measurements below base levels are becoming larger. The stop-start growing conditions that raingrown cotton experiences can affect staple length, length uniformity and micronaire. Local trial data indicates that skip row can reduce the impact of adverse growing conditions on fibre quality. Table 2 summarises the results of five trials comparing different row spacings. Skip row, particularly double skip, does reduce the risk of short staple and high micronaire especially at lower yield levels where discounts can have a more significant effect on profits.

**Table 2.** General influence of row spacing on quality in raingrown cotton.

| Trial Location & Season | Fibre Measurement | • = *best** D = *Discounted*** | | | Solid Yield Bales/ha |
|---|---|---|---|---|---|
| | | Solid | Single Skip | Double Skip | |
| Orion, CQ 1989/90 | Length | *D* | | • | 1.4 |
| | Uniformity | • | | | |
| | Strength | | | • | |
| | Micronaire | *D(high)* | *D(high)* | • | |
| Orion, CQ 1990/91 | Length | *D* | | • | 2.6 |
| | Uniformity | | | • | |
| | Strength | | | • | |
| | Micronaire | | • | *D(low)* | |
| Dalby 1991/92 | Length | *D* | *D* | • | 3.6 |
| | Uniformity | | | • | |
| | Strength | | | • | |
| | Micronaire | *D(high)* | *D(high)* | • | |
| Biloela 1990/91 | Length | *D* | | • | 5.5 |
| | Uniformity | • | | | |
| | Strength | | • | | |
| | Micronaire | | | • | |
| Biloela 1991/92 | Length | | | • | 4.4 |
| | Uniformity | | | • | |
| | Strength | | | • | |
| | Micronaire | • | | | |

* Best refers to: Longest fibre
Highest uniformity and strength
Lowest micronaire (above 3.5)

** Commercial discount (relative to the best measurement)

**Other considerations**

Skip row configurations can be more susceptible to soil erosion due to lack of crop cover. This is readily overcome if the crop is planted into standing stubble. As far as susceptibility to flood flow damage goes, row configuration would appear to have little effect. Plant density in the row, however, is a more important consideration, denser stands reducing soil movement.

Use of skip row configurations do improve the opportunity for using tram lining in the pre-cotton fallow, and its maintenance through the next crop. It does this by giving a little more 'room for error', something which will continue to be required until more sophisticated tracking devices become available.

**Plant population within the row**

Trials conducted in central Queensland and the Darling Downs over the last few years have shown that raingrown cotton is surprisingly yield insensitive to in-row plant density over a fairly wide range of stands. In fact, it is more sensitive to row spacing configuration. Table 3 presents yield data for these trials which show that while the ideal target for all row configurations is probably 8 to 10 plants per metre, the farmer should not be too concerned if he gets 100 % emergence under ideal conditions and ends up with 12 plants/m or if his stand gets down to 3 to 4 plants per metre due to insects, wind blasting or hail. On the other hand, gappy stands with in-row populations lower than 3 to 4/m will most likely have a reduced yield, require a much greater level of chipping and will be more difficult to pick. In very dry seasons, however, such stands may produce some improvements in quality.

**Table 3.** Effect of in-row plant stand on lint yield (bales/ha) across different row spacings

| Location & Season | Variety | Plants/m | Yield (bales/ha) | | |
|---|---|---|---|---|---|
| | | | Solid Skip | Single Skip | Double Skip |
| Biloela 1990/91 | DP90 | 2 | 3.53 | 3.71 | - |
| | | 5 | 4.73 | 4.49 | - |
| | | 8 | 4.27 | 4.64 | - |
| | | 13 | 4.87 | 4.73 | - |
| | | 17 | 4.83 | 4.68 | - |
| Biloela 1991/92 | L22 | 2 | 2.06 | 2.03 | - |
| | | 4 | 2.19 | 2.03 | - |
| | | 8 | 2.35 | 2.67 | - |
| | | 12 | 2.48 | 2.95 | - |
| | | 16 | 2.79 | 2.29 | - |
| Dalby 1992/93 | 1-4 | 3 | - | 1.88 | - |
| | | 5 | - | 1.85 | - |
| | | 7 | - | 1.88 | - |
| | | 9 | - | 1.90 | - |
| | | 11 | - | 1.98 | - |
| | | 13 | - | 2.02 | - |
| Dalby 1993/94 | L22 | 3 | - | 3.23 | 3.09 |
| | | 6 | - | 3.35 | 3.16 |
| | | 9 | - | 3.11 | 3.11 |
| | | 12 | - | 3.09 | 3.09 |
| | | 15 | - | 3.06 | 3.11 |