

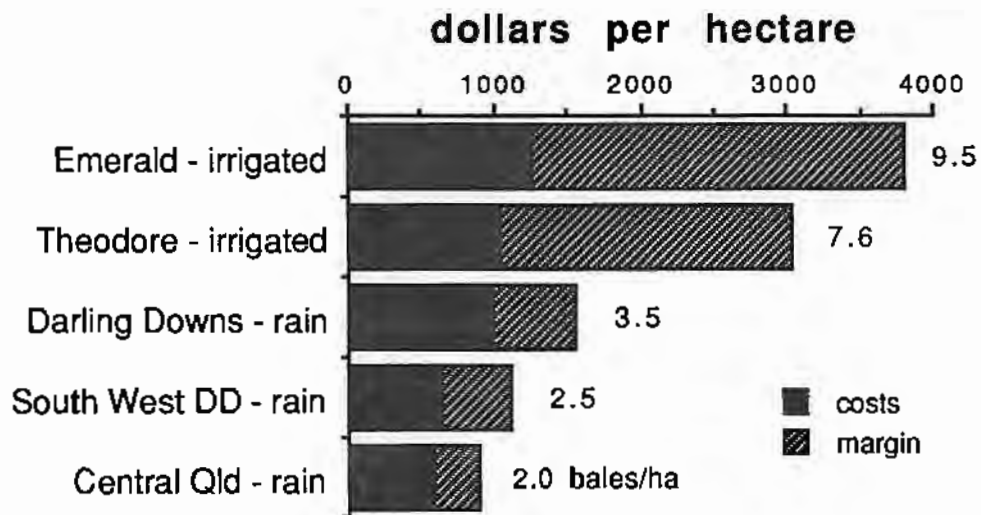
## Costs influence pest management decisions on raingrown cotton.

Ian J. Titmarsh - *QDPI Biloela Research Station*

Attendees at the 1992 Australian Cotton Conference sat in silence as two speakers promoted completely opposite approaches to insect pest management in raingrown cotton. Here, I have explored the apparent discrepancies between the approaches and conclude both were correct - dependant upon their economic considerations.

### Cotton management differs between water regimes and regions

Cotton management now is modified by water regime (irrigated vs. raingrown) and environment (dependable vs. variable), although raingrown cotton management early-on drew heavily on the experience of the managers of irrigated cotton. In changing between water regimes, the status and dynamics of plant-available soil water content became a focus of attention for raingrown cotton growers. The lower yield expectation of raingrown cotton due to water limitation quickly made clear the need to contain variable cost inputs for the profit-performance of raingrown cotton to be maximised.



**Figure 1:** A comparison of Variable Costs and Gross Margin for cotton grown in different centres and water regimes. Calculated @ \$400 per bale + sale of raingrown cotton seed @ \$130 per tonne

Margin (profit) varies far more than Costs across centres and water regimes (Fig. 1) but, in any case, is maximised through good management and cost optimisation. As insect control can consume 20-50% of variable costs, attention quickly focussed on the potential for savings to be made on this operation. Significant cost savings were achieved using ground-based sprayers and a banded application of insecticides during the early growth stages of the plant. Boom application of endosulphan on a 40% band reduced the aerially-applied cost of same from ~\$25 to ~\$6 per hectare - a 75% reduction in outlay.

In changing between regions, good management and cost optimisation is considered "less difficult" in regions such as the Darling Downs where a high and relatively-dependable average yield potential for raingrown cotton means such an enterprise can be profitable over a wide range of actual yields and management "mistakes". A profitable yield of raingrown cotton is virtually guaranteed in south-eastern Queensland provided this cotton is planted into a full or near-full soil moisture profile. At the end of a season, higher yields simply mean there is more money available to cover costs; the remainder to be taken as profit.

In climatically more variable regions such as central Queensland (CQ), profitable yields are not guaranteed unless follow-up rain is received, so the remaining raingrown cotton growers in CQ tend to be cautious. Average potential yields are lower in comparison to the southern regions, and desired actual yields are less dependable. This means Gross Margin usually is smaller and so there is less money at the end of the season from which to meet variable costs and take profit.

#### **Why is raingrown yield potential lower and more variable in CQ?**

In CQ generally, suitable agricultural soils are shallow, and less water is stored in the "full" profile of a shallow soil than in a deeper soil of similar classification. When substantial rains do fall, runoff also presents a severe erosion hazard. Annual

rainfall in CQ is similar to that on the central and southern Darling Downs (~ 600-650 mm), but some 60% of the rain in CQ occurs in falls of less than 10 mm. High evaporation rates in CQ (up to 300 mm per month during October -December) mean less stored soil water goes into active plant growth, rather it passes through the plant in order to cool it. These environmental conditions mean soil water is rapidly consumed, and bitter experience has proven it unwise to hold significant yield expectations in fields where follow up rain has not occurred before first flower.

**What are the apparent differences between regions in management practices for raingrown cotton?**

The idea that soil water is limiting makes an "earliness" approach seem attractive. This approach (supposedly) produces the cotton crop within a minimum accumulation of heat units and without reducing yield and quality or increasing costs and risks. It appeals to people who value efficiency and so this first approach is a logical one - to heavily protect the pre-squaring plants and early fruit because profit is likely (75% probability for Goondiwindi achieving 2.0 bales/ha; 85% for Dalby) and additional rainfall while uncertain is also likely to boost yield. An underlying assumption is made that yield compensation by the plant for early insect damage can occur only if further rain falls allowing an additional flush of plant growth and fruit production to replace those fruit damaged early and shed.

In the CQ scenario, a second approach recognises that a viable profit is as likely as not (50% probability of achieving a 2.0 bale crop). Relatively less money usually materialises at end-of-season to cover costs and, due to high evaporation rates, that money will only present if follow-up rain has fallen. Failure to receive follow up rain means minimal yields are likely. The CQ rule-of-thumb is don't input too many costs unless substantial rain falls before first flower. This approach is a more dynamic one - suggesting raingrown plants should be left alone (when possible) prior to first flower, accepting that plants will compensate yield for early damage

and early fruit loss, and planning to use such compensation to help contain costs and maintain profitability. One "cost" of managing this way may be a slight extension in time-to-maturity.

### **Are raingrown cotton crops sprayed too much?**

Pest management operations such as spray application are justified only where a pest threshold is exceeded AND the crop to be treated has an "acceptable" projected yield. In cases of impending economic loss on growing the crop, spray application to protect yield may be justified in order to minimise the size of the emerging loss. To summarily use lower insect thresholds early so that the crop is heavily protected early then is illogical unless the cost of control is reduced - otherwise the cost accrued exceeds the value of crop production saved.

The frequent use of ground-based sprayers is justified because they reduce the cost of control and so change the insect threshold (the number of insects per row metre which is damaging) -

$$\text{insect threshold} = \frac{C \times R \times Y}{V \times D}, \text{ where}$$

C = cost of control (\$/ha)      R = row spacing (cm)      Y = yield (bales/ha)  
 V = value of cotton (\$/bale)      D = yield lost per insect (g).

Calculating the equation using any dummy set of numbers shows that reducing the cost of control, C, reduces the insect threshold by the same factor. Halving the control cost halves the insect threshold and, similarly, if the cost of control were trebled, then the insect threshold also triples.

### **What is the tangible link in management practices between regions?**

Most raingrown cotton managers use ground-based sprayers to reduce the cost of control, at least for early sprays, and this reduction justifies the use of lower insect thresholds. However, their decision to favour either earliness or plant compensation is made on an individual crop case; giving due consideration to length of season,

cost of control operations, and the likelihood of profitability. As a result, southern managers say costs can be accumulated, but at the cheapest possible rate. In contrast, because of environmental constraints, managers in CQ avoid accumulating costs prior to a particular stage in the development of the cotton plant.

Saving one ground-applied banded application (say \$8/ha) using plant compensation achieves a 3.8% and 2.2% increase in Gross Margin for central and southern Queensland respectively. Some managers consider this not worth chasing. Yet the 2.0 bale/ha yield in calculations for central Queensland is undependable, so for lower actual yields this increase in margin from one saved spray is more likely 5-7%. If the spray saved was to be aerially-applied (@\$25/ha), gross margin would increase 11.8% and 6.8% respectively.

Our ability to control cotton pests with present tools may deteriorate in the future. If so, cost of control may increase dramatically due to the expense of alternative and/or novel products that will need to be used. In this scenario, information on yield compensation and other ways of avoiding spray applications will be used increasingly to keep variable costs to a minimum. As prices of effective pesticides rise, or if more expensive alternate control techniques are employed, variable costs will also rise forcing raingrown cotton management in southern Queensland centres to more closely align with current practices in CQ. Under similar circumstances and without a significant rise in the cotton price, CQ growers will exit from raingrown cotton production.

#### **A case for technology transfer?**

Opposing approaches to managing raingrown cotton seem paradoxical. In context of industry evolution they are not. Latecomers see regional approaches in conflict rather than as points on a continuum of circumstances. Cottongrowers in all centres need to be making decisions based on new information and historical perspectives.

