NORTHERN FOCUS
COVERING NORTHERN NSW AND QUEENSLAND

Dryland cotton makes a comeback for summer cropping rotations

By the CSD Extension and Development Team

In the late 1990s dryland cotton was a popular crop – prices were high and good returns were made. Due to a number of factors, including a prolonged drought, a period of improved coarse grain prices and a horror 1998–99 summer with insects, the hectares committed to dryland cotton has declined.

During this period high Helicoverpa pressure, coupled with the build-up of insecticide resistance to traditional chemistry resulted in a lot of time and money being spent to control these insects – often with limited success.

At the end of a summer growers were left with mounting bills and not much crop to show for it. A lot of summer dryland cropping options have failed in the past – but it seems dryland cotton took the brunt of the backlash.

A lot has changed in cotton production over the past decade making dryland cotton a much more attractive, simpler, and less risky crop to grow. Many growers are again considering dryland cotton as a viable rotational option.

Dryland cotton is an under-utilised crop in the northern region.

If you drew up a list of issues or problems which discouraged growers from dryland cotton in the past – such as cost and difficulty in controlling insect and weed pest, variable yields, fibre quality discounts, high capital and management requirements – you would find that many of these have greatly diminished in importance.

What has changed?

Dryland cotton is one of the most under utilised crops grown in southern Queensland and northwest NSW. These regions are blessed with soils which are inherently fertile and have high water holding capacity. The climate, with summer dominant rainfall lends itself to growing the crop in the summer with plenty of available heat units, then harvesting in the drier autumn.

Infrastructure such as farming contractors, harvest and handling machinery, cotton gins and merchants are already in place supporting the irrigated industry. Agronomic knowledge is plentiful with experienced consultants and industry personnel at hand and specific cotton research and extension facilities are centrally located.

...ii ▷

The introduction of biotechnology traits

Biotechnology traits have been used in the Australian cotton industry since 1996 – initially a single gene for Helicoverpa control, then progressing to combinations with Roundup Ready for weed control, then on to Bollard II for improved Helicoverpa control and more recently to Roundup Ready Flex and Liberty Link which allow full season control of certain weed species, in combination with Bollgard II.

In particular, the latter products, Bollgard II and Roundup Ready Flex have had a significant impact on the whole cotton industry, and have dramatically altered the way dryland cotton is thought about and grown.

Bollgard II provides season-long Helicoverpa control. This means no more long summer nights on the spray rig, no more watching costs blow out because the ground is too wet to use a ground rig, and fewer difficult decisions as to whether to invest money in insect control in a crop where the yield potential is uncertain. There have been many instances in the past few years where Bollgard II dryland cotton crops are not treated for insect pests at all during the growing season.

Roundup Ready Flex allows Roundup to be applied broadacre throughout most of the season – greatly simplifying weed control. Weeds can now be sprayed when appropriate and the need for residual herbicides has been dramatically reduced, which in turn creates more options in replant situations and crop selection following cotton. This in turn has allowed growers to control weeds efficiently and cost effectively between wide rows. This has brought about additional benefits to dryland cotton production.

Wide row configurations

Single and double skip, 60 and 80 inch and super singles (120 inch) row spacing configurations have all been applied successfully to integrate cotton into the modern dryland farming system. Wider row configurations reduce the risk of low yields and fibre quality discounts in less favourable seasons. Wider skip configurations enable a greater amount of stored soil moisture to be available to the plant during the critical stages of boll set and fibre development. This has the benefit of prolonging the period before a crop suffers moisture stress, and expanding the window for making the best use of in-crop rainfall.

Cotton has a strong, foraging tap root system – an attribute well suited to wide row configurations. Cotton actively explores the soil profile for moisture and nutrients much more effectively than other summer crop options such as sorghum, corn, sunflowers and mungbeans. This strong foraging ability enables the cotton plant to access deep soil nitrogen which over time has moved down through the soil profile becoming unavailable to other crops.

Another advantage of wider row configurations is the ability to reduce growing costs. These include the two biggest input costs for dryland cotton – harvesting and Bollard II and Roundup Ready Flex licence fees – as well as planting seed, in-crop insecticides and herbicides and application costs. As cotton pickers are not required to traffic every square metre of the field in wider row configurations, picking costs can be reduced by between 30–50 per cent when compared to solid planting.

Licence fees for Bollgard II, Roundup Ready Flex and Liberty Link technologies are calculated on a 'green hectare' basis, meaning a double skip crop will cost 50 per cent that of solid plant. Monsanto has also added an 'End Point Royalty' scheme this season for Bollgard II/Roundup Ready Flex cotton where the technology provider carries some of the production risk with the grower. If the crop yield is reduced due to drought, hail or any other factor you pay less.

Variable cost savings at average yield levels can be achieved over solid planting, ranging from 20 per cent to 45 per cent depending on the width of the skip (Table 1). In comparison, sorghum shows little difference in the variable costs between different row configurations.

When these benefits are incorporated into a gross margin analysis for dryland cotton, it is not hard to achieve a positive gross margin return, even at very low yield levels, thus reducing production risk (Figure 1).

TABLE 1: Anticipated dryland cotton variable cost savings per hectare over solid planting

	Single skip	Double skip	Super single
Planting			
Operation	100	100	100 (equipment modifications required if 8 metre swaths)
Fertiliser – starter	@ 10 kg	@ 8 kg	@ 3 kg
Herbicides			
Fallow	100	100	100
Planting	Band Row Total 40 66 26	Band Row Total 40 50 20	Band Row Total 40 33 13
In-crop	100	100	100
Insecticides			
Planting	Band Row Total 40 66 26	Band Row Total 40 50 20	Band Row Total 40 33 13
In-crop	Band Row Total 30 66 20 50 66 33 70 66 46 100 66 66	Band Row Total 30 50 15 50 50 25 70 50 35 100 50 50	Band Row Total 30 33 10 50 33 16 70 33 23 100 33 33
Technology fee			
Bollgard II	210	157.50	105
Roundup Ready	32	25	16
Roundup Ready Flex	50	38	25
Liberty Link	50	38	25
Plant conditioners			
Growth regulators	Similar	Similar	May require more product
Defoliants*	66%	50%	33%
Picking	Full	Full to 2/3	2/3

*Bigger plants may require higher %
Calculations based on minimum tillage field, herbicide and insecticide applications made by ground rig.

Variety

Maintaining fibre length under soil moisture deficit has always been an issue for dryland cotton growers. In recent years, varieties have been developed with significant improvements in fibre properties, particularly staple length – a few have become almost 'discount proof', and this trend will continue into the not too distant future.

Examples of such varieties are Sicala 350B and Sicot 75 which in dryland scenarios have an average fibre length 2/32nds of an inch (0.06 inch) ahead of other dryland suitable varieties. Even in the toughest of tough seasons such as the 2006–07 season where crops received no useful in-crop rainfall, these varieties maintained base grade for fibre length.

In the past season, higher fibre quality varieties such as Sicot 71BRF containing the Bollgard II, Roundup Ready Flex technology have performed extremely well in dryland variety trials. This variety combines the technology traits as well as high yield potential with improved fibre quality which dryland cotton growers' desire. Importantly in the near future more Bollgard II Roundup Ready Flex varieties will be released which combine high yield potential with a longer, stronger and a fine fibre.

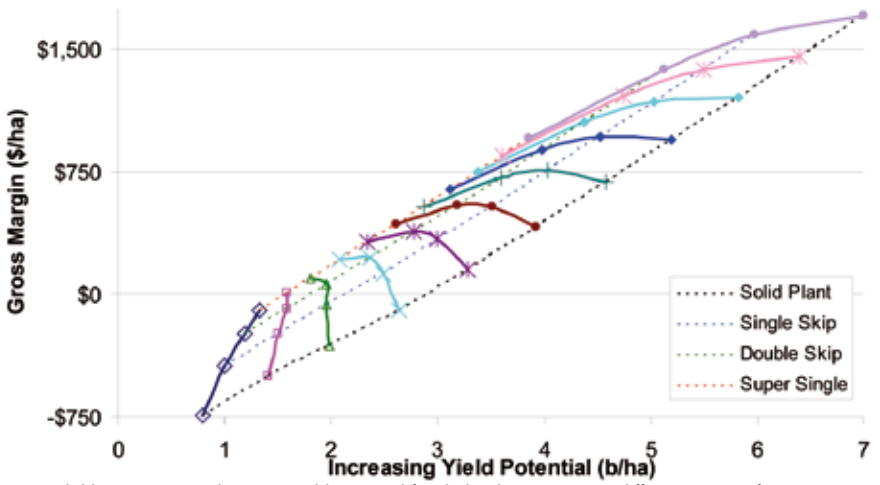
Cotton vs sorghum – How does it stack up?

Sorghum is the predominant summer rotation crop in northwest NSW and southern Queensland for good reason. It

...iv ▷

Sorghum is the biggest summer crop but recent benchmarking studies show greater financial returns from dryland cotton.

FIGURE 1: Dryland cotton gross margin matrix factoring flexible yield potential and variable costs across different planting row configurations ($450 lint and seed price post ginning)



Note: Solid lines represent the same yield potential for dryland cotton across different row configurations. From this $450 per bale/seed example a demonstration of the mitigation of risk due to management of the row configuration sees the same return. Solid plant would have to yield between 4.0–4. 5 b/ha to achieve a similar return per ha as super single at the same yield potential (2.2–2.9 b/ha). Single and double skip have the same relative return at this yield potential (brown and grey lines).

TABLE 2: Three seasons of sorghum/cotton comparisons – Coulton Farming Co, 'Getta Getta', North Star, 2006–09

2006–07		Planted October 2, 2006
Rain: 161 mm in-crop over 32 events (average 5 mm per fall) none effective		
	Cotton	**Sorghum**
Yield	1.54 bales/ha	3.3 tonnes/ha
Price	$401/bale – includes length and grade discounts	$245/tonne on-farm
Variable Costs/ha	$923	$511
Break-even yield	2.3 bales/ha	2.1 tonnes/ha
Gross Margin/ha	–$305	$297
2007–08		**Planted October 15, 2007**
Rain: 286 mm in-crop – mostly in December		
	Cotton	**Sorghum**
Yield	3.5 bales/ha	3.7 tonnes/ha
Price	$435/bale – no discounts	$232/tonne – on-farm
Variable Costs/ha	$984	$524
Break-even yield	2.3 bales/ha	2.3 tonnes/ha
Gross Margin/ha	$539	$334
2008–09		**Planted September 23, 2008**
Rain: 430 mm in-crop – Effective falls in mid Nov, mid Dec and mid Feb		
	Cotton	**Sorghum**
Yield	4.0 bales/ha	3.4 tonnes/ha
Price	$475/bale – no discounts	$195/tonne – on-farm
Variable Costs/ha	$989	$515
Break-even yield	2.1 bales/ha	2.6 tonnes/ha
Gross Margin/ha	$911	$148

About these comparisons:
- Yield – actual farm averages for both crops in a similar planting window.
- Prices – actual farm prices after premium/discounts. Cotton includes seed proceeds.
- Variable Costs – estimated using actual operations and CSD's Dryland Gross Margin Budgets.
- Row Configurations – Cotton double skip; sorghum solid plant (1m).

◁iii...DRYLAND COTTON ROTATION

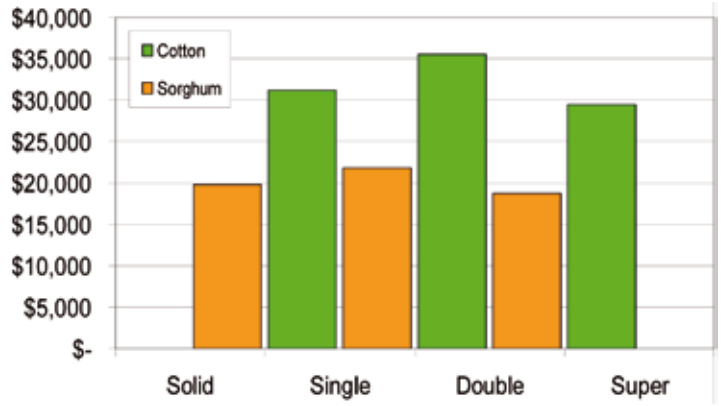
fits well into the rotational programs of many farming operations, it is simple to grow, allows the use of atrazine in the herbicide rotation, has a quick maturity which allows for the possibility of double cropping in the following winter, harvesting machinery can be utilised across many crops, and the stubble can be grazed or left for ground cover.

These qualities offer a lot to the farming system, but recent benchmarking studies conducted by CSD comparing many cropping enterprises have shown that sorghum does not provide the best dollar return to the farming enterprise. Many dryland growers are considering a move back to cotton as part of their rotation mix.

Decisions on what crop to grow are primarily based on commodity price, experi-

TABLE 3: Dryland gross margin analysis for a Goondiwindi/Moree region field on long fallow from wheat

Dryland gross margin analysis for 100 hectares

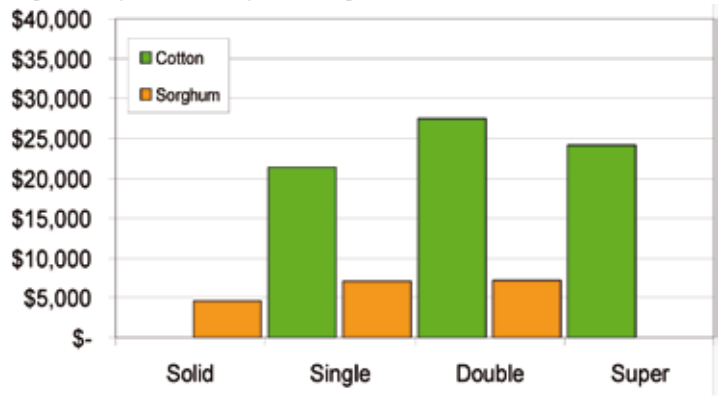


ECONOMIC AND AGRONOMIC INPUTS		
	Cotton	Sorghum
Price	$450 gin for seed	$170 on-farm
Region	Border Rivers	Border Rivers
PAWC	190 mm	190 mm
Start soil water	Full	Full
Plant stand	7.5/m	6/m
Sow date	Late October	Mid October
Soil N	100 units	100 units
Applied N	Nil	Nil

	COTTON			SORGHUM		
	Single	Double	Super	Solid	Single	Double
Average yield	3.01	2.78	2.35	3.55	3.57	3.33
Variable costs	$1,013	$861	$733	$405	$389	$379
Gross margin per hectare	$343	$390	$324	$198	$218	$188
Break even yield	2.25	1.91	1.63	2.38	2.29	2.23

TABLE 4: Dryland gross margin analysis for a Goondiwindi/Moree region field on short fallow from sorghum

Dryland gross margin analysis for 100 hectares



ECONOMIC AND AGRONOMIC INPUTS		
	Cotton	Sorghum
Price	$450 gin for seed	$170 on-farm
Region	Border Rivers	Border Rivers
PAWC	190 mm	190 mm
Start soil water	2/3 full	2/3 full
Plant stand	7.5/m	6/m
Sow date	Late October	Mid October
Soil N	50 units	50 units
Applied N	Nil	Nil

	COTTON			SORGHUM		
	Single	Double	Super	Solid	Single	Double
Average yield	2.73	2.56	2.21	2.58	2.63	2.60
Variable costs	$1,290	$850	$728	$392	$377	$369
Gross margin per hectare	$235	$302	$265	$47	$70	$72
Break even yield	2.21	1.89	1.62	2.38	2.29	2.23

ence and potential returns. Yields cannot be guaranteed in any farming operation but the dryland farming system is heavily reliant on the season. Altering the cropping program to include another crop such as cotton is a balance between risk and reward. To assess the risk and potential returns, comparisons need to be made between the crops competing for the same acreage.

Comparing crops in a dryland farming scenario is very complicated as there are many variables which may impact the final outcome. In the past a crude method has been to take the regional average yield of the two crops, then apply a gross margin to these values to produce an estimate of the relative profitability of each crop. This method develops basic understanding but leaves a lot of questions unanswered, and is not specific to the individual farming operations.

Keeping returns in perspective

For the past three seasons the CSD Extension and Development team has cooperated with Ben Coulton, 'Getta Getta', North Star in a dryland cotton variety trial. The farm has produced both dryland cotton and sorghum in all three seasons. Analysis of the performance of the different crops through the three seasons highlights the variability which can cloud decision making about which cropping enterprise offers the best return.

Cotton, although producing a negative result in the tough 2006–07 season, has returned an extra $122 per hectare per year to the farming enterprise over these three summer seasons (see Table 2). This comparison uses real yields and real commodity prices and shows that, regardless of the historically higher prices offered for sorghum in the past few seasons, cotton is still more profitable than sorghum.

Although this is a good guide for the farming operation at North Star, it does not lend itself easily to transplanting to other properties throughout the northwest NSW and southern Queensland. In a dryland farming sense it is difficult to reliably and accurately estimate crop performance as other variables produce 'what if' scenarios which cloud results.

Variables such as commodity price, soil water holding capacity, amount and timing of in-crop rainfall, soil fertility, row configuration and planting date all play a huge role in determining yield, quality and hence profitability. Estimating the yield and returns of two different crops while incorporating so many variables without specific information on each of the crops is fruitless.

TABLE 5: CSD's dryland gross margin analysis tool allows for numerous combinations of economic and agronomic variables

Variable	Number of options within tool
Price	Numerous
Region	4 with the possibility to expand further
PAWC	4
Start soil water	2
Plant stand	4
Sow date	4
Soil N	3
Applied N	6

Decision making tool

To fill this gap, CSD has developed a Microsoft Excel based dryland cropping model that incorporates aspects of the program *Whopper Cropper* as well as many years of dryland cotton research from CSIRO. This tool has an interactive gross margin analysis superimposed over the *Whopper Cropper* generated yields, which shows the returns and takes into account the refuge and licensing requirements associated with dryland cotton production.

Being able to independently factor in all the variables with specifics for the farming operation is going to be of benefit to growers as they determine their cropping intentions for the coming spring and summer. There are crop models which can independently predict yields based on certain crop parameters, such as *Whopper Cropper*, but they will not allow the simultaneous comparison of two summer crops over various row configurations.

The strengths of this analysis tool is in the flexibility it gives users – they can use estimations of growing costs and yields, or their own values, and they are able to update the cost of different inputs as these change over time.

These aspects allow the user to personalise the tool and keep it relevant to their situation and times.

By tying the interactions together between many economic and agronomic variables, CSD believes this to be the only tool of its kind to achieve this aim. The example in Tables 3 and 4 show how the CSD Dryland Gross Margin tool can be used to assist in the decision making process.

For this coming summer, country on long fallow from 2008 wheat and short fallow from 2008–09 sorghum will present planting opportunities in the Goondiwindi/Moree area.

The tool allows for these scenarios to be compared and individually analysed. For fallows from the 2008 wheat crop, soil profiles are full after good rains in the summer months and through autumn, and mineralised soil nitrogen would also be high.

Conversely, for the shorter fallow scenario soil profile is not quite full (2/3 full) as yet and less mineralisation of nitrogen has occurred during the shorter fallow period.

In both instances it shows cotton to be more profitable than sorghum for these variables. Of note is the improvement in

…vi ▷

CSD's dryland gross margin analysis tool provides a unique capability for growers to account for the interaction between many economic and agronomic variables.

◁v...DRYLAND COTTON ROTATION

gross margin due to planting on a full soil profile in the Table 3 example compared to Table 4 for both cotton and sorghum.

In the short fallow scenario, coming out of a previous sorghum crop, cotton is four to 4.5 times more profitable than sorghum depending on the skip row combinations chosen. This analysis not only demonstrates the ability of the cotton plant to forage through the soil profile to seek moisture and nutrients better than sorghum, but also the many interactions within the dryland farming system and how they can impact on the performance and profitability of the farming operation.

In this example only two variables were changed across the analysis – starting soil water and soil N. But it is possible to alter just one or a combination of seven variables to fully customise the analysis to suit the particular location and management inputs (see Table 5).

This gross margin analysis is applied to Bollgard II Roundup Ready Flex cotton to simplify the process, as this type of cotton makes up about two thirds of all dryland cotton planted in Australia. Therefore the analysis takes into account the yield impact and the cost of management of the refuge requirements for resistance management in dryland cotton.

The dryland gross margin display shows the return from a 100 hectare field, equating to 100 hectares of sorghum and 91 hectares of cotton to factor in the refuge requirement. One of the options under the resistance management plan for Bollgard II is to plant 10 per cent of the area to unsprayed cotton, in this instance nine hectares. To simplify this process, we have assumed that there is no yield harvested from the refuge area, although in many years cotton is picked from refuge crops.

Risk vs reward

For some farmers, the growing of dryland cotton is about the risk or perceived risk and for some it is too high. With sorghum the risk is minor, as it is a simple crop to grow, but coupled with this simplicity, the reward is minor. In dryland cotton production the risk of production failure (a concern 10 years ago) is also diminishing.

Through the use of wider row configurations, biotechnology and improved varieties, growers have been able to reduce the risk profile of dryland cotton. CSD believes at present that dryland cotton is as easy to produce and shares the same risk profile as sorghum and these tend to be the experiences of growers who have incorporated both sorghum and cotton into their summer crop rotation over the past five years.

But the upside in yield potential of cotton especially if the season is favourable, has great reward.

Cash reserves misconception

One of the misconceptions is that you need large cash reserves to grow cotton – it is a fact that it does cost more to grow than sorghum. For many dryland cropping farmers in these regions this is a major stumbling block in trying dryland cotton as a rotation option. Prices have to be at historical highs (over $500 per bale) before they contemplate growing dryland cotton.

But closer examination of the actual growing costs and cash flows when they arise show a very similar cost structure between cotton and sorghum, right up to the end of the season (Figure 4).

It is important to understand the timing of when these costs are incurred as it is a widely misunderstood but a significant factor. For dryland cotton production the major costs are associated with the licensing fees and picking operation which can account for up to 40–50 per cent of the actual growing costs. This large cost comes on the back of the harvest of the crop – when you can see what you have got in the field – and a decision can be made between using strippers or pickers to further reduce costs. The delayed payment terms for the license cost to the end of April will mean in some cases these may occur after you've been paid for your cotton.

The ability to forward sell, in many cases on an area, total production contract, allows dryland cotton growers to further manage risks associated with production – in this case the cotton merchant shoulders some of the burden of delivery risk.

Therefore growers can lock in a price when prices spike at any time, which enables surety in regards to the marketing of the crop and also in obtaining access to finance to produce.

TO SUM UP

Both sorghum and cotton provide dryland farmers with many positives for their summer cropping programs. They are complementary crops and play an important role in risk management. Having a foot in both camps to take advantage of the summer whichever way it breaks is a good risk management strategy.

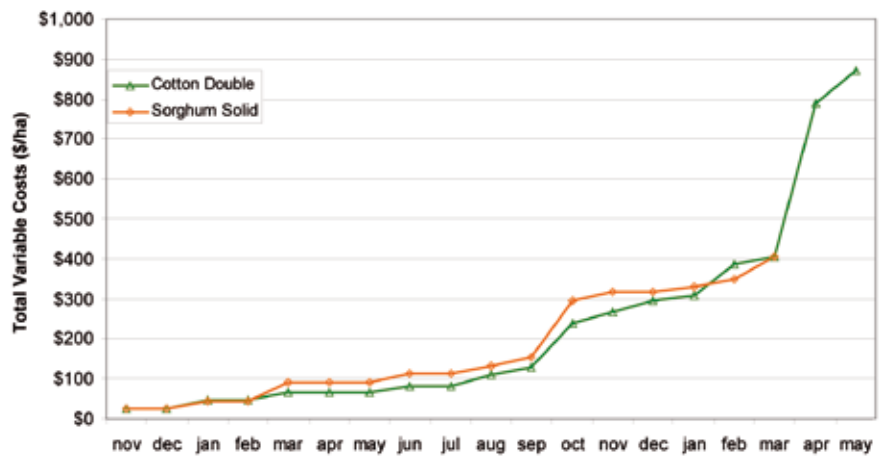
New technologies – particularly biotechnology traits to manage insects and weeds – have significantly changed the prospects for dryland cotton.

But dryland cotton is an under utilised crop and can provide growers with superior returns over sorghum within the rotation. Successfully growing dryland cotton becomes a compromise between selecting a row configuration and variety which will provide break even yields and quality in poor seasons, but still have the ability to respond if conditions are favourable.

It must also allow growers to reduce growing costs. It is not always the highest yielding crop which returns the most to the farming operation, but the one with the best gross margin.

The CSD Dryland Gross Margin Tool is freely available to the industry. If you would like further information or a copy please contact Cotton Seed Distributors or one of the CSD Extension and Development Team – Ph: 02 6795 0000. ■

FIGURE 4: Cash flow analysis across differing row configurations for cotton and sorghum



It is only up until the end of the summer when the variable costs of cotton diverge from that of sorghum.