



Australian Government
Cotton Research and
Development Corporation



Cotton Catchment Communities CRC

FINAL REPORT 2006

Due by 30th September 2006.

Part 1 - Summary Details

Please use your TAB key to complete Parts 1 & 2.

CRDC Project Number:
OR Cotton CRC Project Number: 1.01.38

Project Title: Minimum tillage in northern Australia

Project Commencement Date: March 2005 **Project Completion Date:** Dec 2005

CRDC Program:
OR CRC Program: The farm

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Part 3 – Final Report Guide (due 31 October 2006)

Background

Cotton industry expansion in traditional growing regions is highly unlikely due to land and water constraints. However, research in northern Australia has confirmed that new production areas are technically feasible although regulatory, political and environmental issues have constrained progress. For these reasons, development is most likely to succeed in existing and expanding agricultural production areas such as the Ord and the Burdekin where the industry can develop by crop replacement, rather than by developing new land and water resources.

On 6 October 2005, the proposed Ord Stage 2 expansion took a significant step forward with the signing of a Native Title agreement between the traditional owners and the WA government. Since the signing, the government has expressed its determination to proceed with the project development and expressions of interest were called for in December 2006.

Although the basics of crop husbandry and pest management for Ord Stage 2 are available to farmers, there are some production issues that require resolution before commercial cotton production commences. The most important of these are:

1. achieving reliable fibre quality in all seasons
2. strategies for early sowing
3. nutrition on virgin soils (and following sugarcane)

Objectives

To assess the role of wet season cover crops and minimum tillage systems in facilitating early sowing of cotton in the Ord River Irrigation Area.

Methods

The trial was planted as an unreplicated demonstration block on Field 5B at the Frank Wise Institute, using the varieties Sicala 40B and 40BR. Three main treatments were investigated, with sub-treatments superimposed.

Treatment 1. **Minimum tillage, cotton planted into cover crop.** Planted 15 March.

Sub-treatments:

- a). Sicala 40BR. Sprayseed at sowing, no Stomp at sowing, Roundup at 4 leaf stage. 30 beds.
- b). Sicala 40BR. Sprayseed at sowing, Stomp at sowing, Roundup at 4 leaf stage. 15 beds.
- c). Sicala 40B. Sprayseed at sowing, Stomp at sowing. 45 beds.

Treatment 2. **Minimum tillage, cotton planted into weed fallow.** Planted 15 March.

Sub-treatments:

- a). Sicala 40BR. Sprayseed at sowing, no Stomp at sowing, Roundup at 4 leaf stage. 30 beds.
- b). Sicala 40BR. Sprayseed at sowing, Stomp at sowing, Roundup at 4 leaf stage. 15 beds.
- c). Sicala 40B. Sprayseed at sowing, Stomp at sowing. 45 beds.

Treatment 3. **Full soil preparation including discing, power harrows and bed shaping.** Planted 4 April. Sicala 40B. Pre-irrigate, Roundup and Stomp at sowing. 45 beds.

The cover crop in treatment 1 was forage sorghum planted in November the previous year. The cover crop was slashed once in January and killed with glyphosate in February.

Treatment 2 was left as a weedy fallow over the wet season, with no attempt made to control weeds through the wet season.

A basal fertiliser (DAP 250kg/ha, ZnSO₄ 5kg/ha and S 15kg/ha) was drilled into the bed in two rows just prior to planting. Cotton was planted directly into the cover crop or weed fallow with no further cultivation. Urea 400kg/ha was applied as a sidedressing 6 weeks after planting.

Pix[®] 400mL/ha was applied to Treatments 1 and 2 on 12 April.

Treatments 1 and 2 were inter-row cultivated for weed control on 21 April; the furrows only in these treatments were scraped for weed control on 6 May.

Roundup Power Max at 1.9L/ha was applied to the Sicala 40BR treatments on 4 April at the 4 leaf stage.

Treatments 1 and 2 were harvested for yield on 6 September. Treatment 3 was harvested for yield on 15 September.

Results

Due to the design of the trial, rigorous statistical analysis of yield was not feasible. However, a large number of samples were taken from each treatment in order to construct a crude yield map for the field. In the following analysis these have been treated as treatment replicates. This is strictly an unsound statistical approach because bed effects cannot be identified; however, each treatment was either 45 or 90 beds wide, and because samples were taken from across the width of the treatments, it may serve to identify gross effects due to treatment. For the purpose of this analysis only treatment effects have been tested.

One-way ANOVA.

	SS	Degr. of Freedom	MS	F	p
Intercept	7162.157	1	7162.157	16127.17	0.000000
Treatment	3.462	2	1.731	3.90	0.024002
Error	37.749	85	0.444		

Significance level of Bartlett's test p = 0.257

Means and standard errors

Trt.	Mean Bales / ha	Std. Error	-0.95 CL	+0.95 CL	N
T1	9.47969	0.117806	9.245457	9.71392	32
T2	9.63625	0.105369	9.426748	9.84575	40
T3	10.04750	0.166603	9.716249	10.37875	16

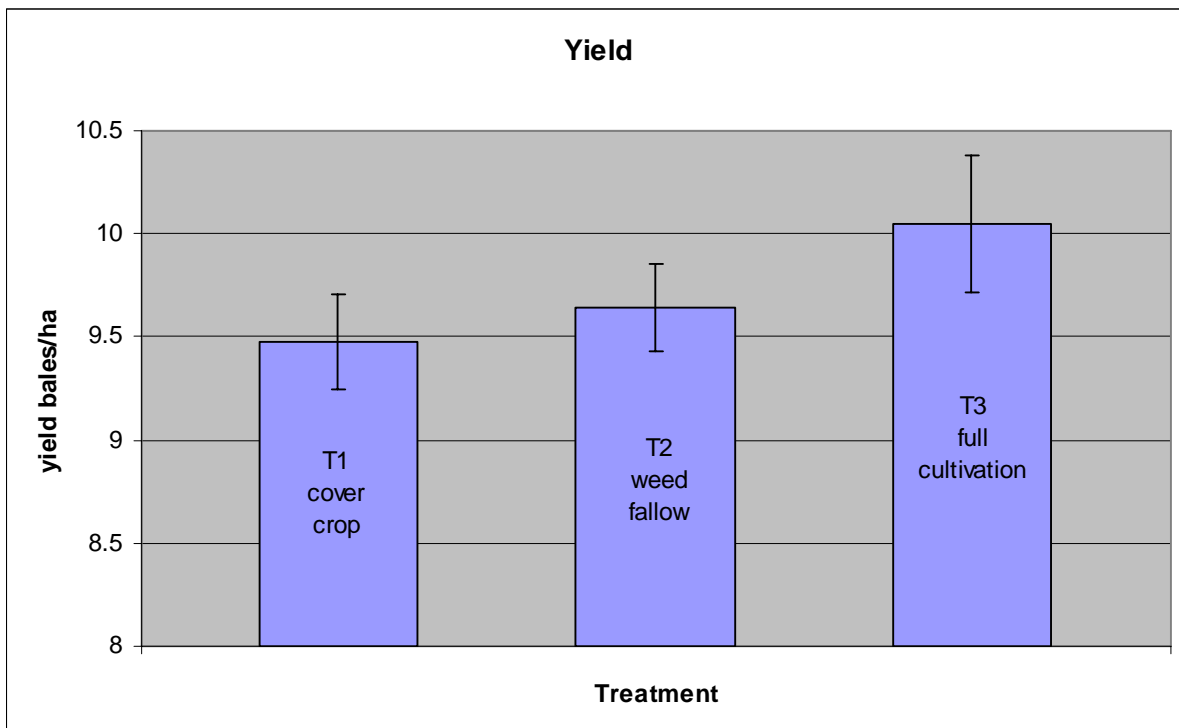
Post Hoc tests.

Significance level of differences: Fisher's lsd.

Treatment	T1	T2	T3
T1		0.324709	0.006640
T2	0.324709		0.039956
T3	0.006640	0.039956	

Homogeneous groups (p = 0.050)

Treatment.	Mean Bales / ha	Fisher's protected lsd	Duncan's NMRT
T1	9.47969	a	a
T2	9.63625	a	a
T3	10.04750	b	b



In this analysis, treatment 3 (conventional tillage) was just significantly different from treatment 1. However, in light of the unreplicated nature of the trial, we would not claim that there was any true difference between treatments.

This trial has demonstrated that it is possible to achieve a significantly earlier planting date if full cultivation is replaced with a minimum tillage system where bed shape is maintained through the wet season using a cover crop or weed fallow. In this case, the two week delay in planting the fully cultivated treatment was artificially imposed, but in a real world situation, this length of delay would be realistic.

The value of the minimum tillage treatments was clearly demonstrated in this trial; following planting of treatments 1 and 2 on 15 March, the field received 130mm rain from Cyclone Ingrid the following day. Bed shape was maintained and these treatments drained rapidly. There is no doubt that a finely cultivated and shaped bed would have collapsed with this amount of heavy rain. The rain received effectively washed the pre-emergent herbicide off those areas to which it had been applied, and consequently the effect of the sub-treatments was obscured.

Outcomes

The results obtained from this trial have demonstrated that:

- substantially early planting is possible if a minimum tillage wet season strategy is adopted instead of conventional full tillage prior to planting. This advantage is transferred to the end of the growing season, where harvest is possible up to two weeks earlier than with a conventional tillage system.
- yields obtained from adopting minimum tillage are not significantly lower than those obtained from a conventional system.
- significant savings in fuel are possible through the use of minimum tillage.
- bed stability is better with a minimum tillage system and beds are better able to withstand heavy rain events.

This trial has demonstrated the suitability of a variety with determinate growth habit to early planting in the Ord. The variety used, Sicala 40, exhibited high early retention, which led to early cutout; most fruit was set early in the season when temperatures were still relatively high. This attribute of Sicala 40B is beneficial in almost all seasons in the Ord, and this variety consistently gives an earlier harvest date than the indeterminate varieties such as Sicut 289, and generally with little or no reduction in yield.

Conclusion

Achieving the earliest possible harvest date will be a critical objective for a future cotton industry in the Ord. This is important for the reason that the risk of storm damage increases rapidly from late October onwards. In a production system based on dry season growing (as opposed to growing the crop vegetatively through the wet season and aiming for harvest during the middle of the dry season), this will depend mainly on two factors:

- achieving the earliest possible planting date
- the use of short growing season, determinate varieties.

We have demonstrated here that by combining the determinate variety Sicala 40B with a minimum tillage production system, harvest is possible in early September.

Extension Opportunities

The results of this work have been incorporated into NORpak – Cotton production and management guidelines for the ORIA, 2006. (submitted for publication 2006)

8. A. List the publications arising from the research project and/or a publication plan.
(NB: Where possible, please provide a copy of any publication/s)
- B. Have you developed any online resources and what is the website address?

Part 4 – Final Report Executive Summary

A future cotton industry in the Ord will be based on a dry season (winter) production system. Attempts to grow cotton in the Ord during the 1960s and 70s was based on a wet season production system. For a number of reasons it is now abundantly clear that wet season cotton production in the Ord is not sustainable in the long term.

One of the major imperatives for dry-season cotton will be to achieve as early planting as possible, so as to reach harvest before the risk of storm and rain damage becomes too high. The main constraint to early planting is usually the ability to access fields following the wet season, and the time lost in seedbed preparation.

Early planting can often be facilitated by adopting a minimum tillage system involving bed formation late in the previous year and either planting a cover crop such as forage sorghum, or leaving the beds in a weedy fallow. Both approaches negate the need for cultivation before planting cotton, and thus allow planting to be carried out as soon as the field has dried down enough to allow light tractor access. The advent of Roundup Ready Flex® varieties removes the need to allow early weed germination and control by cultivation before planting can occur. Additionally, “permanent” beds stabilised by a cover crop are better able to withstand heavy wet season rains without undue soil losses. In short, if wet season rain persists into March or April, it becomes imperative to get the cotton crop planted at the earliest opportunity.

In this current project we have shown that by growing a determinate cotton variety with inherently early cutout in a minimum tillage system, advantage can be taken of the earliest possible planting date, and can result in harvest being possible in early September, well before serious risk of storms. Furthermore, yield is not compromised by adopting a minimum tillage approach.

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