Tramline farming using controlled traffic

Key findings

- There were no significant differences in grain yield or screenings due to the traffic treatments.

Why do the trial?

To compare the performance of a controlled traffic system against a conventional traffic system.

How was it done?

Plot size	33m x 8.5m	**Fertiliser**	DAP @ 50kg/ha + 2% Zn
Seeding date	16th May 2008	**Seeding rate**	100kg/ha JNZ

The trial was a split block design consisting of 3 replicates, each with 2 tillage treatments.

Clearfield JNZ was sown at 100kg/ha. Previous crops are shown in Table 1.

Table 1: Previous crops in the long term controlled traffic trial at Hart.

2007	2006	2005	2004
JNZ Wheat	Kalka Durum	Kaspa Peas	SloopSA Barley

The treatments were,

Controlled traffic (2.05m spacing), seed box and tractor wheels aligned.

Conventional, seed box and tractor wheels aligned, with an additional pass to simulate additional traffic

The trial was sown with the commercial seeding equipment of local farmer, Matt Dare.

All plots were assessed for grain yield, and screenings with a 2.0mm screen.

Results

The traffic treatments made no significant difference to grain yield or screenings.

Table 2: Grain yield (t/ha) and screenings (%< 2.0mm) of JNZ wheat.

Traffic system	Grain yield (t/ha)	Screenings (%)
Controlled traffic	1.0	15.0
Conventional	0.9	11.9
LSD (0.05)	ns	ns

Post emergent weed control - inter-row options

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Accurately targeting the weeds and not the crop.

GPS guided auto steer enables tractors to repeatably sow straight lines however not all paddocks are perfect rectangles and occasionally sowing rigs work around trees or rocky outcrops.

Controlling weeds non-selectively in the inter-row during the growing season while preserving crop safety relies heavily on how accurately the position of the weed control implement is maintained relative to the actual crop sowing lines. Guided tractors hold a line through kinks and curves however various implements being towed by an accurately guided tractor may trail a different path due to a number of variables.

Essentially, a trailed implement tracks with its 'centre of resistance' aligned to the tractor 'centre of pull'. An imbalance in tillage forces across the width of the implement, for instance due to poor depth matching and/or variable soil conditions, results in the implement centre of resistance shifting out of line from the centre of pull, which skews the implement sideways until re-alignment is obtained. This implement shift to the side or 'drift' can be constant for a period (eg. working across a slope) or variable and random across the paddock (eg. 'wobbling' according to paddock variability). In order to minimise implement side movement, a strong restoring side force is required, which is typically generated by implement tyres (Stabiliser discs can be added for greater effectiveness). Their restoring torque is most effective when:
i) sufficient weight acts on the wheels
ii) wheel/soil grip is most effective
iii) the wheels are placed at a greater distance from the hitch point (eg. such as longer implement drawbars).
Implement guidance systems have come onto the market using GPS information and steering software to correct implement positioning via steerable wheels or ground engaging discs - eg. Orthman Manufacturing Tracker IV distributed by gps-Ag - Bendigo (www.gps-ag.com.au/products/default.aspx) and *RigGuide* implement steering offered by AgGuide – Toowoomba (www.agguide.com.au/rigguide.htm).

The above issues become a problem for accurate inter-row weed control when different implements are used for seeding and post-emergent weed control, due to their different tracking behind the same tractor, guided with the same accuracy. Typically, post-emergent weed control in inter-row is conducted with fully mounted 3 point linkage implements with a tracking ability fairly closely aligned to the tractor positioning.

We have begun to assess what effects 'kinks' and 'curves' have on inter-row treatments, and whether crop recognition and line adjustment tools provide value when added to implements being pulled by a tractor enabled with 2cm guidance.

Three paddock-like scenarios including straight plots with parallel drift values of up to 9cm, kinked plots simulating up to ±10cm wobble and curved plots on 80-100m radius were

established using the Bertini disc-seeder setup on 560mm row spacing and towed via a drawbar hitch with a RTK 2cm accuracy auto-steered tractor.

A month after crop emergence, the inter-row was treated with 1.3L/Ha of Roundup PowerMax applied at 6km/hr through a 3-point linkage spray unit fitted with 440mm wide inter-row shrouds (Diamond – WA).

For the post-emergent weed control operation, alternate plots were treated 'with' or 'without' the assistance of a Local Positioning System – LPS – consisting of a crop recognition and line adjustment tool fitted to the spray unit (*Eco-Dan* guidance system from Denmark - www.eco-dan.com). The Eco-Dan unit relies on a camera system to recognise a green crop row, and a computer controlled hydraulic side-shift incorporated into the 3 point linkage to move the implement side to side over a 200mm range. The Eco-Dan hydraulic side shift ensures the crop row remains in the centre of the cameras field of view.

The results so far have shown that targeted inter-row spray applications in variable paddock conditions are best achieved using a guided tractor with 2cm guidance in addition to a crop recognition and line adjustment tool. The trial showed that crop damage could be fully avoided with the use of the Eco-Dan system even under the more extreme simulations. The side shift capacity of the hydraulic correction system must at least match the level of seed row position inaccuracies expected in the paddock. Other comparable systems include the *Robocrop* vision guidance from Garford Farm Machinery – UK (www.garford.com).