

Healthy Country

managing the land for healthy waterways

FarmFLOW
growth through good practice

Controlling machinery traffic in vegetables

What it means for the farming system

Vegetable producer Ed Windley has been assessing what his recent change to a controlled traffic farming (CTF) system means for his farming operation located on the Warrill Creek in the Bremer catchment of south-east Queensland.

Ed has identified benefits due to farming system changes including:

- the number and efficiency of machinery operations
- fuel savings
- timeliness of farming operations
- drainage
- yield improvements.

Kengoon Farming

Kengoon Farming is an 80 ha horticultural property. Ed has been growing vegetable crops (sweet corn, green beans, onions, carrots) for the last five years although the family has been grazing the country for much longer.

Controlled traffic farming refers to keeping machinery traffic in the same wheel tracks over consecutive crops. Soil and productivity improve as crops are not grown in compacted areas and better machinery efficiencies result from trafficking permanently compacted wheel tracks.



Ed Windley and green beans on CTF beds

The motivation for controlling traffic

With a background in cotton and grain, Ed was concerned about the effect that vegetable harvesting and cultivation practices was having on his soil quality. Vegetable production involves intensive cultivation and transporting of large harvest tonnages. Machinery has not tended to be restricted to set wheel tracks or consistent wheel spacing. Typically, the range of machinery and crops grown has meant that set wheel tracks or consistent wheel spacing can be difficult to achieve. External pressures and produce quality windows mean harvest occurs even under wet conditions resulting in widespread compaction. This results in a cycle of compaction and cultivation to 'fix' the compaction.

'compaction is a massive problem...you've got to see a carrot paddock after harvest, it's just the most appalling thing...running semi-trailers in a paddock with 25 tonne every two rows...'

The motivation for CTF was more apparent to Ed following wet conditions for harvest and ground preparation. The resulting compaction caused delays and problems for subsequent field operations and at times seriously affected production.

'you could see everywhere you had put a wheel track'

FF10-022

Healthy Country partners:



Field operations to repair compaction are a significant cost to growers in fuel, labour, time and machinery wear and tear. Compaction degrades soil structure with effects on water holding capacity, infiltration and root development and nutrient uptake. Tillage also degrades soil structure, reduces soil carbon and impacts on soil biology.

CTF and the farming system: the bottom line

Ed began implementing controlled traffic farming in the 2009/10 season and involved several changes to his farm system.

GPS guidance

In 2009 Ed purchased a Greenstar RTK¹ (± 2 cm accuracy) GPS guidance system and set up this system so that it was transferrable between his main tractors.

GPS guidance has enabled him to accurately use the same wheel tracks between crops. The use of guidance on hilling up operations saw a gain of up to 10 additional rows per field due to the greater accuracy and reduced variation in guess row widths.

Drainage

One of the first steps was to obtain satellite imagery and topography of his farm to help identify areas of production and drainage variability across the farm.

While Ed was aware he had drainage issues, the satellite imagery

identified the extent of the issue, provided an indication of the impact on crop growth and helped develop a plan for drainage work to fix the problem.

A large amount of field drainage work has been completed including some laser levelling of each block to effectively drain the permanent wheeltracks. This was critical to achieve expected improvements in timeliness of operations with CTF.

Planting configuration

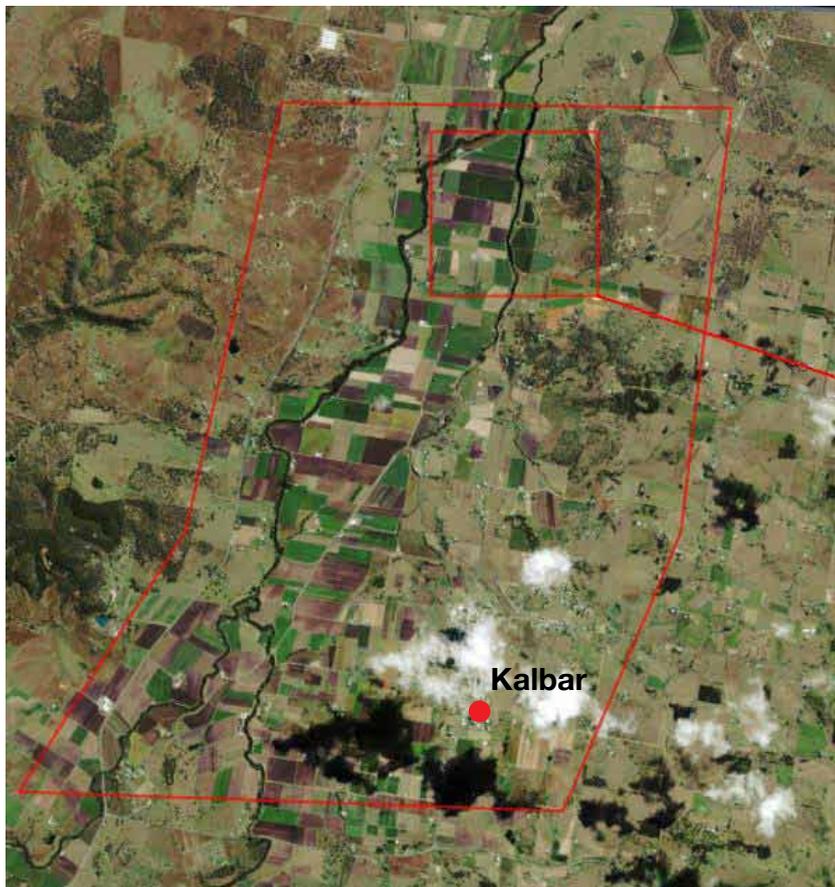
To achieve consistent wheel spacing across crops to fit his CTF system Ed has changed the planting configuration of his onions from hills to beds. An additional benefit of this change in configuration has been 25% more onions per unit area.

Machinery operations

Ed has made some modifications to tillage and hilling equipment to maintain permanent wheel tracks during all ground preparation operations including:

- modifying the width and spacings of Yeoman's hiller
- modify/construct hoods for hiller
- standardise wheel spacings on tractors.

Ed has reduced the number of field operations needed for bed preparation. Following wet weather he has been able to cut operations by 25% and believes that this may be up to 50% in dry conditions. Eliminated operations include ripping and hilling operations.



Imagery of Ed Windley's farm on Warrill Creek, north of Kalbar in the Bremer catchment. Kents Lagoon runs through the farm.





Hilling up CTF beds in preparation for planting

Ed has seen fuel savings of about 15% with most machinery operations, due to improved machinery efficiencies and reduced power requirements from trafficking hard wheel tracks. However, this does not account for fuel savings due to reduced field operations. Ed believes his fuel savings are likely to be closer to 25% when eliminated operations are considered as well as efficiency gains.

Timeliness

Ed has found improved timeliness and turnaround of operations under the CTF system due to:

- increased confidence and knowledge of wheel track location for trafficking after wet weather meaning ground operations can be undertaken days sooner
- not having to manage the large clods turned up from wheel tracks with cultivation.
- reduced number of seedbed preparation operations has improved crop turnaround.

In the future, improvements in timeliness of operations may allow for increased cropping intensity per year or increased flexibility for opportunity cropping.

Yields and other benefits

Ed also believes that there will be some water savings but this has not been quantified to date.

While improvements in high end yield results are yet to be realised, he has achieved higher yield averages so far with CTF. Average corn and green bean yields are up by over 6%, respectively. This may be due to factors associated with CTF such as accurate field layout which has increased production, reduced waterlogging through improved drainage and soil structure benefits.

Table 1: Potential production and natural resource benefits from the CTF system

Production benefits	Natural resource benefits
Production gain from increased accuracy of field layout with GPS guidance	Improved soil structure due to reduced compaction of crop growth areas
Improved soil structure, soil carbon & soil biology	Improved soil carbon due to reduced cultivation and compaction
Greater machinery efficiencies by trafficking hard tracks	Improved soil biology due to reduced cultivation and compaction
Reduced number of machinery operations	Reduced carbon emissions
Improved soil water holding capacity, infiltration, use of irrigation and rainfall	Improved infiltration, use of irrigation and rainfall
Reduced input costs such as fuel, labour	Reduced erosion potential of soil
Improved turnaround times between crops and opportunity cropping options	Reduced runoff and potential sediment and nutrient movement off farm
Improved timeliness of field operations	
Reduced tractor power requirements for preparation operations with subsequent reduced capital expenditure.	
Reduced compaction of crop growth areas	

Challenges with implementing CTF

While Ed is already seeing the benefits of a CTF system, implementation is not without challenges including:

- harvest machinery slipping off wheel tracks
- keeping machinery and implements lined up in the field.
- machinery modifications including cost
- cost of GPS guidance
- cultural practice change as permanent wheel tracks provides new and different ways of operating.

However, the production, economic and natural resource benefits mean that this is a worthwhile change for any vegetable system.

Acknowledgement

The cooperation of Ed Windley in providing information for the purpose of this case study is gratefully acknowledged.

This publication was developed through the Healthy Country program, a partnership between the Department of Employment, Economic Development and Innovation (DEEDI), SEQ Catchments, Healthy Waterways and SEQ Traditional Owners Alliance. DEEDI, in conjunction with CTF Solutions, are working with producers in the Lockyer and Bremer catchments on the development and implementation of controlled traffic farming systems for vegetables.

Footnotes

¹ RTK Real Time Kinematic—a real time signal correction to raw Global Navigation Satellite Systems signals that enables machine guidance with ± 2 cm accuracy



CTF onions September 2010