High Resolution Images - The Key to Sustainable Property Layouts

Russell Stewart Cannon, Rural Property Design

INTRODUCTION:

Over the last 10 to 15 years significant changes in resource assessment, management and monitoring tools allow us to make much better decisions on practices to improve Natural Resource Management in the grain cropping areas of Australia – sustainable property layouts.

Originally Controlled Traffic was trialled to overcome the degradation issues of soil compaction and soil erosion in sub-tropical grain growing areas. These areas experience high intensity rainfall on soils which have low infiltration rates and low rainfall to soil water retention percentages.

At the same time a form of Controlled Traffic, raised beds, was being revisited to overcome the waterlogging effects of low intensity in-crop rainfall in the cropping areas of south-east and Western Australia.

Early systems were implemented on very much a "seat of the pants" or "a wing and a prayer" basis. Considerable follow-up by groups pushing the concept led to change.

Now high resolution and rectified satellite images, which may be in the hands of growers within 7 to 10 days of capture belong, together with intensive topographic images, now allow Advisors and crop managers to make strategic, short term and long term decisions.

METHODS:

A number of publications have detailed methods used in adoption of Controlled Traffic. These are not a significant part of this presentation. Sufficient to say that only four elements were pushed, those being:

- A long a run as possible
- Down-slope
- Keeping all wheels on the one track
- The significant reductions in cost

An example of this is the 30 foot system which has 3 meter wheel spacings and includes modified harvesters.

In the early stages of adoption the header did not appear to have a big place. I was told that 'dry soils don't compact' and it is nearly always 'a dry harvest'. I was also told "we only plant, we don't harvest anything. Get on with it Stew!"

RESULTS:

It sounds a bit ridiculous that only 10 years ago there were no high resolution topographic images and few, if any, high resolution satellite images. The only tools were out of date aerial photos and low resolution satellite images which appeared to have little, or no apparent, agricultural application.

There were no precision steering systems and variable rate technology was looking for a place in agriculture.

To now tell growers that a start was made using 1980's photo mosaics with contour banks as a guide for direction, that three pegs in a line, or any 80' length of bore casing with three long chains was used as a marking system, but even then good operators, using marker arms could achieve better than 1% accuracy over a two kilometre width seems incredible.

This humble beginning has encouraged growers to establish systems that are not always the best. It is a bit like "get bigger or get out", "we need more horsepower", "we need four-wheel drive articulated tractors for efficiency" and "we need systems which are as long as possible"

To focus on those outcomes does not look at runoff management or steering systems. It seems to me, steering systems are being purchased more as an 'ego trip' rather than a system that can be used for innovation, a system to increase yields and decrease costs. A system that, in the future, will provide the basis for crop management and monitoring and allow development of proof that chemical applications are environmentally sensitive and that other environmental impacts are being managed.

High resolution images are now being used to develop strategic management options, but they continue to clearly demonstrate that we are not on top of the basic resource management issues which are costing you, as growers, large amounts of cash.

As a clear example, waterlogging is not only a problem in the south-east Australian grain belt. These images prove that growers in the Liverpool Plains are losing up to 23% yield, and total crop loss, in some years.

For Central Queenslanders waterlogging has cost one grower more than $60,000.00 in one paddock alone.

The cost of timeliness has not been discussed.

DISCUSSION:

Being a member of a team with a project funded by GRDC not only allows you to focus on the applicability of technology, it also enables you to come into contact with a large cross-section of growers. A cross-section of growers who have made the change to Controlled Traffic and growers who have just started to change by implement parts of Controlled Traffic Farming, e.g. tramlines, zero-till or raised beds.

To continue to 'front-up' to growers on a one-to-one basis, small groups or large groups, doing presentations, not only allows you to give people support to make change but also to enter their production environment to try to understand their climate, soils, cropping practices and their general resource management issues. It allows the focus on what is the Controlled Traffic Farming elements, which allows growers to fund any planned change.

While you are in such a privileged position it also allows you to learn from the vast experience of these growers, to distil the information and form a stronger picture each time.

Don't get me wrong, a number of meetings usually one-on-one, have not always gone well. The issues of wheel-track erosion, of deep wheel tracks and un-even planting depths from variable depth of wheeling still remain as issues which require investigation and positive outcomes.

The general outcomes from a diverse participatory group is the willingness of landholders to share knowledge and for us to continue to be a catalyst.

One of the positive initiatives from this conference which will allow Controlled Traffic Farming not only to be sustainable but to move forward is Andrew Whitlock's young Controlled Traffic Farming Group in Victoria.

One of the issues which continues to arise, with continued technology developments, is the need for people with younger and more technology based skills. The need for back-up with better computing skills, the need for back-up when technology breaks down, e.g. yield monitors, and the need to review satellite images from internet access, is critical to advancement.

BASIC COMPONENTS:

What has been gained from the introduction of the basic two technology changes? Those changes being high resolution topographic and satellite images on a GIS basis.

One is the understanding of what soil saturation, or what water-logging, is costing on individual farms.

The Victorian group, centred on Geelong (Southern Farming Systems) arrived at a figure of improvement in yield of 300% if water-logging was removed by the implementation of raised beds.

In the northern production areas of New South Wales and Queensland heresay and group discussions across the grain and cotton industries suggests that water-logging for more than 48 hours stresses crops and reduces potential yield. The lack of germination, the lack of crop vigour all cost the grower grain yield and losses of up to $300,000.00 in a year have been published.

While these may be extreme, a review of high resolution images captured over the last 12 months has clearly defined areas which have clearly been a total loss or experienced a lack of yield. These crop losses can be seen from a header, but are not easily measured. They are not seen from the side of the paddock.

Combining the topographic and satellite images allows remedial work to take place. This would allow growers to manage row-by-row establishment, to establish optimum plant population and to maximize yield. Each plant is doing its job without the problems of saturated or waterlogged soils.

WHY IS THIS DIFFERENT TO WHERE WE STARTED:

Example: Longest run,
Down slope
All wheels on the same track

Optimising time and managing cost is not easy where there is a conflict between planting and spraying efficiency and management of run-off and harvesting efficiency.

Very good images, which allow analysis of soil association, waterlogging issues, to accurately measure area , run length, etc; to enable you to make better decisions.

While I may continue to use hardcopy and clear plastic film I am also sure that better skilled, and people with computer literacy, will come up with a more sophisticated system which delivers parallel systems which incorporate GPS co-ordinates to implement Controlled Traffic Layouts and which prioritise natural resource management issues.

Just a word of caution – one of our GRDC co-operators has a paddock which should clearly demonstrate the differences between natural resource elements. The addition of permanent beds and liberal application of chook shed waste appears to mask these effects.

ANOTHER ISSUE:

People on the Darling Downs in Queensland have raised the issue of changes to relative elevation due to soil/water content. Until accurate topographic maps were available and computer aided sun aspects became available there was no plausible explanation to what was being observed as surface ponding. This can now be explained by the following images and should be cause for concern and a potential catalyst for planned change.

Two examples clearly identify the issues; originally I assumed that there was a problem with the survey on Rob Taylor's property however with the other image we were told about the soil/water height difference and asked "would it cause a problem with the survey". The difference in height was not clear until changes in aspect of the sun clearly showed the old strips.

CONCLUSIONS:

For someone contemplating getting into Controlled Traffic Farming my "take home message" has three elements:-

Have a go with your own equipment. Select a direction, preferably down-slope. Complete workings 'up and back', PLANT.

Have your Advisor order a whole property high resolution satellite image, one acquired during crop growth.

Invest in a high resolution topographic image which give better than 20cm contours, Geo referenced preferably to the Australian Standard Datum.

For an estimated cost of about $15.00 per hectare these will give the best planting tool to cover the resource management elements for sustainable Controlled Traffic Farming.