

Opportunities and Strategies - The Big Picture

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At the 1998 Controlled Traffic conference, just nine years ago, I said that we had developed a collection of unconnected ideas (controlled traffic, downslope layouts, zero tillage and water use efficiency) into a farming system called Controlled Traffic Farming. Technically this was radical but straightforward and successful. Our process depended critically on partnerships with growers, mutual respect, recognition of opportunities and commitment to on-farm actions.

The birth of CTF depended on a clear vision of opportunities and a flexible, structured approach to achieving the vision, a strategic planning approach. Actually there wasn't much planning, there were opportunities, strategies and actions. It all happened very quickly, in three years we developed CTF and in 10 years we had changed about 1,500,000 ha of Australian croplands. I think the keys were the strategies - we all worked very hard to see how the pieces could fit together. We knew what we wanted to do and then, through the on-farm focus, we worked out how to do them. Strategies involve what and how, and then just do it.

At last year's conference we concluded that the "what to do" and the "how to do it" were proven by grower experiences, so the motto was "Just do it, but do it right". Growers have now established that CTF systems are an effective and efficient platform for all forms of cropping. The key words are systems (includes everything) and platform (a launching pad for today and the future). The basics of the systems (the must haves) include strategic thinking or longer term goals (property management plan), action planning (short term), designed farm layouts, controlled traffic, matching machinery, auto-steer, precise row, inter-row and wheel track management, high cover levels, farmer/adviser/supplier partnerships, measure to manage and continuous improvement. These are the goals and opportunities, and the strategies aim to achieve them.

CTF is also a platform - new ideas and technologies can be easily added and new ideas and technologies work very effectively in CTF. This is the story of CTF - the pieces all fit together and are complementary - the whole is much greater than the sum of the parts.

The platform aimed to remove constraints and to create opportunities. Initially, we focussed on two constraints - controlled traffic to manage soil compaction and designed layouts to manage runoff and erosion. This platform was fantastic for zero tillage, high cover retention, managing water logging, whole farm efficiencies, crop growth, flexibility and precision. It simply achieved a wide range of positive outcomes, in fact all the positives we could see. Independently, the same ideas worked for raised beds, these are very robust concepts.

Another constraint was also addressed. It is described by Jamie Grant as "between your ears". Our process of on-farm "have a go" towards a strategic vision enabled all of us to challenge "between our ears". In retrospect, I think that growers have taken this challenge very well as the level of change testifies but the off-farm people in agriculture have found it much harder.

In this paper, I will address the current opportunities and strategies to achieve them. These will be considered at the farm, district and national levels in terms of adoption, R&D and continuous improvement, and include management, marketing, tools and technologies.

ON-FARM OPPORTUNITIES AND STRATEGIES

Complete CTF. The first and foremost on-farm opportunity is the adoption of complete CTF systems. I am frustrated that about 90% of growers who claim to be doing CTF do not include the harvester in this. Indeed, of the eleven basics of CTF, most growers would probably do three or four, but worse, have made recent decisions, e.g. machinery purchases, that are not consistent with the strategic vision of CTF, their strategic plan. Our strategy needs to publicise more farmers on complete CTF. We need to champion them. I will show here that more growers on standardised CTF systems allow a wide range of new opportunities. I call this cooperation with independence.

Partial CTF. This partial CTF misses most of the on-farm opportunities and also constrains the whole CTF community. I suggest that these growers give the impression that a little bit is ok and this is an easy message for others to accept. It is only ok as a transition step in the strategic vision. Partial CTF creates a risk, to move growers from one comfort blanket to a somewhat better comfort blanket without breaking through the barrier. Then it may be harder to continuously improve. But “If you’re on track but standing still, you still get run over.”

Productivity and WUE. The on-farm opportunity is productivity. Cost reductions will happen but the big benefits are in productivity and quality gains. The key indicator is water use efficiency and many growers have now achieved paddock WUE of 30 kg/ha/mm. Ten years ago, the theoretical maximum was 15 kg/ha/mm, CTF has set new boundaries. And how can the same grower produce the highest yields in the district and have the highest cropping frequency? After achieving yields of 3t/ac, this grower was asked “What is your yield target now?” Answer “5t/ac, then I’ll get to 4t/ac really easily.” I am sure that these water use efficiencies will be exceeded, we know from yield monitors that some parts of every paddock yield significantly higher than the average.

Soil types and CTF. I am also hearing more and more reports that soil type differences become much less after a few years CTF. Near Geelong, a paddock with major soil differences has very even crop growth and yield - the grower has removed soil variability by his management, and it is not variable rate. In central Queensland, growers report that differences between deep and shallow soils become much less - “the soil boundary has disappeared in my crops.” Similar experiences are reported from south-western NSW, and will be described at the conference. Managements to remove the constraints of soil compaction, runoff, erosion and waterlogging, to address pH and to improve the general soil fertility (manure, mill mud) are very effective. The results imply that storing water deep in the soil is not too important and crops can do very well with a shallow root zone. We need to document these results and new emphasis on measurements will achieve that. We need new goals to break.

Fence-lines. Another on-farm opportunity is fence-lines; these can be reduced to row spacing width - no structures, the whole area managed, no weeds, no resistance build-up, no pest sanctuaries, and no mess. This has been common in the sugar industry and on the Darling Downs, it is proven technology. The strategic decisions include dealing with livestock, farm record keeping (rectified imagery) and integrating infrastructure (roads, drains, trees) with crop areas (farm design).

On-farm Strategies. The strategies to achieve these on-farm opportunities are to encourage and assist growers to use the capabilities of your CTF systems to test your ideas, to push the limits, and to apply the new technologies to support your continuous improvement program. Farmer driven, on-farm R&D is crucial and easy, but you need support to ensure the rigour, applicability and analyses, and you need to record and measure. The bottom line is that growers can have confidence to have a go, there are no “between the ears” constraints.

I suggest we need strategies to provide support for grower adoption and information about successful stories to build grower confidence and we need to develop on-farm R&D services. These strategies could be themes at CTF07 conference - complete CTF systems and transitions to get there, on-farm R&D, development programs for professionals to provide more services, and approaches (by ACTFA) to agencies for funding to develop on-farm R&D processes and services.

DISTRICT OPPORTUNITIES AND STRATEGIES

At the district or regional scale, the opportunities revolve around cooperation and sharing. This includes machinery, contractors, imagery, GNSS base stations, marketing, purchasing, services, etc. These are business and not social decisions because sharing with “local” people makes business sense. There are also environmental and management opportunities - drainage integration, nature corridors, roads and communications, area wide pest management, spray drift, etc. Some of these clearly have a social dimension, for example, boundaries between conventional and organic farmers. Any success of CTF growers to address these issues through “local” cooperation, will be another leap forward for CTF in resource management, productivity, profitability, the environment, lifestyles and communities.

Machinery sharing. A particular risk for CTF growers seems to be that after a few years of controlled traffic the farm has clearly defined wheel tracks and crop zones. If machinery breaks down, one wheeling of the crop zones will destroy most if not all of the improvement achieved and quite possibly (if it is wet) machinery on a different wheel spacing or implement width won't be able to operate at all.

Technology co-operation. Imagery and GNSS (GPS) technologies are spatial, they don't recognise farm boundaries and deliver information to areas - satellite imagery has a minimum area and base stations a limited range. Cooperation is cost effective. Compatibility across manufacturers and support services will improve if growers group together. On-farm computing, farm record keeping and GIS services will improve. CORS GNSS networks offer quality, up-grading and reliability, but the cost, availability and timing have not been determined. An opportunity is to re-direct the considerable current investment. Issues with telecommunications are uncertain.

Strategies. The strategy with base stations is at the minimum share within the 10 - 15 km range (independent of colour) and in the longer term to have networks of stations that will increase quality, upgrading and reliability at a lower cost. Our strategy is to facilitate the development of CORS networks in agricultural districts by linking current bases. There are few technical GNSS issues.

Standard machinery wheel tracks and widths locally is a necessary risk strategy. At a “local” level, the fundamental strategy is cooperation but cooperative structures have a generally sad history. New approaches are being tested; does your change to CTF create clear goals for cooperation and simple rules of operation? Does CTF provide a platform for simple negotiation; does CTF respect your independence while fostering cooperation? Contracting could be a major driving force in this. Contractors must comply with certain basic specifications, and inevitably this will restrict some individual farm options. Is this a bad thing?

Different approaches across the grains, sugar, cotton and horticulture industries will identify opportunities. The massive changes in the sugar industry will include moves to cooperatives and contracting. Although less obvious, the same basic issues are widespread in all industries. Our recent moves to foster communication and discussion among the industries through CTF Conferences and ACTFA provide strategic support for these changes.

NATIONAL OPPORTUNITIES AND STRATEGIES

At the national scale, CTF provides a platform for all cropping industries to combine around the common issues of soil, landscape and environment management; provision of technology, services and infrastructure; product identification, labelling and marketing; and access to markets and value adding. CTF provides strategic common ground for combined industry approaches and policies to governments, machinery manufacturers, service providers, etc. This could break agriculture's long history of playing one industry off against another, and product differentiation to prevent compatibility. The ACTFA initiative could provide the vehicle, and interactions established at CTF05 last year indicate the potential. We need industries to say that CTF is our platform to the future.

A key national opportunity is R&D. Across all industries there is little CTF R&D. Each industry has its own dedicated body, structures, even culture with highly developed and entrenched directions and operations. CTF is only a small part of these cultures (and the provider linkages) and, interestingly, these agencies have been much slower to change than growers. We need these agencies to say that our R&D will support the CTF platform.

New technologies have provided the tools needed for on-farm R&D. GPS logging of operations, satellite imagery to measure growth and yield monitoring to measure yield and quality, all provide automated, digital, computerised recording of on-farm R&D, with very little disruption to normal farm operations. But farmers need support in experimental design and implementation, data management, analysis and interpretation, and what's next. This creates a large training need for current agronomists (they too have to change) and an opportunity for many in current R&D roles to apply their skills to on-farm R&D instead of working within institutions and research stations. This is a massive change in R&D strategy and that change will need a lot of drive and support. But this change will drive the future of CTF and is essential to achieve our potentials.

New technologies. The positive interaction between new technology and CTF (CTF needs technologies and these technologies are maximised in CTF) is another indication that CTF is on the right track. 2 cm guidance and auto-steer in CTF ensure a perfect job to achieve our clear goals, in any other system it just relieves stress on the driver. In CTF, yield monitors provide accurate and easy to analyse data, in other systems yield monitors produce poor data due to variable filling of the comb and uneven coverage of the paddock. These data are difficult to manage and statistical methods are often used to "hide" this created variability. Satellite imagery measures the on-farm performance of CTF growers and responses to management and changes. The high resolution of imagery is matched to the accuracy of operations to allow assessment of the causes and impacts of variability. We are calling this forensic agronomy - what caused that variability, how large are the impacts? How can we respond? Forensic agronomy is "understand the cause and effect, provides the solution". This analysis is totally confounded in random traffic systems and with large pixel data.

Technology improvement will be in terms of upgrading GPS systems, reference station networks, and redesigning the rovers (specifically for agriculture); increasing the accuracy of yield monitors and adding quality sensors; effective ground sensors of soil and crop condition, particularly less dependent on reflected natural light as used by satellite and aerial methods; and the biggest change will be in data management, GIS applications and delivery processes to the farm computer. Future farm record keeping and software packages will provide effective tools for decision making.

Reference station networks will displace the farm base station and save a lot of money. We guess that farmers are spending up to \$10 million per year on base stations and this could be much better spent. Networks offer better quality and reliability, easy upgrading and ensured quality. The cost, as with all these spatial applications, depends on how many subscribe. Wide access to 2cm RTK signals and manufacturer's changes will support a major move to 2cm auto-steer and encourage widespread adoption of CTF. Historically the development of GNSS has been driven by military and surveying applications. The surveyors are critical as they can guarantee the accuracy of the technology, a complex task as our continents drift around. Recently the GNSS community has recognised that

agriculture offers a large user base, so there will be increased interest in the short-term. CTF growers are in the best place in agriculture to influence the GNSS direction, and ACTFA can have another role as “spokesman” for the industry. The CRC for Spatial Information is a focal point for the latest advances in GNSS and spatial information generally.

I think there is potential to improve the rovers, they are expensive, growers need several on most farms and they duplicate services. I don't know what is possible but expert input should be rewarding.

Availability. Inherent in these improvements will be increased availability. Telecommunications are key and there seems to be a real expectation that wireless broadband services will be available soon. This implies that rural people will have the same access as urbanites without the cost of hard wire provision. There should be an opportunity for a mega-leap forward and I hope our rural politicians have sufficient vision. Availability will also be increased by reference station networks, incorporating technology into new machines and software development. Data and information management provides new challenges. While growers need training to up-skill, the provision of specialist services is a necessity. What does a farmer do, what does a consultant/service provider do? Clearly, the solution will be individual. This is not rocket science, just good business practice and many other industries have been through these changes. We can learn from them and not make the same mistakes.

Product identification - knowing where the product parcel came from on the farm. This will be attached to the smallest marketable unit and has opportunities through the whole value chain to the final marketplace. The potential to link farm product to final markets is enormous and a wide range of information could go with the product - the farmer, the farm, the management system and inputs, the yield and satellite image, all as a small snapshot joining the product to the producer. This has already happened in beef but each CTF grower can provide unprecedented data. A big challenge for us is how can this help you to manage the farm better?

Value chain. The link from farm to processor offers benefits. Sugar growers could use the mill calculated sugar content from individual bins to calculate a sugar yield map instead of a cane yield map. Grain growers may have similar options as grain handlers measure more quality parameters on each truck load. Vegetable growers could construct product quality and value maps. Many growers will have opportunities from product segregation because of this better information. Over the next few conferences we will hear many reports of successful applications because CTF growers have the best possible platform to use the technologies.

Marketing. Is there potential for a CTF tick of approval, a label? We all know that CTF growers have a better product and deserve a higher price.

New sensors and measurements will be developed. A current focus is on-machine sensing for immediate variable rate applications. Most of this technology seems to be a long way ahead of the science. What is the sensor measuring and what is the best response? An example is N sensing. The technology is available and linking to an applicator is easy, but is N the main driver, and should you put on more or less? Our work has not yet shown an obvious application for VRT but as we manage the farm better, opportunities will arise. VRT is one of the later technologies to adopt. Again, CTF growers have a platform to use VRT.

Controllers will continue to improve and we have a range of excellent suppliers in a competitive market. Farm office software is a different story - access to spatial information has left the software behind. There seems to be a reluctance to change and few new players, but this is not new in other industries, we just have to go out and find it, and show we are a big, viable market.

Service providers and advisers, including those in government, agencies and the private sector, are our largest opportunity. While CTF Solutions is very proud of our position in your industries, as a whole, this group has minimal understanding of CTF and, expresses little interest in changing. The Victorian Department has CTF expertise, other State Departments have reduced their inputs. SRDC and GRDC recognise CTF but national agencies, Universities, catchment authorities, etc. invest little

on staff or training. I can't recall a CSIRO publication that has recognised CTF. ACTFA has a big job ahead of it.

National Strategies. The primary strategy is to gain recognition that CTF is the farming system platform for all cropping industries across Australia. We need more people in all sectors of all industries committed to the CTF future, then we will obtain the breadth of support we need.

ACTFA is the vehicle proposed. With a large and widely distributed membership, ACTFA can be an effective, national voice with the advantages of being across the nation, across industries, focussed on the universal basics of farming systems but outside the controversial, agro-political issues. A number of possible ACTFA roles have been discussed; it will take time to achieve them.

R&D and Adoption strategies. The general strategy here is that we can learn from each other, and if we have common issues, the wider diversity among backgrounds, the more we can learn. National CTF Conferences are crucial and local mini-conferences will create local and district solutions, and increase participation and publicity of innovations.

Research and development of new on-farm R&D processes that use the combinations of CTF and technologies is essential for continuous improvement and increased adoption. An integrated ACTFA approach across industries' funding bodies will quickly achieve robust and applicable processes and build a CTF snowball. We have clear and simple goals that apply across all industries, so our opportunities are huge if we coordinate. Again CTF Conferences and ACTFA provide a launch pad.

The strategy for change and adoption is that every change you make means it is easier to make the next change. Every adoption that provides learning and improvement builds confidence to keep building, removes the "between the ears" constraint to continuous improvement. A major challenge for CTF nationally is that some adoption has occurred, some big gains have been achieved, so let's just enjoy it! National funding bodies have responded that CTF adoption is happening and will continue to happen by itself, it needs no more funding. This is a smokescreen that maintains the status quo for funding allocations, i.e. plant breeding, crop protection, environmental impacts, etc. There is a role for everyone interested in CTF to be strong advocates in every forum, committee and meeting. We need a strong national lobby group to change the national thinking and ensure a strong R&D and adoption support program for CTF. This is a role for ACTFA.

Technology strategies. CTF growers are leaders in the use and application of new technologies. We can collectively influence manufacturers and suppliers with our collective needs and innovations. Our strategy is to open communications, to invite them to CTF Conferences and to hold joint meetings. Availability and on-farm practicalities are priorities and our focus will be on compatible solutions rather than proprietary ones, on building a bigger pie rather than offering bigger slices.

People capacities. The proposed on-farm R&D process creates hands-on training and capacity building for everyone involved – growers, researchers, advisers, service providers, etc. Because the on-farm goals and expectations can be clearly defined, it will quickly identify deficiencies in people capacities and training or up-skilling needs. I expect CTF growers to lead this as both the ultimate purchasers and beneficiaries, and a massive training effort is required. But our on-farm R&D process will be the next revolution, the driver of industry and individual profitability and sustainability. And the time and place are perfect – EUREKA.