

**House Standing Committee on Primary Industries and Resources  
Inquiry into the role of government in assisting Australian farmers to adapt to the  
impacts of climate change.**

**This submission relates to dryland and irrigated cropping industries**

**Recommendations**

**Recommendation 1.** That the Committee use a farming systems approach in this Inquiry.

**Recommendation 2.** That Controlled Traffic Farming (CTF) is recommended to government as the farming system to assist Australian farmers to adapt to the impacts of climate change.

**Recommendation 3.** That government predominantly support actions to build on the foundations of CTF.

**Recommendation 4.** That government support actions to assist change in farming systems.

**Recommendation 5.** That government develop a program to implement and augment the shift to better farming systems, the improvement in the whole service sector, the identified extension, training and adoption needs, and a new approach to on-farm R&D.

**Recommendation 6.** That the Committee support an independent Think Tank with systems thinking expertise to oversight program direction, implementation and achievement.

**Submission.**

- 1. Australia needs to establish a comprehensive farming system approach of government support to replace our current practices approach.** Research and experience has identified many improved farming practices, and we all know that they have key roles in our current and future industries. **However practices interact with each other on farms and it is the interactions which drive effectiveness, adaptability and impacts. The farming system approach combines improved practices into practical, comprehensive on-farm systems.**

**Recommendation 1.** That the Committee use a farming systems approach in this Inquiry.

- 2. Why?** The farming system approach has been proven by the development and adoption of Controlled Traffic Farming (CTF) across all cropping industries across Australia.
- 3. Benefits.** The benefits of CTF to cropping industries and Australia are highlighted by:
  - a. Experience in the Wowan district of Central Queensland.** Ms Kirsten Livermore attended a field day recently where these results were presented. Five years ago these farmers had zero or negative gross nett returns on their cropping.

**With the adoption of CTF**, they now have a gross nett return of about \$354/ha. If this was achieved on only 50% of Australia's grain farms (10,000,000 ha) the benefits to industry and the Australian economy would be \$3,500 million per year. During this 5 year period the district had two massive storms, one over 400mm in 24 hours, suffered little damage and bounced back quickly with no longer term impacts. Partners in this program were CTF Solutions (the project leader), Fitzroy Basin Association and the QDPI.

- b. Agribusiness consultant, Kim Bowman, reviewed the performance of adoption of CTF by the Clifton Allora Group south of Toowoomba and presented his results at the 6<sup>th</sup> Australian Controlled Traffic Conference at Dubbo in 2008. The study covered 16 farmers with 4,250ha of cropping land. He found:

**Soil erosion reduced** by 195,000 tonnes/year

**Diesel use reduced** from 338,000 to 130,000 L/yr

**Nitrogen leaving farms reduced** from 119 to 9 t

**Carbon dioxide loss reduced** from 1,199 to 373 t

**Labour reduced** from 4,590 to 1,744 hours

**Annual income increased** from \$1,652,500 to \$2,386,230

**Gross Margin increased** from \$547,279 to \$918,366 (+\$90/ha)

This was the first comprehensive study of CTF benefits in Australia. Climate change preparedness and triple bottom line performance are clear – a comprehensive result. Partners in this program were CTF Solutions, Condamine Alliance and Conservation Farmers.

- c. The Cooperative Research Centre for Spatial Information and the Victorian Department of Sustainability and Environment commissioned a report by the Allen Consulting Group on "Economic benefits of high resolution positioning services" (November 2008) which assessed the benefits from CTF adoption when supported by precision GPS were up to \$206 million in 2008 (current adoption 5%) and would be an estimated \$30 billion by 2030 if a national GPS network was in place. This assumed 80% of cropped land was using CTF by 2030.
- d. **The Allens Report shows the contribution that CTF will make to Australia and the adoption rates used show that CTF will be the future farming system.**
- e. I recently interviewed a farming contractor and CTF Solutions client in southern NSW about a fenceline comparison of stubble grazing by sheep in the 2008 season. All sowing, spraying and harvesting is done in both situations by the contractor in a full CTF system. The only difference is that sheep are put on the grazed side of the fence after harvest. Yield data are from the yield monitor.  
Yield: Non grazed 1.8t/ha, grazed 1.2t/ha.  
Grain price: Grazed deducted \$25/t due to screenings.  
Income from grain: Non grazed \$104/ha more.  
Fuel at sowing: Non grazed 24L/ha, grazed 36L/ha.  
Paddock dams: empty in non grazed (no runoff), full in grazed.
- These data suggest that simply stopping sheep grazing stubbles across the estimated 10 million hectares in the wheat/sheep area, would add about \$1 billion per year to the industry's and Australia's economy, and save 120 million litres of diesel per year in the sowing operation alone.

The outcomes from adoption of the CTF farming system approach are profitability and sustainability, and massive triple bottom line and climate change benefits. CTF provides the platform to productivity and performance, and for responsiveness to external stresses – climate change, markets, financial crises, etc. CTF applies across all arable soils and all crops in Australia.

**Recommendation 2.** That CTF is recommended to government as the farming system to assist Australian farmers to adapt to the impacts of climate change.

4. **CTF was developed in Central Queensland and south-west Victoria as a uniquely Australian farming system approach to the pressures of our climate.** CTF was developed to handle extreme climatic events at both the wet and dry extremes. In CQ, this was severe erosion from massive storms, and in SW Victoria, severe waterlogging from long periods of high rainfall; and in both areas the effects of droughts. CTF performed well through these major storm events with minimal erosion damage in CQ and little waterlogging in Victoria, and with rapid recovery after the events. In droughts, CTF growers have reported their best economic performance ever, due to average yields and high commodity prices.  
**CTF has out-performed all other farming systems in all conditions, because it is a comprehensive farming system designed for the extremes of Australia's climate. CTF is the basic strategy to address future climate change in Australia's cropping areas. CTF has proven to be adaptable and flexible and will be the foundation of our future.**
5. **Farming System Foundations.** All our farming systems have three basic characteristics. **They are mechanised, soil based and in landscapes.**
  - a. **Mechanisation.** Machinery wheels need hard surfaces for traction and easy rolling. Permanent wheel tracks are the **proven solution**, providing efficiency (reduced GHG emissions, less fuel, smaller tractors), trafficability and access (the drivers of productivity through timeliness).  
Wheel tracks compact the soil, this reduces crop and root growth, infiltration and aeration producing waterlogging (increased nitrous oxide and methane emissions), low carbon cycling and low productivity.  
**Controlled traffic is the proven solution.** All load bearing wheels on permanent wheel tracks and crops grown in non-compacted soil.
  - b. **The cropped soil zone.** Removal of compaction is step 1 towards high soil quality. Step 2 is removal of other degradation processes with **proven practices**. **Acidification** is managed with lime applications to optimise productivity. **Low soil profile organic matter** is managed by retaining crop residues, reducing compaction and zero tillage to maximise carbon sequestration and soil health. **Poor surface soil structure** is improved by residue retention and zero tillage.  
**CTF includes all these practices.**
  - c. **In landscapes,** key degradations are water and wind erosion, and waterlogging. **Proven management of water erosion** is reduce runoff (high cover, low compaction, no tillage), reduce sediment concentration in runoff water (high

cover) and manage runoff to prevent flow concentration into rills and gullies. Paddock layouts based on quality topographical data are required.

**Proven management of wind erosion** is high cover and paddock layout.

**Proven management of waterlogging** is safe removal of surface water and increasing soil profile hydraulic conductivity.

**The same farming system – CTF with designed layouts, zero tillage and controlled traffic - will manage all these landscape degradation processes.**

6. **Any weak links?** System performance and outcomes are driven by interactions among practices. Critically, no practice can have a negative impact, the weakest link principle. The three foundation practices interact positively – controlled traffic provides guidance for efficient and effective operations in zero tillage (minimum and targeted herbicides, inter-row operations, timely and night-time spraying, etc.). Controlled traffic with designed layouts ensures efficiency and effectiveness (no overlaps or misses, fences can be removed for better weed and pest control), wheel tracks provide safe runoff removal, and layouts ensure efficient machinery operations and surface water removal.
7. **Experience with CTF.** CTF farming systems based on these foundations have **proven performance** on up to 2 million hectares across Australia in the grains, cotton, sugar and recently horticultural industries. Irrigated cotton started to adopt permanent beds in the mid 1980s, CTF for the dryland grains industry developed in Central Queensland during the 1990s and extended to the sugar industry. Recent work in northern Tasmania and in south-east Queensland has identified exciting opportunities with vegetables.
8. **Adaptation to Climate Change.**
  - a. **Extreme rainfall events.** Case studies highlighted in #2 above show the **proven adaptability** of CTF systems to minimise damage from events, to ensure rapid recovery to full production, and even to take advantage of any consequential high prices in markets. This has national significance as Australia with CTF can take advantage of any World wide crop failures.
  - b. **Drier and hotter conditions.** Despite being designed for extreme wet events, CTF systems have **proven adaptability** to drier and hotter conditions, as discussed above. During droughts, CTF farmers have out-produced their neighbours and often produced “my highest profits ever”.
  - c. **Downstream processing.** Satellite imagery and on-farm monitoring have **shown** much reduced crop variability on CTF farms, a massive benefit for processors. The “Building on the Foundations” section below describes other positive impacts from product identification and on-farm data and monitoring. An early result with CTF onions was much more even onion size.
9. **Building on the Foundations.**

**The need for accurate guidance in controlled traffic led to the GPS revolution in cropping. This world wide revolution started in Australia.** Controlled traffic with 2cm RTK GPS provides an accurate spatial footprint for a multitude of applications. Any digital sensor can be recorded in space and time, and if two way communications are in

the machine, e.g. a mobile phone with Internet, any data can be automatically downloaded to a computer anywhere in the world. For example, yield monitoring, topography, engine oil pressure and fuel use, machine position, speed and operations, seed, spray and fertiliser distributions, etc. This is critical for “measure to manage” for farm management, for farm performance and recording, and for on-farm continuous improvement programs. And the same data can be used, if bulked up, by catchment authorities and government to report on environmental performance and a wide range of triple bottom line targets; or supplied directly to consumers to identify product management from plant to plate. All this data is collected automatically and is computer ready for analysis, report preparation and distribution.

**On-farm, CTF has also proven social benefits.** In #2b above, time to farm was reduced by 62% (more time for family and community), with better work place health and safety (agriculture has a bad record), and less stress (from auto-steer and less time to farm).

**Measure to manage.** New technologies now offer automated, digital and spatial measurements at unbelievable scales and accuracies. We can measure on-farm much more intensively than most traditional R&D methods at very affordable costs. For example, with satellite imagery at 1m pixel scale, we receive 10,000 data sets per hectare for about 50 cents/hectare. With yield monitoring, yields at about 10m pixels are collected usually for free because modern harvesters come with the technology. 2cm RTK GPS guidance for steering also collects at no extra cost elevation data at about 10 m pixels. These data are critical for paddock layouts and are hundreds of times more intensive than a surveyor would traditionally do.

**These technologies support CTF and most importantly, the CTF spatial footprint ensures that the measurements and data are accurate, meaningful and suited to automated processing.** A simple example is yield monitoring where CTF ensures that the comb is full all the time.

**The benefits from these technologies in non-CTF farming systems are much reduced.**

**Recommendation 3.** That government predominantly support actions to build on the foundations of CTF.

- 10. Changing Farming Systems.** Change is always difficult and system change is a challenge to everything the farmer has done previously. Such change demands consistent, broad support. This is why **it is so imperative that the government show leadership and move to the farming system approach. Anything but complete commitment to at least the foundation principles will lead to a very limited preparation for Climate Change.** Government also has a major role to ensure all its instruments comply and to encourage other institutions to support.

**Recommendation 4.** That government support actions to assist change in farming systems.

**11. Roles of government**

- a. **Augmenting the shift to better farming systems.** The first step is to adopt the systems approach and discard the practices approach. Then **a full program on implementation and augmentation is required.**

The components are proven and proponents have experience, much of this has been presented at National CTF Conferences in 1998, 2005, 2006, 2007 and 2008. The motto from these Conferences has been “just do it, but do it right”. There can be no compromises with the foundations; there are no reasons for compromises, except during transition.

**Other steps which government must fund through this program are:**

- (i) **workshops** to create awareness (much has been done here)
- (ii) **1:1 consultant/farmer support** to achieve on-farm change consistent with the system approach (a major current deficiency)
- (iii) **training of the whole service sector** which is currently very conservative and the basis of market failure for lack of commitment to change
- (iv) **national system solutions to these issues.**

These foundations apply to all cropping industries in all parts of Australia. The potential for national solutions is enormous, is indeed essential. Examples include CORS Networks for GPS correction signals, standards for machinery and equipment, direction for R&D investment and government departments, focus for government support, and cross industry cooperation. In all these issues, a unified approach with common goals is essential. All croppers grow crops in soil within landscapes, they all have similar basic concerns and need the same foundation systems. Agriculture must be the most fragmented industry in Australia and this system approach will **facilitate unification and cooperation.**

**The service sector role in resilience and adaptation in the farm sector.**

- (i) **Agronomists – government and private.** New agronomic approaches are needed to convert the higher soil and landscape quality and health, and water use efficiency potential into higher yields and better quality. A commitment to this goal supported by government incentives and direction is needed. Training and up-skilling is needed.
- (ii) **R&D – Universities, government departments, private.** The R&D sector must provide leadership and develop the required new agronomy. Government must give them incentives for this challenge. The private sector is leading the way with innovation and initiatives, particularly with systems thinking and new technologies. CTF Solutions has led the applications and on-farm adoption of CTF across all industries, has linked the GPS technologies developed by surveyors into agricultural applications, has identified the potential and applications of high resolution, automated measurements in agriculture, and achieved verifiable change and adoption across farms in all States.
- (iii) **Organisations – government departments, R&D Corporations, private large and small.** These organisations must provide leadership. This is currently a constraint. There is not one mention of CTF in the current GRDC investment portfolio or in the Caring for our Country Business Plan 2009-2010. Other R&D Corporations recognise CTF, but are not committed to even the higher level

potentials or relevant funding. It is a **priority for the Federal Government to show leadership through the program of implementation and augmentation.**

- b. **Promote research, extension and training for resilience and adaptability. Research, extension and training must focus on building systems thinking capabilities, on reinforcing the system foundations and on building on the foundations. There are major deficiencies in our skills and knowledge base and this mainly needs high level direction and commitment.**

(i) **R&D needs clear systems direction and priorities for efficiency and effectiveness. R&D in Australia is highly discipline oriented. Disciplines compete with each other for the R&D \$. At best, R&D is practice focused. Examples include plant breeding for waterlogging or drought resistance when these are better addressed by resource management R&D in a systems context. And there has been no breeding for CTF systems, when this is our future.**

**Government agreement on the system approach and the foundations of the systems would immediately re-focus R&D direction, ensure all R&D has a common high level direction, and make funding decisions easier with clear focus – all aiming to build collectively on the agreed foundations.**

(ii) **Training. The market failure is with the whole rural service sector which is very conservative, fragmented and isolated, and has changed much slower than farmers. For example, scientists are still arguing the value of contour banks while farmers are pulling them out. A major training exercise is needed to “re-educate” the research, extension, consulting, sales and support sectors to provide the skills, knowledge and expertise to move Australia into this new systems approach.**

(iii) **Extension should focus on reinforcing the system foundations and on building on the foundations. Farmers are bombarded by one-off silver bullets. There is a major deficiency in systems based extension material.**

(iv) **Adoption. The government must augment adoption. As stated above, system change challenges everything a farmer has been doing. In the new system, everything looks different and peers and neighbours can see the change. Farmers need a lot of support with change. This is government business because the outcomes have national significance and there is broad public good. Experience is very clear, the vast majority of farmers (80-90% in recent surveys) have “done it wrong” when attempting to adopt CTF, and have made compromises that compromise the foundations. **The dominant driver appears to be poor, conservative advice from the whole service sector.** The “you don’t have to bother with that” syndrome.**

**Government must fund appropriate 1:1 adoption support for this system change.**

- c. **The role of rural research and development. Further R&D on the foundations of our future farming systems is not currently needed. There is sufficient knowledge and experience to apply the foundations on farms across Australia. Further adoption may of course identify R&D questions.**

**R&D is critically needed to build on these proven foundations of CTF.** These foundations provide natural resource health and quality, efficiency and effectiveness, and environmental and social benefits. These will directly reduce costs but have small impact on profitability. The R&D question is how can these resource benefits be managed to produce higher income (yield and quality)? Income and productivity are key drivers of profitability and system performance.

**The whole agronomy must be re-evaluated for suitability to the system and impacts on climate change.**

Where summer cropping is an option, increased cropping frequency has produced massive returns across all aspects, as highlighted in #2 (a) and (b) above. These growers have changed to CTF **and also** changed their agronomy to optimise crop growth in their new farming system. Clearly, all the cropping fundamentals have to be re-visited.

In winter cropping areas, crop reliability and yields have increased and re-examination of crop types and varieties is essential. Areas where raised beds were the first step are now testing straight CTF, at much lower cost, with initial success. Canopy management is a key component, the environment with current agronomy produces far more biomass than is required for potential grain yields. Hay production is an option requiring R&D, but the whole area can't change to hay! System R&D to manage canopies for high grain production with CTF is urgently required. The management of summer rain is a key issue – storage for winter clearly increases biomass production which may further reduce grain yield.

Key performance indicators are water use efficiency and Harvest Index. New technologies are making these easy to assess on every paddock of every farm.

**R&D to build on the System foundation explicitly means on-farm research.** The spatial footprint provided by CTF opens enormous opportunities for high quality, on-farm R&D. A wide range of treatments can be tested as strip trials – the width of the planter or sprayer, automatically implemented with machine controllers and GPS guidance, biomass measured to 1m<sup>2</sup> pixels with imagery, yield measured with yield monitor, etc. – all with little or no impact on farmer operations.

**Government needs to fund the development of this approach to on-farm R&D as it is critical to building on the foundations, to continuous improvement, and it is new in concept and application (so can not be done by our current, traditional R&D resources).**

**The benefits to government are enormous** because the farmer' benefits outlined above contribute to our National priorities and these new measurement technologies can be bulked up across farms to provide district and regional performance summaries across a whole raft of government targets with the only additional input being some computer skills and software.



**12. Some weak links and poor advice.**

- a. **Australian farmers have bought about 4,000 RTK GPS base stations**, for about \$100 million. **This is more than is required to cover the whole of Australia** with the same quality signal **but only gives coverage to about 20% of Australia's cropping country**. This is because the GPS suppliers to agriculture decided to provide only proprietary signals, i.e. differentiated by each company. These same companies supply the same service to surveying applications with non-proprietary signals. This is a rip-off, constrains CTF uptake since the GPS equipment is not compatible with different makes of tractors and harvesters (the general norm on Australian farms), and contractors cannot use the layouts of the farm owner. This enormous cost to Australian agriculture is all unnecessary, it is just "smart" marketing.
- b. Farmers across Australia in all industries are attempting CTF but at least 80% of them do not include the harvester. All analysis and experience shows that the harvester is the place to start because it is the least flexible.
- c. **"No-till is all we need"**. This was true in the 1980s when NoTill Associations were formed across Australia. No till is necessary but not complete. Unfortunately the no-till community have generally not changed to a system approach and built on that fantastic practice. Fortunately, some have changed and proven the benefits. No-till is incorporated into CTF.

**Recommendation 5.** That government develop a program to implement and augment the shift to better farming systems, the improvement in the whole service sector, the identified extension, training and adoption needs, and a new approach to on-farm R&D.

**Recommendation 6.** That the Committee support an independent Think Tank with systems thinking expertise to oversight program direction, implementation and achievement.

Yours sincerely,



Dr Don Yule  
Director  
CTF Solutions