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Official Committee Hansard

**HOUSE OF  
REPRESENTATIVES**

STANDING COMMITTEE ON PRIMARY INDUSTRIES AND  
RESOURCES

**Reference: Assisting Australian farmers to adapt to climate change**

TUESDAY, 14 JULY 2009

BRISBANE

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**HOUSE OF REPRESENTATIVES**  
**STANDING COMMITTEE ON PRIMARY INDUSTRIES AND RESOURCES**

**Tuesday, 14 July 2009**

**Members:** Mr Adams (*Chair*), Mr Schultz (*Deputy Chair*), Mr Bidgood, Mr Champion, Mr Forrest, Mr Haase, Ms Livermore, Mr Perrett, Mr Sidebottom and Mr Windsor

**Members in attendance:** Mr Adams, Ms Livermore and Mr Windsor

**Terms of reference for the inquiry:**

To inquire into and report on:

- Current and prospective adaptations to the impacts of climate change on agriculture and the potential impacts on downstream processing.
- The role of government in:
  - augmenting the shift towards farming practices which promote resilience in the farm sector in the face of climate change;
  - promoting research, extension and training which assists the farm sector to better adapt to climate change.
- The role of rural research and development in assisting farmers to adapt to the impacts of climate change.

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**Committee met at 10.02 am**

**CHAIR (Mr Adams)**—The House of Representatives Standing Committee on Primary Industry and Resources is inquiring into Australian farmers and climate change. Today the committee will hear from AgForce, Growcom, the Conservation Agriculture Alliance of Australia and New Zealand, CTF Solutions, the Australian Controlled Traffic Farming Association and Biodynamic Agriculture Australia.

[10.03 am]

**MAUDSLAY, Mr Grant, President, Cattle Board, AgForce Queensland**

**SMITH, Mr Howard, Director, Cattle Board, AgForce Queensland**

**WAGNER, Mr Drew, Senior Policy Advisor, AgForce Queensland**

**CHAIR**—Welcome. Although the committee does not require you to give evidence under oath, this hearing is a formal proceeding of the parliament and warrants the same respect as proceedings of the House. Giving false or misleading evidence is a serious matter and may be regarded as a contempt of the parliament. The committee has received a submission from AgForce, submission No. 27. Are there any corrections or amendments that you would like to make to that submission?

**Mr Wagner**—Since our submission was put forward there have been not only quite a few changes to the landscape and the players that the submission covers but also varied policy decisions taken at the governmental level that have changed some of the boundaries to which our submission applied.

**CHAIR**—Thank you. I invite you to make a brief statement.

**Mr Maudslay**—AgForce represents about 7,000 producers across Queensland. AgForce believes that international and domestic policy frameworks required for producers across Australia to adapt to climate change are vital, because they will impact as much on agriculture as any other sector. At this point in time, we do not believe that the Australian government has complete recognition as to what impact the policy mechanisms that are currently being considered, such as the CPRS, will have on farm, but we welcome this opportunity and acknowledge and praise this committee for endeavouring to understand the preparedness that we will need to make our landscape resilient, because that is vital for us. Our landscape has got to be resilient in the face of climate change. These issues are tied in with drought preparedness, drought assistance and all those types of issues.

I guess an example of such a perverse outcome would be the current issue of landscape competition, the inability for us to fully account for the sequestration potential of our landscape in terms of carbon and thus our inability to prepare for landscape resilience. We cannot account for the carbon that is an active part of our environment under the Kyoto accounting rules. So this will have an impact. We need to consider it, because productive systems and livestock grazing are a very active part of the whole carbon cycle and we are a very active part of that cycle, but we cannot measure half of it at the moment. It is sort of half-pregnant, if you like.

This could actually lead to the necessity to import food from countries that do not have the same sorts of rules as we have. Ninety-odd per cent of fresh food consumed domestically comes from our own production. If we are not careful, we may have to import more food. I guess this further highlights the necessity for comprehensive R&D and appropriately targeted R&D to

ensure the viability of the food and fibre sector for domestic and world economies, because we are a major exporter of food.

AgForce welcomes the federal government commitment to \$46.2 million of further investment into adaptation. We welcome the funding. It is all focused on mitigation at this stage. We hope the government will resist at all times the reallocation of current R&D away from production funding towards climate change R&D only. We have got to be very careful we do not just totally focus on the climate change side of the equation. Clear and defined money and new money needs to be allocated for this climate change discussion.

It is concerning that Land and Water was abolished during the last budget period. At that point, it was doing a lot of hard yards in progressing this climate change issue for agriculture. We are also concerned that there is a current lack of strategic direction with respect to drought assistance, with the apparent abolition of exceptional circumstances. AgForce is currently developing a position on the current policy framework surrounding this.

I think that sums up just a few of the issues that we have and that we have discussed at AgForce.

**CHAIR**—Thank you. Are you right, Mr Wagner?

**Mr Wagner**—Yes.

**CHAIR**—On the exceptional circumstances issue, and lines on maps, people are talking about it maybe being time to move on from where we have been in that area. With models showing, under climate change, the frequency of rain and weather patterns changing, we might need a new perspective on the way we look at these circumstances. Maybe helping the individual enterprise meet those circumstances would be the way to go. Do you have any views on that?

**Mr Wagner**—I think there is a fairly generally accepted view that very few other sectors will be more impacted upon by the vagaries of climate change and variable weather patterns than the agricultural sector as it stands. We have seen that both domestically and internationally recognised in many of the reports that have come out from a lot of the players, but there is still not a lot of positioning as to what exactly that means at this point in time. You can look at pretty much any model that you like on any day and come up with a different scenario. The difficulty we have at the moment is trying to get that underpinning policy framework correct to do exactly what you just said, to actually see if we need to work through industries under particular circumstances or work through individual enterprises under particular circumstances and what frameworks or scaffolding are actually required to ensure that some of these positions are still viable.

My colleague mentioned that landscape resilience and sustainability are paramount to our ongoing future in the sector. At this point in time, we are getting a few not so much misleading signals as perhaps a bit of muddying of the waters, so to speak, to try and work out specifically what direction there is. Whilst we have multiple tools available to us at the moment, it is actually about trying to see what best fits the greater model to see whether we go down the path of on-ground outcomes or interest rate subsidies or something similar to the current pathways that we have been investigating. And, as I said, is it on an enterprise basis, a market basis or even a

commodity basis? That is all work that we believe still needs to be undertaken. That is something that we are trying to get somewhat of a handle on at this point in time as well.

**Mr WINDSOR**—You mentioned we have to be careful that we do not end up importing all the food. Could you elaborate on that.

**Mr Maudslay**—It is more about the overlap of the policy that we currently have. It is about the overlapping effect of what the government is doing at the moment, I guess. I will use the carbon analogy. That is the analogy I was thinking of. If carbon is worth \$40 a tonne, and each head of cattle emits a tonne of carbon dioxide equivalent per year, that is \$40,000 that each enterprise has to find somewhere in its cash flow.

**CHAIR**—How much is that per beast?

**Mr Maudslay**—On the current research it is about \$40 a tonne. So that is about \$40,000 per 1,000 head of cattle. That will drive people out of business and we will have to import food. Other countries would not in their wildest dreams plan a system such as the system the government is currently proposing in Australia. We have met with other farm producers around the world, and they are quite surprised at what is being proposed here.

**Mr WINDSOR**—When you say ‘what is being proposed here’, are you talking about the five per cent target?

**Mr Maudslay**—If we cannot account for the mitigation that we do for the whole carbon cycle in our environment—if we cannot measure the grass, the trees and the carbon in the ground—then we have nothing against which to offset our emissions. And you have heard about methane, which is more powerful than carbon dioxide. If it is only one way, if we are just emitters and cannot account for the natural things we do in our cycle as part of our business, we are in a lot of trouble.

**Mr Wagner**—And it tends to have a twofold effect. Not only will it ultimately have a very strong impact on the bottom line of our domestic producers if we do indeed undertake the full coverage circumstances of a CPRS—which is the path my colleague is going down—but there will be an impact on our producers right from the word go as soon as the mechanism is introduced, as there will be across the economy. Dealing with that is obviously something we will predominantly have to manage in house, because it will be economy wide. The difference, though, is that if we go down the path of having full coverage of an agricultural system as far as our emissions profiles are concerned, and participation within that flagship system of emissions trading and the cap and trade system currently proposed, that will have massive imposts and implications for the bottom line of our producers. That will drive out their competitiveness to even be able to survive in the market domestically. It will also put them at a very strong disadvantage against international competitors who may not be under the same frameworks. At the same time they will have to adapt to and overcome the vagaries of the variable climate as well, when some of the more productive systems of our international competitors are not being modelled at this point in time as having the same climate impact upon them as what we might see within our domestic production areas in Australia. For example, South America will possibly have a more productive system under a climate change model and perhaps will not have to wear

some of the vagaries that we see being modelled across the domestic production systems in Australia.

**Mr WINDSOR**—So the food import issue relates to whether we go to full coverage?

**Mr Wagner**—That is one edge of the sword. The other edge is having to deal with international competitiveness regardless of the framework—international competitiveness under the variable climatic impact in Australia versus what some of our overseas competitors may see. We will have to deal with both the adaptational principle of it, which is obviously what this committee is looking at, and we will also have to go heavily down the mitigation side as well if we do indeed have the full coverage system from 2015 onwards.

**Mr WINDSOR**—You mentioned the South American example. Some scenarios would suggest that parts of Queensland will benefit from climate change if it occurs. Have AgForce done their work on what that means? Obviously you have done something on South America. Have you tried to model what that could mean for Queensland?

**Mr Wagner**—AgForce specifically—I have done that work. Meat and Livestock Australia, which AgForce is obviously very heavily represented through as a research body, have started to look at some of those modelling implications. Domestically, we are going to have to see. Regardless of the principle of adaptation—there is a very strong history of adaptation with farmers across Australia over a very long time—we have seen something of the speed with which we will have to adapt to the climate, speed like we have never seen before. To say that some areas of Queensland may become more productive, the modelling that has been done looking purely at a climatic or weather pattern issue is probably a little bit too narrowly focused. You would have to take into account the adaptational principles of what may need to be farmed in those areas, what could be farmed in those areas, the changing face of what is currently there as far as bloodlines, breed patterns, systems, outcomes, outputs—the whole box and dice. There needs to be some work done at this point in time to fully understand what that means. That probably takes us further through our submission to look at a fair and targeted research and development agenda to underpin that. Yes, here are some areas with a possibility of further output but, from the models we have seen, at no point in time would that further output overtake, as far as a 100 per cent ratio, what would decline from other areas.

**Mr WINDSOR**—In terms of methane, is there any research or extension work being done on the ruminant additives—various pasture research?

**Mr Wagner**—Yes.

**Mr WINDSOR**—We know in Western Australia, for instance, that there is development of a legume that could reduce methane emissions by 25 per cent when ingested by an animal. We know there are some genetic implications too in some of this stuff. What is happening in Queensland in those broader issues of trying to adapt to the methane? The other obvious question is: is there any important information about carbon accumulation within our soils?

**Mr Wagner**—At this point in time there is probably a lot of work going on on that agenda. It is part of the \$46.2 million that Grant highlighted in his opening statement that is specifically allocated to mitigation aspects of methane, nitrous oxide and soil carbon inquiries. At this point

in time it is very heavily focused on the mitigation end of town; it is not focusing on adaptational principles—although they do need to go hand in hand because for one to be commercialised there has to be an adaptation of the market anyway.

As far as the methanogens are concerned, there is a lot of work going on around a variety of farming systems not only with that funding that I mentioned earlier—there is about \$18.6 million, I think, being funded through Meat and Livestock Australia as the RDC. As you mentioned, there is work going on in WA. There is also a lot of work coming out of Meat and Livestock Australia in measurement as well as attraction and retention of methane from those emissions. There has been the fabled work into the kangaroo gut rumen antibacterial impacts and possibilities as well.

The biggest difficulty we have at this point in time, though, is that unfortunately not only are some of those R&D agendas probably running now somewhat too late to actually have the outcomes that we need but the funding buckets that we have for them may not go to the full extent of what is required. There is also the difficulty of whether or not they are being targeted in the correct areas. It is one thing to work out what to do with methanogens, but when we do not even know how to measure them it is very difficult to understand if you are putting the horse before the cart or the cart before the horse. If you are trying to work out how to fix something, surely you need to work out how to measure it in the first place as well. So there are those sorts of ramifications coming through.

There is a lot of work going specifically into methanogens. Some of those test plants are across Queensland as well, and there are various RDCs and research and development areas that are looking specifically into those agendas at this point in time as well as a lot of industry-led research and development through bodies like MLA through levies and things like that.

**Mr WINDSOR**—Is there enough money being put in? You intimated a moment ago they might be going—

**Mr Wagner**—The difficulty we have, as Grant mentioned earlier, is that in a lot of cases when we see announcements for these fundings it is not necessarily new buckets of money; it is redirected, retooled, rebadged, re-outcomed or 'rewhatevered'. Money that has been put into other hollow logs, for want of a better word, in previous times has been rebadged or re-funded in certain areas.

The difficulty that we have in the current economic climate is obviously the recognition of the fact that there is not an endless bucket there. I suppose it is about trying to cast forward somewhat to see what the impacts of us not getting this right are. If we start going down a path where our productive systems in Australia are no longer viable, if we start going down a path of the regulatory or mandatory implications of the systems being so overburdening on our farm systems that they cannot still operate, then we have gone too far. Being able to cast forward is intrinsically important but being able to make the investment today has to be an underpinning mechanism of being able to do that forward casting.

I think there would be a lot of players who would tell you the same thing which is that a lot of the focus and a lot of specific agendas are not being set because there is no commercial value dollar today on what a tonne of carbon actually means. It is a fine line getting the balance right

of what needs to be done upfront versus what will be driven commercially once there is a dollar value on that tonne of carbon. Unfortunately, there is a long way to go on that upfront work even just as far as accounting and measurement is concerned as I intimated before.

**CHAIR**—You paint the picture representing your membership but there are opportunities that may exist, if we have in a world scenario carbon sound technology, for marketing Australian produce to the world. You are painting the old scenario that we are all going to go broke. All that rhetoric is okay, but are there opportunities as well if we are on the front foot? We do get measurements of carbon in soils. We know the work that is going on might assist us in that, but do you see the opportunities?

**Mr Wagner**—Without a doubt, but I think we need to get those mechanisms right as I mentioned earlier. Some of those opportunities may present themselves if we get those processes correct. We saw in the original draft report from Garnaut the outlining of the fact that Australia domestically is a low emissions intensity food producer. Unfortunately, he seemed to get somewhat of a bagging over that postulation, so in the final report he put forward he said we are a high emissions intensity producer per capita but, certainly, per tonne of production we do have some of the most efficient production systems internationally. We need to make sure though that, when we put the scaffolding and support mechanisms around that, we do not actually unhinge that balance and push it towards either an unviable or an intensive structure. It is getting some of those forward casting mechanisms correct that will allow us to do that. We need to make sure that we are looking at not only the endgame of how we deal with the methanogens but also how we get the simplest of issues correct as to how we measure, verify, implement and deploy the extension work that is required around that. The strategic direction that is put forward is imperative to do that.

**Ms LIVERMORE**—You talk in your submission about how historically Australian producers have demonstrated a really good capacity to adapt to change and adapt to climate variability. Whatever we do in terms of a response to accelerating climate change will be built on that foundation and that framework. Can you talk about some of the things that you see in the past and present in the measures that industry and individual producers have employed to adapt to changes in the past? What are the strengths of that framework and what would you want to hang on to in terms of responding to climate change? What might need to change in facing that future challenge?

**Mr Maudslay**—I think it said the growth that we have had in 30 years was two per cent per annum or something like that. Forgive me for not reading the figures accurately but a lot of that growth has to do with pasture improvement, watering cattle better, developing country, putting fences up and better using the country we have available. We have a very simple production system in a lot of the things that we do. A lot of the gains that we make are absolutely contingent on any future R&D. Things like pasture species and those types of things. You spoke about legumes before, Mr Windsor. They are absolutely vital to any future productivity gains we make. So any time we have an actively growing healthy pasture, we are giving ourselves the best chance to be stable, resilient, keep our emissions down, do all those right things that we want to do for the environment, things we do naturally everyday. None of us are in the business of emitting stuff that we should not be emitting.

So it really is underpinned by R&D. We have hit a plateau with some of the government regulations we have now. We are hitting a bit of a ceiling as to where we can go in the future. R&D really is the most important thing we can contribute funds to for any future gains in the way we run our businesses.

**Ms LIVERMORE**—Does industry have a pretty strong and effective say in the allocation of priorities in terms of where R&D money gets spent?

**Mr Wagner**—We have. There possibly needs to be a bit of differentiation there because of the amount of investment the industry actually makes in a lot of those R&D projects as well. There are various commodity levies or contingencies that are put forward that are then redirected or reinjected specifically into identified and targeted R&D agendas—whether it is to expand priorities that have been listed or opportunities under a merit selection processes that governments run or whether it is going down that path because specific outcomes are desired by that commodity or that interest group. So a lot of the direction is there.

The difficulty with R&D, though, is that—as anyone involved in research might tell you—you could find the answer tomorrow or you could find it in 10 years. The lead time on getting a lot of this stuff right and then commercialising it and extending the product out to the market can often be very long. There appears to be a reticence to commit to a lot of those longer time frames, which is understandable financially but perhaps, for market development and market accuracy, a somewhat too narrowly focused aperture to get that desired outcome in the end.

There are often times—and I apologise; I cannot think of one right off the top of my head, but we have discussed them before—when R&D agendas have been removed because no outcome has been determined within a set time frame and a new priority has come up, and I mentioned earlier the rebadging of funding at times and the re-shifting of focus. But we need to take it to the nth degree to find out what that end outcome is, because otherwise we are going to keep throwing money at things we have not actually finished. The kangaroo additive, the antibacterial for ruminants, is probably one of those issues: it works bloody well in the lab, but trying to replicate that out in the paddock is very difficult.

**Mr WINDSOR**—They hop over the fences!

**Mr Wagner**—Try mustering them—it is even worse. So, putting some of those frameworks around some of that extrapolation then from the market based instruments of the R&D agendas out to an on-ground field test and then out to a more widely deployed commercialised mechanism is often where some of those agendas or funding regimes start to fall down somewhat. We can get them to work really well in the lab but often we cannot then extrapolate that to a field. We see that some of the funding needs to be focused or targeted there at the same time.

**Ms LIVERMORE**—So you are saying that the funding gets you so far with a new initiative but you cannot then take the next step?

**Mr Wagner**—Yes. It is then the commercialisation, the indoctrination and the extension work required to actually get those opportunities out into the market with the appropriate knowledge and application of that process.

**Ms LIVERMORE**—Following on from that, have you got a vision, an ideal model, that you could describe to the committee for how best to fund and then utilise R&D? If you were sitting down to design what we need right now, what would it look like?

**Mr Wagner**—Without looking like we are sniping from the sidelines, the Land and Water Australia abolition took a lot of industry players very much by surprise. The work that they were doing using the climate change analogy under the CCRSPI program was a very specific and targeted primary industries research program, and the agendas that came out of that and the opportunities that even arose out of that process, while they might not have been able to be undertaken holistically because of the number of possibilities that would put forward, it at least would have allowed for a targeted regime to be worked through. It was getting to the point where a lot of that work was actually starting to get to the crux of what they were trying to achieve, but the flagship that was driving it has been removed. Now, we understand that functionality is still going to be there but, without the specific focus of organisations as executive agencies like that one was, often the agendas can get caught up in the minutiae of what is going on at departmental levels. Even in the short period of time since Michael Robinson and his team were taken back into the parent department, we have already seen a lot of the agendas and time frames start to slip on some of the outcomes that were to be achieved through some of those processes—indeed, including CCRSPI.

So I think dollars are one thing; but the strategic direction, the focus, the identification, the market involvement and the buy-in are obviously extraordinarily strong underpinning processes that need to be involved in that situation as well. Sometimes that is where that gap is. The loss of that executive agency to drive that agenda has been seen as a massive loss and felt not only across the rest of the research and development corps but also across industry at the same time.

**CHAIR**—There is the issue of getting held up on those subject matters of who actually pays for new product and new ways. Does industry have a role there? Does government do it all? Do we have the models right or do we need to look at the models that exist now?

**Mr Wagner**—What is the R&D levy?

**Mr Maudslay**—I will use the beef industry as my example. I pay a \$5 levy to Meat and Livestock Australia. Forgive me if my figures are not exactly right. I think about 90c of that is R&D. It might not be exactly right. That has not lifted for a long time. Obviously, as part of what we do in industry, we need to look from time to time at those issues and at whether or not we are putting in enough money. The dollar-for-dollar funding that government gives that adds on to those bodies is very valuable. So the more we can give, the more the government can give, obviously.

**CHAIR**—It has been a model that we have used for a long time. Both sides of parliament have supported the concept and changed it a bit here and there to make it more effective or whatever. But you think that model still has some relevance?

**Mr Maudslay**—I think it is a pretty valuable model. The more we give, the more you give; it is not so bad.

**CHAIR**—I think it is a bit hard for some of the smaller industry bases that do not have a lot of money coming in from a levy. That causes a few difficulties in that area—the capacity to have enough money to put into research et cetera.

**Mr Wagner**—I think if you remove the commodity-specific R&D agendas that are operating though, a lot of landscape sustainability and resilience R&D goes in as well, which obviously has ramifications and opportunities for all landholders. So those positions are still there.

The thing that worries me and our organisation specifically though—we have touched on it a few times—is the sheer speed upon which we are going to have to see the deployment and commercialisation of these opportunities. We have talked about the ongoing very strong history of adaptation within this sector domestically in Australia since time began. But the difficulty here is that in the past we were talking about it taking generations to adapt and overcome issues. We are now going to be talking about multiple issues within generations. It appears that the impacts which we are trying to adapt to are ramping up almost exponentially. Perhaps the focus on the R&D side of things is not ramping up at the same rate.

**CHAIR**—Do you think your membership is ready for that sort of massive change in speed to adapt or to get on top of that? Do you think that communication strategies are important as well?

**Mr Wagner**—I think the extension work of this principle is extraordinarily important. AgForce itself at this point in time, through Caring for our Country funding, is actually doing what we loosely term carbon 101 training. That is specifically sitting down with landholders in a workshop scenario to look at what carbon is, what things like emissions trading are, what carbon means, what methane means and asking, ‘What does this mean to you on your farm?’ It even goes to principles of what mitigation and adaptation actually are. The second phase of that is going to be sitting down specifically with individual landholders and business concerns and working out what some of the opportunities and positions there are.

I think that is extraordinarily invaluable work. The difficulty that I see is that three years ago the previous federal government had a manual called *Farming for the Next Generation*. It was a carbon 101 workbook. It had industry buy-in from the National Farmers Federation and all of its participants and members; it had been peer reviewed by industry and government; and it was very much the snapshot to sit on mum-and-dad kitchen tables on-farm to explain what a lot of these terms are. We had a signing ceremony and launch date set that just happened to fall two weeks after an election was called.

To this day, that manual has still not been deployed. We are in talks with Minister Bourke at this stage to find out where that is up to, because that communication extension work needs to be underpinned by positions like that. It is one thing for Agforce to go out and speak to 2,000 or 3,000 landholders across Queensland, but I know that New South Wales are doing the same thing and the Queensland Murray-Darling Basin Commission is doing the same thing. There are all these players doing similar sorts of things all over the place without any coordinated effect. That, in a nutshell, almost mirrors what is going on in the R&D agendas. There is so much of it going on, so much disarray and so much being doubled up. It was not until we saw the announcement of the \$46-odd million dollars that was released a few months ago that we saw a coordinated effect starting to come in, and we applaud that strategic direction.

**CHAIR**—Change of governments bring change of directions and changes in policy directions. We have had some of that. That is a pretty normal process that occurs at a state and a federal level. You have used the word ‘chaos’. I think that is the wrong term, but that is your term. We have certainly had evidence given to us in these hearings about the need to get science at the farm level—the extension. This seems to be a re-emerging issue. I think a finding from a Senate inquiry some time ago was in that area as well.

**Mr Wagner**—Was that the food safety and food security inquiry?

**CHAIR**—Yes.

**Mr Wagner**—We also presented evidence to that inquiry, almost to that effect.

**CHAIR**—Another issue is that there are many farmers and farmer groups doing things differently and making their own changes and their own investigations, and some of them do not always have the evidence to back up what they are doing. Do you see a need to get the science out there to support those farmer groups that are actually out in front in many respects, doing new and different things?

**Mr Wagner**—Very much so. I believe, though, that, with respect to the entire climate change argument, if you give me five minutes at a computer I will pretty much be able to argue whatever position you want me to put forward. We have actually had to indoctrinate a policy that says, ‘At this point in time, Agforce doesn’t support, endorse or condone voluntary trading mechanisms for carbon,’—just as an example. It is not because we do not see that there are possibilities down the track; it is just the fact that, today, we do not have the science right and we cannot actually accurately measure, monitor and verify, and we do not know what our obligations are going to be down the track if we are going to participate within the market-based mechanisms proposed. I realise that is outside the area that this committee is looking at, but I use that purely as an example. I can sit here and give you the names of three dozen consultants who would tell you about different opportunities regarding what you can do as far as your biosequestration is concerned; however, how do I know which one I should be talking to at this point in time, because we do not have an agreed direction or position on that?

**CHAIR**—So if there is federal legislation in place that will give you the direction and a price of carbon, you will then as an organisation feel quite sound that there is something pretty firm out there on where the country is going?

**Mr Wagner**—I do not believe it actually needs to be a federal direction; I just believe that we need to get this stuff on the ground and tested accurately. I believe that we need to get the positions correct on ground, because so much, as I mentioned earlier, is still only viable in a test tube. We have seen a proposal—and again I come back to the Garnaut report—to replace eight million head of cattle and 12 million head of sheep from the national herd with 220 million head of kangaroos. On ground, that has extraordinary sustainability impacts. It works beautifully in a test tube—it is defensible in a lab—but to try to put that regime into a sustainable land management practice is just ludicrous. That is just to highlight some of the gaps we have got with some of the statements coming through. The federal government regime is under a regulatory environment. But the actual outcomes on ground need to have the science available at

the farm gate, and it needs to be demonstrable and repeatable to be able to put those positions forward. That is the gap that we have at this point in time.

**Mr WINDSOR**—I have a couple of questions. The debate is really centralising around food production. Australia is an exporter of food. We produce too much, in a sense, for our own consumption, so we have to deal with other players in various corrupt and otherwise markets. You mentioned that, at \$40 a tonne for carbon, the meat industry, for instance, may become unviable. Is Agforce doing any work on or looking at land use change? Instead of this preoccupation with using our land to grow food, if you impose a carbon economy over a food economy, a lot of these negatives—whether they be nitrous oxide, methane or carbon equivalents—in a fuel economy become positives. In terms of the viability of the people on the land, is Agforce or the NFF doing any work in looking at land use change away from food production to a carbon economy/ renewable fuel environmentally friendly economy? I know that has quite dramatic implications in terms of food—and people need to eat food—but the debate is being put on to the food producers to come up with the solutions. One of those solutions may well be to stop growing food and to instead grow fuel.

**Mr Wagner**—As I mentioned earlier, internationally, we have already got acceptance that Australia is a low-emissions intensive producer of food. So, if we were to provide leakage opportunities for that production to go into other systems internationally, we would actually see no greater impact internationally as far as what the overall outcome against international carbon emissions. Therefore, we probably would not actually see any change in climate variability or increases.

**Mr WINDSOR**—No, I am talking about the farmers you represent rather than the globe at you do not.

**Mr Wagner**—I suppose, though, that those farmers actually play a role in the international food and fibre production. Without the farmers there is no food. We have had campaigns along those lines for many years—for example, ‘Every family needs a farmer’, ‘No farmers, no food’ and that sort of thing. I think that, if you were to try to put that supposition to anyone who currently produces food and has an attachment to the land, you would get some fairly interesting responses and results from that inquiry.

To be honest, Mr Windsor, I actually do not know how to answer that question, because at no time whatsoever have we thought of anything other than sustainable and resilient landscape productive outcomes—not about shutting down our processes. We have looked at issues like perverse policy outcomes because of landscape competition. At the moment, the only way for our guys to get any carbon benefit is to stop their current production levels and go and replant everything that they have got—which actually may mean removing some of the old stuff they already have because the old remnant is not included in any accounting mechanisms. So there is a perverse policy outcome in that they have to reseed everything that is there. There is landscape competition as far as investment companies looking at wanting to do that anyway. But, at all times, the food and fibre production needs to be sacrosanct in our systems, and the position that we are putting forward is one of resilience and sustainability to ensure that that continues to happen.

**Mr WINDSOR**—The CPRS legislation that is before the parliament at the moment did have amendments produced by the government that actually create incentives for land use to move from food production into timber production—

**Mr Wagner**—Correct.

**Mr WINDSOR**—to be part of the carbon solution. So there is a precedent being set now in terms of government policy changing the shift from what used to be an emphasis on food to carbon amelioration.

**Mr Wagner**—There is also a new focus at this time. A new technical options development group has been specifically set up for the agricultural sector to work with the Department of Climate Change on the outcomes from moving towards that 2013 review with the possibility of a 2015 start. One of the issues that the technical options group has raised is that, although we talk about water security, land security, biosecurity and everything else, in the current white papers and draft regulations being put forward to parliament there has not been any discussion on food security.

We have raised this with them, and we as an industry are in the process of writing a paper on behalf of that technical options development group. That will be put forward in the very near future and will address having some inclusion or recognition of that process within the structure of what is being developed. At this point, the rules as far as agriculture is concerned, at the admission of the Department of Climate Change, is that everything is up for grabs anyway because no decisions will be made until that 2013 review.

We in industry need to ensure that we move towards that review process being fully educated, unbiased and technically and scientifically sound in our positions. That should be underpinned—unfortunately or fortunately, depending on where you see it from—by making sure that those R&D agendas are actually being worked through and that those analyses and the economic studies you mentioned are done so as to understand what the full ramifications are. But at no point in time has the government actually postulated that what they are trying to do is to reduce the food output or the productive nature of the landscape. They realise that some of the policy positions being put forward may actually have perverse outcomes and are trying to come to terms with what that means at this point in time.

**Mr Maudslay**—Mr Windsor, I think that there are many parts of Australia—if you look at central western Queensland or somewhere like that—where there is not really much else you can do besides raise sheep and cattle. Trees do not grow fast; they grow slowly. You only have to go into that environment and see what happens there, and you will just shake your head and go, ‘Well, there’s really not much else you can do here.’

**Mr WINDSOR**—Kangaroos.

**Mr Maudslay**—There are a few reasons.

**CHAIR**—Thank you very much for your evidence and your time. We really appreciate it. We will send you a copy of the transcript to have a look at.

**Mr Wagner**—Thank you, Chair. Thank you, ladies and gentlemen.

**CHAIR**—We will now suspend proceedings for a short time.

**Proceedings suspended from 10.46 am to 11.03 am**

**MACKENZIE, Ms Rachel Frijya, Chief Advocate, Growcom**

**PUTLAND, Mr David, Climate Change Project Officer, Growcom**

**CHAIR**—Welcome, and thank you for being with us and your very good submission. Although the committee does not require you to give evidence under oath, this hearing is a formal proceeding of the parliament and warrants the same respect as proceedings of the House. Giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. The committee has received your submission as submission No. 55. Are there any corrections or amendments you would like to make to that?

**Ms Mackenzie**—No, thank you.

**CHAIR**—I invite you to make some introductory remarks.

**Ms Mackenzie**—First of all I would like to emphasise the importance of the horticulture industry to both Queensland and Australia. The Queensland horticulture industry is worth about \$2 billion per annum. It is the second-largest agricultural industry in Queensland. Interestingly, 80 per cent of the product grown in Queensland is actually consumed in Queensland, and I think something like 90 per cent is then consumed within Australia. So it is very much a domestic based industry. We employ something like 25,000 people, and that is excluding our very significant casual labour force. We have a very high value of production per operator. We have something like 2,800 producers, representing over 120 commodities. Interestingly, Queensland actually represents every single commodity grown in Australia, so we are quite a good microcosm of the horticulture industry in Australia as a whole.

Horticulture is particularly vulnerable to climate change in perhaps a way that other agricultural commodities may not be in that we are very vulnerable to temperature change. You may have heard the example given about apples in Stanthorpe. Apples need a certain number of chilling hours and even slight changes in minimum temperatures can have an impact on that particular industry. Last year Queensland was actually the second-biggest apple-producing state in Australia. While some people think of it as a little dinky thing down there in Stanthorpe, it is actually quite a significant industry.

I would like to give you another example provided by one of our leading beetroot growers in the Lockyer Valley, Linton Brindlecombe, who is a very passionate advocate of climate change issues and is actually going to speak in the United States on climate change. He sent us this particular example. He grows beetroot for the Golden Circle cannery. Golden Circle like to receive their beetroot in winter. He has been growing beetroot since 1989 on that particular block. In the 10 years from 1989 they always planted their beetroot in January. They suddenly found that the beetroot was not thriving. The temperatures were too hot. They tried watering the soil to cool down the small plants. That would lead to soil diseases. They have had to push their planting time out to 22 February. That has had quite a significant impact on their capacity to access their market and has had quite a significant impact on their business as a whole. Linton is a forward-thinking grower. He has taken it on board, he is asking a lot of questions about how to manage the situation, and is doing his best to adapt with the technology that he has.

It is very important to realise that there are a lot of knock-on effects. It might be that you just change the planting time, but that then has a number of ramifications for a whole range of issues. I am sure you have all heard this before: water stress is an issue; the change in growing season is a big issue; and extreme weather events are significant, particularly in North Queensland but also further south. One issue that many people are less aware of is this potential change in range of pests and diseases. Many pests and diseases may be having longer seasons and moving further south. That has quite significant implications for our food production.

In terms of the Carbon Pollution Reduction Scheme, as we outlined in our submission, we are very strongly of the belief that the plant based industries need to be considered separately from the livestock industries. Horticulture, for example, is responsible for about 0.2 per cent of Australia's emissions in terms of direct emissions from nitrous oxide. This is a very small amount, very difficult to measure and very difficult to actually change without impacting on production. We do not see any benefit in terms of total emissions reduction for the country in including horticulture in the scheme. We also think that it would be an absolute nightmare to administer and manage the system. It would put an extra cost onus onto our producers, who are price takers, which means it is very difficult for them to pass on costs to the consumer. Obviously we will still be impacted, regardless or whether we are in or out, with increased input costs. I guess that is something that we just have to take on the chin and build into our costs like everybody else.

The horticulture industry has been acknowledged as being quite a positive industry in terms of adaptation strategies. For the next 10 or 20 years at least the climate change predictions are such that they are within the limits of existing climate variability and well within the capacity of our growers to adapt. We had some climate change workshops last year and our growers were confident that in the short term, provided they were given the tools and the information that they needed, they could adapt. Obviously things like new varieties, using the shifting growing season in a positive way and employing new technology are all very positive things that can be done. There is the capacity to move to new regions, but that is quite expensive, particularly for people with orchards. Often the argument is put forward that growers can just switch crops. That is fine if you are growing certain types of vegetables, but it is more difficult if you have tree crops, which are very expensive to plant and take a long time to come to fruition.

Another thing that a lot of people have not thought of but that our growers have raised is that if we move further north to hotter areas we are going to have workplace health and safety concerns for the high number of people employed in the industry. We have a very labour-intensive, manual labour based industry. It is not machines; it is people, and people need to be kept cool in the middle of the day.

With regard to what we really need, which we outlined in our submission, absolutely fundamental to our capacity to adapt is better forecasting at a seasonal and regional level. That comes out every single time we speak with growers. We think that support for multiperil crop insurance could be a way forward but we also think that that has to be backed up by a risk management system that insurers are confident in. That could be some form of farm management system or something else that at least means the growers have gone through the risks, taken the information on board and looked at how they might adapt their practices. Other things are water use efficiency programs; research into pests and diseases and crop varieties, among other things; effective water planning, because with less rainfall overall but more extreme

events how we capture and utilise our water is critical; support for industry extension; information distribution; and a range of different funding programs targeting different aspects.

**CHAIR**—Thank you. Mr Putland, would you like to add anything?

**Mr Putland**—I have nothing further to add at this point.

**CHAIR**—In your submission you talk about modelling and analysis specifically focused on the implications of climate change for horticulture. You mentioned heat, cold, frosts and other issues which can change circumstances—and you gave a good example of that—and therefore the difficulties for markets. There are complex issues to deal with from a grower's point of view. Forecasting becomes pretty critical as a tool, doesn't it?

**Ms Mackenzie**—It does indeed. Last year we were involved in a project with the Queensland Farmers Federation, funded through DAFF. It was through the University of Southern Queensland. They looked at the existing models and did a bit of looking back into the past, retrofitting the models to identify which models they felt were most accurate for Queensland conditions. They developed some seasonal and regional forecasts for us which we were then able to use in talking to our growers. That is the very beginning; there needs to be a lot more work done on that, but it was very eye-opening for our growers to see that and realise what sorts of decisions they might have to make. Dave, do you want to add to that?

**Mr Putland**—I think the forecasting issue needs to be addressed on two timescales. One is to get much better long-term climate forecasts so that we can develop adaptation strategies for particular commodities and regions with sufficient time in which farmers can make those adjustments with investment in new technology and new equipment, through switching crops or whatever is necessary. Much more accurate regional climate forecasts going out for several decades are vital. The other thing to facilitate short-term adaptation on the part of individual farms would be to have more accurate medium-term weather forecasts going out a few months so that they know that next year is going to be a dry one or a wet one and they can adjust their planting schedules or cropping dates accordingly.

**Ms Mackenzie**—There is an example with lettuce. In the Lockyer Valley there are a number of different varieties of lettuce that you can grow. You have a reasonably high level of certainty—or you had in the past—about what variety you should plant at what time of year. What they are finding now, particularly for the month of September—it is either August or September; I can't remember—is that it can be either a wintry sort of month or a summery sort of month and that has a huge impact on what variety of lettuce they need to plant. If they could get that information three months in advance with a reasonable level of confidence, that could have a very positive impact on the outcome for their crop.

**CHAIR**—'Reasonable level' is an interesting term.

**Ms Mackenzie**—Yes.

**CHAIR**—Another issue you mention in your submission is the need to make distinctions between the different agricultural industries. I guess you mean that when it comes to setting up

policy it is important that consideration is given to the different sections of the agricultural industry.

**Mr Putland**—Yes. There is a tendency in all of the policy documents that we have seen so far to lump agriculture together as a whole. I think it is much more complex than that. Horticulture is probably more susceptible to the physical impacts of climate change and is likely to bear some of the costs more than other agricultural industries. Also, what is available for on-farm emission mitigation options is very different for relatively small high-intensity horticultural producers than broadacre or livestock.

**CHAIR**—Thank you.

**Ms LIVERMORE**—What drives decisions about adaptation for producers now, and what role, if any, do you see for government in facilitating those adaptation strategies and supporting those decisions that producers are making?

**Ms Mackenzie**—I think it comes down to good information. Like I said, the horticulture industry is recognised as being quite advanced in terms of its adaptive capacity. Even within our own industry everything is lumped together, but how you grow an apple and how you grow a cauliflower are very different. Some annual crops have very short time lines such that you can observe a lot of differences, and that is where a lot of growers are starting to make changes very quickly. Growers like Linton have made those observations themselves and have started putting two and two together and coming up with four. We always have an article about this in our *Fruit & Vegetable News* and we always try to promote climate change as an issue of concern to the industry. We need to give our growers as much accurate and useful information as we can, and I think that government can really help us provide that information. We can be a conduit for that information to a certain extent, but the actual getting of that information is something that we need some assistance with, in terms of facilitating the research that we need and some of the gathering of information and statistics. Horticulture is notorious for its lack of data, because of its multicommodity nature. All of those things and a good information dissemination program would be very useful in terms of driving adaptation.

**Mr WINDSOR**—In terms of Queensland's response to climate change, there are various models out there. What seems to be coming across is that Queensland will be a beneficiary in terms of moisture in some areas. How does your group actually read the dynamics? What model are you following? I note that you have been talking about the temperature effect being probably more critical than anything else and weather severity events as being critical. How are you reading the moisture regime that Queensland will face?

**Ms Mackenzie**—Because our state goes such a long way up, we move from areas that are going to become drier, according to the predictions, to areas that are going to become wetter. I would argue that the areas that are going to become wetter are not particularly thrilled about the concept. As you can imagine, the floods that occurred this year in the Tully region had a massive impact on the banana industry. As for extreme weather events, yes, a lot of rain happened with Cyclone Larry but it also managed to wipe out the banana industry while it was at it. It would be naive to be completely pessimistic, but I think that we also have to take on board the fact that increased rain in North Queensland may not actually be beneficial to the horticulture industry.

**Mr Putland**—There are two other issues. One is that horticulture is dependent on irrigation. So as long as there is some sort of regular water supply it is not so dependent on rainfall on farms. Something like 95 per cent is irrigated. The other point to make about these long-term predictions of rainfall patterns is that there are much larger bounds of uncertainty over rainfall than there are over temperature. I think we can be fairly confident about changes in temperature patterns across the state but far less so about patterns of rainfall. I think we need to be cautious about looking at the little blue patch on the map and saying it is going to rain more in the Burdekin area or whatever.

**Ms Mackenzie**—The other thing with increased rainfall is that, particularly with increased temperature, it often leads to increased pests and diseases, which we alluded to early. That has significant impacts on our industry.

**Mr WINDSOR**—Has your group done any work in terms of turning what is potentially a negative into a positive? I just cite as an example the injection of carbon dioxide in a greenhouse environment to promote growth.

**Mr Putland**—Yes. We are involved in research projects to identify the potential impacts on various commodities and regions. Part of that is looking at some of the positive impacts as well. Carbon dioxide fertilisation is one; the potential increased rainfall is another. We may see the expansion of regions suitable for growing tropical crops further south. But then to balance that out we may see dry areas in South-East Queensland. We may see a contraction of areas suitable for growing temperate crops such as apples. There are swings and roundabouts. The research on that is ongoing so that we can identify critical temperature thresholds for certain crops and overlay that with the climate projections and try to identify what areas are at risk and what areas are potentially facing benefits from climate change as well. Particularly for scenarios where farmers may want to switch crops, we want to be able to identify what are likely to be the profitable ones for them to switch to.

**Ms Mackenzie**—I would like to point out that that project that we are talking about, which is led by the Queensland department of primary industries, was funded through Land and Water Australia. The funding was coordinated through Land and Water Australia whilst the actual money itself came from HAL and Woolworths. At this stage we have no absolute confirmation that the project is going ahead, although it does look like the GRDC will take that project on. That is very good news because we think this project is absolutely critical not only for the Queensland horticulture industry but for the Australian industry.

**CHAIR**—On the rainfall issue, we need to take advantage of rainfall storage and those opportunities. Do you see that as—

**Ms Mackenzie**—Yes. We see improved water planning that takes on board climate change predictions as absolutely essential. We are of the understanding that what was formerly Queensland department of natural resources and water is starting to take on board climate change predictions in its water planning processes, and we strongly support that.

**CHAIR**—You talk about how the horticulture industry must be proactive. Would you like to talk about the farm management scheme? I think that is a project that you have been involved in.

**Ms Mackenzie**—Certainly. Growcom has developed what we call our Farm Management Systems project. It was developed as a risk assessment tool that could be applied to a broad range of activities within a farm, so it does not just have to be an NRM type of activity. Thus far, we have modules on water use efficiency, water quality, soil health and nutrient management. I think we have now had 10 per cent of growers in Queensland go through the Farm Management Systems for water quality through the Reef Rescue funding. That has been quite a positive achievement and it has also given us some really good data about what practices our growers are actually undertaking.

The way it works is that the growers sit down with one of our extension offices and go through a series of, say, 50 questions in the case of the water quality module. Each of those questions relates to a ranking in terms of best practice. From memory, a four is best practice and a one is worst practice. That goes into an access database which basically crunches the numbers and comes up with an action plan. At the end the grower gets the very obvious question, 'Do you understand your water planning legislation?' Some growers have no idea; some growers are completely on top of it.

In the action plan, they would get something that shows them the question, gives their response and says, 'Here are some things you need to do to improve that.' So it is not just saying, 'You are good or bad'; it is actually saying, 'Here is what you can do about it.' We would like it to set a benchmark that we can then come back to again later. For example, with the Reef Rescue stuff, we are now able to say, '25 per cent of growers'—of the 10 per cent of growers—'in the Burnett Mary region are unfortunately using the worst practice for cultivation at the moment but 40 per cent are using best practice.' That sort of data that is really important in terms of management of the issue but also to the actual grower. It is really important for them to have something that takes them through a strategic process, gives them an action plan and gives them a mechanism for achieving those actions.

**CHAIR**—It is critical to improving standards and reaching higher levels of soil management and water control.

**Ms Mackenzie**—Absolutely. A number of growers have given us positive feedback on the module. We are hoping that we can build a climate change module in the near future.

**Ms LIVERMORE**—I am curious about Growcom's relationship with the processing and distribution side of the industry and whether, if you are talking about the output of various regions changing—either increasing or decreasing—anyone is starting to factor any of that in as to how it affects distribution networks and investment in processing facilities.

**Ms Mackenzie**—Are you talking about supply chain issues?

**Ms LIVERMORE**—Yes.

**Ms Mackenzie**—They are of significant concern to our growers. We would love to do some kind of analysis of the supply chain consequences and the outcomes of the tipping project that Dave discussed earlier, but obviously we need to get that information together before we can get into the supply chain stuff. The supply chain stuff is extremely complex for the horticulture industry, but we think that it is very important. I am aware that the sugar industry did a small

analysis in, I think, the Mackay region. It came out with some really interesting results, looking at it from paddock to end product in terms of the impact of climate change. We would very much like to do that, but we need to do this primary research on the impacts on the commodity itself before we can get too involved in the supply chain issues.

**CHAIR**—An issue that is emerging as we take evidence is the need for communication to growers. Do you think this is an important part where government can play a role—communications through groups such as your own to communicate back to your members?

**Ms Mackenzie**—Absolutely. I think that communication, as I said earlier, is fundamental to the capacity of our industry to adapt to this issue. I think that supporting existing channels of communication as well as looking at new and innovative communication channels is important. We already have good links with our growers and good networks and we, as I said, are pumping out as much information as we can.

Growcom is very fortunate that we have David as a climate change project officer. I believe we are the only horticulture body that has a dedicated climate change person. It really makes all the difference in terms of information dissemination. We have just generated a number of fact sheets. We put articles in our *Fruit & Vegetable News*. We run workshops and all of those kinds of things. But I think that there could be more support from government both by providing further support to industry in terms of bodies to actually carry out the information dissemination and in terms of funding the research and the messages that you would like us to disseminate.

**CHAIR**—How many of your members have web based communications or a BlackBerry? As MPs we receive information through BlackBerries. The whip even sends us a birthday message on our BlackBerries. These are modern communication technologies. What level are your members at? Do you know that?

**Ms Mackenzie**—We do not actually have any recent data. We still use a number of different methods to disseminate information to our growers because we are aware that some of them still do not access the internet or may have the internet but do not really use it. That said, the number is always increasing, as you are probably aware. We tend to use a combination of faxes, mail outs and emails. We have an email newsletter and a hard-copy magazine. We try to use a range of stuff.

**CHAIR**—With forecasting in the future, I think the agricultural sector generally will need to get into that high-tech level of gaining information. As we have heard from previous submitters, the changes are rapid and it is important to be able to keep up.

**Ms Mackenzie**—Absolutely. I think the Bureau of Meteorology website is the most popular website in Australia. I would suggest that most of our growers who are internet savvy do in fact use that website. That would be a very good home for information like that because that is obviously where they access information about weather.

**Mr WINDSOR**—The horticultural industry, because of the intensive nature of it—and this is an opinion—is probably more likely to have done something about mitigating nitrous oxide emissions than the broadscale farming industry has done. What is happening there? Are you

achieving anything in terms of mitigation, or are you just accepting that whatever happens will happen?

**Ms Mackenzie**—One of the issues with the horticultural industry—and again this is a bit of a research question—is that we do not know the optimum rate of fertiliser application for a number of our key commodities. We have obviously been looking at this from a water quality perspective rather than a climate change perspective. But it has the same effect in that, unlike the sugar industry for example, we cannot say that farmers should put X tonnes of nitrogen on the paddock to ensure that they have a good crop outcome. We really need that basic research. We are coming at it from the angle of doing nutrient budgeting. Again, through other programs like Reef Rescue, more and more growers are learning how to do nutrient budgeting and coming up with a more tailored fertiliser program than they had in the past. So that is something we are doing. But I think there are some fundamental research questions that we need to get answered for some of our big commodities. Unfortunately, on a national scale this is not really getting a lot of prominence—although in Queensland, because of the reef water quality dimension, it is a concern.

**Mr Putland**—You have hit on the key mitigation problem with horticulture, and that is cutting nitrous oxide emissions from nitrogen fertilisers. As Rachel said, horticulture is a bit more difficult than something like sugar or wheat, in that every crop requires different application rates and every soil type has different emission rates. It varies with the other minerals in the soil, water content and too many other things. It is really difficult to get a handle on the recommended application rates for nitrogen fertilisers.

There is work going on. The fellows doing research on the sugar industry—and even they have huge variations in nitrous oxide emissions because of varying soil types in different regions—are now starting to look at horticultural crops as well. So hopefully within a few years, and given funding for R&D, we can identify the optimum fertiliser application rates to minimise nitrous oxide emissions while maintaining productivity. It is a fine line.

**Mr WINDSOR**—Are there any early indications of the method of application showing up as being—

**Mr Putland**—Yes.

**Mr WINDSOR**—I know that, at the broadacre level, there are some indications out there, but with the more intensive nature of your industry I am wondering how putting nitrogen on through your irrigation system and in ground compares with other systems.

**Ms Mackenzie**—‘Fertigation’ is quite commonly practised within the horticulture industry. It is not the practice 100 per cent. Again, through our farm management system we are trying to increase the level of fertigation. I guess it has not really been thought of in terms of climate change mitigation. It has been thought of more in terms of cost reduction and off-site water quality impact. But it obviously does have a benefit in terms of nitrous oxide emissions. Technologies such as controlled traffic farming do have an application in the horticultural industry—and I am sure you will get the full lowdown on that next. But because of the multi-crop nature of the horticultural industry, and the machinery and all those kinds of things, there is quite a lot of complexity around getting controlled traffic farming up and running. We have put

in a number of bids for Caring for our Country funds but we have not been successful. But there does need to be some sort of investment in controlled traffic farming in horticulture to ensure that it is viable, and we need to start promoting that viability and the positive outcomes to our growers because they are not really picking it up at the moment.

**CHAIR**—Thank you very much for your evidence today and for your very good submission. We will send you a copy of the transcript.

[11.39 am]

**BIDSTRUP, Mr Wade, Farmer Member, Conservation Agricultural Alliance of Australia and New Zealand**

**ROCHECOUSTE, Mr Jean-Francois, Chief Executive Officer, Conservation Agricultural Alliance of Australia and New Zealand**

**McCREATH, Mr Robert Douglas, Farmer Member, Conservation Agricultural Alliance of Australia and New Zealand**

**CHAIR**—Welcome. Although the committee does not require you to give evidence under oath, I should advise you that this hearing is a formal proceeding of the parliament and warrants the same respect as proceedings are house. Giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. The committee has received a submission from the Conservation Agricultural Alliance of Australia and New Zealand, which it has numbered 54. Are there any corrections or amendments that you would like to make to that submission?

**Mr Rochecouste**—No, Chair.

**CHAIR**—You might like to make a brief statement to the committee or some introductory remarks.

**Mr Rochecouste**—Yes, I would.

**CHAIR**—Please proceed.

**Mr Rochecouste**—Just to explain who the alliance members are, they include six grower organisations combined. One of them is New Zealand, which is not involved in this particular submission. The five members of the alliance in Australia include Western Australia, South Australia's SANTFA, Victoria, New South Wales and Queensland. They are known by the names we have indicated in the submission. They represent some 3½ thousand conservation tillage farmers, and their interest in this is to highlight issues relating to communication and, I guess, extension principles. We are particularly concerned that research often gets done without involving farmers, because as farmers we do quite a lot of our own research on the ground and I think all of us would benefit from actually understanding what some of those researchers are doing, as well as what farmers are doing. So I have with me two farmers who would be happy to answer any questions you may have in relation to our submissions.

**CHAIR**—Thank you very much. We certainly have some questions. How do your conservation agriculture techniques assist farmers to adapt to the impact of climate change? Can you give us a sort of breakdown?

**Mr Rochecouste**—I guess the technique is water use efficiency. I would like to ask one of the people who actually does it—Rob, would you like to explain how you do it on your place?

**Mr McCreath**—Sure. The thing we have to think about in Australian agriculture is that our limiting factor is water or moisture availability. If we want to farm as efficiently as possible, we have to farm to make the best use of that moisture. So we employ techniques such as zero tillage to conserve as much moisture as possible, because if you utilise European methods of ploughing the soil and cultivating here you lose a lot of moisture into the air. Obviously that is not very sensible from the point of view of saving moisture, and it is not sensible from the point of view of protecting the soil from erosion. By utilising zero tillage techniques, you keep a stubble cover on the soil and you conserve the moisture that is there. So, by using appropriate machinery and appropriate methods, you can establish crops directly into the stubble of the previous crop and make the best use of the moisture that you have.

**CHAIR**—In your submission you talked about extension, and I would like to explore that with you a little bit as well. But, in relation to those techniques, are the machinery manufacturers and people like that proactive in this? Do they assist, or do you have to go out and build your own machinery, get new machinery or adapt machinery to take advantage of what you are talking about with the moisture?

**Mr McCreath**—I think that in Australia we have some of the very best engineers for this farm equipment in the world. We have some very good companies that are making some very good products that are also exported around the world for this purpose. But then farmers do a lot on their own, too, and very often the best designs have evolved from ideas that farmers have had and then tried on their own farms. So I know a lot of farmers make their own machinery—partly to save on costs but also to develop new ideas they have had. No two soils are the same; no two farms are the same. So the machinery you might need for a heavy black soil like the soil I have would be very different from the machinery you would need for a sandy red soil somewhere else. So I think there is a lot of innovation there.

**CHAIR**—Should there be better ways to help farmers to be innovative in that way? I do not know what techniques there are. I suppose it is a claim on you, as a cost of making your income, but I am just thinking about ways that could assist farmers to do that.

**Mr Rochcouste**—Machinery is an important concept for all our members because they have invested so much money into it. The degree of research and capacity in areas is not really heavily supported in Australia, and we would very much love to see a lot more work done on that. We have suggested that machinery is an intricate part of helping farmers change because one of the costs involved in changing to zero till is obviously equipment. We have a number of farmers who are extremely brilliant at adapting machinery. That has been alluded to. That is an area where we see some real opportunities to make changes on the ground.

**Mr Bidstrup**—I would agree with that. A lot of the machinery starts off as a ‘farming better’ machine and gets picked up by manufacturers. The farm machinery-manufacturing business is very competitive. For example, with disc openers for zero-till planting there must be a dozen manufacturers out there all competing for the same business. They are not just sitting around with old machines; they are always trying to make them work better.

**CHAIR**—And localised opportunities in localised regions—engineering?

**Mr Rochecouste**—There are small manufacturers around. Queensland, for example, produces machinery that I know is used in the south. There is also an opportunity in that we get a lot of interest from South Africa and other countries because we are leading the way in zero till in dryland agriculture. We are one of the few technological countries that are well adapted to that. In fact, we have a Chinese delegation coming up from Canberra to have a look at some of the methodology that we use in conservation tillage.

**CHAIR**—I would like to go to the opportunities for new ways of extension for Australian agriculture. Would you like to elaborate on that.

**Mr Rochecouste**—Certainly. The thing we feel is important is that farmers are often excluded from the extension process or are at the end of the pipe and we would like to see them a lot more involved in developing the information for themselves. As previous witnesses have said, farmers might not access the internet in the same way that a lot of businesses might, but there is quite a lot of capacity for people to communicate and demonstrate. We are talking about something that you do not just read but you would like to see happen in the field. A lot of our communication is done working with farmers in paddocks, and that capacity has been severely eroded in the last 10 to 20 years. A lot of departments of agriculture have pulled back from their on-the-ground extension. That has been picked up by farmer groups. All our members pay to become members and they do that because they get a benefit out of it. We would like to see extension that actually involves farmers a lot more in doing things on the ground, working with them in their area. I would like to ask Wade or Rob to comment on that.

**Mr McCreath**—There is no doubt that farmers like to see machines working. It is one thing to read about a new machine or a new idea in a book or look at it on the internet, but if you get a farmer at a field day where there is a header harvesting and there are machines moving then you can see how the thing might adapt to your own situation. I am sure field days and practical demonstrations are what farmers need.

**CHAIR**—So government could assist in funding organisations to get that extension out there?

**Mr Rochecouste**—We would ask: why would government not invest in areas where farmers themselves are already investing?

**Mr WINDSOR**— Only a week or so ago this committee spent some time on the Liverpool Plains where there are similar soils to some you are dealing with. The adaptation of no tillage has been going on there for quite some time too. What seems to be showing up down there is that no till in the better black soils is the equivalent of about six to eight inches additional rainfall compared to traditional farming systems. On the Downs and in Central Queensland, what sorts of comparisons do you have? You mentioned earlier that you are essentially farming moisture. How much more moisture are you able to retain compared to the traditional systems?

**Mr Rochecouste**—I have two gentlemen with me that have made an investment in that area, so I guess the easiest thing I can think of is to ask them why they have actually made that investment.

**Mr Bidstrup**—It depends on the soil type, obviously, and the temperature and the rainfall in the season. I think the biggest benefit of zero till and controlled traffic farming is that you can

plant on time. Another part of fighting climate change or whatever is that you can, say, plant your summer crops early, so you miss the severe heat later on in the summer. With zero till farming, you are conserving moisture, so you can plant on time instead of waiting for a rainfall event and just being guided by the rain as to when you plant, for example. That is probably the biggest benefit I see from it. You can make your own decisions and be the master of your own destiny in many ways. I would say six to eight inches would be about the money; I have not actually measured it myself. It is a huge difference.

**Mr McCreath**—I do not have a number in my head, but an illustration of the extra moisture you get from a controlled traffic, zero till system would be the fact that farmers who operate under that system have more crops. They grow crops more often. If you go into a drought in an El Nino year, very often the conventional farmer will not have enough moisture to plant a crop but the zero tiller will still be able to plant a crop. Perhaps the yield would not be as high as it would normally be in a good year, but if it is a drought year the price will be a lot better. From the farmer's point of view, a zero till farmer can do reasonably well, even in a drought year. Double cropping is one thing that is used a lot. On my own farm we harvested sorghum in February. We got a bit of rain after that and we zero tilled chickpeas into that in May. So we have been able to go from a summer crop into a winter crop. If I had ploughed that sorghum stubble and cultivated it, it would have been in great big lumps right now and there would be no way of getting it broken down to plant it conventionally. So it makes a lot of sense.

**Mr WINDSOR**—I do not mean to put words into your mouth, but would it be the biggest adaptation to climate variation that you have seen as farmers?

**Mr Bidstrup**—Climate change is all about more heat and maybe less rain, maybe more rain or whatever. But zero till farming and controlled traffic farming is all about conserving moisture, and I think that is pretty much the only way you are going to fight rising temperatures with climate change. It is also good for the hip pocket now. What is good for farmers now is going to be good for farmers when climate change comes along. I do not necessarily think farmers are going to have to change the way they are farming now. The farmers that are not zero tilling now are becoming fewer and fewer and natural attrition is probably going to make those farmers become less profitable and less viable when climate change comes along.

**Mr McCreath**—I always thought a government buyback scheme for chisel ploughs would be a good idea, along the lines of Mr Howard's buyback scheme for semiautomatic weapons. That would be a good way of fixing the problem once and for all.

**Ms LIVERMORE**—Robert and Wade, I just wondered how long you have been employing this zero till method and whether, when you came to that decision, it was something that came at the end of a series of other adaptations you had made. What process did you go through to inform yourself about it and come to that decision?

**Mr McCreath**—In my case 15 years ago I was a farmer in Scotland, where the problem was too much moisture, not enough. We used to plough the ground to dry it up so we could then plant a crop. When I came here it did not make any sense to do that; it seemed pretty obvious. But I am sure Wade has a different story.

**Mr Bidstrup**—Ten years ago when I came back to the farm we were cultivating somewhat then. A number of times it would rain on finely ploughed up fields and you would get some heavy rains that would just sheet straight off and it would still be too dry to plant, which drove us crazy. You would leave in standing stubble and it would fix that problem. It would break the rainfall impact down and you could plant your crop into it. A lot of the time you would be ploughing and you would think you would have a lot of moisture because of all the rain you had had but you would plant a crop and it would just die or not yield very well.

We changed over to zero till pretty quickly because we realised it was going to be a good thing. The yield increases were really dramatic. You could see it in the soil and feel it. It was just so much softer. Then we shifted over to controlled traffic as well. You could go and plant on time with zero till farming. With the wheel tracks you could not plant because it was too hard. That is why we shifted over to controlled traffic as well. The two of them combined have made a huge difference to farming. Most farmers are going that way now. I think it is the way farmers are going because it is good for farming business now and it will be good for farming business when climate change happens.

The way the government could help the most is by helping farmers research what effect climate change policies are going to have on farmers. Maybe fuel prices are going to go up. There may be alternative fuels for tractors. You might try fossil fuel based fuels. Fertiliser prices might go up. There might be different fertiliser types, whether it be manures or even waste from cities. There has been plenty of research done on denitrification. I think farmers have a pretty good handle on that—about when to apply fertiliser and what types.

**CHAIR**—You have experience in the area of weed control and soil health, which is something that we are receiving quite a bit of evidence on. There is the issue of carbon in soils and how we measure it and, when it disappears, how we get it back. Those things are a part of this debate and there is a lot of science going on there. What is your experience with weed control and the sprays et cetera that are used?

**Mr Bidstrup**—I can tell you about our experience when we were ploughing. Our soil was getting carbon levels down to around 0.6 per cent. Under the virgin brigalow country it was probably one per cent to 1.1 per cent. Since we have been zero till farming, organic carbon levels have gone back up to about one or 1.1 per cent, the same as under the virgin country. It is at a plateau and it will not go any higher. I speak to a few scientists about that in the CSIRO and they say the same thing. Once you get to that limit where soil microbes come into balance with carbon in the soil, you are just not going to break above that plateau. I asked them how I can negate it and about different soil types. He said, ‘The best soil type I have seen was 1.7 per cent.’ I think that was probably down your way somewhere, Tony. I do not think there is much potential for zero till farmers to increase organic carbon levels much more, because they have already made the improvements. If you are going to find improvements there it will be from farmers who are still ploughing and destroying their organic carbon. Even then it is not going to be huge because it is just not going to break above a plateau. In relation to weed control, you just cannot go back to ploughing. There are weed seekers, I guess—

**Mr Rochecouste**—Yes, there are a number of technologies available now that can significantly reduce the amount of herbicide that we use. Obviously herbicides are an expense, so we do not go out there using it willy-nilly. There are weed seeker technologies, better

spraying, better nozzle use and more targeted systems. We can demonstrate and show farmers these things through field days and all those sorts of things. We had a field day on a weed seeker technology that only sprays the weed as it finds it in the paddock, and about 50 to 60 farmers attended that. That was great. I know quite a few that have gone on to buy the machinery, despite the investment. They said, 'It is using 80 per cent less chemicals.' And that is a cost. That will be returned to them within two seasons. It is a big bill for them.

**CHAIR**—So technology helps in that area.

**Mr Rochecouste**—Yes.

**Mr McCreath**—Just to comment on the weed issue, another thing that we can do in a zero till situation is to rotate our crops. So on the Downs we have a summer season and a winter season. In the summer we grow crops like sorghum and corn and in the winter we might grow wheat or chickpeas. Different weeds grow in different crops. If you have a weed that is a bit of a problem in one crop you can rotate it back into another season. So you can target certain weeds by growing a certain crop. That is a help if resistant weeds turn up.

**Mr WINDSOR**—In terms of rotation, as a farming system, what you are doing seems to address a lot of the environmental issues. You mentioned carbon going from 0.6 to 1.1. That is 100 per cent. If all our soils could store 100 per cent more carbon, we would not have a global problem. There are a whole range of debates about measurement and release and depth, and we will not solve that here today.

The other thing you are doing is retaining moisture. Reduction in soil erosion losses, the infiltration rate, the microclimate—there are a lot of very positive things happening, particularly if you are double cropping and using the moisture when it is available. One thing that is still a bit of a negative out there is the nitrous oxide issue. You mentioned chickpeas. What do you think we should be doing in terms of green manure crops, break crops, legumes in the system? Do you have any anecdotal evidence of reductions in the release of nitrous oxide from those systems as against artificial fertilisers?

**Mr McCreath**—First of all, chickpeas are a legume, so when you plant chickpeas you do not need to put any nitrogen in. On the subject of break crops, or green manure crops, the big snag with those is that to grow a green manure crop you use a lot of moisture. I know organic farmers sometimes rely on green manure for their fertiliser needs but I would be reluctant to try it in my system because I would have to use a lot of moisture to grow the green crop and then destroy that green crop. I think there are other ways of doing it.

With regard to nitrous oxide emissions, I think there is a lot of work going on there but I do not think agriculture should be scared of the global warming debate and the carbon debate. I think we need to look at the whole thing in its entirety, not just at little bits individually. We cannot just look at nitrous oxide emissions from fertiliser application; we have to look at the whole system and look at what is being locked up by the growing crop. You could say the same about the livestock sector. Don't just slap a tax on the cow; think about what crops are being grown on the farm to feed that cow. I think agriculture really needs to be involved in this because climate change is a crucial issue to farmers. We are really at the pointy end. If things are going to get hotter and drier it is not going to be very easy for us.

**Mr Bidstrup**—The nitrous oxide out of a legume crop is more an organic nitrogen. It is slow release so you do not get a big bulge of nitrogen that is more prone to denitrification if you get a wet period. They reckon you get hardly any denitrification from legume crops, but if you put urea on at planting or close to planting you do not have as much chance of a waterlogged period turning up beforehand to cause denitrification. A lot of farmers are seeing that it is not in their best interests to have denitrification because it is just their N, which they paid a lot of money for, going up in the air. In the old days, farmers would fertilise six months before they planted their crop. Those days are gone. Everyone is now fertilising with disc openers, not disturbing the soil, just prior to or at planting for that very reason. When denitrification happens you have N<sub>2</sub>O and NO<sub>2</sub>. I think only two per cent of what you do lose in denitrification is nitrous oxide. You might lose 30 per cent if you fertilise six months before you plant, or you might lose nothing if you do it at planting. It depends on weather, soil type and those sorts of things.

**Mr WINDSOR**—So you do not see it as a real issue?

**Mr Bidstrup**—I definitely see it as an issue with fossil fuel based fertilisers, not with the more organic ones like legumes and manures. There is a lot of research out there, especially in the cotton industry, that shows that if you put your fertiliser on at planting there is little chance for denitrification to occur. When there is a huge amount of Ns in the soil, with no moisture being pulled out of the ground from crops, waterlogging can happen and denitrification occurs. Farmers are now putting nitrogen on at planting or in crop, as the crop demands it, and that has cut down on it. It still does happen of course. Denitrification happens when nitrate is formed from other organic nitrogen or fossil fuel based nitrogen fertiliser applications, but when legumes turn into nitrate, which is what a plant needs, that can be prone to denitrification as well; it is just that there is not a huge bulge of it at once, so there is not so much denitrification occurring.

**Mr WINDSOR**—Thanks, Chair.

**CHAIR**—On the issue of farmer-to-farmer communications, including communication with your members and the uptake of new ideas or the sharing of information—does the information flow take place using IT? Is it through a newsletter by email or in hard copy by snail mail?

**Mr Rochecouste**—We communicate largely by newsletters because, if you are someone who works outdoors a lot, probably the last thing you want to do at the end of the day is come in and turn on the computer and put a computer disk in; we recognise that. We also recognise that farmers talk to a lot of other farmers because they have actually got the experience. I think a lot of our researchers are not familiar with farm machinery and how it operates. So what we would like to see is a lot more on-farm research. We feel that, if you want to actually get information across to farmers, some of the best people with the capacity to do that are farmers who have done it themselves. They can go to their community and say, ‘I can do it and I’ll show you how I’ve done it.’ We get a good crowd at most of the field days and events we have where farmers speak.

One of the things with researchers—and they have told me this quite openly—is that they like to do the research but they are not particularly interested in doing that extension, because it is not their area. So what happens is that this particular type of extension gets very little funding at all. We rely on our subscriber members, basically.

Now, we want to develop information systems on the web through an HTML process so it is a lot easier to find the information, rather than having lots of PDFs that they have to download to look at. We are at the forefront of technology; we have to be because we have no money to spend on this process, apart from what we can work out in the most efficient way possible. For example, we also use systems like webinars, where people are able to talk over the internet—and we have some lectures on that; I think, Rob, you have attended some of those—because travelling is just an enormous cost to farmers. It is at least a couple of hours. For most of us it would have taken all day to get here for this—and it is the same for a lot of people in rural areas. I think one of the things that would be very useful would be if the federal government could make available some of the communication technology capacity. Another thing is to make available money, not a lot of money but money over a longer period of time, so that we are able to demonstrate effectiveness. Social change does not come very quickly. It is not a two-year or a three-year project; it is a five-year, persistent type process with a small amount of money. It requires not necessarily a huge bucket of funding but just a small amount of money over the longer term.

**CHAIR**—So a communications strategy is pretty important to this whole exercise?

**Mr Rochecouste**—It is for us because we do not have a lot of money to spend on communication.

**CHAIR**—So that is one way government could assist you, through communications strategies?

**Mr Rochecouste**—Yes. If we wanted to, for example, communicate zero-till information in an area where there was not a lot of zero till, our strategy would be to have a field day and organise guys who have done it to show how they modified and adapted their machinery to do it. That is so much easier. We have a mentoring process, for example, between farmers. We can come in and look at adaptation systems and have demonstration farms and demonstration paddocks. We have got the capacity to improve research enormously quickly by starting the research on the farm and then having yield monitors and a controlled traffic system collect that information, and we can have that distributed to the farmers within the season. We do not have to go through a three- or four-year research program. So, if researchers would just work with us, I am sure we could achieve results a lot faster.

**CHAIR**—Do you think it is necessary to get scientists who maybe have a few more extension skills, instead of ones who say, ‘I am only interested in the science; I am not really interested in the extension’? That seems to be emerging issue.

**Mr Rochecouste**—It is an issue, but I do not know that researchers are going to develop extension skills. I think it would be better if we sat down together. There are a lot of really good technology based farmers and other people who know how to communicate. I think if we could sit down and work as a team it would be far more effective. That means working with grower groups that know how to do this. This is their bread and butter. They spend a lot of time in the paddocks. We have had, for example, the Bureau of Rural Sciences ask us about paddocks on farms and how we measure what is on the ground. They can take photographs aerially, but we actually know what is on the ground because we drive past. We have also said, ‘If you want to know about farming systems, instead of going around asking farmers a whole heap of questions

about what they're doing, show me their planter and I'll tell you what systems they're doing,' and most farmers will be able to do that. So we can get down to a lot of simple assessment processes and surveys. We can get a lot of farming systems organised very quickly. We have had to do this, because that is how we operate. As I said, we do not have a lot of funds, so we operate this way. It is really a farmer exchange. We are asking farmers to talk to other farmers. The whole alliance is about one farmer demonstrating to another farmer how it works.

**CHAIR**—Sharing information.

**Mr Rochecouste**—Yes.

**CHAIR**—So for extension officers communication is a pretty big thing.

**Mr Rochecouste**—They help do the logistics and all that sort of thing. I have asked these guys to come down today because, if you have a specific question, this is the process we would use. We would ask one farmer to talk to another farmer.

**CHAIR**—But having opportunities to help them set up—

**Mr Rochecouste**—Absolutely.

**CHAIR**—As you say, there are some people around these days with really good communication skills to help people get that message out.

**Ms LIVERMORE**—Earlier today and in a range of submissions there seems to be an emphasis on research looking at what is going to happen on quite long time frames. The representatives from AgForce said that farmers need information about what is going to happen quite a long way down the track to guide where they are going now. I am interested in hearing from Robert and Wade about where they place that emphasis. In your submission and in the testimony that you have given today, you look at a practical time frame that is about results and impacts in a more short-term time frame. How do you feel about where that emphasis should appropriately be placed?

**Mr McCreath**—It is difficult, and I think you need both. You need the short-term information for how you are going to establish your next crop, whether you should be changing your farming system and that sort of information. You need that information, but then you also need to be able to plan ahead, because some of the decisions that farmers make these days involve a lot of money and investment, and you need to be well prepared for those. At the moment, people are talking about moving north, where there is water. To make a big decision like selling up, shifting to the Northern Territory and buying the necessary equipment is a massive investment. So we need short-term information and we need long-term information.

**Mr Bidstrup**—The rainfall predictions will probably stay around the same—I think that is what they are saying—but temperature could go up. We are pretty lucky that we have a winter and a summer crop in our area. For example, if temperatures went up five degrees you might find yourself planting sorghum in July or June—you would miss the heat and you would pretty much be at square one—and you might plant your wheat in February and have it flowering in June, if you did not get any frosts. In our area we have a lot of room to move. If I lived in South

Australia I would be pretty concerned about the long-term impacts where you can only grow a winter crop. But in our own situation I am probably not as concerned about the long term since we can adapt our own cropping programs to suit a lot of different situations.

**Ms LIVERMORE**—So on an individual enterprise scale you really do need that high-level science as well.

**Mr Bidstrup**—You mean the long-term stuff?

**Ms LIVERMORE**—Yes.

**Mr Bidstrup**—Probably not as much as if I was farming in South Australia. Where we are, in the downs, we have a winter cropping and a summer cropping program, two distinct seasons where it rains all year. If I was in Victoria or South Australia where it just rains in wintertime, I would be pretty worried about it.

**Mr Rochcouste**—I think a lot of farmers talk about the fact that they already live with very extreme conditions. We have had some drought years in the last few years, we have had some changes of weather recently and we have a good crop coming in this season, so farmers are used to living with big changes already. We would like researchers to come and talk with us about what needs doing and not go off on their own and make a decision about what they think we need.

**CHAIR**—I guess, from what you were saying about South Australia, that it is about how you store the water and how you use the water in other ways as well and using new ideas in that regard as well. Thank you very much for your time and for your submission. We will send you a copy of the transcript of today's hearing. Best wishes.

**Proceedings suspended from 12.15 pm to 1.30 pm**

**YULE, Dr Donald Franklyn, Director, Controlled Traffic Farming Solutions**

**CHAIR**—Welcome. Although the committee does not require you to give evidence under oath, I should advise you that this hearing is a formal proceeding of the parliament and warrants the same respect as proceedings of the House. Giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. The committee has received your submission, submission No. 45. Are there any corrections or amendments you would like to make?

**Dr Yule**—No.

**CHAIR**—I invite you to make a brief opening statement.

**Dr Yule**—Thank you. I should say that I am also treasurer of the Australian Controlled Traffic Farming Association. Jeff will be talking about that in the next presentation.

I wish to make some comments as background to our submission and today's discussion. The submission does not really deal with the background. Our evidence relates to all cropping industries—grains, sugar, cotton, vegetables and fodder—and to dryland and irrigated systems. I have read several of the submissions and there are many good ideas, but they all fundamentally lack a comprehensive framework. I wish to outline two projects in which we developed such a framework.

In the mid-1990s, I led a team in a Land and Water Australia funded project with supporting funds from GRDC, CRDC and the National Landcare Program. That established the six principles of this comprehensive framework. No. 1 is to take a holistic farming system approach. This involves the farm and the farmer. No. 2 is to recognise that all cropping is mechanised. No. 3 is to manage soil health and compaction with controlled traffic farming. No. 4 is to include zero tillage for soil health and stubble cover, which of course drives the soil water. No. 5 is farm planning—paddock layouts for run-off, erosion and waterlogging, and roads and infrastructure for efficiencies. No. 6 is that farming systems only happen on farms with farmers. Each combination is unique and we must engage individually to be effective.

This is all common sense, nothing radical. The innovation, though, is to use this as a comprehensive framework. This project was independently assessed as having the biggest impact of any LWA project in a decade but sadly it received no follow-up support. Consequences from the project relevant to the committee are that it provides a simple checklist. But you must have all the components—farming systems are a chain only as strong as the weakest link. This is technically easy, if you know how to do it. The principles have been applied in grain, sugar, cotton and forage, and we are now working successfully in vegies. The principles also apply across all cropping environments, soils, landscapes and climates.

The adoption is also easy. The one-to-one process is proven over hundreds of growers. The framework therefore is robust and comprehensive. Growers report large benefits. These are statements from growers: 'I doubled my yields with half the fertiliser.' You will visit a farmer tomorrow, I believe, who has more than doubled his productivity. 'Highest profit ever, and it was

a drought.’ Our science maximum water use efficiency is about 20 kilograms per hectare per millimetre, but growers are reporting and measuring 40-plus at paddock scale. And there are across-the-board benefits when whole systems are analysed. I have included some data in the submission, on page 2. Jeff will talk about some of this later today too. In summary: from this project, CTF is the basic adaptation needed today and for the foreseeable future.

The second project started in 2003, funded by GRDC and DAFF. It showed that everything works better with CTF. This reinforces my comments above about adaptations for the future based on CTF. The project looked at new ideas, R&D developments and new technologies and found that these all worked easily within the CTF framework and delivered better outcomes. In other words, CTF is future ready.

The project focus was on spatial technologies which are loosely termed ‘precision agriculture’, such as GPS guidance and auto steer, remote and automated sensing to measure performance, the ‘measure to manage’ principle and GIS forward data management analysis and presentation. The consequences are: these technologies only work to full potential within the CTF framework, and there is large potential for further increase in profitability and sustainability by reducing in-paddock variability and identifying new production potentials, increasing yield quality and water use efficiency, improved oil input efficiencies to reduce costs and off-site impacts, improved natural resource management, flexibility, adaptability and opportunities, and automated digital recording, measuring and reporting at all scales. This takes cropping agriculture into the computer age. This provides a basis for continuous improvement, on-farm R&D and future innovation. It also brings computer and GPS based opportunities into rural communities. In summary, the CTF framework is critical to our future cropping industries and their communities.

**CHAIR**—Thank you. On the issue of the economics of farming—that is what it is all about—how do the controlled traffic farming solutions assist in the adaptation to climate change? How do we use this scheme? How does it add to the wellbeing of farming?

**Dr Yule**—Controlled traffic has already proven itself. We designed it actually for really wet conditions, managing waterlogging in Victoria or heavy rainstorms and erosion issues in Queensland. It has performed really well under those conditions. But now farmers find—which we knew, because of it involving zero till and the management of compaction and the degradation process—that it also works better during dry seasons, because of the better water balance. It is improving all the natural resources. It works across the whole range of different environmental stresses—proven. The big issue then is: once you have got better soils and better water conditions and all those things, the grower really needs to increase productivity to get the economic benefit. So we need agronomy that is taking advantage of those new benefits, new soil conditions. We have got a problem in that the historical agronomy, the last 30 or 40 years of it, has degraded and compacted soils and things. So there are new things that have to be done. You will see tomorrow how some farmers have responded to that. You also heard about it this morning from Wade and Rob.

This has just opened so many more opportunities. It gets rid of all the problems and then you have got to take some new ways of doing the agronomy. There is a lack in the agronomy at this point of time because we do not have that background of research. In Central Queensland, where

we did the original work, I knew how to actually make it work. I think you will see that with Neal Johansen tomorrow.

**CHAIR**—So that is looking at the cost of setting up a scheme. Do we have any idea on figures?

**Dr Yule**—Costs of change?

**CHAIR**—Yes.

**Dr Yule**—This is on an on-farm basis. The costs of setting up for controlled traffic are no different to the costs that a farmer really is involved with in his ongoing maintenance and upgrading of equipment. The point is that he has to have a plan of what he is going to achieve and where he is going to get to and make all his decisions consistent with that plan. He is going to end up with much fewer machinery anyway because he does not need any cultivation machinery and, because of the increased efficiencies, he can cover his land much more quickly and he will need fewer bits of gear.

I did an analysis of farmers and how much time they spend on their machines. I looked at how much time was spent by a farmer to do 2,000 hectares, or 5,000 acres—and this is dryland farming. I spoke to guys in Central Queensland, New South Wales and Victoria, and it worked out that they spent about 1,000 hours in a tractor, a harvester or a sprayer. I said, ‘That leaves you a lot of spare time,’ and they said, ‘Yes, we know.’ But they also said that 20 years ago they used to spend an enormous amount of time. The table on page 2 shows how much less time it takes to farm.

**CHAIR**—Does that work out in economic terms, or just that you have got more time to learn other things?

**Dr Yule**—The economic return has to be an increase in yield. We can reduce the costs, but—

**CHAIR**—Reducing input costs and increasing yield, is that—

**Dr Yule**—Absolutely.

**CHAIR**—But you need an on-farm plan to make sure that this is—

**Dr Yule**—For that transition from conventional farming to CTF farming, yes. There are a lot of other things besides machinery, but I think it is interesting to note that there is often no mention of machinery in the submissions and yet it is the first thing that we have got to manage and deal with. Machinery is a plus and a minus.

**Mr WINDSOR**—I have a couple of questions. I would like you to elaborate on the points you make at 3(b) on page 2 of your submission under ‘Benefits’.

**Dr Yule**—The Kim Bowman exercise?

**Mr WINDSOR**—Yes, on those numbers. I think your summary goes partway to writing our report in terms of cropping agriculture, anyway. I think it is excellent. There are some very important figures that this fellow Bowman, an agribusiness consultant, alludes to. Could you flesh those out and tell us whether they are supported in other areas?

**Dr Yule**—Rob McCreath was one of the farmers in this group. He was here this morning. Kim Bowman did an analysis of 16 farmers who were in the process of changing from traditional farming practices to a controlled traffic farming system. He had certain relationships from the literature that he used in some of these calculations. Soil erosion was reduced on the basis of less run-off and less erosion due to both the controlled traffic and the zero till. That is based on literature. The diesel use was, I think, their own use—the amount of diesel that they used on a yearly basis. The figure for nitrogen leaving farms was literature based and showed losses associated with erosion, run-offs and those sorts of things.

**Mr WINDSOR**—Very impressive figures.

**Dr Yule**—If you get rid of a lot of the erosion, you cannot move very much nitrogen, can you? I am not certain how he worked out the figure for carbon dioxide, but it was a combination of a data that he used to work that out. The figure for reduced labour was on the basis of recordings from the farmers about how many hours they had used—similar to the results I just mentioned. He did the calculations for the annual income and gross margin figures. That is farmer data.

**Mr WINDSOR**—That is on 16 farmers. That is not one farmer getting—

**Dr Yule**—It is a number of the farmers, yes.

**Mr WINDSOR**—Yes.

**Dr Yule**—And the farmers are at different stages of changeover and things like that. There are undoubtedly some assumptions in that. But we can provide you with that paper if that would help. It was given at the CTF conference last year in Dubbo.

**Mr WINDSOR**—If you could, please. I think that would be very handy. You say that the maximum science water use efficiency is about 20 kilograms per hectare per millimetre but growers are measuring double that in the paddock. Can you give us a bit of background as to how that is being done?

**Dr Yule**—The 20 comes from French and Schultz. Water use efficiency is a calculation of yield divided by water that goes through the crop, so there are some assumptions on that. French and Schultz in South Australia nearly 20 years ago did some calculations. It worked out that water use efficiency of about 20 was about potential. So the calculations are: you have your yield and you divide that by the amount of rainfall you get and an amount for losses in evaporation and other losses. It is a relatively simple equation, except also in there is a change in soil water content between planting and harvesting, and that gets pretty hard.

The numbers that have been done with the 40 have been done in research trials or with researchers working on farm with farmers in doing those sorts of calculations. They measure the soil water and things like that. They have done some work on Neil Johansen's place. You can ask

him tomorrow what his numbers are, but he has certainly got at least 30 kilograms per millimetre. I do not know if you have been into the raised bed country west of Geelong in Victoria. That is a great place to go and visit. They have got 40 down there.

**Mr WINDSOR**—Is that explained by the different soil treatment—the scientists using old technology and the farmers using new technology? Does that explain the difference?

**Dr Yule**—I do not know how to answer that exactly. I did a bit of an analysis with some data that was produced by the APSIM model. It is fairly close. The potential yields that it predicts are in the order of about 20 kilograms per millimetre.

**Mr WINDSOR**—So how do you explain that there is a doubling?

**Dr Yule**—The new technologies with controlled traffic are just producing far better than the old ones.

**Mr WINDSOR**—The 20 kilograms is not based on controlled traffic and no till.

**Dr Yule**—Yes.

**Mr WINDSOR**—It is based on other—

**Dr Yule**—Yes. That was our traditional system.

**Mr WINDSOR**—So it could get down to factors like root development and other things?

**Dr Yule**—It obviously gets down to all those sorts of things. But I was trying to stress in the submission that we have to think of this as a big box of things. We really need to try and dig into it and find out whether this little bit makes a difference or not. I think we make a lot more progress while we are thinking of the whole farming system impacts on that, because they all interact. The reason the old traditional data of the 20 is failing is that it has not got that ability to work on the interactions that really drive the system.

**Ms LIVERMORE**—Don, in the statement that you have given us this afternoon you talk about the project that you did in the 1990s. You said that here was a big impact resulting from the initiatives employed but there was no follow-up support. Can you describe what follow-up support, in your view, was needed to take that to its full potential?

**Dr Yule**—I think we need to understand that this was all totally new when we started in 1993. We did this little project where all we were trying to do was work out how to do controlled traffic on broadacre farms. That made us think about the fact that we were going to have wheel tracks with controlled traffic, so which direction do you put them and what are the impacts on erosion? I am a soil person by training. How you did that in the farming system was the big question. Then we wanted to do zero till, so how do we do those things? The project went through all those machinations. How do we build a farming system? That is where those learnings came from because we had to go on farm because the farm is the only place where a farming system can exist. We had to talk to farmers and we had to convince them that they

should do this on their paddocks. It was a process of convincing them to change and see what happened.

**Ms LIVERMORE**—Having gone through that process of testing these methods and getting results, the question is then what role do you see for government in facilitating the uptake of this and getting it out there? One side of the question is how the government can facilitate that shift to a systems approach as you have described it. The flip side of that is whether there is anything that is happening now in the policy sphere that is actually standing in the way of achieving what you see as an optimum outcome.

**Dr Yule**—I did not answer the second part of your question before either as to what happened at the end. The five years of the project just proved that it could happen, proved the content that was needed, that it would work and also demonstrated the process of the one-on-one interaction with the farmers. We had a few farmers that had done it, so we knew it would work and that was across at least eastern Australia. In terms of what government can do now there was no follow-up from Land and Water Australia. At the end of the project they said, ‘Thank you very much, see you later.’

**Ms LIVERMORE**—So what was missing was additional research or extension of results?

**Dr Yule**—I was working for the state government—this affected the whole-of-government approach. What we needed at that stage was for them to say, ‘This is really good stuff, we need to take it to the wider farming community and we also need to take it to the wider service sector.’ What happened was that they said, ‘We’ve done it, we’ll move on to something else.’ Land and Water said, ‘We’ll move on to something else.’ GRDC was involved in that and they said, ‘We’re going to work on something else.’ They also came back with a bit of a thing that we were supposedly so successful that everyone was doing it. It fell in a bit of a hole, I suppose.

**Ms LIVERMORE**—What are you looking for from government now? Is there anything standing in the way of the further uptake of this?

**Dr Yule**—As I said in the submission, I think that government has to really provide a leadership and direction role. As part of that leadership we are looking at some standards to say that this is the way to do it. It sounds like a Big Brother approach I suppose. Agriculture has a serious problem of letting everyone have a go. We heard this morning about how fantastic we are with innovations with machinery. Sorry, every little workshop makes his own bit of gear. He does all right for 10 years and then he goes broke. That bit of gear is really good in this situation but it does not fit into the rest of the farming system.

The leadership is not Big Brother, I do not think. What I am arguing is if we just said that we will do controlled traffic farming with those few common sense components everyone could then go ahead and have their innovations with machinery, chemicals, crop uses or all those land uses within that framework. If we have standards on machinery where we can have three-metre or two-metre wheel tracks and we can have nine-metre or 12-metre machines, that would not really stop any innovation. It would just mean that when a guy comes along and innovates with machinery he can put it on all the farms around Australia instead of the way it is now where, if he makes it, it will not fit.

**Ms LIVERMORE**—Is there any precedent in the industry for that level of regulation and mandating of methods?

**Dr Yule**—There is very heavy regulation. In the cotton industry they have to do something stupid like cultivating after harvest. When you buy your seed at planting time, you sign a form to say that you will do that. They come around and do that. That is an enormous level of regulation.

Another comparison that I think I alluded to in the submission is with GPS guidance. GPS equipment is all developed in the surveying industry. In the surveying industry there are basically three major producers of equipment. They all put out a signal that is what is called open architecture. So one coloured machine can use the signal from another one. A person in surveying can go and buy equipment from all three of these suppliers and it will all work. But when they went into agriculture they decided they would not do that. So a Trimble in surveying can talk to all these other ones, but a Trimble in agriculture cannot. So a farmer who has a Trimble which is associated with a certain brand of tractor and who has another coloured tractor, like a green one or something, cannot use the same GPS technology. But the industry did it themselves in surveying. So agriculture has this enormous breaking up of things. We are all in little boxes—

**CHAIR**—Is that about consumerism?

**Dr Yule**—I honestly do not know what drove that. There is a long history. I think Growcom said that in horticulture the bean growers do not talk to the corn growers or the zucchini growers or whoever; they all have their little boxes. In GRDC we are grains and then there is cotton R&D. I would argue that we are trying to grow crops in soils in landscapes, so why do we complicate it? They are all using machinery, so why do we not have machinery that they can use right across the industry? But no-one is really interested. Because they do not have that machinery, that is where the enormous cost is on a farm. If you went to a sugar farm or a horticulture farm you would see that every bit of gear is specialised, they all have different footprints and there is no compatibility.

**CHAIR**—And you feel that there could be a reduction in input costs if more machines were designed that could be used across a wide section of different farming techniques?

**Dr Yule**—The capital costs would come down amazingly. Go and have a look at how many machines and how many tractors a farmer has and how many he needs—that is the capital side of it. Of course the other input side is all based on efficiencies on a farm. We are talking about zero overlap and zero misses, whereas traditional farmers would have 10 per cent or 20 per cent overlap.

**Mr WINDSOR**—In terms of our terms of reference, it is actually a win-win, isn't it? Through adoption of this framework you are talking about, we would be cutting down on the day-to-day costs of production and also generating high outputs in terms of better water use efficiency, less capital outlay and a whole range of other things.

**Dr Yule**—Absolutely. And, Kirsten, I think some of those constraints you were talking about are a sort of science background thing. We have a lot of rules. In dry land agriculture, the rule

used to be that you only planted on a full profile. Soil like that stores about 20 per cent of the rainfall, so that does not really make a lot of sense. The value of getting rainfall on the crop is probably four times that; you get 80 per cent of it through the crop. We can double our productivity—certainly in Queensland we know this, and Neil will show you this tomorrow—by doubling the frequency. If you are using it in fallow, you lose it all by evaporation. It is not as though it did not rain. It is just that it rained, it went in the soil a bit and it came out again. I used to tell Neil it is really hard to get rain on the crop if you have not planted. And he took me to heart. He is a recreational planter.

**CHAIR**—So with extreme climatic conditions—say, climate change—this system will really help the process?

**Dr Yule**—I believe so. It is proven that it can deal with extreme events on the wet side and it has also proven that it is much better in a drought.

**CHAIR**—Which is what you did the original work on.

**Dr Yule**—Yes. And it is all about the feedback that we have got from farmers. We did some solid research, but the vast majority of the stuff I am talking about was feedback from farmers whom we assisted.

**Ms LIVERMORE**—You are working with farmers and talking to farmers. What questions are they asking when they are trying to learn about the system and make these decisions? Coming back to the stuff that we have heard from previous witnesses about the importance of research and development and the need for research and science, are there any questions or areas of knowledge that farmers are looking for which you cannot answer at the moment with the existing research in science?

**Dr Yule**—I think farmers now have as much information as they can handle. They do not need any more information. But we do a lot of training as a company. That training is to make them aware of the benefits and the content of the ideas. Farmers come to us and say, ‘I want to have a go. What have I got to do?’ That is why they come to us. We do not go to them and say, ‘We’ve got something for you mate.’

**Ms LIVERMORE**—So by the time they come to you they have crossed the threshold.

**Dr Yule**—That is what the training and the information are for. They have come to us because they have to pay us. We have programs that work through the various issues in relation to machinery and zero till, the layouts, the landscape issues, and also the agronomy that will increase their productivity. As to the questions, in terms of the basic controlled traffic issues there are not really very many questions now in terms of R&D. The big R&D questions, as you mentioned, Mr Chair, are about turning the resources into higher productivity.

**CHAIR**—And you are about systems, not practices?

**Dr Yule**—Yes.

**CHAIR**—But it is really also about outcomes, isn't it?

**Dr Yule**—The system outcome is really the only one that counts.

**CHAIR**—The bottom line, I guess, is the outcome that most people count.

**Dr Yule**—Yes. We are working with systems, and it is easy to measure the outcome of the system. So we are very reactive. People can tell us whether we are doing better or not.

**CHAIR**—And you make judgments accordingly in a business model approach to the enterprise.

**Dr Yule**—Yes. And that has been the feedback from the people who have done it.

**Mr WINDSOR**—You complained that the five or six years of work just came to an end and was picked up by innovative farmers et cetera. In that sense the work has not come to an end, but in terms of policy it has come to an end. Now that you have a chance to tell the government what they should be doing, what are the top two or three things you would encourage them to do? One of those things might be some regulation across GPS, for instance. In my mind, that could make a significant difference—subsidised adaptation of satellite technology for those who adopt a certain practice. If you were writing the book now, what would you be recommending back to yourself?

**Dr Yule**—I think I have outlined some of that in the submission. I should say that, after the GRDC project we did in 2007, that came to an end as well. And that was critical for us as a small company because all of a sudden we lost more than half of our annual income when that finished. The work we were doing on the new technologies, the GPS related and spatial technologies, really hit a brick wall because of that, too. What has happened for CTF adoption, to a large extent, in the constraints and brick walls that Kirsten was talking about is that, because controlled traffic farming has gone so far ahead of agriculture or cropping, the whole sector is stuck behind—I mean researchers, universities, economists and the whole government system—and the farmers are way ahead. So government needs to say, ‘We need to help you to get up there,’ because they are holding everything back. As I think I said, training and improvement of the service sector is a massive requirement.

As I said, we do quite a lot of workshops and things. I did some talks for the Victorian No-Till Farmers Association. They are not a controlled traffic farming association. They are interested in no-till farming but not controlled traffic farming. But a lot of no-tillers are now becoming very interested in controlled traffic farming because it helps make tilling easier. When I spoke to these groups I would have 100 people in the room. I would say, ‘How many are doing no till?’ I would get 80 hands up. I would say, ‘How many are doing controlled traffic?’ I would get maybe 20 hands. I would say, ‘How many of you actually have the harvester in the controlled traffic system?’ I would get two or three hands. To do controlled traffic without the harvester is absolutely ridiculous. So that is where we are at. That market failure is, I believe, associated with the service sector, because people are telling farmers they can go and do controlled traffic but not worry about harvesters. And then the benefits from controlled traffic are considerably limited. The same goes with what they do with their auto steer. It is fantastic having auto steer; you just drive up and down and you do not have to do anything. That makes them feel good. But it is what is happening behind, or where they are going with it, that is really important. I suppose the frustration is that we are really the only private company in Australia offering those services.

We need some government support. I suppose the reason I was keen to do this is that we are trying to get controlled traffic on the radar screen. Does that make some sense?

**CHAIR**—Yes. It is a communication issue.

**Dr Yule**—Yes.

**CHAIR**—Thank you very much for your submission and for your attendance. We will send you a copy of the *Hansard*.

[2.13 pm]

**TULLBERG, Dr Jeff, Executive Committee Member, Australian Controlled Traffic Farming Association**

**CHAIR**—Welcome. Although the committee does not require you to give evidence under oath, I should advise you that this hearing is a formal proceeding of the parliament and warrants the same respect as proceedings of the House. Giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. The committee has received a submission from the Australian Controlled Traffic Farming Association, submission 43. Are there any corrections or amendments you would like to make to that?

**Dr Tullberg**—No, thank you.

**CHAIR**—Please proceed with your presentation.

*A PowerPoint presentation was then given—*

**Dr Tullberg**—I will give you a bit of background. I am an engineer. I did a PhD in a botany department and I have worked with agronomists for most of my life. I guess farm machinery has been my major concern. I want to talk briefly about the impact of controlled traffic farming in terms of resilience and emissions.

The first slide shows two soil profiles. The one on the left is zero tillage soil which has been driven over once a year by a tractor with about four tonnes on its rear axle. The one on the right is identical soil about three metres away which has not been driven over for four years but otherwise has produced exactly the same crops and has exactly the same treatment. The white in there is the space available for air and water. Obviously on the right you have soil which has porosity data depth. Over the four years of the experiment and subsequent years the depth to which that better structure persisted went further down the profile. Porosity and aeration are quite critical factors in soil performance.

With random traffic as normally practised it is almost impossible to grow a crop in zero tillage without driving over almost 50 per cent of the area with wheels with about five tonne axles—that would be the minimum. You damage about half the area, you waste about half your fuel in the process and you damage soil as well, particularly in terms of the infiltration of rainfall and the soil's ability to store water in a plant available form—both reduced by about 40 per cent. It damages productivity and water use efficiency, and that seems to me to be the key to the resilience of cropping industries under climate change. It damages nitrogen fertiliser efficiency and also increases greenhouse gas emissions.

If I may, I will say a little bit more about one aspect of productivity, and that is soil health. The graph shows the number of earthworms per square metre in soil that had been growing grain for five years. The bar on the left represents conventionally farmed soil and has two tillages between each crop. The middle bar is zero tillage with random traffic and the right-hand bar is controlled

traffic and zero tillage. This is not rocket science. Worms and most soil life do not like being tilled and they do not like being driven over either. As I say, it is not surprising.

The next slide shows what people are actually doing in controlled traffic—and you will be seeing this sort of thing tomorrow, I understand. The slide shows somebody harvesting controlled traffic, so the harvester is working on permanent traffic lanes. There is planting going on on permanent traffic lanes, there is a crop growing in the stubble of the previous crop and there is spraying going on—all from that same set of permanent traffic lanes. As I say, the rocket science of this is: plants grow better in soft soil and wheels work better on roads. That has seen the system yield doubled and it has seen fertiliser and herbicide inputs decline very substantially.

I would also like to talk about emissions resulting from this practice. It is well known that, by reducing tillage, you reduce the amount of fuel you use, so you reduce the amount of carbon dioxide that gets produced as a result of burning diesel fuel. That is what those two left-hand bars on the graph show. The right-hand bar shows that, when you are no longer tilling the soil, you are disturbing it very little, and most of your fuel is actually used to carry this weight around the paddock. If you are going on permanent wheel tracks which are hard you use a lot less fuel—about half the fuel. Those are the emissions related to diesel fuel use—and, as I say, that is commonly known.

People often do not consider the energy that goes into producing herbicides, which is one of the issues of zero tillage. In controlled traffic, because you grow more crops and because you can get onto ground quicker, you can deal with weeds when they are smaller, you can use less active ingredients and you get reduced herbicide use. But the big one in terms of energy going into modern cropping systems, as I am sure you know, is nitrogen fertiliser. These figures are worked out on the basis of 50 kilograms of nitrogen per hectare, which might be a reasonable Australian broadacre situation. There is very little difference between conventional mulch tillage and zero till. There is a significant improvement in controlled traffic again because of course you do not put fertiliser on permanent wheel tracks and because you do not get the inefficient fertiliser use associated with compacted soil.

The final one to be concerned with is emissions from the soil, primarily nitrous oxide. Nitrous oxide is produced when you have soil at a particular levels of water filled porosity. That occurs much more often when you have a compacted layer further down the profile. You avoid this in controlled traffic farming. Zero tillage alone actually increases emissions because you will get more soil compaction, particularly in heavy soils. There is plenty of data out there to demonstrate that. CTF can reduce emissions by approximately 45 per cent. It will be highly variable but has not been properly investigated. The few places where it has been investigated would lead to this conclusion.

The other thing that should be mentioned is that because you are producing more crops, more biomass, you are also going to provide the maximum chance of increasing soil carbon because you have absolute minimal soil disturbance; you do not need to disturb beneath seeding depth. If you are in non-compacted soil, it maximises the chance of carbon sequestration. Again, the data is not as good as we would like it to be, but in several parts of the world it has been demonstrated.

I have put some recommendations in my submission, but may I add to them?

**CHAIR**—Sure, please do.

**Dr Tullberg**—I think the Caring for our Country program should include research which does a better job of trying to quantify the impacts of controlled traffic farming on water use efficiency because that is essentially resilience. It should also quantify the effect on greenhouse gas emissions because that is going to be important to agriculture. It should also investigate all the opportunities we will then get as we get much more precise. We are talking about GPS guidance technology which gets things to within two centimetres of where we want them. This means all sorts of admittedly long-term opportunities such as relay cropping—planting one crop before you harvest the previous one—intercropping and alley cropping. All of these things are what quite a lot of the biodiversity people are aiming at. You can start approaching some of that sort of stuff in conventional agriculture once you know precisely where things are. That is looking a long way ahead. It is very important, I believe, for our future. As Dr Yule said, this needs to be on-farm because our research facilities simply lack the technology and personnel to do it. It just is not there.

The extension services have the same issues of technology and personnel. Farmers have to translate anything to do with systems into practice, which is using machines. There are virtually no people concerned with farm machinery throughout the extension services in Australia and, for that matter, there are very few in research.

Caring for our Country can do things like supporting farm training via FarmReady and that is going on. But there is a problem underlying a lot of what I and the previous speakers have said that in our scientific establishment, DAFF, GRDC and all those organisations, when people talk about agricultural technology breeding springs to mind and GMOs spring to mind. They might perhaps think in terms of herbicides or insecticides but nobody thinks of the technologies that are actually causing a revolution that have produced greatly improved production now and show promise if we work on them for a long time in the future.

Thank you for your patience. I hope I do not sound too much like the lecturer I have spent my life being.

**Mr WINDSOR**—Do you know anybody who is relay cropping now?

**Dr Tullberg**—I know somebody who is trying it. That would be Wayne Chapman near Taroom. Whether he has actually planted his first relay crop I do not know. It is something that we have tried on an experimental scale. We tried at UQ Gatton a few years ago and we got beaten by our own incapacity to manage weeds properly. That does happen on college farms.

**CHAIR**—You might give us a definition of relay cropping.

**Dr Tullberg**—When you have, say, a wheat crop approaching maturity it is spaced at 30 to 50 centimetres and you have ample room to actually plant your next crop three or four weeks before harvesting the previous one. That is happening at a time of year when you might well have had rain already and that rain is just going to get wasted. The wheat crop cannot use it, but the next crop can get going. As a landscape matter, we need to maintain cover much better than we do at the moment. That is one of the approaches. I should say that all of the things to do with precision are long term. They are not things that everybody is going to be doing next year.

**Mr WINDSOR**—I was not suggesting that we all rush out and do that. The important point that you are making is that, if we adopt those precise techniques, it opens the door to a whole range of concepts that we have not even contemplated because we have not been precise enough.

**Dr Tullberg**—Indeed.

**Mr WINDSOR**—Just to develop that concept though, in a theoretical sense, one of the issues that we have now is the price of nitrogen and the nitrous oxide emissions. Do you see the possibility under these systems of actually having a green manure crop planted pre-harvest to one crop so that it is producing the nitrogen for the following crop?

**Dr Tullberg**—I would see that as being very appropriate in a lot of the southern systems where they do not have much hope of another economic crop on those occasions when they do have rainfall in summer at harvest time—which was last year, in fact, in a lot of places. In Queensland where we have so often got rainfall at winter crop harvesting, I would see it as being more commonly an economic crop. As long as you are producing biomass and you are taking away only the minimum that you have to, the grain itself, then it seems to me that you are at least on the winning side in terms of the potential for soil organic matter and soil carbon.

**Mr WINDSOR**—You were talking about nitrous oxide emissions and how they are reduced over the three systems. I think you also said that there needed to be more work done. Could you elaborate on that?

**Dr Tullberg**—I think there is a major nitrous oxide program that started earlier this year; in fact, I think it was supposed to start last June or July. To my knowledge, this is not being looked at. Yet it seems to be one of the few things where relatively economic technology can be applied almost immediately, whereas, for instance, the economics of other things like coated fertilisers, slow release fertilisers and things like that, do not look very attractive from a grower's point of view at the moment. I do not set myself up as an expert on that subject but it seems to me to be one of the obvious things that should be being investigated, and as far as I know it is not. I was overseas until two weeks ago and since I got back I have been trying to contact Professor Peter Grace, the man who is, I think, in charge of that program but he is in the USA and does not seem to be reading his email at the moment. I might be wrong there. I would be very happy to be corrected in what I have said.

**Mr WINDSOR**—My last question is: who is leading the world in controlled traffic technology?

**Dr Tullberg**—Australia, no doubt; Australia is way out ahead. There would be perhaps 1,500 hectares in Denmark, perhaps 1,000 in the UK and, at a guess, about 5,000 in the USA. It has happened here. I should say that a lot of the research was done in the USA in the 1960s. So it is not new; it is just that it has actually been made to work here in practice and farmers have picked it up.

**Mr WINDSOR**—Just as a corollary to that: how important has GPS technology been to the more rapid adoption?

**Dr Tullberg**—There are growers who got into controlled traffic in the mid-eighties who were doing things with marker alarms and by eye, and they were making the system work. But they were just the enthusiasts; it would have been a few thousand acres. GPS technology makes it so much easier, and you can get things exact. You do not have those soldiers standing at the paddock after harvesting and things like that. It just makes life vastly easier.

**Ms LIVERMORE**—Just to follow on from that: is there any danger—and this is betraying my lack of familiarity with any sort of technology—of obsolescence in the technology? If a farmer makes the initial investment, is it going to be simple enough to upgrade if and when the time comes?

**Dr Tullberg**—You are talking about the guidance technology?

**Ms LIVERMORE**—Yes.

**Dr Tullberg**—There are two bits to it. There is the electronic side of it, and I am sure there will be obsolescence there because there are going to be many more capabilities of recording built into that, so that most of a farmer's paddock recording can be done in his home computer via his GPS system. That sort of technology is just on the cusp now. But with that technology we are talking about \$20,000, \$30,000 or perhaps even \$40,000, and that is technology that five years ago was costing \$120,000. It is one of those things that is happening and is getting a lot cheaper. The more expensive things are the tractor, the planter—those big chunks of steel—and I do not see that changing very quickly. And now that people are only using tractors for 300 hours a year, those tractors are going to last for 20 or 30 years. You can see why John Deere and co are not all that happy. But they are actually joining in and actively committed to looking at standardisation to overcome some of these problems. Their attitude is that they may not actually like it but it is going to happen and so they want to do it and to do the best job possible.

**Ms LIVERMORE**—On the experience in Victoria which you refer to in your submission, I think you are saying there that the Victorian government, presumably, is implementing a continuously operating reference station network.

**Dr Tullberg**—Yes.

**Ms LIVERMORE**—Can you talk a little bit about that—about what has driven that decision by the Victorian government and how that has affected the awareness and the uptake of controlled traffic farming in that state?

**Dr Tullberg**—This is something that is happening now and is, I think, still not complete in Victoria, but it is going to provide the potential to reduce the cost of getting high-precision guidance by about 30 per cent or 40 per cent. Essentially, the base station and the receiver in the tractor are very similar pieces of technology. So you will get rid of one of those. The difficulty is the one that Don Yule referred to—these things have to be able to talk to each other. Because John Deere, Case, Trimble and the different manufacturers are using different codes to communicate, it is going to mean that that Victorian government system initially will work only with one brand. I suspect the other brands will find a way of making sure it will work with theirs before long, but there are a whole lot of commercial decisions involved there.

As a matter of interest, I have considered making as one of my recommendations that this is something that could be subsidised and pushed by government. It is all in the process of happening now. I do not know how it is going to sort out but, if many farmers see this as something that they have got to have, they are going to do it, and I am sure the commercial world will find a sensible solution before a government system can think about it and reach a decision.

**Ms LIVERMORE**—Do you have any idea how much that has cost the government? I guess there is an initial outlay to set up the infrastructure and then the recurring cost of maintaining it.

**Dr Tullberg**—I will take a wild guess and say that it would be less than \$5 million. But that is a wild guess. There might be somebody in the room who can provide an accurate opinion.

**CHAIR**—We have the issue of industry demonstrated projects. The committee has heard about communicating things to farmers, farmers communicating to farmers and that sort of thing. Is a practical solution to the learning process having funded, demonstrated projects out there saying, ‘Here’s a whole farm approach that we can show somebody or groups of people’?

**Dr Tullberg**—I find that a difficult question to answer straightforwardly. In the mid-1980s we had some farmers doing that. They were making money and it was working well. But it remained restricted to a very small group of enthusiasts. Only when people started dealing almost on a one-to-one basis saying, ‘Here’s the advantages; are you interested in having a go?’ and then going through the process bit by bit did it really get going large scale on farm.

Of course there are farmers looking over the fence who will find their own way of doing it—and good on them—but there would, I think, be dozens of farmers in every state except Tasmania and South Australia who are actually doing it. The examples are there. I would have expected that that would mean that people would go to it and do it, but there is a huge well of traditional ideas about what is good farming, and one of those is uniformity—‘You’re actually leaving compacted strips! That’s where you get all your weeds. It’s going to cause massive erosion’—and there are people who will say that, even though the data is there to show it is not the case. It has not happened. So, while I would love to say, ‘Yes, we need a few demonstration farms; that will fix it,’ I do not believe that to be the case.

**Ms LIVERMORE**—I have two questions. First of all, are you aware of any farmers who have gone down this track and then have actually walked away from it? Is there another side of the story somewhere?

**Dr Tullberg**—I have heard of one, but I have not found out why or how, sorry.

**Ms LIVERMORE**—The other question is this. We spent a bit of time with Don talking about the government’s role in facilitating the uptake of this method and getting awareness out there. What do you see as the role for industry organisations? Have you had support from industry organisations or any resistance from industry organisations that you want to share with us?

**Dr Tullberg**—As in CAAANZ, the conservation and agriculture alliance—those sorts of people?

**Ms LIVERMORE**—Yes. Agforce et cetera.

**Dr Tullberg**—They are all positive, but their major focus is that they have to get members. There would be perhaps five per cent to 10 per cent who are actually in some sort of controlled traffic farming. Perhaps there are 15 per cent to 20 per cent more who are playing at the idea and starting to talk about it. It is not mainstream enough for them to push really strongly. They are more concerned with getting everybody into what they see as the current technology. They are all essentially no-till farming organisations. They have generally been supportive, but we had optimism that they would be more supportive than they have been.

**Ms LIVERMORE**—I am thinking more of organisations like Agforce, Canegrowers or NFF.

**Dr Tullberg**—We have not had very much joy with them. Again, it is not that they are not supportive, but the senior people in these things tend to be very well established growers who tend to be very conservative people. Farmers have good reasons for being conservative. They have been led up the garden path a few times with new technology. We can easily be seen as snake oil salesmen. I wish there was a better way of making money out of that snake oil.

In the cane industry there is a huge problem because, even if they do everything absolutely right, with the current equipment they are still going to be driving over something like 40 per cent of the area. There is no way they can avoid it, just because of the physical arrangement of their machines. I think there are two growers who have said, 'To hell with that; I'm going to find a way of getting a better machine,' and have built something themselves or imported things specially from Brazil. But they are a very tiny minority. The mainstream organisations tend to say, 'They'll probably go bankrupt next year anyway.'

**Mr WINDSOR**—You mentioned the possibility of erosion with hardened zones et cetera. Are you across the slope or down the slope?

**Dr Tullberg**—I am up and down the slope.

**Mr WINDSOR**—Down the slope.

**Dr Tullberg**—There has been a lot of controversy about that. I worked at Gatton College for years and years. We trained all the people who said you should go round and round the slope. Then there is this guy up there saying, 'You go up and down.' It has caused considerable distress. But the data is there that, particularly in major events, controlled traffic up and down the slope works, provided of course that you have the cover there, provided you have a good zero-till system—it is a system, not just one thing. It works and you no longer get dirty great gullies running through paddocks.

**CHAIR**—Thank you very much. That was excellent. We look forward to seeing some tomorrow on farm. I thank you and the association for your submission. We will send you a copy of the transcript.

**Proceedings suspended from 2.44 pm to 3.10 pm**

**TILLET, Ms Cheryl Anne, Acting Business Manager, Biodynamic Agriculture Australia**

**CHAIR**—Welcome. Although the committee does not require you to give evidence under oath, I should advise you that this hearing is a formal proceeding of the parliament and warrants the same respect as proceedings of the House of Representatives. Giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. The committee has received a submission from Biodynamic Agriculture Australia—submission No. 49. Are there any corrections or amendments you would like to make to that submission?

**Ms Tillett**—Not that I am aware of.

**CHAIR**—I know that you are going to make a presentation to us, so please proceed.

*A PowerPoint presentation was then given—*

**Ms Tillett**—I going to give you a little bit of the history of biodynamics, first of all. In 1840 Justus von Liebig, a German chemistry professor, developed NPK to address the evident decline in agriculture production. Around 1900 it became obvious to more sophisticated farmers that this attempt degraded the soil conditions. In 1920 a group of European farmers concerned about the future of agriculture approached Rudolf Steiner, philosopher and scientist, to give them guidelines to improve soil fertility to solve the deterioration in the health and quality of crops and livestock. In 1924 Rudolf Steiner gave eight lectures from which the biodynamic movement arose. Biodynamics as we know it today is the manifestation of those farmers attending his lectures and putting the indications from this first agricultural course into practice.

The basis of biodynamic work is around biodynamic preparation. Steiner gave indications for the use of a series of preparations to stimulate the life processes in farm organisms. The first of these is cow horn manure (500). This goes through a process of filling cow horns with manure from a lactating cow and burying those cow horns in the ground during the winter to produce a humus-like colloidal substance. This is applied to the soil late in the afternoon and ideally when moisture is about, such as after rain. The cow horn manure (500) brings in the calcium processes and helps the soil develop humus and structure, thereby increasing the absorption and retention of water and development of a deep-rooting system. It attracts earthworms and other soil micro-organisms. This is a picture of 500 being buried for the winter.

The second of the preparations is horn silica (501). To make this preparation cow horns are filled with crushed powdered quartz and buried in the ground over the summer. This preparation is an atmospheric spray to aid the photosynthesis of the plant. Through this plant, sugar sap levels and mineral content are enhanced and excess sugar sap is sent to the roots as root exudates to feed the bacterial fungi that form the symbiotic relationship around the roots. These raised sugar levels increase the plant's resistance to pests and disease. This preparation is applied in the early morning as a fine mist.

There are a group of preparations that are used together to create the compost. Each of the herbs in the making of the compost preparation has the ability to concentrate elements that are present in the herbs or stimulate bacteria in the soil that will mobilise specific elements. The six

compost preparations, (502) to (507), are used in conjunction with each other. The first of these, the yarrow preparation (502), stimulates the potassium, silica and selenium, activating bacteria, and helps combine sulfur and other substances. Yarrow blossoms are prepared and stored over a period of one year to make the preparation.

Chamomile preparation (503) retains nitrogen and calcium and stimulates manganese and boron, as well as actobacter activity—the best bacteria for nitrogen fixation in the soil. Chamomile blossoms are prepared and stored for six months over the winter to make this preparation.

Each of the preparations needs to be stored in a particular way to retain vitality. In this photograph we have pottery vessels. The preparations are stored in the pottery vessels. They are surrounded by peat moss and there is an outer container around the whole. It is important to keep the preparation moist and keep it away from things like electrical influences.

Nettle preparation (504) aids chlorophyll formation and stimulates iron, potassium, calcium, magnesium and sulfur activity in the soil. Stinging nettle plants are prepared and stored for one year to make this one.

Oak bark preparation (505) aids calcium and phosphorus penetration into the earth. Oak bark is prepared and stored for six months over the winter.

Dandelion preparation (506) stimulates the potassium/ silica bacteria in the soil, which aids in flowering and the filling out of fruit. It also stimulates magnesium, boron and selenium soil activity. Dandelion flowers are prepared and stored for six months over the winter.

Valerian preparation (507) stimulates phosphorus processes and mobilises phosphorus-activating bacteria in the soil, as well as selenium and magnesium. Valerian flowers are pressed and the juice is extracted and then stored.

That is the last of the compost preparations. Another preparation that is commonly used as both an atmospheric spray and a soil spray is equisetum preparation (508). Dried equisetum is made into a tea and can either be used fresh or made into a fermented liquid.

In Australia, preps were first made by Ernesto Genoni in Melbourne in 1927, and then later by Bob Williams in Sydney in 1939. Around 1950, the Biodynamic Research Institute was established in Melbourne. In 1989, Biodynamic Agriculture Australia was established. Biodynamic Agriculture Australia provides workshops and field days for beginners and specialist areas and is the largest biodynamic growers organisation in Australia. Here is a photo of a field day—and they are filling cow horns. Today biodynamics is practised in over 50 countries worldwide.

I would like to give you some information about what is happening today. There are 3,500 certified farms, certified through Demeter International, and around 500,000 hectares of certified land, also certified through Demeter International. There are also many non-certified farms. In India there are around 7½ thousand non-certified farms, and in Australia there are many farms that are not certified by Demeter International. The majority of biodynamic organisations that

certify are members of Demeter International, which is not just a growers organisation but also certifies wholesalers and processing plants.

Various studies have been conducted over the years and, in general, it can be concluded that biodynamic farming practices have many benefits. The total energy for fuel production of mineral fertilisers and pesticides et cetera to produce a dry matter unit of crop was 20 per cent to 56 per cent lower. Biodynamically grown fruit had significantly higher brix levels. This is due to the use of horn silica (501). With regard to soil aggregate stability, soil pH, humus formation, soil calcium, microbial biomass and faunal biomass, the biodynamic system was improved.

This is a photograph of a lucerne plant. By looking at this plant we can see how the soil has grown using the biodynamic system. The fork in the root on the right-hand side represents the spot where the seed was first put in the ground. The plant has branched off and, as the shoots have been suffocated by the soil build-up, it has sent down another root on the left-hand side and then continued to build up. Over a period of about four years, as represented by this plant, there is about a five centimetre to seven centimetre increase in soil from the original seed planting. Biodynamic farms also retain water better through that build-up of humus in the soil and the change in structure.

Biodynamic Agriculture Australia is a not-for-profit, membership based organisation working with farmers to produce high-quality food and fibre. We have around 1,400 members at present. Our objective is to foster, guide and safeguard in Australia the biodynamic method of agriculture as indicated by the late Rudolf Steiner. We provide information on the use of the biodynamic method through phone advice and our quarterly *News Leaf* journal. We also provide bulk preparations to our members. As well as this, we conduct farm based workshops on biodynamics for both our members and the wider public. We believe farmers are the best people to train other farmers, so when we run our workshops they are farm based and we have farmers as part of them. Government support for farmers to learn about biodynamic farming practices, which build healthy soils that are rich in humus and have better water-holding capabilities, would help farmers to build a more resilient farm organism to deal with the challenges of climate change.

Biodynamic farming has been increasing worldwide over recent years and has been successfully practised in different cultures, climate zones and agricultural sectors to increase the healing of the soil and provide better conditions for the atmosphere. Through this we are able to help prevent further detrimental climate change. Biodynamic practitioners all over the world continue to develop biodynamic practices from the indications given by Rudolf Steiner in 1924. Here in Australia biodynamic management has been adopted by farmers once they have seen the benefits to the environment. If they can see what is happening on somebody else's farm they tend to come along and want to try it out on their farm. Biodynamic Agriculture Australia can see the advantage of adopting biodynamic management on an even larger scale in Australia if support is given to both those farmers practising biodynamics and those farmers converting to biodynamics. Thank you.

**CHAIR**—Thank you for that. We will have quite a few questions, I reckon. You feel that soil health is much improved with this process?

**Ms Tillett**—Yes.

**CHAIR**—How do we prove that in the sense of production or hold that up as a science based argument?

**Ms Tillett**—A soil based trial has been run in WA. I am not sure if that information is part of what went in as the submission. There has been a bit of a changeover of people in the office. On the original submission it said that it was one of the attachments, but I am not sure whether in fact that is the case. There have been trials run in WA, which started in 2008. They ran for a period of nine months and then there was an extension to that. As I understand it, they are still being carried on.

**CHAIR**—What is the cost involved for somebody who has been farming in a traditional way to set up biodynamically? What extra costs are involved in becoming a biodynamic farmer?

**Ms Tillett**—The major cost would be to get some device for the mixing and stirring of the preparations. The two field based preparations, the 500 and the 501, are rhythmically stirred for one hour before they are put out over the land. There are a number of different ways in which you can go about doing that but in the broadacre sense you would need to buy either a stirring machine or a set of flowforms, which would cost a few thousand dollars. Putting the spray out is usually a fairly simple process of adapting existing farm equipment so that you have got the right sized spray nozzle for the droplets to go out in the way that they need to go out.

**CHAIR**—So you can adapt those processes. How will this process assist farmers to adapt to climate change in the world and in Australia?

**Ms Tillett**—By using the biodynamic system you are looking at the whole farm organism. You are building up the health of the farm organism and building up the humus content and the structure of the soil so that there are better water retention capabilities. As well as the water retention capabilities, there is a reduction in the amount of irrigation. For instance, if the farm is in an area where they need to irrigate, people who are using biodynamics tend not to have to use the same quantity of water for the same outcome as a conventional farmer might have to do. So there is the building of the carbon in the soil through the build-up of humus, the sequestering of the carbon from the atmosphere into the soil and then the water retention as a bonus so that the whole farm becomes more resilient to changes that might be happening.

**Mr WINDSOR**—What is the significance of the cow horn? Why can't those products be applied without the cow horn?

**Ms Tillett**—The whole philosophy behind biodynamics is that as well as a physical process there is also a spiritual or cosmic connection. The idea is to look at the macrocosm rather than the microcosm. In that process of making the preparations—for instance, the 500, if we just take the soil spray—the cow horn is a particular form which draws in the energy from the cosmos. So when the manure is put into the cow horn and buried over a period of time, during the winter forces from the outer planets are drawn into that material and transformed into the humus-like colloidal mass that comes out at the end.

**Mr WINDSOR**—Have there been trials done with and without the cow horn?

**Ms Tillett**—There have been some trials done using cow skin instead of the cow horn. The cow is central to the whole process, though, because the cow has a particular digestive system that processes things in a different way to other animals. Further down the track there may be an issue with having access to the quantity of cow horns that might be necessary, with the dehorning of cattle for transport, and that sort of thing, that seems to be happening now.

**CHAIR**—Is it cows—as in female?

**Ms Tillett**—Yes.

**CHAIR**—That is the philosophy.

**Ms Tillett**—Yes.

**Ms LIVERMORE**—Is there any issue around the availability of inputs for someone wanting to convert to biodynamic farming? Obviously it is based on the use of those very specialised and specific inputs. If someone in North Queensland wanted to convert, is it difficult to access or to have a steady, reliable supply of the inputs that you would apply?

**Ms Tillett**—At the moment we are able to supply the membership and each year we produce according to what we think is going to be needed. They have a life. You cannot just make huge quantities and store them forever; they have a vitality that diminishes over a period of years. So we tend to look at what quantity has been used in the past and then project into the future also for that. But if there were a huge influx of people suddenly wanting biodynamic preparations we as an organisation would not be geared to deal with that. The whole idea of the organisation is to pass on the information so that the farmer can do it himself. The farmer can actually do all of these things himself. He does not need to depend on somebody else for those inputs. He can make his own preparations, in time.

**Ms LIVERMORE**—From your experience, is it an ‘all or nothing’ proposition? Is it the sort of thing that a farmer might try on a small scale—to be largely doing conventional farming and then put their toes in the water a little bit and start trialling some of these things—or is it more a case of someone embracing it holus-bolus from the outset?

**Ms Tillett**—It tends to be the first instance. People often have some sort of introduction to it then tend to go away and think about it for a year, or maybe a couple of years, or they do a small trial and see how that goes before they move into it. For conventional farmers, sometimes it is that thing of not letting go of their conventional system altogether in that first instance but of slowly moving into it and decreasing the amount of fertilisers or weedicide that they may be using until they feel confident about changing over to another system.

**Ms LIVERMORE**—I can see that you have spelled out in your submission that there are clearly benefits and savings on inputs into the farming system. Are your members also finding benefits in the rate of productivity and in the quality of outputs and are they able to realise a premium on their products as a result of being able to certify them or identify them as biodynamic products?

**Ms Tillett**—Yes, there is definitely a premium if they are able to certify them and sell them on as biodynamic products.

**CHAIR**—So people will buy certified biodynamic products in shops if they are listed that way?

**Ms Tillett**—Yes.

**CHAIR**—You have a certification process. Is that robust?

**Ms Tillett**—At the moment Biodynamic Agriculture Australia is in the process of setting up a separate certification body. For the last few years we have not been involved in that because it requires a whole input of energy that we have not had the time for, especially when there are other certifying bodies in Australia that can already cover those aspects. At the moment NASAA and the BFA—the certifying arm of the BFA is now called ACO—are the people that biodynamic farmers from our organisation could go to to become certified.

**Mr WINDSOR**—Have the levels of increase in humus that your document talks about been independently verified? Could you tell us what sorts of increases you are getting? When you talk about humus, are you relating that to soil carbon? When you say our soil is now probably half a per cent humus content, do you mean carbon or are you talking about humus, which is partly made up of carbon?

**Ms Tillett**—With the WA trials there would have been assessments of the content of the soil, but I am not aware of the details of other independent trials that might have been run. Often it is more about observation. The farmer can dig a spade in and see that there is a change there, but it has not been necessarily analysed through an independent organisation. There are several trials that have been conducted including some currently being carried out with the support of our organisation.

**Mr WINDSOR**—It might be worth talking to your organisation about having it independently verified, if those sorts of levels of humus or carbon accumulation are occurring. One of the documents your organisation refers to makes the point:

We require only 10% of our productive, degraded lands to absorb the estimated 6.1 gigatons of carbon dioxide emissions to make a carbon negative world possible in our life-time.

In a number of areas we have looked at how we can increase soil carbon and put the carbon back into the ground from whence it came. All of these things have to be looked at, but encouraging people to change technologies will need some scientific verification as well.

**Ms Tillett**—I agree. There needs to be some funding in that direction so that more scientific investigation of those things can happen.

**Mr WINDSOR**—The other issue is, if you get an increase in humus and organic matter in a soil, you obviously increase the infiltration rate and the moisture-holding capacity of the soil. I think most soil scientists recognise those linkages. You say in your submission that, if you get to five per cent of the soil being humus, a massive amount of water can be held in that soil. How

long does it take for the landscape to get back into balance again? If you upgrade the humus content and cut down on the run-off because the soil is holding the moisture, the creeks and streams will not be gaining the moisture. However, at some time, theoretically at least, the moisture will have to re-enter the creeks and rivers again. How long does that process normally take?

**Ms Tillett**—For the water to filter through to the creeks and rivers?

**Mr WINDSOR**—Yes, or to restore the environment to what it was—say, five per cent carbon soil, which holds the moisture. How long does it take before the original system is re-established, where the groundwater rather than run-off is actually feeding the streams?

**Ms Tillett**—Is the question about taking a particular farm organism that is conventionally farmed and changing it to biodynamics, whereby it grows the soil to a point where it is retaining water?

**Mr WINDSOR**—Yes. That is water that under a so-called degraded system would have been running off into our streams. Are you saying that, for each percentage point of humus in the soil, the capacity of the soil to absorb water increases such that water is not running off as it would have previously? At some stage it must re-establish a balance where that water re-enters the streams from the groundwater systems, and I am just wondering how long that takes. The reason for the question is that we are right in the middle of designing a plan for the Murray-Darling Basin which will be partly based on 1990 run-off figures.

**Ms Tillett**—If we are looking at the big picture, part of the issue is that in the current conventional system you have water just running over the land instead of going into the ground. It is running into the river, which is going out to the sea, or it is being irrigated back onto the land and then running off. If it is just a cycle of running off and not going into the ground then it is not able to sustain the soil processes in the same way that it would if it were seeping into the ground and then gradually making its way into the river. It would be a much more natural occurrence for it to seep into the ground so that the life processes on the farm were regenerated.

**CHAIR**—We understand that. We are well aware of that. I think what Mr Windsor is trying to establish is whether you have any idea how long it would take for the water to get back to the rivers. There would be a period of time in which there more water would be staying in the soils, therefore there would be a loss to the river. Do you understand?

**Ms Tillett**—Yes, I understand. How long it would take to seep back would depend on the location of the farm, I suppose. I do not know how long it would take for the water to seep down to a groundwater level and then make its way back to the river—if that is the question.

**Mr WINDSOR**—Okay. Thanks for that.

**CHAIR**—Thank you very much. We will make sure you get a copy of the *Hansard*. Thank you for your presentation and for coming to day. Thanks to everybody. Thank you, Hansard. I declare the meeting closed.

Resolved (on motion by **Mr Windsor**):

That this committee authorises publication, including publication on the parliamentary database, of the transcript of the evidence given before it at public hearing this day.

**Committee adjourned at 3.41 pm**