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## **STATE DEVELOPMENT AND REGIONAL INDUSTRIES COMMITTEE**

### **Members present:**

Mr CG Whiting MP—Chair  
Mr JJ McDonald MP  
Mr MJ Hart MP  
Mr RI Katter MP (via videoconference)  
Mr JE Madden MP  
Mr TJ Smith MP

### **Staff present:**

Ms S Galbraith—Committee Secretary  
Ms M Telford—Acting Committee Secretary  
Dr K Kowol—Assistant Committee Secretary

## **PRIVATE BRIEFING—INQUIRY INTO THE IMPACT OF CLIMATE CHANGE ON QUEENSLAND AGRICULTURAL PRODUCTION**

### **TRANSCRIPT OF PROCEEDINGS**

(Private)

**TUESDAY, 21 MARCH 2023**

**Brisbane**

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### **The committee met in private at 10.31 am.**

**CHAIR:** I declare open this private briefing for the committee's inquiry into the impact of climate change on Queensland agricultural production. My name is Chris Whiting. I am the member for Bancroft and chair of the committee. I would like to respectfully acknowledge the traditional custodians of the land on which we meet today and pay our respects to elders past and present. We are very fortunate to live in a country with two of the oldest continuing cultures in Aboriginal and Torres Strait Islander peoples, whose lands, winds and waters we all share.

With me here today are: Jim McDonald, the member for Lockyer and deputy chair; Jim Madden, the member for Ipswich West; Michael Hart, the member for Burleigh; Tom Smith, the member for Bundaberg; and Robbie Katter, the member for Traeger, via videoconference.

The purpose of today's briefing is to assist committee members with building a strong knowledge base upon which to take the inquiry forward and to identify targeted areas for further consideration. This briefing is a proceeding of the Queensland parliament and is subject to the parliament's standing rules and orders. Only the committee and invited witnesses may participate in the proceedings. Witnesses are not required to give evidence under oath or affirmation, but I remind witnesses that intentionally misleading the committee is a serious offence.

The proceedings are being recorded by Hansard and we will provide you with a copy of the proof of transcript to check. The transcript is for our records only and we do not intend to publish it. If we do decide to publish the transcript, we will only do so after notifying you in writing and giving you the opportunity to provide a submission as to whether the transcript should or should not be made public. I ask people to turn their phones off or to silent mode.

**FELL, Mr James, Program Lead, Trade and Global Change Program, Australian Bureau of Agricultural and Resource Economics and Sciences (via videoconference)**

**GOODAY, Mr Peter, Assistant Secretary, Farm Performance, Biosecurity and Information Branch and Chief Commodity Analyst, Australian Bureau of Agricultural and Resource Economics and Sciences (via teleconference)**

**GREENVILLE, Dr Jared, Executive Director, Australian Bureau of Agricultural and Resource Economics and Sciences (via videoconference)**

**HUGHES, Dr Neal, Senior Economist, Australian Bureau of Agricultural and Resource Economics and Sciences (via videoconference)**

**CHAIR:** Welcome. I invite you to make some introductory remarks to provide a general overview of the effect of climate change on agriculture in Australia—the challenges, the opportunities, the existing programs to support adaptation and resilience and the way policies and policymakers could better support farmers. We will then move to questions from committee members. Professor Hughes, if we may start with you.

**Dr Hughes:** I will speak to a report that ABARES published about a year ago called *Climate change impacts and adaptation on Australian farms*. I emailed that through yesterday, so hopefully you will have received a copy. The modelling that ABARES has done looks at the effects of both historical changes in climate and potential projected future changes in climate on the productivity and profitability of farm businesses. It specifically looks at broadacre farm businesses—extensive livestock and cropping businesses excluding some other sectors like dairy and horticulture and irrigation.

This work draws on ABARES's farm survey program, specifically our broadacre farm survey, which collects a bunch of detailed information from farm businesses all around Australia every year. We incorporate all of that information into a statistical model that predicts farm outcomes conditional on climate conditions. For a particular farm in a given location, if it faces this temperature and this rainfall we can estimate what its production will be and what its profitability will be. That allows us to

run these scenarios looking back historically and to isolate the effects of variations in climate from all of the other things that are naturally affecting the profitability of farms, including variations in commodity prices and improvements in technology over time. We have presented results in that report.

Looking back historically, we compared the most recent 20-year period to the 50 years prior to that. It shows that at the national level there had been a decline in climate conditions that had had a negative effect on farms, holding all else constant. That was driven primarily by a fairly significant drop in winter season rainfall, mostly in south-east and south-western Australia. If you look at the Bureau of Meteorology's *State of the climate* report, they do a good job of summarising the trends in temperature and rainfall. There is a range of different things going on. Obviously, temperatures have been going up. Rainfall in the summer season has increased in parts of Australia, particularly north-western Australia. The most relevant one and the one that has had the biggest impact on agriculture has been the decline in the winter season rainfall in south-west and south-eastern Australia, which has had a significant effect on the cropping farms in those regions. To a large extent, those effects have been outside of Queensland. The most severely impacted areas have been more in New South Wales, Victoria and Western Australia in terms of that winter rainfall decline, but we have seen a bit of that impact also in southern Queensland in terms of reduction in winter rainfall.

We also presented some long-term projections. These are based on CSIRO climate change projections for rainfall and temperature. There are a wide range of scenarios in terms of the projections for different emissions pathways, or RCPs. For each of those emission scenarios you have a range of different global climate models, or GCMs, that give you different potential outcomes in terms of rainfall and temperature. We looked at the projections to 2050 and we contrasted those against what we had seen in the historical data—both the last 20 years and the 50 years prior to that.

Those results are summarised in the report. I will not go through them in detail other than to say that, as with most climate projection studies, you get quite a large range of possible outcomes because there is a lot of uncertainty in the future projections, particularly for rainfall. With temperature there is a reasonable level of agreement across the GCMs about where temperature will go for a given amount of future emissions, but there is a lot of disagreement about what is going to happen to rainfall in the long term, just because of the natural variability of rainfall and the difficulty these models have of projecting rainfall patterns in 2050. It is extremely hard, considering that we have trouble even projecting what rainfall patterns are going to be like in coming months.

In terms of characterising the results, you will see that they kind of bracket what has happened over the last 20 years. There are a lot of scenarios where rainfall and conditions for agriculture are actually better in the future projections than we have seen in the last 20 years. It is important to keep in mind that the last 20 years have been particularly dry, and drier than a lot of the future projections would suggest. There is uncertainty about the extent to which we have just been unlucky in the recent past versus to what extent the future projections might be overly optimistic. Basically, that is a big area of uncertainty.

When you are doing this kind of modelling, there are certain things you can measure and some things you cannot. We are looking at the impacts of future climate on current farms with current technology and current commodity prices, so we are not allowing for adaptation, which is obviously going to happen, and we are not allowing for future changes in productivity and technology. We are not allowing for changes in global commodity prices which may happen as a result of global climate change. Being a statistical model, we are also not accounting for CO<sub>2</sub> fertilisation effects—that is, the direct effects of higher CO<sub>2</sub> levels on crops in particular.

Really, you look at these results as a starting point. We call it an estimate of adaptation pressure. It shows you which farmers may be affected by the future climate and will need to adapt, but it does not tell you what the end outcome will be. It may be that in some of these instances there are simple adaptation options that farmers could adopt in order to mitigate those impacts, but the modelling stops short of predicting what those adaptations and changes might be.

The last thing I will flag—we can get into it more—is that where this analysis has been going recently is getting more into informing farmers and providing decision support. We are working with the CSIRO contributing to Climate Services for Agriculture, a program being run under the department of agriculture's Future Drought Fund. A lot of this type of modelling is feeding into those systems and trying to provide as detailed estimates as we can at higher resolution than we have done in the published reports you have seen so that you can give customised information about exposure to climate change risk and drought risk at particular locations that farmers might use that hopefully will help inform their decisions. That is part of that larger work program related to the Future Drought Fund. I can elaborate more on that, if people are interested.

**CHAIR:** Thank you very much, Dr Hughes.

**Mr Gooday:** To quickly follow on from Neal, I would make two points. In terms of the Queensland impacts from the work that has been done, there is a big difference between (audio missing) pathway in terms of the impact on the livestock industry. We are seeing quite big impacts when we go to RCP8.5—

**CHAIR:** Peter, you are breaking up and freezing. If you turn the video off, we may be able to hear.

**Mr Gooday:** To follow on from Neal, I have two quick points. In terms of the Queensland impacts from the work that has been done, (audio missing) there is a big difference between the emissions pathway in terms of the impact on the livestock industry. We are seeing quite big impacts when we go to RCP8.5 (audio missing)—

**CHAIR:** Sorry, Peter, you are breaking up a bit. Your machine is freezing occasionally. If you turn the video off, we may be able to hear.

**Mr Gooday:** In terms of the Queensland impacts, there is a difference between the lower emissions pathway and the livestock sector. That is through the higher temperatures rather than difference in rainfall. That is one thing to bear in mind. The other point I wanted to make was: the analysis we have done looks at what happens on average, if you like. Cyclones, long periods of above-average temperature or long heatwaves and things like that are the impacts that you are quite interested in, I imagine. To put our analysis in perspective, it is what we expect on average.

**CHAIR:** Peter, your line is still breaking up. We will text through to you some teleconference instructions and will come back to you in a moment. You may be able to come through a bit clearer then.

**Dr Hughes:** If I could jump in there, I am pretty sure I can paraphrase what Peter was trying to express, if that would help.

**CHAIR:** Yes.

**Dr Hughes:** Peter's first point was that, in the climate projection results that we sent through in that report, under the high-emissions scenarios at RCP8.5 you have some fairly large negative impacts on Queensland livestock farming areas that are being driven by temperature effects. Essentially, a lot of the results were done historically. It was the rainfall that had been the key thing driving the outcomes. Obviously under those high-emission scenarios we start pushing temperatures up quite significantly, and in parts of Northern Australia, which are already fairly hot and exposed to temperature extremes, that starts to have a negative impact.

The second thing I think Peter was going to say was that, as I mentioned, there are a bunch of things that we can model and some things that we have not. On the one hand the results may be overly pessimistic because we are not allowing for adaptation responses, but on the other hand they may be overly kind because there are extreme events that we are not factoring in. A lot of this analysis is looking at average temperature and average rainfall levels and how farms perform under those, but they do not factor in extreme events, particularly things like floods, storms or heat extremes that are a bit hard to factor in to the modelling. That can create a bit of a bias. You might look and say that the changes in average temperature and rainfall are modest and easily manageable, but underlying that could be an increased frequency of extreme events like floods. As we have just seen, they can have big negative impacts on agriculture, but by their nature they are much harder to predict and model.

**Mr HART:** Neal, what is RCP? Can you explain that to us and the difference in the two numbers?

**Dr Hughes:** RCP is 'representative concentration pathway'. These are abbreviations used by the IPCC to describe their different emission scenarios. They have moved on. We have just had the latest IPCC round of reports come out recently. They have switched over to a slightly different set of scenarios. The ones that we were using were from what was called CMIP5, which is the previous generation of climate modelling. The RCP refers to basically a future trajectory for emissions. They have different assumptions about what is going to happen in terms of global efforts to decarbonise and reduce emissions. With RCP8.5, you more or less have uncontrolled growth in emissions with virtually no mitigation; you just keep burning all the coal and fossil fuels, and emissions rise quite high. Then you have other various scenarios that have different levels of decarbonisation, lower emissions and therefore lower temperatures and less impacts on rainfall et cetera.

**CHAIR:** Jared, you have heard what we are talking about, but feel free to make some opening remarks.

**Dr Greenville:** I am happy to add to the conversation that has been going on and some of the other aspects which we will be able to talk to in more detail. There are also behavioural changes that changes in climate have created for Australian farmers. What we are seeing over time is that producers have had to focus, given the (inaudible) Neal was talking about on managing downside risk, as it is called—they are becoming better at managing downside risk but at the expense of being able to exploit the upside—emissions are better and so forth. So we get a shift in what (inaudible) outlook looks like across Australian farms as well. We have these direct impacts from climate change and shifts in climate that Neal and Peter have been talking about, but you also get a range of behavioural changes in response to the risk that change produces in the environment that they operate in.

The only other aspect that I wanted to touch on which I think would be of relevance to the committee really relates to what happens in the international sphere as well. Australia is very reliant on international markets. We estimate that across (inaudible) products that Australian agriculture produces that around 70 per cent of what we produce gets exported. It is not only the conditions in the international markets—that includes production conditions and other countries in competition—but also the policies they enact in response to climate change and climate pressures that will have a direct impact on the production outcomes within Australia because they (audio missing)—

**CHAIR:** Sorry, Jared, you have just dropped out.

**Dr Greenville:**—our main market dynamics. Oh, have I? In light of the changing dynamics in the international markets, what we have seen is really a combination of a shift away in response to the COVID pandemic and also some of the other aspects of a change in the geopolitical environment. A number of the subsidies and the like have started to increase. With instability and so forth as you go forward, these subsidies for agriculture production might (inaudible) outcomes on Australian farms to a greater extent as we go forward. We have done some work recently that has shown that if the world was to go a different path and started to reform some of the subsidies and other international distortions to markets, that could actually help reduce overall emissions from agriculture which would mitigate some of the risks that we are talking about and that Neal has described in his work, but it also has the potential for an increase in agricultural production within Australia as we position ourselves as a more productive, more efficient but also potentially lower emissions provider of food (inaudible). That would be (audio missing) dynamic that sits alongside (inaudible).

**CHAIR:** You were dropping out a bit there, Jared.

**Dr Greenville (Inaudible)** I am on the same network as Peter, so it could be the same problem.

**CHAIR:** You were talking about the international markets and the pressures or dynamics that affect that in this particular aspect. We will have some questions for you in a moment. We will go to James and ask if you have some introductory comments.

**Mr Fell:** Hopefully my audio works and you can hear me. Hopefully I do not cut out like Jared and Peter did. This ties in very well with what Dr Greenville was just talking about. It comes to the institutional arrangements that Australian farmers, and obviously Queensland farmers, operate under. Essentially we have with agriculture (audio missing) three pillars that are worth considering. Agriculture is an innately biologically emissions producing process. When you think about livestock (inaudible) be that in the forms of CO<sub>2</sub> or methane. We can think about this as having these three pillars. We have these three objectives of food security, reducing greenhouse gas emissions and then in other countries, when we tie in agricultural production, they are also tying in agricultural support, which we can think of as subsidies and tariffs. That is what I mean when I am talking about institutional arrangements—the factors that farmers are responding to. We approach this with this idea that there is a commitment to reduce greenhouse gas emissions, but we should consider all the avenues available.

The piece of work that we conducted—the research and the evidence base that we produced—essentially does answer the question: 'is it possible to reduce emissions to maintain or improve that food security and to maintain or improve economic development?' It supports, essentially, Australia's international advocacy efforts for that competitive environment that Australian farmers benefit from—that low-support environment that they benefit from. Basically, what we found is that the environment Australian farmers operate in does contribute. This low-subsidy, low-tariff environment does contribute to these favourable outcomes globally, and we can achieve more of that globally if other countries overseas that have these high subsidies and high tariffs reduce those.

I might wrap it up there rather than go into finer detail. It was a bit of work that just emphasised the multiple objectives coming from agriculture and how those multiple objectives can be achieved through our international advocacy efforts.

**CHAIR:** Thank you, James. Peter, are you on the line?

**Mr Gooday:** Yes, I am on the line. I can hear everything perfectly. Neal did a better job than I would have in explaining the two points I wanted to make.

**CHAIR:** I appreciate that. I mention that we also have Robbie Katter on the line from Mount Isa. I could see his ears prick up where we talked about the effect of temperature and what happens with rainfall up around his area, around the gulf. We will start with questions. Neal, one of the things we are finding really interesting is that we can start plotting temperature futures according to emission pathways, so we have that higher level of reliability—I would not say certainty—about what the future looks like according to temperatures. It is the impact of those temperatures at a local level—the rainfall and different weather events—that is unpredictable. Certainly with those emissions we can see different emission pathways and different temperature pathways; would that be correct?

**Dr Hughes:** Yes. I think it is an important thing to emphasise that the rainfall is less certain than the temperature. There is a lot of uncertainty over the temperature because we do not know what the emissions pathway will be in the future. For a given emissions pathway, scientifically the models are reasonably accurate, at least relative to rainfall, in terms of projecting what will happen with the temperature. We can see a very clear trend historically. We know exactly what has been happening to temperature over the last century, so there is really no debate about that. For rainfall, both the projections and even what we have seen historically are kind of open for debate. There is uncertainty about how much of the last dry 20 years we have had is caused by climate change and how much is bad luck, basically. These are difficult things to work out.

The other thing that is worth adding is that what that means for agriculture varies by sector. There are certain industries, particularly horticulture, where the temperature effects are kind of what matters, so they are already taking action based on the temperature trends. One of the most obvious cases is where we have seen migration of wine grape farms in parts of the mainland basically moving south and new wineries being set up in Tasmania. Areas that were previously too cold are now expected to become suitable for growing grapes, and areas that were previously good are now getting too hot. You are already kind of seeing adaptation in that space.

The New South Wales government have recently done a bunch of work doing various types of suitability mapping, and you might talk to those people. They have been looking at different crops and questioning whether we are going to be able to grow cherries in an area, because we know that the temperature changes might move the locations in which you can grow different things. For horticulture, you can do a lot of reasonably precise projections, like 'We are going to have to move this crop here.' However, for broadacre, which is much more driven by rainfall, it is a lot harder to make those kinds of calls at this point.

**CHAIR:** Peter, this is a question to you and it ties in with what Neal has talked about. In the short to medium term there is uncertainty, but in the longer term there is that acceptance and the policy direction is based on the increasing effects of greenhouse gases. Firstly, I will just confirm whether that is the case—that we are plotting for that long-term change. Tied to that, within the national sphere, is there a resistance to the science of climate change or the idea of climate change? Are we still seeing that?

**Mr Gooday:** To the second part of the question, we do not see any resistance to the science anymore in our trips around the country. We hold the Regional Outlook conferences across Australia and there has been good debate in all of those when the Bureau of Meteorology gets up and talks about what the future climate projections look like. More and more, I think it is the case that people are just accepting that this is the world we are living in and they are thinking about the best way to adapt to it.

There are still obviously questions about what investments to make at what times, given the climate that people are facing at the moment. It is not as though there are a set of investments that clearly make sense for every farm, given the uncertainty that surrounds what the future climate might look like. I think that is part of the role we are trying to play in terms of painting that picture about what the future might look like but also importantly making sure that people understand there is a fair bit of uncertainty around that. Neal has gone through a lot of that. That uncertainty is playing on the investment decisions that people are making at the moment. The time horizon that people have is not a 30-year time horizon when they are making an investment decision today; it is like five years or 10 years. That is the difficulty with all of this. I cannot remember the first part of the question.

**CHAIR:** That was the nub of the question.

**Mr Gooday:** I do not know if Jared, Neal or James want to jump in on that.

**Dr Greenville:** I think Peter covered that well in the sense of both the feel that we get from domestic stakeholders as we go around the country and the feedback we get from the publications and so forth we put out. You also asked about the international sphere and whether that is influencing government decisions, whether there is some reticence to the science or some scepticism. It is not something that we see at all. It is quite the contrary. I think the governments are acting more and more deliberately and consciously around the science, and that is extending to agriculture.

The thing they are trying to really wrestle with is aspects of the food (inaudible). James touched on it. It is a natural system which will have inherent emissions. Most long-term strategies, if they exist to net zero by 2050, do have agriculture as an emitting sector, so the question really is about how they manage and what role agriculture plays in that pathway, and they are beginning to talk about and look at emissions intensity related to trade and so forth. Countries in Europe are obviously much more advanced along that, but our neighbour in New Zealand is also taking active steps around that. That would be the dynamic that we see most prevalent internationally.

**CHAIR:** James, do you want to add anything on that?

**Mr Fell:** I think Dr Greenville summed it up quite well. There are a lot of initiatives that Australia is participating in, and pretty much all our trading partners are as well. There is all the work that Australia is doing in international forums—the World Trade Organization and the OECD just for starters—working to get these policy institutional arrangements set up so that there are fewer environmentally harmful (inaudible).

**Dr Hughes:** I could add some brief comments on that, if you do not mind. Backing up what Peter said, that is my experience as well. Even over probably the last 10 years that I have been attending conferences and talking about this, you are getting increasingly less resistance in terms of presenting climate change science. It kind of makes a lot of sense that you have a group of people in Australian farmers who are probably more aware of the climate trends than just about anyone in terms of being directly impacted by the higher temperatures and the changes in rainfall that they have seen.

There is actually some research out there in terms of comparing the level of confidence and belief that people have in climate change across different countries. It is showing that Australian farmers are quite high on that list in terms of people who are believing in climate change and trusting the science, relative to particularly the farmers in Europe and the US. That is despite the fact that the average Australian person does not show a higher level of trust in climate change science than global averages. To me, a lot of that kind of tells you that farmers have experienced it, they have seen the temperature increase and they have seen some pretty dramatic change in rainfall, so they are probably more understanding of what it means than the average person, for whom temperature or rainfall does not necessarily affect their livelihood.

**CHAIR:** You mentioned some research. We will send you an email to identify where that research is and we can get a copy of that.

**Mr McDONALD:** I appreciate you all being here today and the input you have already given us, particularly around the alternative measures you are considering in a broader economic sense. I am the member for Lockyer, which is an area that is very important for our fresh fruit and vegetables and other activities. I can tell you that there is a vast number in our community who do not believe in climate change. However, when I talk about climate variability, they have been dealing with floods and droughts for years so it takes out the argument of the science, and they all want to be resilient. With that background, I was heartened to hear Jared and James talk about some issues regarding being able to manage the up-front costs. It is obviously a business decision for the farmers to make, given the climatic conditions, to minimise any potential loss versus the risk and that whole economy, because if they are out of business there are no farms left. I am also interested in the tariff arrangements that have had a positive impact across a global scale. Could you expand on those two concepts for us?

**Dr Greenville:** I can start and Neal might be able to jump in in terms of some of the results he has found relating to farm management because of that drought risk and downside risk and how that has gone. It is true that, as we have moved into a drier but more variable climate sequence, producers in the broadacre sense in terms of cropping make decisions around plantings and the like which will give them a better outcome in a drier situation rather than if there is an (inaudible) to a wetter situation. A classic example there is around barley—that producers (inaudible) plant barley because it performs a bit better under a drier sequence and you will get a higher yield, rather than putting in wheat, which

might give you a higher return to your crop. Those kinds of investments and decisions become more pervasive as your climate becomes more variable over time. We observe a distribution of farming returns and profits, which is the key thing about what is coming back into rural communities and keeping those producers viable. That changes its shape over time. I do not know if Neal wants to jump in on that point.

**Dr Hughes:** Some of our research has looked at what we call drought risk or basically how much variation there is for a farm between a normal year and a (inaudible) drought. We do a lot of this work for the Future Drought Fund, because they are very interested in trying to improve drought resilience and to monitor the impacts of the Future Drought Fund to know whether they are actually having an effect. We found that particularly within cropping there have been a lot of technological improvements that actually reduce a farmer's exposure to drought years. They are essentially improving water use efficiency of crops—where they are able to maintain higher yields under dry conditions than they could in the past with all kinds of new management practices. They are finding ways to basically conserve and exploit the soil moisture that they are getting preceding the start of the season in order to make up for the fact that they are now getting less rainfall during the season.

We also found over the last 20 or 30 years that for the broadacre sector as a whole the exposure to drought risk has actually increased, largely because we have had an increased shift towards cropping. If you go back to the collapse of the wool price in the early nineties, after that period you had 10 years where we had a big shift—where a lot of mixed farms and sheep farms were doing more and more cropping and less sheep. On the whole, cropping is riskier than livestock. They are the two big things that came out of that.

**CHAIR:** Does anyone else want to add a comment on that?

**Dr Greenville:** Do you want me to go to the second part of the question?

**Mr McDONALD:** I think Jared and James were going to answer the tariff one.

**CHAIR:** Absolutely.

**Dr Greenville:** I will start with the tariff issue. As we have mentioned, the other element I guess in defining the returns to Australian producers really is our international environment. At the moment we are seeing a longer term trend towards the higher tariff space by Australian exporters. There has been some reduction in the level of distortions globally in agricultural markets as the agreement on agriculture that was issued came on line. It has come onto that and we saw reforms, particularly of the European subsidies but also of the US. That (inaudible) a lesser trading environment.

Australia is actively pursuing (inaudible) agenda and so forth. That has helped as well to reduce the tariffs that we have faced. Again, the caution to that is that in recent times—not with tariffs but particularly with (audio missing) subsidies have started to trend upwards. We also have some rules and different requirements around trade, which can often frustrate producers in their involvement in trade. Those things have started to shift the other way. James, did you want to add to that?

**Mr Fell:** Hopefully my audio does not cut out. It may have cut out before. I would add: Jared was talking about how since this big agreement in 1995 world tariffs and world agricultural subsidies have gone down. What we have seen in the last, say, five to 10 years is this kind of resurgence where the distorted value, you could call it, of agricultural production in a whole bunch of countries has started to increase. That is a sign that subsidies and tariffs are on their way up again. The OECD confirmed this in some of their data.

What does this mean? Essentially, we have taxpayers in other parts of the world who are potentially subsidising some emissions. That is what we really wanted to look into. We did look into that. Is it possible to carve up that kind of taxpayer and consumer cross-transfer to the producers—those essentially subsidies and tariffs? Is it possible to cut those and get this improved environmental outcome whilst also maintaining food security? The answer was, indeed, Australia's international advocacy in this area to cut these subsidies and tariffs is actually hopefully producing better environmental outcomes, lower emissions being one of those.

To address the tariffs specifically, most tariffs these days we see in developing countries for agriculture. The likes of India come to mind. The thing to remember is that—and this is all public information—other countries or regions of the world, like the EU, that maintain these domestic subsidies can essentially only do this (inaudible) but in a financially sustainable way from a government perspective by having these tariff walls. Otherwise, they will just keep paying more and more subsidies. They do have these tariffs there as well to financially sustain that. The two are linked. That is the point there. A reduction in agricultural support overall does contribute to those better environmental outcomes.



One of the papers, which I hope has been provided to you, is called *Emissions, agricultural support and food security*. That maps out where in the world this agricultural support is highest and where in the world those agricultural tariffs are highest. I could keep talking, but I will point this out: the four parts where agricultural support really affects agriculture (audio missing) cost of production is. What is produced (audio missing) things are tighter. Those are also factors—

**Mr McDONALD:** James, we just lost you when you said the first point. Could you start again, mate?

**Mr Fell:** In agricultural support, it affects these four points: what is produced, how much is produced, where it is produced and how it is produced. This goes to all these factors that also tie into emissions. I might leave it there.

**CHAIR:** We will go to Robbie next, who has been waiting patiently. Robbie, do you have any questions? You have had a look at all the briefing papers. I throw to you for any questions you might have.

**Mr KATTER:** I certainly do, and I will try to limit it to two main questions. I am told that when they open up the ROP plan for the Flinders River, one of the major river systems in Queensland, they have taken into account climate change. I picked up a bit of what you were saying in the papers, but I am still unsure why that will be predictable. To get to the point of my question, I think they have dialled it back from over six million megalitres a year. The average annual flow they have reassessed at 3.8 million megalitres a year. They do not even have flow meters where those floods are occurring at the moment. There are no flow meters below where all of that is happening, so I am not sure how they detect these massive events. There will be people making their decisions for agriculture based on this. We still do not have one storage system on the entire Flinders River to capture any of that water. We do not even have any farming because none of it ever got up and running because you cannot store any water in the gulf, on the Flinders. Decision-makers will be relying on your advice when they say that climate change is going to reduce. We have only taken seven per cent of the average annual flow at 3.8 million megalitres a year.

You give advice. The department of water will say, 'All of these departments, ABARES and CSIRO have given us advice'—and I would argue that they use it for their own political devices. How does that work? Do you ever come back into the mix and say, 'We didn't realise that our advice would be extrapolated and used in this way' or, 'That's not exactly how we intended our advice to be used'? I can see a scenario where they will just dial back the average annual flows or how much we can take out. Everyone else can take 20 or 30 per cent out of the system and we are still stuck on seven per cent and there is enormous resistance. Bear in mind, not one storage has been built under that and it has already gone out. I am hearing this advice and I have already been told that it could get worse when the new ROP plan comes out, but nothing has even happened on the Flinders. How do you approach my problem, given the advice that will come down? I do not want to anticipate what it will be too much, but I think we have a fair idea.

**CHAIR:** I do not know who would like to go first. Robbie is talking about the reliability of advice; is that right, Robbie?

**Mr KATTER:** Yes. If we are stuck in a debate two years down the track, where the input you have given is what has been relied upon under water policy, do you come back into the debate or are you engaged at any stage during that? While CSIRO or somebody says this is it for the next 10 years, that may not be what you intended in the message that you have given; it is just that they have conveniently extrapolated a bit of your advice. Do you ever get some protection or feedback to come back into the mix of when policy goes down to government?

**Dr Greenville:** I am happy to start and then Peter or James might jump in with an example. I do not believe we have done any work on the specific example that you have given of the Flinders. Saying that, on the southern Murray-Darling Basin water side of things, we certainly provide advice and generally we try to make it public, as an independent advisory body. The idea of making it publicly available is so that people can critique the way that it gets used later on as well. We have done a number of reports and so forth in water markets.

In this recent example, we do not stay out of things. It is not that we treat it once and then let it be. If we think the reforms are taking a path that is incongruent with some of the past advice, we will try to do a new set of research and body of work to help push the debate on further (inaudible)—

**Mr KATTER:** My other question is that it is interesting about tariffs and subsidies—

**Dr Greenville:**—so we do provide that advice.

**Mr KATTER:** I think you have answered that question adequately. Another thing intrigues me. You talk about the tariffs and subsidies. I was advocating for a reconstruction board or a development bank that could come in to assist grazing families under stress from drought conditions. If you break that down to an elemental basis, graziers who are stressed are going to stretch their country more and consume more of that vegetation matter on the place, which reduces carbon sequestration. Eighty-three per cent of Queensland is grazing country, so to me in many cases that could be completely counterintuitive given that message, because that would be classed as a subsidy.

I would say that a constructive way to achieve those goals you are talking about would be if in the grazing industry people were less stressed and did not have to flog their country in times of drought to try to keep the banks happy. Can you see where I am coming from? There could be counterintuitive efforts there if you are trying to have that one-dimensional approach to tariffs and subsidies by saying that we have to get (inaudible) make us less effective. I have given you an example where I think that could be counterintuitive. Have you considered that?

**Dr Greenville:** That is right. It is a good point. Part of Australia's particular mix is about that risk management side of things where we set up arrangements and so forth to help producers manage risk to avoid some of those perverse outcomes that you have just spoken about. When we talk about tariffs and subsidies, there is more nuance to that debate as well. We have not gone into details but (audio missing) broken down is to basically how that (audio missing). There are subsidies which they term most production distorting, and the ones that are really bad are things like subsidies for fertilisers or subsidies for production, where you are paying people to produce more. That just reinforces some of those negative outcomes like you describe. If you are getting paid to have more cattle on your property (audio missing)—

**CHAIR:** You are breaking up a bit there, Jared.

**Dr Greenville:**—and you are holding onto them as long as possible just to (audio missing)—

**CHAIR:** Jared, you are breaking up a bit there. Peter, do you have anything to add to that?

**Mr Gooday:** No, I do not have much to add, other than to clarify where Jared might have cut out there at the end. It was basically that some subsidies are less bad than others. Australia, for a long time, has not been into the really bad types of subsidies. We have been into the things that are classified as subsidies that do not have these big production effects and have the unintended consequences that were given in the example. There are things that governments can do that will help producers mitigate the risk. We would generally take the position that this should be something producers decide for themselves, but there are things that governments can do to help them make those decisions.

We have been at pains at other times to point out that sometimes, in trying to help producers, governments provide incentives that actually make things worse. The way in which you provide subsidies to move fodder around, for example in droughts, can mean that people keep stock for longer than they otherwise would, which leads to these sorts of effects. It is a pretty complicated set of policies, but I think you are on the right track of thinking about the unintended consequences of some of these things, because they are not easy to see sometimes.

**CHAIR:** We are running out of time. I am going to go to Jim, unless there is something else that you wanted to add, Robbie?

**Mr KATTER:** It is probably just a comment, but multi-peril insurance is another one that fits into that same category. I just wonder whether you considered that. I know that self-insuring in the industry can also lead to better habits.

**Dr Hughes:** ABARES does have an interest in drought insurance and has some ongoing research. We have been collaborating with the University of Southern Queensland, which is doing work for the Queensland government through the DCAP. That is something we have an interest in.

**CHAIR:** Certainly from what we have seen, we will look more into those insurance products as part of that adaptation and resilience.

**Mr MADDEN:** All of my questions are directed to Professor Hughes—and it is not just because you have the best wi-fi connection and we can hear you clearly! In your opening address it appeared that you were speaking to a paper you had written. I see that you have written a number of papers. Can you tell me the name of the paper you were mainly speaking to?

**Dr Hughes:** The main report I was speaking to is an ABARES report called *Climate change impacts and adaptation on Australian farms*.

**Mr MADDEN:** I thought it was that paper. People were telling me it was a different paper, but I thought it was that paper. I also note that you wrote a paper called 'Farms are adapting well to climate change'; is that correct?

**Dr Hughes:** Yes, it is a conversation article, which is like a summary.

**Mr MADDEN:** What year was that published?

**Dr Hughes:** That was 2021.

**Mr MADDEN:** I note that you say that farms are adapting well but there is work ahead. Can you summarise what you meant by 'the work ahead', because I do not have the paper?

**Dr Hughes:** That article is just like a plain language summary of the ABARES report. It was written for a wider audience. It just summarises all the same things that are in that report. When it says there is work ahead, it is just saying that some of the projections suggest that we could have hotter and drier conditions than we have had in the past 20 years which will mean there will need to be more adaptation. The good news story with all of this is that, even though we have had much hotter and drier conditions for a lot of Australian agriculture, farmers continue to be highly profitable and productive. We have just had some of the most record-breaking results in the last year. Clearly, things are still going pretty well despite that, because of adaptation, productivity improvements and new technologies. The point is that we have been doing well and we have been able to adapt to what has been thrown at us so far, but we cannot be certain that there will not be harder conditions ahead and we will have a lot of adaptation to do in the future.

**Mr MADDEN:** I agree. With the record wheat crops in Western Australia and the record crops of barley and wheat in the Western Downs in Queensland, it has been an absolutely extraordinary few years. As you say, we cannot count on that as being the norm. It could be a peak with a bad period in between. I notice that you use the term 'Professor'; are you still based at a university?

**Dr Hughes:** No. I did not correct you. I was being polite. I am actually not a professor. I am an adjunct associate professor at Deakin University, but that is not particularly important.

**Mr MADDEN:** That is an honorary title, isn't it, rather than an actual title?

**Dr Hughes:** That is right.

**Mr HART:** Going back to that report, is the report based purely on CO2 levels? Are they world CO2 levels or Australian CO2 levels? Is RCP4.5 reflective of net zero going forward?

**Dr Hughes:** My understanding of the CSIRO and the IPCC projections is that they are accounting for all greenhouse gases. They are projecting trajectories for CO2, for methane and for all the greenhouse gases and looking at their combined effect on rainfall and temperature. Is RCP4.5 net zero by 2050? Off the top of my head, I am not sure would be the honest answer to that. I would need to take that on notice. I am not sure whether Jared or anyone else has the exact answer to that. The basic point is that these are set by the IPCC and do not correspond to any particular policy promises made by governments. They are just hypothetical scenarios. If you look at, as I understand it, all of the global climate change policies and net-zero targets that governments have set, the commitments that we have seen so far are still small relative to what would be required under the more aggressive decarbonisation targets that the IPCC are predicting. Do you want to add to that, Jared?

**Dr Greenville:** That is right. Most of the RCPs have a net-zero timing, but it is not generally associated with 2050. It is further out. They are about peak levels of concentration and then falling over time.

**Mr HART:** On the graph 'total factor productivity', I would have thought that productivity would be linear and would either go up or down. What are the big dips there? Are they some sort of environmental impact—a flood or something like that?

**Dr Hughes:** I suspect that they would be the drought years. The standard productivity number that ABARES produces is very heavily affected by droughts because of the big drop in crop production. We have a separate series which tries to take out those drought effects, to smooth it out a bit.

**Mr HART:** Just going back to the accuracy of predictions, you were talking about having to move cherry farms in the future because weather will have changed. I assume you are talking about the fact that some governments have not yet implemented policy but maybe have announced it, so we are not sure what will happen over the next 50 years. How accurate are our predictions for next year or five years time?

**Dr Hughes:** That is a good question. When I was speaking about cherries, I was just referring to some work that New South Wales DPI have done recently. They have done a bunch of suitability mapping to try to estimate which areas will be suitable for which crops under different climate scenarios. Even for temperature, there is uncertainty there. It is worth pointing out that this has been provided as information for industry. It is not as though government is stepping in and saying, 'Well, we are going to pick up all cherry trees and move them.' It is putting the information out there and letting industry make its own calls. Because there is uncertainty, as Peter was saying, if you are making investment over a five- or 10-year horizon, like any investment, you have to take a bit of a risk with your decision and you want to make sure everyone has the information at hand.

**Mr HART:** It could be a real worry that people would not make a decision, because some of these predictions are detrimental to productivity or income in the future.

**Dr Hughes:** That is right. The fact that there is uncertainty kind of slows down the adaptation response. There are areas in Australia, particularly in south-eastern and south-western Australia, where you have had a really big reduction in rainfall. If farmers in those areas knew for certain that that was going to continue or worsen, I am sure they would be behaving differently than the situation now, where they are really not sure whether the next 10 years is going to be as bad or better. Even if the long-run trajectory is very much for dry, there is still a lot of natural variability around rainfall. We could be on a very hot and dry path and have suddenly a dramatically wet decade, just through natural variability. That obviously makes it hard to make those investment decisions.

**Mr HART:** What would it take for the modelling to become accurate? What would need to happen?

**Dr Hughes:** In terms of rainfall, there is a long way to go. This is a global effort. You probably need to be talking to the CSIRO and the Bureau of Meteorology when it comes to the climate modelling because it is not ABARES's area. We kind of take what we are given from those agencies, basically. There are some fundamental constraints on being able to project. I know that there is ongoing work at CSIRO about trying to improve weather forecasting on decadal time steps so that you can try to say that we are looking at a wetter or drier decade. This is leading edge research and there is a long way to go.

**Mr SMITH:** At the risk of playing favourites, I will go to Neal again because he is a senior economist. That is where my questions are leading. My questions are really based around the economic flow of the product and its value within the family home, at the dinner table, when we talk about crops in particular. Generally, if you get a low supply but there is a high demand you get a higher price. As we see particular yields start to drop because of the impacts of accelerated climate change, is there a foreseeable risk that the supply of any current crops could drop so far that their demand decreases to a point of minimal value? Could a crop be so at risk of being so little in supply that it actually loses its demand and therefore loses its value to the general consumer?

**Dr Hughes:** No, it does not seem like a likely scenario to me, at least in terms of the commodities that we model in our analysis and particularly when you have domestic and international trade in commodities. There is certainly potential for local shortages where a particular region or state may not have access to a particular commodity but, generally, those are able to be overcome through trade. In some cases we run into challenges internationally, if we have biosecurity constraints. For example, a few years ago we had the banana shortage and we did not want to import bananas for biosecurity reasons. That can be an issue. I do not think it is going to turn people off commodities.

It is probably more important to think about the price effects. Jared and James can jump in there. Firstly, on the domestic side, when we have severe drought years we tend to get spikes in the grain prices in Australia relative to world prices, because of the shortages and the demand for grain from livestock sectors and the limited ability to import grain. That has kind of led to a bit of a focus at the moment on on-farm storage of grain and increased storage in supply chain to kind of deal with those spikes that we are starting to see.

There is also this issue of what climate change could do to global commodity prices, which is a really difficult thing to predict. The IPCC has done some work and suggested that there is more upside risk than downside risk that climate change could reduce yields globally and lead to higher commodity prices, which to some extent would be good for farm businesses and bad for consumers. The error margins on those are very wide, because it depends on what happens not just to the future climate but to future productivity trends and the like. I am not sure if James or Jared want to jump in on that.

**Mr Fell:** I am happy to. If I have understood the question correctly, if the supply of a commodity was to disappear I imagine that would be caused, for example, by shifts in climate and shifts in climatic production zones. I am not aware of work that ABARES has done, but the path to go down

in answering that kind of question is to dig into some of that research. I am not sure who is doing it; others here may be able to tell me. I have seen mentions of it here and there. I do not recall it myself, but there are people out there mapping where production zones will shift over time under certain temperature or climate scenarios.

**Mr SMITH:** I am from Bundaberg, so obviously what we are producing out of the ground is very important to our region, as is how the rest of the community and the wider globe feels about the products we are producing. It has a social effect. As the acceleration of climate change continues—without a drop in supply so far—have any economic studies or modelling been done on how climate change in certain regions could affect the social habits of consumers? We just spoke about the banana shortage. Most people just said, ‘Prices are really high. We won’t buy bananas this season,’ but then we go back to normal. Will the changes in the climate and the availability of luxury items change the social factors or the relationship between people and their purchases? Has any modelling been done to 2030 or 2050 to help guide farmers into the future about what might be the best crop investments?

**Dr Greenville:** I am not sure that any work has been done particularly around climate induced behavioural changes like that. The work that we have seen has been on the other side—consumers adopting what some would argue are climate-friendly diets. No doubt you have seen a fair bit (audio missing)—

**Mr SMITH:** Can you repeat that? We lost you again.

**Dr Greenville:** Peter is on the line. He might know where I am going and can jump in if I drop out again. The research I was alluding to that I have seen is not about the changes in climate reducing supply and then habits; it is more about how diets influence emissions and, therefore, climate and sustainability and so forth.

**Dr Hughes:** I think Jared is referring to the idea of food labelling. There has been a bit of work around whether there will be demand from consumers to pay for carbon-neutral meat and environmentally friendly commodities generally. That could be a way to generate a premium for farmers.

**Mr McDONALD:** I have two questions. I will go to the second one first, because it flows on from Neal’s response. Has there been any work done on businesses promoting their green credentials to promote a market advantage where there has been no real impact or a positive impact from what they are doing?

**Dr Hughes:** I imagine that Jared, if his connection is working, is probably best placed to respond to that.

**Dr Greenville:** I will try to answer as briefly as possible. In terms of research, I do not think there have been any systematic studies of producers putting forward green attributes and whether or not they are remunerated for them. We do know that across industry there is an increasing thought that these attributes will be market preserving rather than value creating in all instances as we go forward. I guess we do see anecdotally products on supermarket shelves such as (audio missing)—

**CHAIR:** Sorry, you have broken up again there, Jared.

**Mr McDONALD:** I wonder, Chair, if some of these questions might be taken on notice.

**CHAIR:** We might send a few questions for you on that particular topic.

**Mr McDONALD:** The other question I have is around adaptive agricultural systems. How are farmers practically dealing with what they are confronted with at the moment regarding floods? I will give a case study of a forward-thinking farming business. They are planting a crop of broccolini using tea tape. They are harvesting that crop and using tea tape to grow sorghum, as both a cover crop and a mulch crop. They are harvesting the sorghum, taking the green growth of the sorghum and then ploughing that in as a mulch. In the Lockyer 10 years ago there were probably two per cent of farmers mulching. Now, almost without exception, they are mulching both for the nutrient value and for water retention value. Are agricultural adaptive systems like that something we can embrace and make the new norm to assist the whole issue?

**Dr Hughes:** I think the answer is yes, broadly. We know that all of these new practices have had a big effect so far, and I am sure there will be all kinds of new technologies and practices popping up in future. This is where there is a big emphasis on research and development spending. I know it is a big focus for the RDCs, Agricultural Innovation Australia and the Future Drought Fund to be putting money into researching those methods and the development and extension services to promote adoption.

**Mr McDONALD:** The system I was just explaining came about as a measure to create flood immunity—planting sorghum where a flood plain might happen. The floods of last year occurred and most of their topsoil was retained on that farm, so they will continue to do it.

**Mr MADDEN:** This is probably left field—I will direct the question to Dr Hughes because he has the best wi-fi connection. Within the community of researchers dealing with climate change, is the issue of carbon capture being examined in Australia? I ask the question because in Europe they have moved ahead to the point where they are putting carbon into former gas wells in the North Sea. They capture the carbon and put it into tanks and gas wells. Are we making any progress in research into carbon capture in Australia?

**Dr Hughes:** You might have to direct that question elsewhere; it is beyond the remit of ABARES.

**Mr MADDEN:** I thought so. My apologies. Like I said, it was left field. It was a general question about whether anyone is aware of any research in that area, because I am not aware of any research.

**Dr Hughes:** I think CSIRO might be. You might have to direct the question to them.

**Mr MADDEN:** Thank you very much, Dr Hughes.

**CHAIR:** Peter, we are seeing better planning and we are planning where we can for extreme weather. How confident are we in predicting those extreme weather events in terms of frequency over the medium to longer term?

**Mr Gooday:** The only thing people can say, really, is that they are expecting more of them. There is no certainty, obviously, around when they would occur, and I am not even sure that there is great quantification of how much more serious it would be. One of the main findings of the climate work is to expect more extreme events. To the extent that you can do things to mitigate against extreme events—in conjunction with the gradual adaptation work that Neal has just been talking about—there is some thinking to do about how to better cope with those extreme events. I think the jury is still out on how certain any of that is other than that the general consensus is to expect more of it.

**Dr Hughes:** Again, this is something that probably needs to be directed to the Bureau of Meteorology. They summarised this information in their State of the Climate report. They provide different types of information for different types of extreme events—so heatwaves and extreme rainfall and cyclones—and there are slightly different projections coming out of the models for each of those. There is a lot of uncertainty, but there is some information there. The BOM would be the best people to talk to about it.

**CHAIR:** Peter, are the tools in the Future Drought Fund being used well and as much as they could be? That is for the Drought and Climate Adaptation Program as well.

**Mr Gooday:** We have not really looked at that. The Productivity Commission are having a look at the Future Drought Fund at the moment. I think they are due to report before the end of the year, so they will be looking at all of those sorts of issues. We have not looked at that in any detail, unfortunately.

**CHAIR:** Okay. We will send a general email with some more specific questions that we may have. Obviously we do not want to take up too much more of your time, but that may be useful for us. How would that be?

**Dr Greenville:** That works for us. Given the connection, I think it is the least we can do.

**CHAIR:** Wonderful. Thank you very much. That concludes this briefing. Gentlemen, we appreciate you taking the time to speak with us as representatives of the Queensland parliament on this important issue. As I said, we may email some more questions to you. Thank you for participating today.

**The committee adjourned at 11.58 am.**