COMMONWEALTH OF AUSTRALIA

Official Committee Hansard

HOUSE OF REPRESENTATIVES

STANDING COMMITTEE ON SCIENCE AND INNOVATION

Reference: Coordination of the science to combat the nation's salinity problem

FRIDAY, 7 NOVEMBER 2003

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HOUSE OF REPRESENTATIVES

STANDING COMMITTEE ON SCIENCE AND INNOVATION

Friday, 7 November 2003

Members: Mr Nairn *(Chair)*, Ms Corcoran *(Deputy Chair)*, Mr Martyn Evans, Mr Forrest, Ms Grierson, Mr Hatton, Mr Lindsay, Mr Anthony Smith, Mr Ticehurst and Dr Washer

Members in attendance: Ms Corcoran, Mr Forrest, Mr Hatton, Mr Nairn and Mr Anthony Smith

Terms of reference for the inquiry:

To inquire into and report on:

The Commonwealth's role in managing and coordinating the application of the best science in relation to Australia's salinity programs.

In conducting its inquiry, the Committee will give particular consideration to the:

a) use of salinity science base and research data (including the development of new scientific, technical and engineering knowledge) in the management, coordination and implementation of salinity programs;

b) linkages between those conducting research and those implementing salinity solutions, including the coordination and dissemination of research and data across jurisdictions and agencies, and to all relevant decision makers (including catchment management bodies and land holders); and

c) adequacy of technical and scientific support in applying salinity management options.

WITNESSES

Committee met at 9.23 a.m.

TUNSTALL, Dr Brian Robert, Research Development Manager and Acting General Manager, Natural Resource Intelligence Pty Ltd

CHAIR—I am pleased to declare open this public hearing of the House of Representatives Standing Committee on Science and Innovation. This inquiry is into the coordination of science to combat the nation's salinity problem and it is the result of a request by the Minister for Science, Peter McGauran, to inquire into this issue. We have now received over 60 submissions and we have held a number of public hearings in Sydney, Wagga, Shepparton and, previously this week, in Canberra. Our focus is on managing and coordinating the application of the best science in relation to Australia's salinity problems. Today we are hearing from agencies and organisations whose work is at the centre of these issues. I welcome our first witness today, Dr Brian Tunstall, who is from Natural Resource Intelligence.

Although the committee does not require you to give evidence under oath, I should advise you that the hearing is a formal proceeding of the parliament. I remind all witnesses that the giving of false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. I also remind you that the committee prefers that all evidence be given in public. However, at any stage, you may request that your evidence be given in camera and the committee will then consider your request. We have received your submission, which is submission No. 32. It has been authorised for publication, so it is all on the public record, including exhibits Nos 23 and 24. Would you like to make some opening comments and then we will move to questions.

Dr Tunstall—I think it is probably useful if I give a potted history of where I have come from and who I am. I will then identify some of the key issues that I have raised. I did my PhD on water relations at Brigalow—there are a few remnants left—and I looked at the patterns of water use and plant response. One of the key issues there relative to this inquiry is that the salinity of the water in that system is one and a half times that of sea water. Basically a lot of natural systems have a lot of salt sitting in them. I encountered salt very early in the piece. I then went to work with CSIRO and looked at shrub encroachments in semi-arid grazing lands. That was about 100 kilometres to the south-east and was all in south-east Queensland. That work looked at the impact of tree killing and grazing on the native vegetation systems. I basically concluded that the encroachments were coming in because of desertification caused by grazing and in fact the soil compaction was decreasing infiltration of water and there was greater surface run-off.

Then, for devious reasons, I was placed on research in support of the management of Army training areas. I looked at a great range of land use impacts. You had the usual ones like clearing and fire, but you had unusual ones like bombs and tanks. Again, it was looking at the impact of land use and giving advice. One of the advantages of working for Defence was that it took us out of the immediate research focus, if you like. Defence actually manage their lands, so I was in a position where I could give advice on management and I could also see if the advice worked. I wrote management plans, environmental impact statements and reviewed them from others. There was a broad range of experience, including representing Defence at public hearings like at a commission of inquiry and other meetings. That experience with Defence made me aware that CSIRO was not well placed in terms of delivering benefits from the research. CSIRO is set up to do research but not to actually deliver the benefits.

I agreed with Rob Gourlay, who I believe has made a submission, to set up a company which was known as Environmental Research and Information Consortium—ERIC. The aim of that was really to promote regional development, to make sure that people had good access to good quality information, and to promote planning and land management. I joined ERIC about five years ago and then ERIC was sold about one year ago, and the remnants are now Natural Resource Intelligence. Natural Resource Intelligence is about providing information to help people improve their planning, land use and management. It is not just saying, 'Look, I have a product.' You have to provide a full suite of services to back that up and services that aid them. You have to develop methods that suit their particular requirements and give ongoing support. It is not just a product based company; it is based around services to improve land management. I think that is about the summary.

In relation to the research I did for Defence which was not just all application, the key aspects I think were the derivation of information on vegetation and soils using remote sensing—satellite imagery and geophysical data. If you like, they formed the core products that ERIC provided—the technology around which it was built. If you look at the flagship product which is still there—the soil map—it gives very good information on salinity. It helped identify the preferential pathways for the movement of salt. It also gives the information on soils that is needed to implement remediation. To my mind that is fairly crucial.

In terms of the key issues in the submission, the first one was the organisational structure. I must admit I am a bit fascinated by catchment management boards and how they have evolved. I wonder why they are there and what their role really is, especially when there are other organisational structures that have statutory responsibilities. They already have management systems in place and I cannot see any benefits from an environmental or social perspective.

Another key issue is the need to allow for deficiencies in knowledge. They are inevitable. It always happens. You never know everything about anything, so, even if you think your knowledge is good at the time, it is going to be improved down the track, hopefully. At the moment, I do not see that that allowance is being made. I see a very rigorous sort of framework that says, 'This is the cause of dryland salinity and this is how we're going to remediate it,' and as a scientist I do not really find that acceptable. It is certainly not going to allow us to move forward.

The other issue, which would have been brought to your attention by others, I would guess, is basically the dominance of public organisations in addressing broadscale land use issues in Australia. In my submission I have outlined that this is historic; this is the way Australia has evolved, but we have to continue to evolve—that is really what I am suggesting. The last point is that the evolution involved here is, in fact, the involvement of industry. There needs to be a delivery mechanism for the services. It is all very well to come up with the research and with products, but you have to have people to help the community apply those. There needs to be a service delivery function there and, logically, that service delivery would be provided by industry.

I can give the history of the research into salinity, if you like. There was an edict back in the mid-seventies in CSIRO that people who were working on water were no longer to work on water; they were to work on salinity. That was when I decided—when people came in to work on salinity who did not know about water—that it was time to get out. I went and did other

things. I got into remote sensing. But, back in business, I do not have an option. Rob Gourlay said, 'Look, there's money there. You've got to work on it.' That is when I bought back into the salinity issue.

If you analyse it, there has been a lot of technology. You would have had a lot of technology thrown at you. From my analysis, there is not a lot of scientific method going on, in terms of testing. Just how effective is it? What are we achieving? It is very hard to find out because it is not being evaluated. One of the benefits of industry I had was that, researchwise, I had an excellent year last year. I could not believe my luck. When I analysed why I made the gains I did, it was really because I am being exposed to a wide range of circumstances. I am meeting with a whole range of people who are raising all these different issues, and I find out: yes, I have the skills to address those. If you are in a cloistered environment where you are not exposed to it then that does not happen. So there is a benefit in moving some of the research, at least, into industry.

Mr FORREST—Who is this 'industry' you keep referring to?

Dr Tunstall—As I pointed out, it does not exist. Therein lies the issue. If you look at the environment industry, as I pointed out, people see it as waste disposal. That is where the money is at the moment. But if you look at agriculture, for example, there is a very large industry. Wesfarmers are doing very well. Elders are doing very well on extension services. There is a whole lot of them. If you go out to Harden, there are two local people who make their living out of providing technical advice to farmers about what crops to plant and what fertilisers to use. Over the last 20 years, the agriculture industry has developed a very good technical service provision. If you look at it historically, that was done previously by state agencies, but state agencies, rightfully, are moving out of that role.

CHAIR—Brian, you have been in the public sector and the pure research area and you are now in the private sector. Are you confident that the science that is being developed through that research area and in that public area is finding its way through to the people who are actually doing things on the ground?

Dr Tunstall—There are two issues there. One key issue is that I consider a lot of the research, or the results that have been promoted, to be either irrelevant or wrong. Even if you had good service delivery it would not help, because you would be trying to communicate the wrong information. The issue to me is: how do you get the testing of that information?

They are putting up ideas and suggestions, and one of the things I learned with Defence was that you might think it is a good idea and then you try it and it does not work, so you go back and look at where you went wrong and what you have to change to get that to work. So there needs to be this process of continuous feedback. The people doing that research need to get feedback on whether it is useful or not, not just say, 'Look, here is a project that is good for you, it is going to solve it, take it.' There has to be an intimate involvement whereby they get feedback.

Ms CORCORAN—Is that happening?

Dr Tunstall—I know a few individuals in the research environment specifically who do that in the agricultural area, but in terms of the general operation of these organisations, no, it does not, because they are not structured in a way to achieve it.

CHAIR—With respect to solving salinity problems, is the only proof there the dead trees that were planted five years ago that say that was wrong, they were the wrong tree in the wrong place or that was the wrong crop, that was the wrong perennial? Is that the only way? Part of this inquiry is to ensure that the right science is ultimately being used in some of those projects that are being funded fairly extensively by the taxpayer to overcome a particular problem.

Dr Tunstall—This is looking at the feedback. My broad scale view of that is that I have talked to very senior people in organisations and they have said, 'We have had 25 years of research; we will need another 25 years.' I am a bit horrified by that statement. Where is the professionalism there? So they are really all predicting dire consequences. That is a good way of raising money for research but it is not a good way of solving problems. In terms of monitoring outcomes, given the model they have put up, they are saying, 'It is going to take a long time to fix and therefore we cannot decide in the immediate future.' I know of any number of examples where farmers and some of my ex-colleagues in CSIRO have put in local ones and you get local remediation. There are examples where you can show you can remediate particular situations. But if you have a focus on it having to be on a landscape scale, it is self-defeating; you have decided you cannot do it.

This is a bit close to home for me because we put in a patent last year on a new technique which has been reviewed by the establishment, if you like, and in effect due process was not followed, which I knew would happen because it was completely radical. They say, 'You can't do it,' but we had no right of reply, no discussion with the people who were doing the review, so due process was not followed. At the moment do we know the process of how it works completely? No, we really do need to go in and find out what is going on. With this particular method, which is an extension of soil map, it appears as if we are picking up salinity directly using the gamma radiation signal. Technically that should not be possible, and for over a year I did not believe we were doing it, but it is the only explanation for what we are doing. If so, if the mechanism that we are proposing is right, then obviously this gives us a means of monitoring change over periods as short as one year. It also tells us how the systems are working better.

This is really what I am talking about in research, looking at the opportunities, not knocking it and saying, 'It's not from here and therefore it's not going to work.' It is a case of opening it up so that everybody can get involved and solve the problem. It is a closed shop at the moment. If you look at the recent public forum of the Australian Academy of Science and look at the speakers in that—

CHAIR—Did you attend that?

Dr Tunstall—No, I did not. I was actually sick on the day, but I looked at the speakers and I know what they were going to say anyway. They were all from public organisations and there was no-one from industry. They know what we are doing. They know we are going to say something that is a bit different, so we do not get invited.

Mr HATTON—I want to draw down a bit on where the science is wrong, because this is crucial. The committee is looking at the proper application of what we have learned. You are arguing that we do not have proper applications because we do not really know what we have learnt because that has not been tested. It seems to me that what you are suggesting is that the way in which they have scoped out what needs to be done has been done at the larger level—the landscape level—and the organisations have created a paradigm around the issue and, because they have a set of explanations based on their past experience and they may have gone a bit forward, they are asking all the wrong questions within that kind of framework. Are you suggesting that, because they have identified it as a broad landscape problem rather than picking up on the work that has been done recently to identify how the rivers run underneath and carry it in particular locations, you could go in and spot fix a lot of the problems without worrying about trying to fix the whole landscape because that is too hard?

Dr Tunstall—The key point—in fact, Rob Gourlay is the one who first pointed it out, and this was all said by ERIC a long time ago—is that there are in fact preferential pathways for movement of salt and water in the landscape. These were done with gamma radiation data looking at surficial flows. The ones you are talking about now are being done with airborne magnetics and are looking at deeper structures. One of my key concerns about the science is that, when they decreed that it was salt and not water, we got a new wave of scientists coming in and basically the focus was ground water and geological systems.

CHAIR—Hydrogeologists?

Dr Tunstall—That is it—hydrogeologists. Basically, they were stating that it was all due to deep subsurface flow—whereas, in fact, it is caused by dryland agriculture. It has to be caused by changes to that surface meter. The thing that is important in determining why it occurs and how to fix it relates to that surface meter and you really need to understand the hydrology of that surface meter before you start worrying about the other systems. If you look at those deeper systems, yes you can get landscape related effects going on but, even if they are landscape related, they are still localised because you have got preferential channels.

CHAIR—But isn't it both? With the deep channels, something can be happening on the surface but way down deep you can have a huge salt deposit which is actually finding its way into maybe a creek and you find that there is incredibly salty water running in a creek. Often people are looking at the surface and saying that that is because of all the problems farming wise when, in actual fact, down deep you have all this salt coming from this huge salt deposit, which is a potentially naturally forming thing, coming through into that creek. So the problem is down deep, and you have to deal with two different problems.

Dr Tunstall—I would express it slightly differently. I am agreeing with you, but the slight difference is that, if you have a large salt deposit anywhere, it accumulates because it is immobile. Sodium chloride is highly soluble, and that is why there is the strong link between water and salt. Sodium chloride dissociates in water and it just goes through as iron. You have to have very high salt levels before it precipitates out. Wherever the water goes salt goes. If in fact you get an accumulation of salt in the soil it is because you do not have water moving through it—the processes have built it up over time. If you have salt soils, they are there because it tends to be immobile.

We have seen systems that operate in the way that you are suggesting. We have it at Cootamundra and we pointed it out there. I think 15 per cent of the salinity in the stream comes from the three per cent of the catchment, but it is coming from an old marine sediment that happens to be high in salt. So it is not so much a salt store, if you like, as material that has a high concentration of salt. So focusing on a particular salt store is not necessarily going to help you—you still have to know the process of the movement. From a lot of the things that they have shown you see that there is a large body of salt sitting there, but you need to get the dates on it to see if it is moving. You will find in those situations that it is really very static and most of the salt is coming from elsewhere.

Mr HATTON—Some of the work using magnetic resonance and so on by CSIRO in Victoria, South Australia and so on seems to indicate that, if you look at the deeper flows, you see that there is an effect on the farmland from one side of a ridge to another. They have been able to identify whether or not there have been flows through, but they could not otherwise work out what was happening underneath.

Dr Tunstall—My situation with information or data is that I am a scientist and so I just love data-ready form. So I am not going to knock anyone who goes out and collects good information. The more information you have, the better the chances of coming up with a reasonable conclusion. Where things go askew, it is a bit like Mr Nairn indicated—it is not just that. The constraints differ so much between systems. The geology of these systems is particularly important. Really what we have been pushing for ages is preferential flows. Preferential flows, at the landscape scale, come about through geological structuring—fault lines, fractures or unconformities. Previously people were talking about this rising ground-water mound; we are going into this system saying, 'No, it is not; it's palaeodrainage, it's fractures. This is where your salt is moving. It is coming up against a barrier and accumulating.' So it is really about getting that information and helping you understand the system. It is looking at the system in toto and realising that in different systems, depending on the constraints, it can actually operate or function differently.

Mr HATTON—So how varied do the solutions have to be given the nature of what we are facing in different parts of Australia?

Dr Tunstall—They can be very different. At the moment we are mapping salinity across New South Wales for DPINR, the state agency. One of the things they are doing is bringing people from different sections to actually advise on how to map the salinity in different areas. In the Hunter Valley, it is all done on geology. It is a geological formation and it is the way that the salt has accumulated way back that determines where the salinity issues come from. The processes there are very different to, say, if you go down to the Mallee. The way the salt has risen in the Mallee is very different, and the structure of the system is very different.

Mr HATTON—So in a quick historical snapshot going back to when you first started, if the amounts of money available now to try to address the systems were applied then would they have been way out because we just did not know enough about what happens?

Dr Tunstall—I do not see the issue as money; I know others do. I would like money, and I would like to know how to get it in business, but I think every businessman would say that. It is really a question of the application of science: using the method appropriately. I have had any

number of occasions in CSIRO where people have said, 'Look, we haven't got it right yet; but if we do more of the same then we will get the solution.' You soon find out that doing more of the same never gives you the solution. If you have not got it right now then there is something that you are doing wrong and you had better look at what you are doing and how you are going about it.

Mr HATTON—Is part of the problem the fact that we do not have an independent or private arbiter—which possibly CSIRO should have been—and we need almost a scientific ginger group?

Dr Tunstall—There is a particular culture in science—and I was involved in it for 26 years. You could describe it as a club, and as largely a boys club. Scientists are pretty intellectual—they can pass exams—but they are also highly self-motivated. That self-motivation means that they will work and endeavour to promote their own position. So once a position is established, they work to maintain that position. The institutions take that attitude as well. One of my concerns with CSIRO is that its mandate was to promote science in Australia. The implementation of that was to get all the money they had to do the science—if it was not done by CSIRO then it sort of did not count. Their mandate, going way back, was to promote. My interpretation of 'promote' is that you link with others and do it collaboratively, you do not go and set up your own institution.

Ms CORCORAN—I have a couple of different questions, and I think you may have already answered my first one. You made an earlier comment about CSIRO being good at doing research but not good at promoting or providing information. Later on you said that there is not a lot of scientific testing going on. That, to me, is a bit of a contradiction.

Dr Tunstall—If you look at some of the things that have been done scientifically—say, the ground water modelling and exercises in that—basically it is an empirical correlation against outputs. They are just hoping that their models are right. They saying, 'Look, if I calibrate my model against that output then that model is going to be all right.'

Ms CORCORAN—'They' being CSIRO?

Dr Tunstall—It is not just CSIRO; this is the method that is being used by virtually everyone who is involved in the modelling. If you look at the overall structure or framework that they using, they have a few inputs there. They have this process based model or an empirical model in the middle; then they have the outputs. To make sure their model is working and is reasonably valid, they tailor the working part of the model to give the right answer.

Ms CORCORAN—Is that something peculiar to scientists in this area or scientists across the board?

Dr Tunstall—That is reasonably common, generally with people who think that prediction is the truth and that you can base it on the model. No, the model is just a simulation. It is only as good as the assumptions that you put into it.

Ms CORCORAN—This is a problem with scientists across the whole board, not just scientists in salinity research?

Dr Tunstall—To my mind there has been a movement away from fieldwork. Going way back, people wanted results and they did not want to pay for the fieldwork. Fieldwork is expensive, so if you want the results and you want to have something to present then you go to models. Computers are great, and you can produce results at a great rate of knots. The trouble is you really do not know how realistic they are unless you have the really good field observations. It is something that has developed over the years as part of the pressures and the structural constraints.

Mr HATTON—Would Ian Plimer agree with respect to climatology and climate change that the models are driving everything even though they think models are good? Is it similar?

Dr Tunstall—Modelling can be used in an analytical fashion. Some of the climate work is being done in an analytical fashion and that is where I really like it. In other words, you set it up, you test it, you keep it going and you have this feedback level of continuous improvement. The problem I had with the ground water one is the limit to the availability of information. That is why they are doing it: 'We don't really know the constraints on the system, so we've got to make this assumption or that assumption and all the information we have is a few outflows.'

The best example I have of this was a major project in CSIRO called the Representative Basins Program, which was designed to be able to predict the water resources of Australia. You have a few basins which you instrument properly, you set up models and that should allow you to predict the water resources of all other basins in Australia. It turned out that that failed after 20 years. CSIRO, the Bureau of Meteorology and everybody was involved in it. Peter Laut did a study that showed that the performance of the catchment was consistent, so you could set up an empirical statistical model to characterise that catchment, but the trouble is you could not take that information from that catchment and apply it to another one. This is really the issue that I am talking about with the salinity model and it is the same issue with the ground water modelling—you really have to test each case example on its merits.

Ms CORCORAN—You talked about the dominance of public organisations in this area being a problem. Do you want to expand on that?

Dr Tunstall—If you look at the models that they put up, they expect to be able to do the research and then tell people what needs doing. That is expected to be handed virtually straight to the farmers or the people on the land. They will be told: 'This is what you've got to do. It will work.' This inquiry is about the technology transfer and how you get it through. I can assure you that, even with the soil mapping technique, the biggest problem we have is that the form of information we present is completely different to what has previously been available. So the method itself is developed in a way that we can involve clients in the implementation so they get to understand the nature of the results and how you use it. There has to be a very strong educational feedback service link in there.

Ms CORCORAN—Is the issue that whoever is doing this work does not go to the coalface first—they sit somewhere else, do the work and go out with their results—and that we would be better off if they started at the coalface and worked back? Is that the real point rather than whether the people who are doing it are public servants or private industry? What is the real issue?

Dr Tunstall—Part of the issue is the interaction and the level of interaction that you can have with the client. In industry, you do not have any option—you had better interact with the client or you do not survive. There is the old publish or perish type attitude with the CSIRO. In a sense, who are they working for? Are they working for the scientific fraternity? That is the way that it is seen within the organisation—that their main reason for being there is to do science, which means publishing papers. I can assure you from my experience that the information in the papers you publish cannot be directly applied in land management.

This was my experience with Defence. I spent a lot of effort—to my detriment in terms of operating in CSIRO, as you might gather—working out delivery mechanisms so that I could hand this information across to the land managers for it to be applied to the land users. They talk about soldier proofing—working with Defence—as you hand it over. After that you just watch and see what happens. It is a very good testing ground.

Ms CORCORAN—To be applied more broadly.

Dr Tunstall—I would think so.

Ms CORCORAN—I am sorry to go backwards but I do not know very much about natural resources intelligence nor about ERIC, the precursor to this.

Dr Tunstall—It is a very little company. It is smaller now than it was a year or so ago. It has high ideals but—I must have an egalitarian streak—it really was about getting information out there and helping regional development. As you know, the rural areas of Australia need every bit of aid. We have put the line that there is information that really should be regarded as a basis for infrastructure. For these people to manage their land, they should have access to good, reliable soils information and vegetation information, because this is what decisions should be based on. At the moment, I can assure you that the soil information is not—it goes back to the organisations that developed it. Public organisations were there to support government. The early work for CSIRO was all regional; it was for the development of the north. It was all broadscale planning information which was not applicable to management.

If you are going to achieve anything in improvements in land management, the information that is developed has to be applicable to that purpose, which means it has to be much more detailed. The line given to me by state agencies, which is perfectly correct, is that their responsibility stops at the farm gate. They are not there to support the management of that particular property or that particular piece of land. They are there to get information for the government to make policy and decisions. Because of this historic role and because of where the funds have been going from and to, we have not developed the information that is really needed to support the people on the land.

Ms CORCORAN—In your experience, where do the people on the land go for information? What is their first step if they have woken up one morning and there is a salty paddock?

Dr Tunstall—It is like going anywhere; it is like dealing with councils: each one you go to is different.

Mr ANTHONY SMITH—That bad?

Dr Tunstall—We see councils as a major client; on the other hand, it is a challenge in itself. There are some progressive farmers who almost seek us out, if you like. There are a large number of people who say, 'We didn't need it before; why do we need it now?'

CHAIR—Don't they mainly go to their state agriculture office? They walk down the street and find the department of agriculture or whatever the equivalent is and walk in there and say—

Dr Tunstall—No, they do not, because the information is not relevant. If they seek information, it is through their local agricultural representative or farmer groups.

Ms CORCORAN—The agricultural representative is from where?

Dr Tunstall—They do have local consultants but the major firms are Elders and Wesfarmers.

Mr ANTHONY SMITH—I will be brief, because you have answered quite a few questions on some of the topics I am interested in. You have been making the broad point about the culture in the CSIRO and, for that matter, across the whole field, and I want to flesh that out a bit more. Is it the same or incrementally better than it was, say, five or 10 years ago, looking back on your experience? More to the point, how do we change it? If it stays the same or improves at the rate I think you are suggesting it might have improved, it will be 100 years before we get anywhere.

Dr Tunstall—No, it is not improving, and it is unlikely to improve. It has deteriorated and my prediction is that, unless there is a dramatic change, it will continue to do so.

Mr ANTHONY SMITH—Do you think we need some sort of structural gateway, almost—another linkage?

Dr Tunstall—I think we need to reconsider the way we go about doing research in Australia. I do not want to knock CSIRO. If I look at CSIRO, it is a soft target but it is also still doing some of the best work there is.

Mr ANTHONY SMITH—No, none of us want to do that.

Dr Tunstall—One of the things that did not help in CSIRO was this requirement to gain external funds.

CHAIR—We have changed that.

Dr Tunstall—Thank you very much. But of course that has had an impact; that has had an effect. One of the things was a lowering of the standards, because, in the last three years that I was there, there were no reviews of research. Normally, each year you would thrash it out and have discussions. I really loved the research discussions, but they disappeared because if anybody brought in money for a project then the project went ahead regardless of what it was like. There is a lot of research within that category now.

For people to survive, there are pressures put on them. It is interesting. People do not cope well with uncertainty. In science, everybody aspires to be a top scientist, if you like; that is the pinnacle. On the other hand, as soon as you get there, if you are doing fair dinkum research,

there is no guarantee of success and so you are vulnerable. There is a high level of uncertainty. So scientists automatically find ways of trying to reduce that level of uncertainty, and that means getting back to rote work.

I have thought this through, as you might gather, and I have got a great plan that involves looking at the entire gamut of research in Australia. Say in terms of research management, I perceive a need for a structural change whereby you manage the scientific part of it separately from the implementation. Look at what happened regarding my work for Defence. I started doing programs—they would say, 'Here's a program,' and you could work out what you wanted to do—and ended up doing tasks. Okay, the task came from me but it was still task related. You had to deliver against those particular tasks. If you look at the structure that you can set up, all the review should be done scientifically. There should be a good review of any work done scientifically. On the other hand, it should be implemented through a task based structure. So there is a need for a duality in management to address both requirements.

Mr FORREST—I can see why you do not get invited to the seminars and symposiums.

Dr Tunstall—I just love public meetings!

Mr FORREST—I was interested in your comments about the catchment management authorities, actually. I am with you on some of the other points you are making, but I am a bit confused about that one. I think there were about 55 catchment management authorities around the nation. Then the Commonwealth got involved with the national salinity action plan and coordinated some of these. A lot of good ones crossed state boundaries—like the Mallee; you mentioned that. I think there are five catchment management authorities in one big region. I think that is the way to do it. I hear your point about local government. In that region, you have 27 local government areas, with all their different parochial interests. Isn't there a need to have a regional strategy organisation, and then the detail might come down to your point with local government?

Dr Tunstall—I did make the comment in my submission that councils are too small, which is basically what you said. But there are regional organisations of councils. I have dealt with them. We have recently done a soil-mapping job out in the Mallee, and I did an exercise back there on Sunset and Big Desert lands in the late seventies, so I am reasonably familiar with the Mallee. I must admit that the people on the catchment management board there were delightful to deal with.

Mr FORREST—The Wimmera and the Mallee ones are excellent.

Dr Tunstall—Certainly some of them have made progress, and I do like the community involvement. But I still look at the structure and say, 'You are putting up another bureaucratic structure—to what effect?' especially when they are not elected by the community. I know that in some areas they are democratic and they know how to run it. In other areas, people come in and the agencies dominate it and run it and so it is really a de facto agency body.

Ms CORCORAN—Which agency?

Dr Tunstall—State agencies. State agencies put in money. In Victoria, say, these catchment management boards are legislated for. I am not sure what New South Wales is going to do. Not surprisingly, the states take an active role in these because they put in money. But some of our experiences have not been good in terms of state agencies because, when they come in, they want to channel money towards their own sources. It is state money. They want to recycle it back to themselves. Again, there is no role for industry. This is really the concern that I have. We were delighted to win that tender for the Mallee but, to be quite honest, there are very few tenders for which we can ever put in for the work that goes into these catchment management boards. They just do not come out.

CHAIR—Where or how are they getting their work done then?

Dr Tunstall—A lot of it is being done—or previously it has been done—by state agencies or local groups. It has improved. Given the bigger structure, that has certainly improved it in terms of being able to get tenders to come out so that there can be an open and competitive system. One of the difficulties that we face if you look at putting in for research funds or any of these things is that often they like to leverage funds: 'I will give you this much money, and you can put in all these services for free.' Industry cannot operate on that basis—you die. So basically industry is automatically excluded from a great range of activities.

Mr FORREST—On another point related to what you are saying about the club and the cultures, I really get disappointed sometimes when some innovative ideas are developed right at the coalface, usually by farmers, and because they do not have PhDs the club says, 'How could you possibly dream up a solution that works?' They keep doing it because they get commercial outcomes. So it gets dismissed because it is too far outside the box.

Dr Tunstall—That is my concern. That is why I like interacting with the users, because that is the feedback I need to improve my performance. That is where I make my gains in research—by working on the observations. With the soil mapping we do, the best test is how the farmers relate to it. They know if it relates to what they have on their property or not. I can do statistical tests, but they are limited in what they can do. I do have an example of that—you might have heard about it. There are a few water conditioning systems that can give local improvements. Use saline water for irrigation and you do not get the degradation of soil. In fact, it seems to leach the soil out too much when you apply these treatments. I think I have worked out the underlying fundamental mechanism behind it. I can show that there is a physical change to the water when it goes through these treatments, but they are regarded as black magic by the scientific fraternity. I would dearly love to get in there and show what the underlying mechanism is in terms of the change that these treatment systems bring to the water that allow you to get those improvements, but, again, given the way the system is structured you cannot even get the funds to do the research, and we do not have the money to fund it ourselves.

Mr FORREST—I will give you a classic example of this. We have a major problem with the interaction of flood with salinity and all of that. I have a farming family of three generations, the eldest member of which is 93. The scientists came up with their computer model about different interactions, and the 93-year-old, who had memory recall, said, 'That is wrong.' There was no process to somehow integrate his memory and knowledge.

Mr ANTHONY SMITH—He had actually been there.

Mr FORREST—He has seen it, and it does not happen like that. He said, 'This is what will happen,' but the scientists said, 'Sorry, you are wrong.' A 93-year-old who has seen so many floods is wrong!

Dr Tunstall—This is what I mean about the testing of what you do. If you look at the scientific method, it is based on testing: you make a hypothesis and you test it. At the moment they are avoiding that. They are making a hypothesis, they predict a model and there it is—that is taken as reality. And that testing has to come in. As I indicated, the best testing is out there in the field and it is using the local knowledge that does exist out there.

Mr HATTON—To follow up on that, because there is not enough knowledge, you are almost suggesting there is a Pythagorean or Platonic approach within the scientific community versus an Aristotelian one where you actually go out and test it and see if it is working in the real world—because there have always been those two castes of mind. But that is a fundamental problem. I link that, if that is correct, back to your observations about CSIRO and ask you—following Tony's question in regard to that—whether there has been a change in this with the development of the CRCs, and particularly the CRC for Freshwater Ecology under Professor Cullen. What sort of a model do you think they are following?

Dr Tunstall—I cannot comment on any particular CRC; I have stopped watching them. Basically, the good things that came out of the CRCs that I did watch were already being done. I was fortunate enough to have a Swedish gentleman, who was a visiting fellow on innovation at the ANU, question me about innovation. We addressed CRCs and he said what they are really about is getting interaction between the different parties to improve the quality of the research. I said that that does not happen and he said, 'Yes, they are program based rather than task based.' So basically you are just taking programs from different areas and coming through with them. The same was going on before but in a different guise. There could be some that are not like that but the ones that I have seen have increased the bureaucracy without changing things.

Mr HATTON—So in terms of the thinking you have done about the new research regime, are there any developed models elsewhere in the world where it works better—or as well as you might like—and is that linked to the task based activity that a lot of the technology parks adopt where there is a better interface between science, the institutions and industry?

Dr Tunstall—My problem with that is that I am a scientist and I like to work in absolutes not in comparatives because that is how I think you make progress. My forte is analysis of complex systems. That is what I enjoy doing. So I just looked at the organisational structures in Australia and what has been going on. Yes, I have used some of the elements from overseas and some of the experience—you can never reinvent the wheel—and there are papers out that ask: how many large organisations have been successful in getting innovation back in? Unfortunately, the answer is: none. The history of success in changing these things has not been good. Some of the better examples come from industry. We might think CSIRO is big but the research there is less than in Xerox, for example. So large organisations with very large research groups have faced this. That model that I put up before, of the duality of management, has been successfully applied in the pharmaceutical industry. In terms of the overall structural arrangement, Australia has a tradition—we are Australians; we are different from elsewhere. We have this large land with few people; the constraints are different. In the US it is application en masse. They do it with their defence and they do it in their research: they say, 'We need that.' The response is,

'What do you need by way of resources?' We do not have that level of resources so we have to be cunning about how we do it. The structure we set up has to take those constraints into account, so it will inevitably be different to anywhere else.

Mr HATTON—So you are arguing, in the implementation part, that we effectively need knowledge brokers to understand the separate scientific approach which should be taken in the proper way and someone to interface with the people who are the users of the information. Part of the problem we have now is that any knowledge brokers working in that way would not have the right basis to be starting on. We may have the problem that our farmers, in particular, could be in as difficult a situation as they have been in in the past because the problems have not been identified properly. So the application of that misidentification could make things worse.

Dr Tunstall—It has not helped the improvement. My concern is that the credibility of science is what has made it worse. Where results do not accord with their experience, farmers obviously disregard them. We get some work—we get some benefit out of it—because farmers do not believe what they are being told by others and they get us in to map out what is going on by way of vegetation or soils.

Mr HATTON—And they have been told repeatedly that, because they have substituted deep-rooted vegetation with shallow-rooted vegetation, they are the ones who have caused the problems with the increasing impacts on the ground water. Can you explain to me the differences in approach that you have adopted? Most of what you read follows the argument that the watertable has changed and the salts are being brought up as a result of that. What is the difference between that common explanation and the preferential flows that you are suggesting?

Dr Tunstall—In fact, the preferential flows explanation is really just a means of mediation. That is how it is expressed. The actual cause that I propose is degradation of the soil structure, basically due to a loss of organic matter. I have developed a new technique. It is a completely new physical property. It lets me look at the ability of the soil to hold water—to bind water—very easily and very simply. I have just done a few observations to date. As you might gather, in business I have limited time and money that I can spend on this, but I can show quite happily that, if you take completely intact native vegetation—which is my love—and compare it with an adjacent cleared paddock, you will see that the soil is completely compacted in the cleared paddock and it is really friable in the intact one. Basically the ability of the soil to hold water in the intact one is much higher than in the other, which is compacted—if you get heavy rain, it will run off. So the main impact of this agriculture has actually been increased surface run-off.

In some systems, there has actually been decreased infiltration into the soil, not increased as they are proposing. It depends on the soil; with some of them you do get increased filtration. Again, the constraints vary. If you look at the mechanism involved—and this goes back to some very good work done in CSIRO back in the early seventies—as somebody pointed out, this is preferential in these catchments to looking at salt. The concentration of salt in the water going through the soil is not the same as the concentration of salt in the soil. In other words, it is going through preferential pathways. Really you are changing the balance in the system. To my mind, in most systems you are getting this compacted layout, with decreased infiltration but increased lateral flow, and it is seeping out further down the slope. It is picking up more salt as it goes, because you have lost this structure that gives you the preferential flow. So it is a completely different mechanism, but it means it can be remediated, because basically, to my mind, salinity is

a symptom of land degradation, not the cause. It is something that has come about. So we need to address the cause, which is the structure of the soil.

Mr HATTON—Do you have a paper specifically on that?

Dr Tunstall—Yes. One of the papers I submitted on that scenario for dryland salinity outlines that.

CHAIR—Can I, in finishing, ask you about access to data and the cost of data? What are your experiences working in the private sector and doing soil mapping and various things in councils and other organisations, and do you have any particular comments about that?

Dr Tunstall—Your committee did very well, thank you.

CHAIR—The previous committee?

Dr Tunstall—That is right. Access to data has improved dramatically. It has not resolved all issues, but you never expect that.

CHAIR—That is access to federal data?

Dr Tunstall—Yes. The states are starting to follow suit. As I said, it is not resolved completely, but—

Mr FORREST—You do not have to purchase that, do you, like you do with the Bureau of Meteorology? Do you have to buy basic data?

Dr Tunstall—It depends. We are value adders to data, if you like. We take broad geophysical data, satellite imagery and things like that and develop information from them, but we also, to meet the needs of clients, need access to existing information like cadastre. The costs of those things were prohibitive. A lot of those costs have not gone completely, but they are reduced, which makes it possible for us to do things. There are still issues in terms of data quality. This DPINR study that we are doing is delightful in the sense that we are being paid to produce consistent data sets across the entire part of New South Wales. For the first time, for a number of these data sets, people will be able to access consistent information state wide. There are more issues to be addressed in terms of consistency and quality, but it has been dramatically improved.

Mr HATTON—To follow up on that, we heard just the other day that there was a major problem in inconsistency between the states in terms of how they put the data sets together, and the fact that you cannot, Commonwealth wide, integrate any of that because it is like the railway system that used to operate or any of the other disjunctions that there have been in the past.

Dr Tunstall—With natural resource information that applies with any states. What we are doing at the moment is really unusual, if you like. Getting data sets that we know are consistent and comparable across the whole state takes a bit of work and costs money but it really is well worth while. When it comes to vegetation descriptions—I have had the advantage of working in all states of Australia, I am a vegetation person—I have just got to know the way that the

different people describe their vegetation. I can translate between them but I must admit there are not too many who can.

Mr HATTON—But if you have different language systems operating does not that make it more difficult? If we had the same situation operating in the geological area in terms of mineral exploration and the rest, if people are not talking the same language it creates a barrier.

Dr Tunstall—I have two answers to that one. I hate standards. They are a bit like records: they are made to be broken. As soon as you set a standard, it is obsolete. They are too constraining. On the other hand, it is worth while for a lot of these things to have what you might call minimum standards. If we want to make things comparable then this is the sort of information you need. Having looked at past experience in this going back over 30 years—it is an interesting exercise to do this—where I have run into trouble, say with our soil map technology, that is when I have said, 'I do not want soil types according to the Australian soil classification,' which is taken to be the standard, because that just tells you it is a podsol or red earth or whatever. What I want to know are the physical properties—what is its pH, what is its texture, what is its depth? That is what we need for modelling. So it is the nature of the information as well as how you would describe it by way of standards.

CHAIR—This is seen to be a constant problem. I remember when we were first writing digital data and there was an Australian standard—

Dr Tunstall—AS2482.

CHAIR—That is right. We had AS2482 for the local road authority and we had AS2482 for the local lands department because they all interpreted the data in a different way, so we just had a different converter for each client.

Dr Tunstall—That is right. The thing is that it was so cumbersome that virtually no-one used it anyway.

CHAIR—Are you saying that has not really changed?

Dr Tunstall—AS2482 has sort of gone out the window.

CHAIR—What about the later standards?

Dr Tunstall—In terms of standards, fortunately what has happened with most of the spatial information is that there are a number of commercial systems that are mainly used and so the data interchange has really been via these commercial systems. The only bugbear with that is that one of these major developers has managed to get their system as a US standard, which Defence has taken as a standard. Again, I suggest that that is not very productive. Open systems are what are required.

Mr HATTON—The electromagnetic sensing work and so on that is being done in the minerals area by either companies—when that is finally released—or state or Commonwealth entities, is that useful at all? Does that feed in, in terms of salinity management or, given the nature of the way you have typified it, is it not so useful?

Dr Tunstall—I have developed that soil mapping technique. It is one of these funny ones. I was thinking about soils and what was required, I am interested in what controls the distribution of native vegetation, so I needed good information on soils. I knew it did not exist. I eventually worked out that the reason we did not have the information was because we were not paying sufficient attention to geology—to the parent material. It just so happened that I had a new offsider who was a geophysicist and I explained the problem to him. He said, 'Why don't you use airborne radiometrics?' I said, 'Why not, but what are they?' I had never heard about them, but it turned out it was precisely what I was looking for. I knew how to analyse and do everything once I saw the data, and so we are using this airborne geophysical data to actually map soils. When it comes to EM or the magnetics, I am more circumspect on that because the radiometrics are multidimensional. You have a lot of information there. Magnetics is one-dimensional. There is very little information whereas a number of factors affect it. So again, it depends on the system. I saw a block of data I had to comment on—ground EM data—ostensibly to map soils. I looked at the satellite imagery which should map the patterns of water very well. At low levels of conductivity, that is what you are doing in a clay soil. You have at least three factors affecting the EM signal and you only have one dimension to analyse it with.

Mr HATTON—But the other techniques have been very useful and the fact that they are—

Dr Tunstall—The gamma radiation data I think is superb and I would love to be doing more research on it but as I said the salinity map comes from that but basically we have been blocked. I can give you an example. We are working with the Earth Resources Foundation at Sydney University and we put in for an ARC grant, which we had to subsidise 50 per cent to have a student work on it. One review said, 'We have knocked these people over the head enough, let's give them a go.' The other review just panned all the individuals and was directed specifically against the individuals as if to say, 'We are not having you in our territory.' There is a culture there that has to be broken somehow.

Mr FORREST—Full of preferential flows!

CHAIR—Thank you for your contribution this morning. It was very useful.

Proceedings suspended from 10.25 a.m. to 10.35 a.m.

CAMPBELL, Mr Andrew, Executive Director, Land and Water Australia

CHAIR—Welcome, Mr Campbell. As you were here the other day in another capacity, I will not reread the legalities on giving evidence; those comments still apply. We have Land and Water Australia's submission, No. 59, which has been authorised for publication, so it is on the record. Would you like to make some opening comments before we go to questions?

Mr Campbell—Thank you very much, Mr Chairman, and members of the committee for the opportunity to appear before you. Firstly, I apologise for our chair, Bobbie Brazil, who is otherwise occupied up on the Darling Downs this morning and cannot be here. This submission is on behalf of the board and management of the corporation. The essence of our submission is summarised in the conclusion on page 5. I will talk to that very briefly, and then I will be happy to answer any questions that the committee may have.

Firstly, the premise that this inquiry seems to be founded on—that there is room for improvement in the coordination of science to combat salinity in Australia—is well founded. We certainly do need to improve the coordination of science and research activity to address salinity. That is not because there is a lack of activity but because there has been such a huge increase of activity in recent years and the number of players has increased enormously. However, we do not think that we are starting from a standing start in this regard. We do have some excellent measures and mechanisms that are in place that could be enhanced. The last thing we need in an already crowded sector is to create another institution to try to deal with an issue such as this. We need to look at the existing institutions and how they can work better together.

I just caution the committee in its deliberations to keep in mind that, if you focus too exclusively on salinity, you might find yourselves dealing to a large degree with symptoms rather than causes. Salinity is really a symptom of inappropriate land use and management. We need to make sure that our research activity is focused on improving land use and management, not just on trying to fix up salt scalds or we will be fixing up salt scalds, or not fixing them up, forever.

The fundamental challenge is for us to develop land use systems that, in effect, do not leak and that work in Australia's extremely variable climate. Happily, those farming systems are likely to make us more money, and that is why Land and Water Australia have been working so hard with our sister R&D corporations to get industry much more involved in salinity research, because we believe that is where the answers lie. I am delighted to see that you have the Grains R&D Corporation appearing before you also today. Our relationship with grains, meat, wool and, increasingly, other industries, even with respect to salinity, is tremendously promising. One of the areas in which we can improve our coordination is to find better ways of enabling industry to plug into the work that is happening and to influence that work.

Finally, and by way of introduction, Land and Water Australia initiated the National Dryland Salinity Program, has been the major investor in that program for more than 10 years and has managed that program for 10 years. So we believe we are very well positioned across all the agencies in Australia to know what is going on and who is doing what and identify where the gaps are, identify where the areas of overlap are and identify measures to try to improve the

situation. In recognition that we have been in this area for 10 years, our board has decided that it does not want us to continue to be the major funder of this area of research. It believes that it should now be much a more mainstream area of research that is picked up by the bigger research funding bodies in Australia. We are very happy to continue playing a coordination role and a networking and a brokering role, but we think that we should be directing our limited resources to the next salinity issue, so we should be looking around for those issues that might be coming up over the horizon and affecting us in the future, much as salinity was in 1993 when we started investing in this area. We are very keen to continue to be involved and we believe we have something to offer, but I would want to distinguish between that role of coordination and the role of being a major funder of salinity research.

CHAIR—Thank you, Andrew. Is the budget of Land and Water Australia totally funded within AFFA?

Mr Campbell—Yes. Our core appropriation of something just under $12 million is a line in the Agriculture portfolio budget. However, this year we are budgeting to invest just under $30 million. That is achieved predominantly through our partnerships with industry. We have more than 40 co-investing partners across our whole portfolio. More than half the money we spend is, in effect, other agencies' funds and we are managing their research moneys on their behalf.

CHAIR—So most of those are R&D corporations and the like?

Mr Campbell—Yes, R&D corporations. In irrigation it is rural water authorities and in climate we hope to be tapping into urban water authorities. We are also commissioned by Australian government agencies to manage research on their behalf over and above our core appropriation.

CHAIR—So Environment Australia?

Mr Campbell—Yes. Environment is the main other one. The biggest one is the Agriculture portfolio but after that it is environment. We have some dealings with the Department of Transport and Regional Services as well.

CHAIR—Is there any private money going directly into Land and Water Australia?

Mr Campbell—We have private philanthropic partners. In effect, some of the corporatised bodies in the irrigation sector would see their money as coming from growers, as do some of our sister R&D corporations.

CHAIR—The R&D corporations' moneys come from levy payers as well as government.

Mr Campbell—Yes, with the exception of Land and Water Australia. Importantly, we are predominantly operating in the public-good area of research activity and the reason that industries are getting involved with us is to tackle those issues, across farm boundaries and commodity boundaries, that are generic across a number of commodities such as irrigation, climate and salinity. They are not things that you can pin on any particular commodity.

CHAIR—Do you have any indirect involvement in any of the CRCs?

Mr Campbell—Until recently the board's policy had consistently been that we were not a core partner in CRCs. But we were instrumental in the establishment of the CRC for Plant Based Management of Dryland Salinity. We funded the bid, we facilitated the bid and we did likewise for the irrigation futures CRC. In both those instances we did so because in the longer run we would prefer that others take up the running in funding that research. For us, building capacity and getting better coordination through the establishment of a CRC is a very good legacy and enables the corporation to allocate our very modest core appropriation to the areas that the mainstream is not picking up. Our appropriation has been pretty static. In fact, it has just grown with CPI since 1990.

CHAIR—How much of the $30 million that you are investing in 2003-04 is going into the NDSP?

Mr Campbell—A fairly modest amount. From memory we are contributing $420,000 to this enhanced communication year of the NDSP.

CHAIR—I thought that they said the other day that there are other investors in that program. But I thought Land and Water Australia were the biggest investors.

Mr Campbell—We have been historically. I think we still are because this final year is a very modest year of funding.

Ms CORCORAN—It is $400,000 this year but what would it have been in previous years?

Mr Campbell—It would have been over $1 million a year. I think the total budget this year is still only $750,000 or $800,000. I could stand corrected on that; I am happy to chase it up separately.

CHAIR—There is nothing for 2004-05?

Mr Campbell—No, as it stands it will close its doors on 30 June 2004. The board has made it clear that we are prepared to continue investing in the NDSP at a limited level in a coordination role but not as a major research investor. Now that we have a CRC, now that we have a national action plan, now that we have industries significantly engaged in funding this sort of work, we should be moving on into those areas that people are not directing their moneys to. Our corporation sees itself as being set up to fund the things that are not being picked up by the big players.

Ms CORCORAN—You talk about moving away from your current research into other research not being picked up yet. Do you have an idea of what sort of research that will be? How do you identify the areas of research that you might need to move into?

Mr Campbell—I will start with our process for identifying priorities and I can tell you the issues that have emerged out of that process in recent times. We start with the management of the corporation identifying the range of issues in natural resource management. About 18 months ago we came up with a list of 72 emerging and potential issues in natural resource management. We think it was a reasonably comprehensive list.

Ms CORCORAN—Are you able to give us an idea of some of those?

Mr Campbell—I am happy to provide you with the list. There is everything from genomics, nanotechnology and endocrine disrupting chemicals in the water system through to a range of biodiversity issues and so on.

Ms CORCORAN—Where do those ideas come from?

Mr Campbell—Out of the heads of the professional staff that we employ. We do review what other countries are doing. We do look at the literature, obviously. As science funders we are in contact with the research community and we talk about the issues that are coming up. We whittled those down to about 60 issues that we thought were the more likely and prospective and consistent with our mandate. We prepared some short issue sheets on those. The management team culled those down to about 24 issues, again against our strategic plan and our mandate and our knowledge of what other organisations are doing.

We then put each of those out to two or three nominated experts across Australia and had them write them up in terms of their significance to Australia—the potential to do useful research in those areas. Then our board looked at the issue sheets for each of those 24 areas against a systematic framework based around attractiveness and feasibility, with seven criteria under each of those broad headings; so we had 14 criteria to score each of the 24 issues on a scoring system.

Things which emerged out of that include the following: information about Australia's northern rivers, or tropical river systems, of which we have a very limited understanding and yet potentially significant development pressures over the next 10 to 20 years; biodiversity, not so much from a national parks and conservation perspective but from a management and decision-making perspective across a range of land uses; social and institutional research; property rights, incentives, governance, regional arrangements, how we make smarter decisions, how we better use information and so on. We noted vegetation management as a key lever in landscape processes like salinity or what have you. Those were the four issues that the board asked us to go out and do some detailed scoping on and negotiation with perspective partners right across Australia. Those are the things that we would like to start shifting more resources into. With a static appropriation base, we can only do that by identifying things that we are going to move out of.

Ms CORCORAN—You partly answered my next question, and that is: are you moving out of what causes salinity because you think that has been done, or are you moving out because there is a whole range of other things to do? We have been hearing evidence from other people that we might think we know what causes salinity but in fact we do not.

Mr Campbell—Certainly we do not believe that there is no more research to be done on better understanding salinity in Australia; however, we believe that other organisations are now taking that up. It was important for us to be a catalytic organisation 10 years ago, but we no longer see it as being something that we should be the major funder of with our very modest appropriation. We believe that our appropriation is about four per cent of the amount of money Australia is spending each year on natural resource management R&D. We believe we need to use that four per cent in a very strategic and catalytic way. When there are CRCs funded to the tune of more than $20 million, national action plans, natural heritage trusts, emerging catchment

bodies and industries starting to fund this area, we are very happy to continue to play a role coordinating the mass of information, and bringing key players together and being an honest broker, but we do not see why we should be bankrolling the effort to the tune that we have been over the last decade.

Ms CORCORAN—My final question for the moment is: I gather you see your role as doing groundbreaking types of research, which is partly why you are moving out of salinity now. Do you think that those who are in that game understand what the end users want?

Mr Campbell—That is why I think the interface with industry is critical, and that is why we have been at great pains in recent years to get the Grains R&D Corporation, MLA and Australian Wool Innovation in as partners in the National Dryland Salinity Program. As I said on Monday, they do not get enough credit for now being some of the major funders of salinity research in Australia. At the end of the day, our biggest lever in landscape change in Australia is farming practices. So the single biggest opportunity for restoration activity is improved farming practices. Whether it is cultivation, crop rotations, grazing practices, clearing, burning and so on, farming practices have by far the biggest impact on the Australian landscape.

So, yes, we can fence off some creeks and fence off some patches of bush, and that is important work to do, but it is what happens between the fences that is most critical. There, you are talking about working with commercial businesses that have to make commercially sensible decisions. So we need to develop farming systems that do not leak in order to tackle salinity. We need to do that to make better use of our erratic rainfall and we need to do that in the long term to build soil health and more productive capacity in the soil. That is the end that we should be tackling it from: how to develop better grazing systems and better cropping systems that work with Australia's hydrology, not try to deny Australia's hydrology and climate. It should not be how do we fix a salt scald or coming at it from the problems focus that we thought was important in the 1980s. We should be moving on from that now.

Mr ANTHONY SMITH—So your point really is that you have to stay ahead of the game and make sure that you are working on what will inevitably be the next challenges.

Mr Campbell—Yes. I would just clarify that we do not actually do any research; we fund it.

Mr ANTHONY SMITH—Yes. Would you clarify who funds you? I just want to make sure I have it right.

Mr Campbell—As I said, our core appropriation, which is really the only funds that are at the discretion of the board, consistent with the act that we operate under, is a line in the agriculture portfolio budget.

Mr ANTHONY SMITH—I want to clarify that it is totally federal.

CHAIR—That line item there.

Mr ANTHONY SMITH—Yes.

Mr Campbell—That is right; that is our core appropriation. We then use that core appropriation as the basis for developing partnerships with other investors who entrust us, who contract us, to also manage their funds, usually in partnership with ours.

Mr ANTHONY SMITH—That is what I want to flesh out a bit.

Mr Campbell—That is why this year we are budgeting to spend just under $30 million, of which the core appropriation is slightly less than $12 million. The rest is funding that is tied to specific research activities, so it is contracted to deliver research services in a certain area.

Mr ANTHONY SMITH—What do the states do?

Mr Campbell—With respect to our budget?

Mr ANTHONY SMITH—Yes.

Mr Campbell—We receive no direct state contributions. Some of our programs have limited funding from the states, but there is none to the corporation per se.

Mr ANTHONY SMITH—Some of them do?

Mr Campbell—Yes, but much less than in the past. The state contributions to our programs have been steadily declining now for a number of years. For example, when the national program for salinity was set up, we had all the states with a salinity problem around the table as active funders. Now the bigger states are tending to say, 'We've now got state salinity strategies. We've now got a lot more money. The limited amount of money that we can leverage through being around the table with you guys isn't worth the effort; we'll do our own thing, thanks very much.'

Mr ANTHONY SMITH—That is what I want to explore a little if I can.

Mr FORREST—Where does this $18 million come from?

Mr Campbell—It comes from grains, meat, wool, irrigation authorities—as I said, we have more than 40 partners across our 15 programs. Some of those partners, particularly grains, meat and wool, invest in more than one program with us.

Mr FORREST—They sound like they are other statutory organisations, like GRDC and so on.

Mr Campbell—Yes.

Mr FORREST—They are not private enterprise?

Mr Campbell—Some of them are corporatised bodies, such as bulk water providers in irrigation districts and so on, that are predominantly spending producers' funds. And, as I said, we have some philanthropic investment through the corporation as well, but we do not have corporate Australia funding us to any significant degree.

Mr ANTHONY SMITH—The reason I want to flesh that out is that you made the very good point that you need to be looking ahead to the next 10 or 20 years.

Mr Campbell—Yes, and beyond.

Mr ANTHONY SMITH—Yes. You used as an example the northern rivers and the fact that we do not know much about them and there are bound to be some big development challenges there. That is really why I asked the state question, I suppose, because if you cut across the policy lines there are a lot of state policy issues involved in that. How do you coordinate that or is that not being coordinated?

Mr Campbell—We try very hard to work with the relevant state agencies. If we take the northern rivers as an example, we have a memorandum of understanding with Queensland. It is highly likely that the relevant Queensland agencies will be partnering us in that work. The research will be done predominantly by the universities in that part of the world. Western Australian natural resource management agencies are really struggling for resourcing at present. They have battled very hard to maintain funding in our programs. In fact, their level of investment in this area is dropping off. The Northern Territory agencies are fairly under-resourced. If you are operating across Northern Australia you need to change your expectations of how much the state agencies are able to put in, because they tend to be really struggling for resources in that part of the world. Some of the river systems up there do not have rain gauges on them, let alone stream gauges. Our understanding of their ecology is very limited. The work that we have done in the lower Ord, the estuarine work, found the river behaved quite differently from what the scientists expected based on the research they had done over on the east coast. So we have a very slender understanding of the ecological functioning of those systems.

Mr ANTHONY SMITH—Would you say that the states need to increase their funding component in some of those areas as well?

Mr Campbell—Yes, I would. I believe it is a sensational part of the world. We know from bitter experience that prevention is a hell of a lot cheaper than cure. I think you need a basic understanding of the functioning of those systems before you invest in major interventions. We will be seeking to work with those agencies. Clearly, they have the policy management responsibility for those systems, so they are the key end users of the research. As a guiding principle, we always try to have the end users either at the table or very closely involved in the R&D.

CHAIR—We are getting off the point a little, I suppose, but the points you make are interesting, given the potential huge growth that is planned in that area of Western Australia east of the Ord, across to the border and into the Northern Territory. Talking from an agricultural point of view, it is a monstrous area that they are looking at developing.

Mr FORREST—This may have already been asked but in a different form. It is really disturbing to hear that, whilst we are getting some good scientific research done, it is not in a form that people at the coalface can either understand or adapt to commercial advantage.

CHAIR—Maybe that is a good opportunity for you to tell us about all the publications that we talked about before we started hearing evidence.

Mr Campbell—I think that is an excellent point, John. From where I sit, it is very common to hear the refrain that the research is not hitting the mark and is not in an appropriate form. I am sure some of that is true, but I think the bigger issue is that we are not getting it out sufficiently well to the people who need it. When we sit down with the farmers and go through some of this stuff, they think it is fantastic.

CHAIR—'Some of this stuff' meaning the documentation?

Mr Campbell—Yes; we have a range of publications and newsletters here. For example, this book contains everything Australia knows about saltland pastures and the whole 40 years of research on saltbush, bluebushes, lucerne, puccinellia and tall wheat grass and so on. It has practical examples, case studies, production information, stocking rates, grazing regimes, how to fill the autumn feed gap—the whole shooting match. The issue is: how do you get this on the kitchen table of all the farmers who need to see it? It is a continual dilemma for our research agencies and our sister R&D corporations. We are having to spend more and more of our research budgets on extension, because the extension systems have been run down over the last 20 years.

Ms CORCORAN—What steps are you taking now to get that information out?

Mr Campbell—In this particular instance, through our partnership with Australian Wool Innovation Limited, we have a major program called Land, Water and Wool. The biggest single component of Land, Water and Wool is a subprogram called Sustainable Grazing of Saline Lands. In the first instance, we have hundreds of farmer groups across Western Australia, South Australia, New South Wales and Victoria involved. It is groups of farmers doing trials on their own farms that are literally getting this one-on-one interface through the coordinators that we fund, often in partnership with the relevant state government agencies. We are contracting them to do the work, but the point is that we are actually spending research dollars to pay state agencies to provide extension services. From a public policy point of view, I do not believe it is the optimum allocation of resources. There are still some people in state agencies with excellent extension expertise and excellent know-how to contribute, but the services are run-down. To direct all the opprobrium at the researchers is a bit rich. I do not want to have to try to turn each researcher into a David Bellamy or a David Suzuki or a David Attenborough. Some of them are good at it, but most of them are better at doing the research.

We actually have to build an interface that takes what they do and efficiently gets it to the people who need it in the form that they need it. For those people who are computer literate, we are seeing a massive expansion in the use of our web interface. As I said, we had 35,000 products downloaded in the last three months—that is downloads not hits; it is actual products that have been printed off by people or put on to their own systems. There has been a dramatic increase in the use of that, but I would not pretend for a moment that that is getting to every farmer who needs to see it yet.

From my perspective, Australia needs to be having a hard look at the way in which we deliver extension services using modern technology, using industry, using non-government organisations. I am not saying for a moment that we should have fleets of public servants in government cars in a return to the 1950s or 1960s. The private sector can deliver a lot of this, but we need to recognise that for problems across farm boundaries with a strong public good

dimension, it is just unrealistic to expect that the private sector is going to pick that up. We actually need skilled people who can work at a landscape scale on these public good issues, but who are literate in the farming systems that are needed to solve the problem at the end of the day.

CHAIR—A previous witness made the comment that a lot of farmers' first stop for questions is their local agricultural agents—Wesfarmers, Elders or whatever. You talked about getting stuff to the private sector and the private sector being involved. Is that one way that that could be done more efficiently?

Mr Campbell—Yes. Through the NDSP we have had some fairly promising discussions with Elders, who I understand have about 60 agronomists at last count. The program would have a relationship with all those private sector agronomists. I am not sure precisely where those negotiations are at but that is a fruitful area. Those people, though, have a private job to do for a company that has to work for its shareholders. We can get them to take this information where it fits in with their business. We cannot turn them into catchment planners.

CHAIR—They are out there advising their clients. If they are not advising their clients of all the information they should have from a commercial/professional point of view they are not doing the right job. But if they have easy access to that information they are in a far better position to be proper consultants, surely—professional consultants.

Mr Campbell—Indeed.

Mr FORREST—The process is that a scientist compiles a report and it is scientifically related. Somebody then has to produce a friendly document like that example you have given us. But then the next step of dissemination should not be difficult. You have got some incredible networks out there, with Landcare and Greening Australia. You have got all those catchment management authorities of which the board members are locals. Often most of them are from the farming community. The dissemination step should not be that difficult.

Mr Campbell—I agree with you; I agree with that contention. But unfortunately it is. As a national science funding agency we cannot even get a list of the facilitators and coordinators being funded by the Australian government.

CHAIR—Where is the blockage there? The state authorities who do the employing?

Mr Campbell—I think there is a nervousness about people's mailboxes getting filled. That would be a very useful database for people to have. That is one concern I am aware of. But it is extremely frustrating for us. I completely support the need for regional delivery of these major national programs. However, it is very difficult for national agencies like ourselves, the CSIRO, BRS or whatever to have a relationship with each of the 60-odd regional bodies in Australia. We can do it through a web interface or whatever, but it is very difficult for us to have direct face-to-face relationships with 64 different agencies. The transaction costs would eat up all our budget.

So we have proposed both to the committees that sit under the standing committee of natural resource management, and in the review of the national Landcare program, that there should be a clearing house—a sort of a first-stop shop—which all the regional bodies, any extension officers or farm consultants can go to and say, 'Who is doing work on this? What is useful,' or, 'I'm after

a CD-ROM,' or, 'I'm after a decision support tool,' or, 'I need to know if anyone has done this sort of mapping that we propose to be doing. Who can I talk to?' We believe that we can run something like that closely linked to the National Land and Water Resources Audit for a fairly modest overall expenditure. But it has proven to be quite difficult to get that sort of coordination idea through the national action plan because resources are allocated primarily through bilateral agreements between the Commonwealth and each state and territory.

Mr FORREST—We keep coming back to that every time. When will the national Landcare review be completed?

Mr Campbell—That is a question you might ask the department this afternoon, but I understand they are trying to finalise it right at the moment.

CHAIR—I thought it was by the end of the year; they had some consultation meetings in various regional areas.

Mr Campbell—I think the intention was for it to inform next year's budget, so I think they are on track to present it some time later this calendar year.

Mr HATTON—Land and Water is paying money to get the scientific research done, and that has been happening for a long period of time. How much commonality of approach has there been in that research and, therefore, how much commonality has there been in the answers they have come up with to the problems that have been posed?

Mr Campbell—I am not quite sure what you mean by commonality. Do you mean commonality in the research methodologies?

Mr HATTON—In methodologies but also purely in the types of questions they have posed, which have therefore conditioned the outcomes of those questions.

Mr Campbell—I think there has been a fairly eclectic and pluralistic approach, certainly over the 10-year period that the National Dryland Salinity Program has been operating. One of the critical things about the National Dryland Salinity Program that I think is under recognised is an outfit called the Operations Committee, which sits under the board. The Operations Committee of the NDSP has had in it, throughout its entire history, Australia's main expertise on salinity—from the major science agencies and from some of the key private consultants. It has been a forum where they can leave their jurisdictional or organisational hats at the door and sit around the table as technical experts debating the technical merits of the issues. They have had some fierce and energetic exchanges over the years around the technical merits of different issues, and certainly they have not put all their eggs in one basket in terms of scientific theories, concepts or methodologies.

I would argue that the real strength of the program has been its ability to get the key players around the table in such a way that they are not wearing a state or territory hat, an agency hat or an organisational hat but just sitting around as experts, because we had a structure that had them separate from the board. The board was making the funding decisions and allocating resources but it took advice from the Operations Committee. We think that, in something like salinity, you need to separate the technical understanding from the allocation of money, particularly where it

goes across jurisdictional boundaries. You need to be able to free up the scientists to talk about the science in as free flowing and energetic a way as is necessary.

Mr HATTON—That partially answers my following question: how do you achieve quality control, in terms of moneys expended, and how do you evaluate how scientific the science is? In previous evidence there has been an indication that one of the big problems with CSIRO and the other major organisations—and the argument generally, as Dr Tunstall put it—is that there has not actually been the normal operation of a scientific method, in terms of reviewing what has been done. There has been application without enough rigorous review. As a corollary to that, he is suggesting, in a renegade or maverick way, that the dominant motif that this is a ground water problem may in fact misunderstand a lot of what is going on. He is arguing that the change from natural vegetation, with relatively friable soils, to a compacted agricultural use has made a major difference in the top .metre, and the way that water flows within that top metre, and that very few people are actually looking at that kind of approach, which may be the solution. Within the Operations Committee how much of these ideas has been kicked around—or has it been a case of working towards doing more research in the same area and, therefore, coming up with mainly the same answers?

Mr Campbell—That is an interesting question. I must admit I have not been part of the operations committee so I am not completely aware of that, but I certainly know that there has not been group think of: 'There is only one salinity and there is only one answer.' A key finding of the National Dryland Salinity Program after 10 years is the fact that salinity operates in many different ways in different parts of the country and that you need to understand that functioning in order to have the best chance of succeeding in the long term. I did not hear that previous evidence, but I agree that you cannot simply see it as a ground water issue. You need to look at the complete hydrological cycle. Run-off and what is happening in the surface layers of the soil are equally critical, especially in terms of farm productivity. As I said at the outset, we actually need farming systems that use the rain where it falls for the average rainfall event. We need some run-off, or our rivers will not be in very good nick, and we need some base flow or our river health will be suffering. So it is not a matter of coming up with a farming system that uses every drop of water or we would not have any rivers. Nevertheless, I am sympathetic that what happens in the surface layers of the soil is fundamentally important for agriculture, and we should not just be considering deep aquifers in our analysis of salinity issues.

Mr HATTON—In terms of the impact on our land over time, our agricultural uses and abuses have had different impacts, but we have also had different ways of viewing what the problem was at any particular time, so there were the old conservation methods directed at erosion and so on at one particular time and then the question of not refreshing the land enough, its general fragility and so on. If we look at the fact that we have got some clapped-out country in the past from erosion and from a series of other problems, salinity seems to be the major problem in terms of having vast tracts of land clapped out and therefore of us having to adopt an approach that we use parts of it or reclaim parts of it or use what we can and not try to remediate the whole thing.

Thinking about irrigation-driven salinity in the Murray-Darling Basin—and we will be hearing from the Murray-Darling Basin Commission next—it occurred to me that there is another series of problems that could potentially arise not only in the north around the Ord but also in areas that have been developed substantially around Emerald in Queensland. But that has

also shown that you can have new agricultural areas of significance. If the Elliott main channel went ahead and the Eungella Dam went ahead further north in the electorate of Capricornia, you could open new agricultural regions on a better basis in terms of the impact of irrigation and so on. So with regard to resting the Murray-Darling system and allowing it to recover—if that is a proper approach to take—what are the other possibilities for shifting activity to areas that have not been impacted upon? And do we first need to have, as I think you have suggested with regard to the north, a very close look at those areas hydrologically and in terms of their soil profiles and so on?

Mr Campbell—Minister Truss announced only two weeks ago an $800,000 study across three main areas of northern Australia from a future irrigation perspective. It is a study that will look at issues of soil constraints, underlying geology and, obviously, where the water is, not so much to identify areas for future irrigation but to get an understanding of the inherent constraints in that part of the world that you would need to take into account in thinking about any future development. From a public policy perspective I think there are some problems with the notion of saying: 'We have not quite got it right in the Murray-Darling Basin. Let's just give that a spell for a while and move somewhere else.'

Mr HATTON—I know the people cannot and the activity cannot.

Mr Campbell—I actually think we have invested a hell of a lot in the infrastructure in the Murray-Darling Basin. That is where our processing sectors are and we should be getting it right in the Murray-Darling Basin, where the people are, where the infrastructure is and where the downstream processing is. We should not be abandoning that at all.

Mr HATTON—But so far we have been compounding the problems, haven't we?

Mr Campbell—That is true.

Mr HATTON—Despite our best intentions for a long time, we have been creating the problem. Some people have had to walk away because there has been nothing left to work with.

Mr FORREST—We have to avoid elsewhere some of the problems we have made in the Murray-Darling Basin.

Mr Campbell—That is right. We certainly need to be focusing on prevention in the north, but I do not think we should be writing off too many areas in the south yet. We have a lot of work to do to do it better—but we have to do both; it is not one or the other.

Mr HATTON—A related question is about the Lockyer Valley and the Darling Downs. They have been dramatically affected by the last period of drought, to the point where, although there has been enormous investment in water storage, they virtually have nothing left. They are under significant pressure because other sources of available water, apart from rainfall, are already allocated and will be allocated in the future, so they do not have very many other possibilities of finding water. They have come up with a project that was $600 million—now it is maybe $400 million or less—where they could use waste water from Brisbane. Instead of $200 million being spent by Brisbane City Council and the treated water then being dumped into Moreton Bay, that could be channelled to the Lockyer Valley and provide for their needs, at $200 million or so and

using about a third of that waste water. If you then pumped it up the escarpment onto the Darling Downs you could use the rest of the water. But there is a salinity question associated with those uses as well, and I imagine that applies to not only this scheme but others that will arise for reusing this waste water. It has not been the best use, just pumping it out to sea. We probably could be using the European experience and so on. What thinking is around in relation to that and what potential problems do you think there could be?

Mr Campbell—That might be a good question for your next witnesses. Certainly, I think water reuse is quite an exciting area of work over the next 10 to 20 years, particularly in urban and periurban contexts. We are entering into a partnership with CSIRO through one of their flagship programs, called Healthy Country, that will be working in greater Melbourne and also greater Perth—in the catchments out of Perth—to look at precisely those issues. We are putting a lot more scientific horsepower into that area than we have to date, and I am very excited about the potential of that work over the next little while. But it will be some time yet before we have large-scale operational schemes in place. The human health side will need to be very carefully covered off, but I agree with you it makes no sense at all for us to be pumping very good water, especially water that is rich in nutrients and so on, out to sea.

Mr HATTON—Hear, hear!

Ms CORCORAN—I wanted to go back to the points we were talking about before on the dissemination of information. Are you aware of what I think is called the CANRI system in New South Wales?

Mr Campbell—Yes.

Ms CORCORAN—Do you have any comment on how that works—people's reaction to it?

Mr Campbell—None in specific terms, but in general terms—

Ms CORCORAN—Sorry, I did not mean how it works technically; I meant how it is working.

Mr Campbell—I think it is critical because, as the National Land and Water Resources Audit showed, when you can get the data out of the map drawers of the state agencies, get it into a consistent format and make it publicly available through a user-friendly system, then the community can start to access some often very useful information. I think it behoves us to do that.

CHAIR—CANRI does not quite do that, does it?

Mr Campbell—I am not aware of any jurisdiction that has properly done it yet. Mr McDonald from the Murray-Darling Basin Commission knows more about this than just about anyone else in the country, so it would be a good question to ask Warwick. I am not aware of any jurisdiction that has the gold standard yet in making that information user-friendly and having it in every transaction centre, shire council and primary school. But the technology and machinery is such that we should not be very far away from that, and that is what we should be aspiring to. I can see a time where each agricultural adviser or farm consultant would just sit at the kitchen

table, plug in their laptop and have a CD-ROM or log onto a web site to pull up that sort of information. It could be linked with farm-scale telemetry that is satellite-linked to have the catchment-scale data and the farm-scale data in the same system. That is where we should be headed, but we have not joined all the dots in any part of Australia as yet that I am aware of. Warwick may correct me.

CHAIR—I will ask him some questions about that shortly. In your submission, you say that Land and Water Australia could play a key role in any enhanced national effort to better coordinate science to combat salinity with. We have already talked about that. But, in addition to that, we have had evidence from various quarters that have said there needs to be some sort of national depository, for want of a better word, where we can go and find at least connections to all of this. Do you think Land and Water Australia could play a role in that as well?

Mr Campbell—Yes. I would endorse the comments that Mr Goss made on Monday in the NDSP discussion that it is not a matter of creating a bank vault with everything poured into it; it is a matter of creating a portal through which people tap into the relevant networks that they need.

CHAIR—Yes. I guess that is what I meant. Do you think Land and Water Australia could be an appropriate portal?

Mr Campbell—Yes, in conjunction with the National Land and Water Resources Audit and potentially in partnership with the Bureau of Rural Sciences as well, because they have some of the critical hardware that we already contract them to provide for the services of the audit. It does not make any sense to me to have the R&D done without linking it to the assessment, monitoring and resource condition work that the audit is doing. We have to bring those two areas of work more closely together. Our corporation, if it were appropriately resourced, would be delighted to host such a function. We would see it as entirely complementary with our mandate and our current infrastructure.

CHAIR—Thank you very much for your time and your submission. Those two reports would probably be valuable to the committee.

Mr Campbell—I am quite happy to make them available. The National Dryland Salinity Program and the National Land and Water Resources Audit joint salinity report is from 2000. If you have not got it yet, I will definitely make it, as well as the other one, available to you.

CHAIR—The committee accepts as evidence the *Australian dryland salinity assessment 2000* from the National Land and Water Resources Audit, and the second edition of *Saltland pastures in Australia: a practical guide*. Thank you.

[11.36 a.m.]

AKEROYD, Dr Michele, Salinity Program Officer, Murray-Darling Basin Commission

GOSS, Mr Kevin Frederick, Deputy Chief Executive, Murray-Darling Basin Commission

McDONALD, Mr Warwick Scott, Director, Integrated Catchment Management Business, Murray-Darling Basin Commission

NEWMAN, Mr Robert John, Part-Time Coordinator for Salinity Management

CHAIR—Welcome. Do you have any comments to make on the capacity in which you appear?

Mr Goss—I am the General Manager, Natural Resources, for the Murray-Darling Basin Commission.

Mr Newman—I work part time as a consultant to the Murray-Darling Basin Commission.

Mr McDonald—I am also a former technical director of the National Land and Water Resources Audit.

CHAIR—Thank you. Although the committee does not require you to give evidence under oath, I should advise you that the hearing is a formal proceeding of the parliament. I remind you, as I remind all witnesses, that the giving of false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. I also remind you that the committee prefers all evidence to be given in public. However, at any stage you may request that your evidence be given in camera and the committee will then consider your request. We have the Murray-Darling Basin Commission's submission, No. 51, which has been authorised for publication, so it is on the public record. I invite you to make an opening statement before we go to questions.

Mr Goss—Thank you. There are four of us today. We planned to bring three, but we brought Bob Newman off the reserve bench for today and I think that is worthy of a serious comment. The reason there are four of us is that we have people here with deeper knowledge than I do, in particular of matters to do with salinity and the way that the Murray-Darling Basin Commission handles them. Some of it goes a long way back and Bob certainly represents a long history of how we have handled salinity up to this point. I would like to start with some opening remarks.

Mr FORREST—Could you give us a brief background—who is an economist, who is an agronomist or whatever.

Mr Goss—I will invite my colleagues to say something briefly about their expertise.

Mr McDonald—I qualified as a soil scientist, but with program executive management skills.

Mr Goss—That was a little too cryptic for me. Warwick also had several years as the senior technical person and virtually the second in charge of the National Land and Water Resources Audit.

Dr Akeroyd—My qualifications are basically in plant physiology and plant water use, particularly in relation to flooding and salinity. I have completed my postgraduate studies through CSIRO Land and Water and the CRC for Catchment Hydrology.

Mr Newman—I am a professional engineer. I have been involved in geotechnical and hydrogeological work for 30 years or so, in particular in the construction of engineering works to mitigate salinity in the lower Murray. With an increasing recognition that this is a basin-wide problem, I then assisted the commission through the audit and with the development of the strategy.

Mr Goss—I guess I am shallower and broader in my background. I have an agricultural science qualification and I have an agricultural communication and rural sociology qualification. I have been associated with the way that governments respond to drylands salinity since the mid-1980s, particularly in Western Australia. I was fairly heavily involved in the initial salinity action plan for that state in the mid-1990s.

I would like to open up with four points I would like to focus on. Briefly, one is what we see as the challenge of an entirely integrated approach to a salinity strategy for the Murray-Darling Basin and the National Action Plan for Salinity and Water Quality. The second one is what I would suggest to you is unfinished business in the way that investment flows into land-use change directed at salinity. The third one is the long-term agenda for R&D and the innovative cutting edge that is so important to that. The final point is some of the broader threats to water resources, which impact on salinity. We have some material that we would like to table today. The chair agreed that we could do that when I spoke to him last. Through that, we will emphasise what is unique about the multilateral approaches that we take in the Murray-Darling Basin and some of the issues and challenges around that.

Let me start with the basin salinity management strategy. Since 1989 the commission has been operating under agreed strategies to deal with salinity—firstly a salinity and drainage strategy and then a basin salinity management strategy. The evolution from the first to the second was that the first strategy was very focused on salinity in the River Murray and the urgent actions that had to be taken to deal with that, from some catastrophic salinity events in the mid-1980s. History now shows that that was successful, when reviewed and audited in 1999. The river salinity today is much improved from the salinity spikes that occurred in the mid to late 1980s. There are a lot of reasons for that, but it is a good track record.

The new basin salinity management strategy which was agreed in 2000 dealt with the new threats to salinity, not only on the river but also on land, infrastructure, biodiversity, and how we could effectively deal with the salt in the basin that is moving much more gradually over a much longer time period into the future, into the river systems out of the upland catchments, particularly in a defined rainfall zone—it tends to be around 450 millimetres to 700 millimetres—a long-term threat which is expressing itself today but which has a long way to go. In fact, one of the core things which drove that strategy was a prediction that, if nothing further was done or changed, the salt mobilised within the basin and moving towards the rivers would

double in the next 50 to 100 years. There are a lot of other predictions that came off the back of that.

The new strategy had to respond to that while preserving the gains from the earlier strategy. Without going into detail, it has elements of understanding every tributary catchment that flows into the Darling and Murray system. There is a salinity target for each, 15 years into the future. There is more than an expectation that those targets will be met in 15 years and that, in doing that, the current improved salinity in the river system will be maintained at today's levels over the duration of the 15 years through a combination of what happens in those catchments and what happens in the River Murray system itself, with the continuation of the earlier works.

The challenge in that, which becomes very important in a national context as well, is that there is a balancing act in how far we can take engineering solutions to improve salinity or to maintain improved salinity—certainly getting benefits but also, in a sense, buying time—against the longer term threat, which is a much more diffuse pollution problem, while giving sufficient incentive to the land management actions and the catchment management actions that will then have to start to pick up their share of the contribution and expand their share of the contribution within that 15-year period. That is where it gets very challenging indeed, because the short-term engineering solutions are more certain, we have got better modelling behind them and better prediction capacity and you can relate cause and effect in a reasonably straightforward way.

But with the catchment management actions, as I think you have heard from many people, the understanding is building, there is still debate over the nature of the cause and the effect and we are still largely in a planning phase in terms of dealing with it through a regional approach. So from a Murray-Darling Basin Commission perspective our concern at this stage is that the basin salinity management strategy is vulnerable in terms of its 15-year target. It is vulnerable because we do not yet see the momentum under the national action plan and its regional delivery so that it is moving from planning to investment and works happening with sufficient speed and precision to be able to deal with the rising need so that those catchment management actions will start to choke salt moving to the river. I will leave that as a challenge. It is unfinished business, but implicit in what I say is a challenge in terms of Commonwealth coordination, because by now we would want to see that the national action plan investment framework is now starting to really dovetail with the basin salinity management strategy, which has accountability built into it—that is really important; it is an accountable strategy.

My second point is about the investment itself. While there is clarity about outcomes and targets—and on the way to meet those outcomes in the basin, measured in rivers, those salinity targets are mentioned further—there is not yet confidence that the investment will hit the catchments in a way that meets those targets. It is not about a popular notion of equity—that is, that everybody gets funds to do things. If you measure outcomes expressed in the river then there is no choice but to decide where the investment goes to achieve the most effective contribution to that outcome. It is not necessarily equally or evenly across catchments and, in fact, there are some areas where you would hardly contemplate that investment at all in terms of living with salinity or managing it in certain ways.

One of the issues is where investment will come from and how it will be attracted into reforestation, afforestation, vegetation management or deep-rooted perennials going back into the landscape in many and various forms in a way that starts to take that pre-emptive action for

the long term. As a commission we know that there are forestry companies sitting to the side of this whole process and they are frustrated. They have what they call patient capital behind them and they believe that they can be part of the long-term solution. But they expect the salinity component of that contribution to be paid for and not out of their own income and expense stream but as a public good. They are looking for ways of getting involved. They are trialling it—you have probably heard of some trials—with different technologies such as salt tolerant genotypes with eucalypts and salt tolerant vegetation more generally. They are looking to respond to incentives to move tried and proven plantation forestry options down the rainfall isohyets, whether they be blue gums or pines.

There are some initiatives in this area. For example, there is the oil mallee experiment in Western Australia and a new initiative in Western Australia to do with medium rainfall forestry called Infinitree. It is interesting that we in the commission look outside our borders to these sorts of things. That is just unfinished business; it is not moving at the moment in a way that would give you confidence that within 15 years we will meet our outcomes.

My third point is about R&D, and it is a more general point that I made when I was here as the chair of the NDSP. I think there would be resounding agreement across the board that we need a highly coordinated, sustained commitment to R&D, with nationally, regionally and basin directed R&D depending on what the work is; it all has to come together. We have to keep our nerve for the long term. We have done it with salt interception, and there may be an opportunity to talk about that later, depending on your questions. If you were a fly on the wall at commission discussions 20 or 30 years ago, when there was highly speculative work about engineering solutions, that is now reality. It has required a sustained commitment, $60-odd million in investment and the solving of problems along the way. People are now receiving engineering awards for solving those problems, and that work has delivered a result from 1989 to 1999.

We would urge that the same work be done in the area of targeted afforestation and revegetation and in the broader area of redesigning farming systems for the future. It has to be innovative and, by its nature, there are some risks in that. I mentioned the oil mallee experiment a moment ago, and I mentioned it last time I was here with my NDSP responsibility. The reason I continue to mention it is not because it is proved but because if you explore the process by which that experiment has been put together you will find in that a lesson, a case history, in how R&D, combined with very smart thinking around market driven industry development, is a blueprint to follow, regardless of the outcome. It is inherently risky, and probably four out of five of these things might not get up. But one will, and that is an approach that we urge you to follow.

CHAIR—We will be having a look at the oil mallee experiment this time next week.

Mr Goss—I think you will have your eyes opened. I spoke to Jerome about it, and the plant is being built in Narrogin. There is something to see there now, physically. It is the way they have thought it through. They have thought about world markets for activated carbon, and they have thought about world markets for eucalyptus oil. They acknowledged early that the current production systems are not within a bull's roar of being able to compete in those markets, because the unit cost is so high, and they have worked on ways of dramatically reducing that. It is a very good lesson in sustained R&D and industry development.

My final point—and this is one I imagine you have had to think about a fair bit—is that, around this question of salinity management, which is salt carried in water, and trying to deal with the energy that drives that in landscape change, there are now other threats to the water cycle—whether they be from reforestation in high rainfall zones, farm dam development, climate change, ground water or so on. We have worked very hard at trying to understand what those threats are and finding a way through so that we do not lose our nerve with the afforestation option. I am very happy to speak to that.

I will invite two of my colleagues to make specific comments which I think are quite relevant. The first issue is the length to which we go, which we think is a lesson in building accountability and very tight review processes around how you respond to salinity. It is done very much in an adaptive management sense—you review, you evaluate, you decide and you move forward. Michele Akeroyd will speak to that. Then I want to come back to the matter about repositories of information and what our experience is there. I will ask Michele to speak to how we undertake our reviews on salinity.

Dr Akeroyd—One core component of the salinity strategy is the rolling five-year reviews—that is, there is a review of each valley every five years. So there is a continuous review process, which is built into schedule C of the Murray-Darling Basin Agreement and is supported by its implementation protocols. The reviews are essentially a bringing together of the best available scientific information at the time on which to base our predictions of what is likely to happen in the future. Each review sets a clear process for bringing that information together. It brings the people to the table who are required to bring that information together, such as the jurisdictions, the regional organisations and the scientists who are actually doing a lot of the work.

That process for bringing the information together also exists to bring it into policy. It is not just left out there alone, it is also brought into the policy arena, where we make decisions on what to do in the future and on other issues that are raised through that process. The states are obliged to undertake these reviews every five years, and it is the Murray-Darling Basin Commission that offers support and facilitates and coordinates a lot of these processes. That is what we are currently doing in the Mallee review.

In the Mallee review we are looking at the Mallee zone as a whole, rather than the three different valleys in each of the three states—South Australia, Victoria and New South Wales. It is really a key to improving our understanding of the processes in a broader zone, rather than just in the states. We have had full support from the jurisdictions. In fact, that process has been implemented through the Lower Murray Natural Resource Management Forum. This forum was instigated through the national action plan processes, using those existing networks to bring together the information from all the projects that have happened recently to try and improve our knowledge about where salt comes from in the landscape and what the predictions are for the future. The findings of these reviews, as I have already elucidated to you, will be directed into policy processes through the Basin Salinity Management Strategy Implementation Working Group and, through there, to the state and relevant basin working groups.

The key message that I would like you to think about from this process is that we are bringing the different jurisdictions around to consider a whole-of-zone process. We are including the regional processes and the people who actually do a lot of the research on the ground, and

bringing that information together to improve our knowledge to direct our policy decisions in the future. There are clear processes and linkages between those.

Mr Goss—Can I just underline a point there which is quite important in the current thinking around targets and accountability against targets. We have set targets for the basin on the basis of current knowledge. Time goes on and then we start to get some feedback, some further understanding or whatever, which asks, 'Well, is that right?' In this case, it is the modelling and the prediction in New South Wales, Victoria and South Australia, and this is a combined effort. What might come out of that process is, in fact, sufficient knowledge to say: we now reset the target. This is what I mean about updating: that by a very conscious, multigovernment decision, so that there is no easy way out on this—it is not a matter of convenience; it is a matter of discipline—the target is reset and then we move on, because everything is played out on credits and debits against those targets.

Mr McDonald—Feeding on from that, the Basin Salinity Management Strategy, while it is a 15-year strategy, has a 100-year time horizon. Clearly we do not have measurements 100 years out, so we are very much dependent on the best available science and modelling that is available to provide us with the trajectory for focusing our management actions and investment. I would like to focus a little on the fact that the role of science is absolutely fundamental to the way in which we operate. We cannot operate without it. It does not just set the scene in terms of an understanding that we have an issue and we must deal with it; it actually is a tool by which we can set management actions and directions. It will also serve as the performance measurement tool for judging our success.

I would like to respond a little bit to what I have heard, in terms of what that means for the information and the science that underpins salinity. The important point here is that salinity is not an issue that stands alone in the landscape. It must be judged on the basis of a more integrated catchment management approach, recognising that one action does not necessarily have only a single effect; it may have a multiplier effect—a benefit multiplier in terms of benefit. And, in terms of the activity in the lower Mallee that Michele just outlined, it will heavily depend on the comparability of the information that can be brought to bear from each of New South Wales, Victoria and South Australia in trying to undertake that review. Therefore we are highly reliant on establishing agreed standards and protocols by which information in the long term can be gathered, shared and published as we gather it.

The key lesson I learnt being part of the National Land and Water Resources Audit—and having the principal responsibility behind the salinity report, in particular—was that we entered into that process thinking we were going to provide a description, an expression, of dryland salinity across Australia—its actual expression—depict that in map form and wrap that around in terms of what that means for its management. We could not do that. Australia does not have the data and information to provide Australia-wide information on that. It has it in patches. So we need to step back from that and look at what the driving forces are behind dryland salinity and whether we can get an expression of at least the inherent risk of dryland salinity expressed in our landscapes. Again, we had to step back from a direct measure to an indirect measure based on the best available understanding of the physical processions within Australia's landscapes.

The key thing here in terms of science and the way we move forward is that there is a wealth of information, there is a wealth of science, there is a wealth of activity going on within

cooperative research centres and organisations such as CSIRO and the work initiated through Land and Water Australia and the National Dryland Salinity Program. Yet we cannot bring all that information together. I am not proposing to you that we should have a gigantic repository. What I am suggesting is that, over and above all, we need networks that share information—distributed networks. Yes, there is a technology component to that which can help, but it is a change of behaviour and a change in attitude in terms of information sharing, pricing policies and access to information. It is about coming to some agreed standards by which we can exchange and compare apples with apples, rather than having a mishmash of approaches when we are asking national scale questions.

CHAIR—I come back to a point you were making earlier regarding funding to the catchment management authorities under the national action plan. You were saying that you cannot just say that all of the catchment management authorities should be getting a certain amount of funding to deal with issues of salinity because of the big differences between areas. Some catchment management authorities probably should not need to get anything. Would that be true?

Mr Goss—In the basin I do not know that there would be any catchment management authorities at that level because they tend to align with whole tributary catchments that would get nothing—far from it. But when you get down to subcatchments, there may well be some that get nothing. The important thing from our perspective—and we are talking about a basin that is driven by flowing rivers—is that the commission does not have to be the custodian of all action, or the font of all wisdom in those actions. It runs a pretty tight coordination over the top. So for each catchment for which there is a catchment management authority or board—proposed to be an authority in New South Wales—they know what the target is at the end of the river system in their catchment. It has been agreed by the government. It is coming together in a multilateral process, consulting with their own catchment management authorities. The target is agreed.

Our responsibility as a commission is to make sure that there is accountability on those targets being met. How a catchment management authority meets that target is its business to plan, but it needs guidance and assistance and direction to do that. They will have an understanding of what is happening in their landscape to that target. That will dictate both the investment quantum and the pattern to deliver it. So, if you like, the whole business of biophysical modelling and the prediction and setting of targets, in a sense, sets the balance of investment.

CHAIR—So, to meet some of those targets, those catchment management authorities will develop a program or a number of projects that they are seeking funding for from the national action plan which then has to be agreed between the state and the Commonwealth.

Mr Goss—Yes, they would develop that under the national action plan. It is a bilateral agreement between the state and the Commonwealth, and that is where it gets difficult for the multilateral process that is embodied in the Murray-Darling Basin Agreement. The way that we administer accountability under the salinity strategy is by a system of credits and debits which is unprecedented for diffuse pollution in the world. There are a few examples but not many. A catchment management plan developed as part of the basin management strategy to contribute to the outcome will have to be assessed for what it will deliver to that river system against that target; assigned credits with a pattern over time in future, because these things build slowly; and placed on the account for the catchment and the state. Those credits have to stay ahead of other decisions in the state that drive the debits side. Debits are typically the rising salinity from the

legacy of the past, which is clearing and conversion of land use and the policies behind that, and other developments that put more pressure on the river system, such as water trading into areas that are mobilising salt. Our concern is that these plans are both assessed for their contributions and credits and that the mix of these plans maximises the contribution of credits for the basin as a whole. That requires pretty tight coordination, and it is difficult when the investments go through bilateral arrangements.

CHAIR—I want to pick up on some of the things that Andrew Campbell said before. Given that the national action plan is a predominantly a bilateral agreement between the Commonwealth and each state, do you think there is a gap in that program that could be filled probably at a Commonwealth level for coordination, particularly of information?

Mr Goss—There is certainly a leadership role for the Commonwealth within the Murray-Darling Basin initiative. The Commonwealth is also an investor in salinity outcomes in the basin in a very specific way. Because of the pattern of salt mobilisation over 150 years, it hits states in different ways for different reasons and not all of it can be blamed on human intervention. The salt has been moving down into South Australia geologically over a very long time period, so there is an equilibration required in balancing out what the states invest with investment from the Commonwealth so the rivers see the best result. The Commonwealth investment and the credits that it earns from that investment contribute to that. It has been doing that since 1989. Leadership from the Commonwealth with the states, and its investment hitting in the appropriate way, becomes very important, and that goes right through accountability.

When it comes to the investment side, again leadership and some innovation by the Commonwealth become important because some of the things I spoke about, including the investment driven forestry, are on a scale that a regional catchment authority really cannot deal with. We are talking about companies—some of them are multinational companies and some of them are certainly national companies—that have options about where they put their money and they will have a hard edge to their investment portfolio which is maximising returns. They also, to varying degrees, have a more stable ethical component to their investments, such as superannuation schemes. They are looking to optimise a profitable return to their investors but still meet some sort of stable rate of return—nevertheless, it is a more modest one. That can only be encouraged, I would suggest, at a national and a basin level, and that is the investment issue.

I come back to the knowledge part. I reinforce what Warwick has said—that this is a distributed knowledge base where decisions are made at different levels. Andrew made this point: there are farm level decisions, catchment level decisions and, in our case, basin level decisions. The knowledge is best in the hands of the people who are closer to the decision front, because that is where you adapt it and refresh it and so on. No one party would take control of the knowledge process, but there is certainly a need to deal with it nationally and at the basin level and, therefore, the Commonwealth automatically comes into it.

CHAIR—All those various levels need to know where to find that knowledge.

Mr Goss—Yes, although they are generating it themselves as well.

CHAIR—So as well as the knowledge that they generate themselves.

Mr Goss—Yes.

Ms CORCORAN—At present, how close is that knowledge to the person who is using it?

Mr Goss—In an industry context, it is reasonably close. R&D corporations have a pretty clear message. Senator Troeth sends to the R&D corporations an annual letter which communicates the Commonwealth's position and preference on its investment. That sends a signal to the R&D corporations, and they respond to that—and not just in the private good area but in the public good area. They largely do that, as you would expect, with enhanced productivity being part of the objectives. As long as they have a strong productivity objective in there, they have their farmers engaged and have pretty good systems of getting it there.

We question whether they are sufficiently introducing the more challenging messages here. Just to emphasise a point, the R&D corporations have demonstrated their credentials by aligning increased productivity with marginal improvement in water use, and those two are moving on. Our issue is that increased marginal improvement in water use, in the absence of land use change, is not sufficient. Therefore, there is another line of work to be done, and I do not think the relationship between what they are doing and farmers is good enough. This is where public agencies come into play and it is particularly where catchment management authorities come into play. It is short of R&D and commercial systems that work, and so it is not just a communication issue. In my estimation, the capacity of catchment management authorities to be closer to land-holders has a long way to go.

Mr HATTON—Already Geoscience Australia coordinates mapping activity and provides it to mineral explorers Australia-wide. Some of that material would be and has been of use in terms of working with salinity. Would that be an appropriate organisation for drawing together a lot of this material? It is already doing part of that work anyway. I think it has been very successful and has been prodded by our committees into being more successful at disseminating that information widely in order to improve our competitiveness. Would that be a natural linkage to get around the problem of the states doing it?

Mr McDonald—It is interesting that Geoscience Australia came to exist in its current form by the merging of two organisations: the Australian Geological Survey Organisation and National Mapping. The strength of that merger is what you are picking up on here in terms of this being an agency that has a mandate to do survey work—and in a particular field of expertise, absolutely. Geoscience Australia is aligned with the CRC LEME—Landscape Environments and Mineral Exploration. This partnership is a critical one in that it broadens Geoscience Australia's contribution to spatially referenced information.

Just picking up on the comment Kevin made about information in the hands of the decision makers, it is critically important to understand that we are talking about the different scales at which those decisions are made and the different sorts of decisions that are made at each of those levels. For example, the information generated through the National Land and Water Resources Audit was, in a sense, to set the policy debate going to get salinity and other issues on the public agenda and understand the scale of the issue. I have seen the information quoted as being totally inappropriate for paddock scale decisions. Of course it is; it was never designed to be that. So we need to be mindful of lumping sciences in one box and lumping data and information in another box. We need to separate who has the roles and responsibilities as custodians for that

information. Getting back to your point, Geoscience Australia is a key custodian for some of the fundamental datasets in Australia. It has the capacity, linkages and discipline in the information sciences to provide a support role.

Ms CORCORAN—We heard earlier today that perhaps using public organisations to disseminate information is not the most useful way of doing it and that there is a good role here for private industry. What is your reaction to that statement?

Mr Goss—That is absolutely true. I speak from my background of working for agricultural agencies and in agricultural extension, and I have been associated with that for more than 30 years. There is a long-term trend with public agencies of withdrawing from servicing farmers with free-to-farm services. That is well advanced and almost complete, I suppose, in straight commercial advice. There has been a substitution for that with funding positions with land care and NHT now taking over, particularly in the catchment management framework. But there is a mature commercial consulting industry around natural resource management and around salinity now, and it can contribute an enormous amount.

There is the question of who pays for that advice. One thing I would suggest—we have not sufficiently thought about salinity—is that there are different capacities to pay for the advice. If you are a farmer with a small patch of salinity or a few hectares, or it might even be a bit larger than that, and it is creeping up incrementally—and these services come at thousands of dollars—the capacity or incentive to pay is not very great. So farm by farm, I suggest that a straight-out commercial arrangement with these consultants would not be a common or necessarily a growing industry at the moment.

But there are other ways of getting there and there are other service providers that are working with farmers in the commercial world, whether they are Wesfarmers, Landmark people or whoever. That is why the group thing is so important. Groups can bulk up their resources and then start to employ these people, and they tend to do that with public funding. But in other areas—whether it be the threat to infrastructure, which brings in local governments and city councils; whether it be the threat to biodiversity, which brings in public agencies managing the conservation estate; or whether it be water quality, which is so centrally important to irrigation authorities—there is a very live market for commercial services.

Mr Newman—Perhaps I could add a comment here. Taking the point that agricultural commercial advice has evolved over 30 or 40 years, in the salinity game the science is really just coming out of the cupboard to some degree. Whilst there are some really excellent people, there are also some snake oil salesmen. A coordinating role that could be assisted would be to try and get some sort of quality assurance process into that. I have used the words ‘snake oil salesmen’, and there are some scientists and agencies that would be party to that as well. It is a very multidisciplinary game that we have to play from here on.

Ms CORCORAN—I guess that is part of my concern. I keep on asking the question: where does the farmer go for his first bit of information? We are getting all sorts of different responses to that. One response is: down to his local agricultural ‘agent’—if that is the right word to use. Sometimes he goes off to a government department. It seems to me that there is a bit of a conflict there. If my job is to flog X, Y, Z grass seed and you come to me with a problem, the answer I give might be ‘X, Y, Z grass seed’.

Mr Newman—Absolutely; for everything.

Ms CORCORAN—On the other hand, if I am the person who is talking to the farmer, I am a very good conduit for this sort of stuff. That is my dilemma.

Mr Newman—Catchment management organisations with a locally appropriate rigour are an emerging enterprise as well, and they have done an excellent job in understanding the problems and also in coordinating activity at the local scale. But they are still learning to appreciate the application of science, particularly its interdisciplinary application.

Ms CORCORAN—Linked in with that, I notice that in your submission you talk about the salinity drainage strategy. You say that worked very well for a number of reasons. That might be a good example of science moving down the process to the end user and being applied appropriately or successfully. Is that a good example of this stuff flowing through and being used properly? How did it happen?

Mr Goss—It is an example that has to be qualified heavily because at the end of the day it did not involve dryland farmers facing a very slow-moving incremental problem. I will ask Michele to get out a graph which will help; we have copies for all of you. River salinity has improved. By our measure, it has improved by around 200 electroconductivity units against what it was in the late 1980s. What were the elements of the solution of that 200? Firstly, there was additional dilution flow: running storages differently and providing additional dilution flow down into the lower Murray, particularly into South Australia. That had to be a whole-of-government matter, with governments coming together in agreement. So that is not at the farm level. The second element of the solution was to start a program of salt interception schemes, again with governments coming together and committing to a program and to accountability around that program and investing tens of millions of dollars over the decade.

The third element of the solution gets closer to your question, and that was to go back to the irrigation areas where the threat was greatest with rising ground water and where land rehabilitation action needed to be taken—areas which, if left unconstrained, would have just drained land and dumped salt into the Murray. While that was going to be catered for, it had to be capped to stay below the credits you build from additional dilution flow and salt interception schemes. So we went into an era of land and water management plans, very much working on an irrigation area by irrigation area basis, where the irrigation authorities came together and took on this integrated planning approach. Engineering was part of it, as was drainage. Water use efficiency was a critically important part of it—and that brought the farmers into play, managing their water cycle and getting into reuse and a whole range of things like that. But it was structured and managed at the collective level when it came to the irrigation districts, and that is the way that part of it was delivered.

Ms CORCORAN—So the end user, through the mechanism of the irrigation board somehow tweaking their supply of water, perforce suddenly had to become aware and take notice of what was going on. So, if I am the end user, I do not know whether I am going to lose some of my water or whatever and presumably I now have a problem. What was there to help the farmer cope with that change?

Mr Goss—Significant public funding into R&D and systems to respond by improving water use efficiency along with the very direct relationship with irrigation authorities. Bob has a lot more experience than I do in this area.

Mr Newman—You have mentioned losing water because of irrigation efficiency. In fact, they gained water. The water that they no longer wasted and that became drainage water was theirs to own. South Australia is a good example with irrigation development: a 25 per cent increase in area from only a 10 per cent increase in water diversions in the last 15 years.

Ms CORCORAN—So presumably they had to change their practices or their farm management.

Mr Newman—Absolutely; reuse of drainage water.

Ms CORCORAN—How did they know what to do? How did they learn what their options were?

Mr Newman—It was through the application of science and information. It was fairly fundamental information at that level; it gets somewhat more complicated when we try to get out of the irrigation areas into the dryland.

Mr ANTHONY SMITH—I think Ann is asking: how do they get that information?

Mr Newman—Through the land and water management process.

Ms CORCORAN—Our big temptation is to get involved with what the process was; that is very tempting. We have to stay off that and ask: how do I know today, getting up, what to do on my land differently to what I did yesterday?

Mr Newman—A huge number of education and training and incentive programs were delivered through that district scale action, appropriately designed but meeting targets of the day for land and water management plans, so taking salinity management at the broader scale, learning the lessons. It was really Victoria that put the lessons on the board best in the early 1980s about getting all of the people together, asking whether they had a problem, going through that sort of exercise, asking what the options were, what the solutions were and how they would use our drainage water—taking that philosophy and extrapolating that basin wide is essentially what we are doing. In those days there were not catchment management authorities; they tended to be irrigation authorities. But nowadays we have organisations with a far broader horizon and they are very much looking at bringing not just salinity but the whole ICM, integrated catchment management, approach and the whole multiple objectives into play. It is really working quite well.

Ms CORCORAN—I assume part of that process was some sort of assessment of the economic effects on the landowners.

Mr Newman—Absolutely, including the public and private benefit question—very strong.

Mr Goss—A lot of demonstration on farm, show and tell, getting groups together, field days and those sorts of processes, with commercial involvement, because some of it was amenable to technology change: changing your whole application system in water, moving from overhead sprinklers to micro-irrigation systems and so on. So there was a commercial incentive very much aligned with a water use efficiency objective.

Mr Newman—In the irrigation scene there was also a somewhat paternalistic culture, I suppose, in that most of the larger irrigation systems were set up by public enterprise and you had this automatic almost authoritarian approach between the irrigation supply manager and what you do on your farm. It is somewhat different when you get into the dryland; there is a very independent character out there in the dryland with very different objectives and not inclined to be told what to do. So it is a very much more coercive approach needed.

Ms CORCORAN—I have one more point. We have also heard different evidence that there are landowners who do resist very much people in suits coming out telling them what to do. I guess I can understand that.

Mr Goss—I was tempted to respond this way to the earlier part of your question too, and that is that there is an understanding of human behaviour that is quite important here. It also works at a state or regional level. When you get a problem like salinity which you cannot turn around easily—its signal is muted and the idea of reversing it is almost an impossible ask—people react in particular ways. They tend to go through a sequence of reaction. One of the earlier reactions is to ignore it, reject it, pretend it will go away, then they get absolutely angry, then they get in despair. Then at some point out the other end people find a way to live with it, where you are managing it and you are preventing a level of damage that would otherwise have occurred. You have worked through the other phases and you are not going to reverse it and you are going to find a way of living with it. I suggest that you see patterns of that across Australia. Western Australia is probably much further advanced in living with it and the farmers can handle information more than they have in the past. The characters Bob describes are probably in the early phases and they might be in denial or they might be in the angry stage. The way that the governments and the catchment management authorities deal with it has to be adapted to how people are responding.

Mr FORREST—I have got three themes. Kevin Goss knows my views. I live in the most salinised part of the basin down at the junction of Barr Creek. There is an extreme amount of impatience now, and certainly from me. We hear about the constant need for more research. That might apply to drylands salinity but it does not to the river. I have been associated with that river all of my life and in a technical sense since 1970 during my undergraduate days as an engineering student. Thirty years later, we have to bite the bullet. There are some areas we know we cannot save and we should compulsorily acquire them and bite the bullet. There are engineering solutions, and I am waiting as patiently as I can for governments to come up with the massive amount of capital and do it. After 100 years we are only just piping the Wimmera-Mallee stock and domestic system. It just has to be done. We do not need any more research.

I would be interested to know how the commission responds to that. I come from the days when there was no commission. It was just a regulator running water and now it has teeth and an excellent model with international interest in getting the obstacles out of the way. Those of us who live there are really frustrated. We want to see action, not more research.

Mr Goss—The commission is committed to the same outcome now, John. We will continue to argue over the means to get there, but the outcome is the same. I make the point that it is not just driven by salinity; it is now driven by water also. I will give you some examples. With respect to acquiring land and retiring land, we have accepted that, in the case of our operations, we have impacted on land and caused salinity—for instance, around Lake Victoria. So we are now acquiring land as our responsibility to deal with that particular impact.

In the case of the whole water initiative, if you look at the pattern of salinity and how governments have responded to salinity and then think about what the water recovery program would be for an agreed amount of returned environmental flow to the River Murray and how that water recovery program would be conducted in an intelligent way to deal with your observations, governments will have to exercise courage in water recovery coming from areas where you know the long-term sustainability prospects are poor and you may as well deal with that matter now. My observation is that the Victorian government, because of its track record with the Kerang area and so on, is probably more in tune with that approach right now than, say, the New South Wales government.

Mr FORREST—How long will it be before the Lake Victoria precedent will apply to the Winlaton depression and around Lake Tutchewop? That country cannot be saved.

Mr Goss—I do not know enough about that depression to be able to comment. We will continue our program of identifying our footprint and then dealing with our footprint. We will work with the state governments to make sure that they are starting to take some action. I will give you another example, and this one is in South Australia. Water is trading into South Australia, and you may well know that there has been a pretty vigorous exchange between the Victorian and South Australian governments over, 'If water is trading out of Victoria into South Australia, then we expect a level playing field in that water trade, and that is that there is not a net increase in salinity hazard in that process.' At the moment there is, and the South Australian government has made a commitment that it is going to fix that. It will now start to exercise some pretty serious policy about water not trading into high salinity hazard areas or there will be necessary actions taken to prevent that salinity impact in the future—either in obligations to individual farmers or in shared schemes. So those things are happening, and we are committed to that. But the water issue now will be as strong a driver as the salt issue to those outcomes. The commission will have to think about further salt interception schemes to avoid aggravating salinity because of environmental flow. We are exercising our mind as to how we are going to do that.

Mr FORREST—This is an excellent result, but if we have another 1956 type flood all that hard work will just disappear. That is my view. I think I have read that this is part of the what the commission is trying to drive—that is, that all of this hard work that has achieved a small improvement can evaporate very quickly.

Mr Newman—I would like to question the assumption that it would all disappear. There is no doubt that floods mobilise salt. But to the extent that those engineering works, in their location, have given space for floods to come and go now—under the Living Murray, for example, trying to manage, say, the Chowilla region, which is a very salt-rich floodplain region—if you manage that just with extra flow that is where the conjunctive schemes need to be developed so that we

can do the two things together. A 1956 type flood would give us a blip in our long-term data but it would not undo all the good work that has already been done.

Mr FORREST—I think you underestimate it, but never mind. My second question relates to the role of the commission. I think it is an excellent model and I am pleased to hear you say that the commission is looking outside its own borders. However, its primary function is to drive improvements for the Darling and the Murray, and it is a good model, because it has been able to crack through some of those state obstacles. We are looking at salinity as a national issue, so I am wondering whether there is a role for that sort of model elsewhere around the nation. The commission has accumulated an enormous amount of expertise, so I would be interested to explore your reaction to that suggestion.

Mr Goss—So your question is: why is the commission a good model and how can it be progressed?

Mr FORREST—Yes.

Mr Goss—The commission is a good model for several reasons, and some of these reasons come courtesy of history. Firstly, it is a good model because the states have no choice but to share the water of the River Murray system. So whatever happens, in a boardroom meeting or whatever, they cannot walk away from it: the wealth in that water binds the states together. That is difficult to replicate anywhere else, other than perhaps in a couple of other basins that go across state lines where there is economic wealth in the water. That is just a statement of reality. What we have chosen to do, which I think can be looked at very closely, is to take a multilateral approach at all times in the interests of the shared catchment. So state boundaries are blurred in the way that we operate and in the way that we direct investment.

My chief executive got a bit excited yesterday and made the point that if you tried to build Dartmouth Dam in Victoria under the current bilateral arrangements, one state would be building the spillway, another would be doing this and another would be doing that and so on—and you would not have a dam. The way we operate is that the funds of the governments go to where the most appropriate place is. Dartmouth Dam was built with South Australian, New South Wales and Victorian money, regardless of where it was geographically located. That is what a multilateral approach does for you. You know, at the end of the day, that you have a shared benefit. That is the only logical way of getting the shared benefit, which is the River Murray system itself.

The third characteristic, which I think can also be learnt from, is to build your knowledge base and understanding before you take a policy decision and before you commit yourself to an expectation that that decision will be implemented. The commission is unique in that way. I have to give the governments credit; they have been prepared to fund the commission, which is now spending around $20 million a year on the straight knowledge behind what we are doing. It is a major investment that we make—a shared investment.

The pattern of how we operate is to build knowledge and to do that in an anticipatory way. If there is a problem looming, we will conduct an audit, let the audit stand for itself and then start to work on the policy response and, while we are doing that, we are starting to work on the implementation arrangements. So there is no surprise in the process as it unfolds. I suggest to

you that that has not been a characteristic of some other policy issues that Australia has faced in the recent past. That is pretty much my analysis of why the commission is strong. It is stable, it is technically competent and it has been able to direct a significant amount of investment that has leveraged the other investment that hits the basin.

Mr FORREST—So that is not easy to do anywhere else, because there is not that common bond.

Mr Goss—Yes.

Mr FORREST—My last question is on something that has bothered me about the role of CSIRO. There is some evidence that the commission uses the CSIRO, and its funding, as a research resource of its own and that it also uses the CSIRO to vet other funding requests. I see a conflict of interest there. We are talking to CSIRO later this afternoon. I am hoping that you have some nice transparent processes by which you can avoid a conflict.

Mr Goss—I am not sure of the specifics when you refer to us using them to vet funding requests, but there is no doubt that we go to CSIRO when it is appropriate for advice that we see as being well based and independent of our internal processes. There is no doubt about that.

Mr FORREST—I have no problem with that; that is appropriate. But using them to vet other requests for funding is a conflict of interest.

Mr Goss—Most of our decisions on funding that comes through our circles is done using our own multijurisdictional arrangements. When we take decisions to fund, we have committees and working groups that comprise all six governments that take those decisions and advise the commission, which is the ultimate decision maker. We have advisory arrangements which feed into that, but they are advisory. So, yes, they are influential; but they are advisory. So if we take the Salt Interception Scheme program as an example, we have a high-level working group of very senior people in the governments and they review those programs. They build a list of programs which have all been checked for feasibility, cost effectiveness and so on—and we actually have a graph here to show you how we map that out into the future. We will make our own decisions. There are people like Bob Newman and others who have very extensive experience in these matters, and we go to them for advice—but we do not delegate that decision making to them.

ACTING CHAIR (Ms Corcoran)—Before we go on, Gary Nairn, the chair, has asked me to apologise for him. Because we have gone over time, he has been called away to commitments elsewhere.

Mr HATTON—Starting with the CSIRO and starting at the other end of this down in South Australia, some months ago I had a briefing from CSIRO—and possibly the commission; I cannot remember at this stage—about river flows. It seemed a good idea at the time to turn this money around and use that to assist irrigation in the Murray-Darling. It seemed a good idea at the time—despite 20 years worth of CSIRO work that was completely disregarded, particularly in southern New South Wales around the Murrumbidgee area—to open up those areas. CSIRO said, ‘You should not be doing this because there are problems in terms of salinity and so on.’

Those areas have opened up and they have utilised the waters that are available. We have significant salinity problems as a result of that.

Linking into the sorts of points that John was making, how much of a problem have we got in terms of areas having become clapped-out? We have either just got to work around them or, in a systematic way, encourage industries that could otherwise use them—like salt tolerant forestry and so on—to reuse that land in a clever way. How brutal do you think we will have to be in the future in terms of saying, 'We've helped to create our own problems here. We really have to take major steps to say that areas that have been developed should not have been and we cannot just avoid having a fairly major program of readjustment.'

Mr Goss—I will start with your last point first. I think there is no doubt that there will be a major program of readjustment. That was implicit in the question and answer session with John Forrest. Victoria has had to face this matter early. It has had to retire areas from irrigation and deal with the adjustment issues associated with that. Driven as much by the Living Murray process as by salinity, we can expect to see that in other parts of the southern basin. It will have to be handled very carefully by governments coming together as the commission. As a general point, I think we just have to face up to that. Going back to your CSIRO advice, and going back to a point I made earlier, there is no doubt that the commission is concerned about South Australia in particular getting its policies right and making sure that water trading into South Australia is not going into areas that will contribute more salt to the river in the future and therefore create unfairness in water trading.

Secondly, the strategy we have in place does need that policy. That has to do with where the development occurs, what protection is around that development as far as salt inception schemes and so on are concerned, and what the obligations are for the new players who are coming in and developing off the back of that water. The message is being given loud and clear to South Australia that they need to address that, and there are moves to do that, particularly using the River Murray act. That ought to address the concern you are raising, but it is a work in progress, I have to say.

Mr Newman—I could add a little to that. We have talked previously about land and water management plans and how they are increasingly informed by good science—by whoever is the service provider for the science. As things like the national action plan have a hierarchical planning regime, they force that sort of understanding of the local issues. It is often not complex science in some of those irrigation areas where watertables have risen to the surface. It has much to do with the data and the evidence—that is, is it really happening or not? We see that in Queensland now. Queensland as a whole were in denial on the salinity issue and now, progressively, they have recognised that they do have salt and it is potentially on the move. But the only way to really bring that together and make those sorts of land retirement and water retirement type decisions is to apply it at the local scale, with the level of information that is appropriate—long-term, visionary, multidisciplinary and multiobjective. It is quite challenging. Integrated catchment management is a tough game, but we are getting the model in place and the national action plan has taken up that philosophy.

We asked the question earlier: are there some places within Australia where we should not invest salinity management? The national action plan fundamentally shows only 23, I think, out of 65 potential catchments in the nation. Even within the catchments for which salinity money

was not provided, there will be minor salinity problems that things like the NHT will also pick up; similarly within catchments where salinity is already a hot issue. We have a poster here which might be worth looking at. There are real risks in taking a bland approach to, for example, putting trees in the landscape, where you might lose more water than you do in terms of managing salinity. Those messages have to be applied at the local level and science must be capable of being delivered through that devolved network of scientific information. It must be available to those local planning areas. As the Commonwealth is a major investor in salinity management, it needs to have the QA approach. I think the commission has very strongly set up a QA principle in what it has done, and it has increasingly tightened that. A lot of what we have been saying today is along those lines.

Mr HATTON—With Land and Water Australia, I suggested that there are areas in the Murray Darling Basin that are effectively clapped out, but we will have to deal with them in other ways. I would say that, instead of the areas being clapped out, you need another use. How much have you learnt through your experience that can be effectively used now in a much better planning framework for areas that look like they might go ahead—for example, in the Emerald region in Queensland and the different problems that the Darling Downs has got, if it is able to use waste water in the future and so on? How much do we know from the localised experience that is transportable, given that there could be different geology, and so on?

Mr Goss—If we are going to take a regulatory approach—and, ultimately, there has to be a regulatory approach underpinning this—then it has to be on the basis of very good knowledge and very good tools. To that extent, I think we have something to offer on the issue that I have talked about—water trade in the southern basin. We have developed a rapid assessment tool through an iterative process. When you have potential trade there and you know the source, the location, the character of the water, and so on, we can draw a conclusion about the likely net salinity impact of that trade—the impact at source, the impact at destination and the impact in transmission in the river. That then gets you in front of arguments and challenges over the regulatory invention that says that trade cannot occur or, if it is going to occur in that area, then these preventative actions have to be taken.

In the case of southern Queensland or the northern Murray-Darling Basin it is a very different set of circumstances in terms of trade and that very direct impact, but the regulatory backstop is nevertheless there. The Queensland government, when it agreed to the basin salinity management strategy—and there is a statement in the ministerial council's decision record—agreed that from January 2000 it would be committed to offsetting the impact of its future actions, and it will have to do that by one means or another. The question is: how do they do it? Do they do it at source and get things right, which is clearly the most logical and beneficial thing to do? Or do things continue to slip a bit and then they have to clean up at the end of the system by investing in salt interception schemes in the southern basin to offset their net impact? That would be an unpopular thing for the Queensland government to do. But that is the regulatory backstop we have.

Meanwhile, the commission is assisting Queensland directly—through the CRC for Catchment Hydrology, the National Dryland Salinity Program and other arrangements—to catch up in its understanding of the salinity processes operating up there. That is what Bob has spoken to. From a commission perspective we would expect Queensland to be a fully compliant member

of the basin salinity management strategy and to do that through regional processes, and we assist them in informing what actions they will have to take.

Mr HATTON—I am aware of the time; I just want to make this last point. The Colorado River system is similar to the Murray in terms of the problems created with environmental flows and also some salinity problems in the most productive areas. South Australians have argued that they have become very good at water management, using very efficient methods of utilising water. There is a problem here of disjunction if you want to return environmental flows to the Murray. I think it is Professor Mike Young from CSIRO who argues that we need something like 1,500 megalitres per year to be returned to the Murray. That has been taken out and utilised in a number of places where it might not be appropriate, and that has helped to create the problem of rising salinity—it has come back. There is also another problem: the more efficient our farmers get within the irrigation areas, the greater the potential problem of providing recharge back to the Murray. We do not want them to become too efficient or we will not get the recharge. How do those two things intersect and how disjunctive are they? You could do them together; it is just fairly hard.

Mr Goss—When it comes to environmental flows—and this is a matter for the Living Murray—there is no choice but to manage it on a net use basis, which takes account of return flow. As Bob correctly pointed out earlier, the whole on-farm water use efficiency has progressed because farmers have been able to capture the savings and expand production and they have not been accountable for the reduction in return flow. That is the Mike Young argument, and we cannot afford to repeat that with environmental flows. The advice of the commission to the ministerial council for a decision on 14 November on the first step in the Living Murray has some elements to it that set out the basis for water accounting.

Just as we have salinity credits and debits in a register that is reviewed regularly through a peer review process and so on, we would expect to see the same thing for environmental water accounting. There is one account for the southern basin, it is across governments, it is administered by the commission, it is reviewed and audited by the commission, and what you see on that account is what the river sees, which means you net out the reduction in use and reduction in return flows—that is what the river sees. There might be an acquisition of 100 megalitres on a farm, but if the river only sees 80 megalitres—from what you have described—then 80 megalitres is what will be on the account and what we will be accountable for.

ACTING CHAIR—Thank you for appearing before the committee today. If we have more questions, the secretariat will get hold of you.

Mr Goss—With your permission, can I just table a couple of things that I arranged when I was here over the week. I will just mention them briefly. We would like to table a poster which describes how you can target afforestation to maximise salinity while minimising water yield trade-off. There is a copy for each of you. We would like to table a graph which shows how we measure the cost-effectiveness of salt interception schemes into the future, so you drive investment with forward planning as well. We just think that they are important resources to your inquiry which we did not put with our submission. Thank you.

ACTING CHAIR—Thank you very much for that and thank you for appearing today.

Proceedings suspended from 12.55 p.m. to 1.43 p.m.

LEE, Mr Mike, General Manager, Commonwealth Regional Natural Resource Management, Department of Agriculture, Fisheries and Forestry

THOMPSON, Mr Ian, Executive Manager, Natural Resource Management, Department of Agriculture, Fisheries and Forestry

VEITCH, Mr Simon Murray, Manager, Industry Involvement in Natural Resource Management, Department of Agriculture, Fisheries and Forestry

BAKER, Mr Peter Anthony, Program Leader, Integrated Water Sciences Program, Bureau of Rural Sciences

GRANT, Dr Colin James, Deputy Executive Director, Bureau of Rural Sciences

DICKSON, Dr Rhondda Gay, Acting First Assistant Secretary, Land, Water and Coasts Division, Department of the Environment and Heritage

CHAIR—Welcome along this afternoon. Although the committee does not require you to give evidence under oath—you probably all know this off by heart now—I should advise you that the hearing is a formal proceeding of the parliament. I remind you, as I remind all witnesses, that giving of false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. I also remind you that the committee prefers all evidence to be given in public. However, at any stage you may request that your evidence be given in camera. The committee will then consider your request. Thank you for the joint submission between Department of Agriculture, Fisheries and Forestry and Department of the Environment and Heritage, which has been authorised for publication and is now on the public record. First up, would you like to make some opening comments or statements, then we will proceed to questions from there.

Mr Thompson—The Australian government recognises the importance of coordinated science to meet the challenges of salinity. What our submission does and what we would like to do today is outline how our two departments—Environment and Heritage, and Agriculture, Fisheries and Forestry—have put in place arrangements to work together to ensure effective management and coordination of the best science into national salinity programs. By way of context, the vast bulk of our natural resource management programs are based on regional approaches. They are being pursued through programs such as the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality. This regional approach is being adopted at national and state levels.

We see regions as the right level to develop options and implement integrated solutions to natural resource management issues. This is the result of policy work done over the last few years. The regional level can be effective in getting community engagement in landscape-level change. It is also appropriate for strategic natural resource management planning, where regions can identify their problems and participate in solving those problems and we can capture that local energy, enthusiasm and knowledge into broader projects.

Significant progress has been made with the NAP and the NHT in building that regional framework. All regions across Australia are now developing plans and investment strategies. At the present time 14 plans have been accredited and two investment plans approved. We expect 33 of these to be completed by the end of this year. We have bilateral agreements with the states which entrench landmark policy and institutional reforms that include strong emphasis on salinity management and ensure the states' agreement to empowering regions to develop these plans and implement natural resource management.

For the change to regional planning to be successful, it does need to be driven from the grassroots. It needs to be responsive to regional priorities. We are seeing increasing demand, as regions build their capacity, for scientific services at that regional level. This is in contrast to older models of providing science to regions which had suppliers of science delivering information to unengaged communities. There are, though, some real challenges in equipping regions to be able to manage science and to access science, and in ensuring that the best scientific expertise can work with regions.

There is widespread support in the regions for the Commonwealth officers to work collaboratively with the regions. There have been recent announcements of a number of facilitators and coordinators to assist that two-way interaction of information and access to expertise. That sort of interaction enables science to be linked in with regional natural resource management. It can also then enable it to be put in the context that spans social, economic and biophysical issues, takes into account production values and biodiversity values and engages all levels of governments, communities and private enterprise at national and local levels.

We believe good information is critical. The key strategies include the overarching data and information collection through things such as the Land and Water Resources Audit. Regional groups need guidance about how data is to be used and how to access it, and they need tools to enable them to collect it and access it systematically. We are trying to help with this process through the establishing of information banks and through easier access to information. As these data resources are collected and become more readily available and more comprehensive, tools such as the publicly accessible Natural Resources Data Library and the *Atlas of Natural Resources*, which are products of the Land and Water Resources Audit, will be able to assist them significantly.

We also support scientific innovation and investigation and, as the introduction showed, we have with us people from the Bureau of Rural Sciences. The Australian Bureau of Agriculture and Resource Economics also has expertise that can contribute in this area. The bureaus can provide integrated advice about things like salinity mapping, hydrogeological assessment, land use change and planning, social science and economic information. There is an example that you may like to pursue in the discussions today. The BRS has been instrumental in developing airborne geophysics as an aid to mapping salt in the landscape and pathways through the landscape. We are equipped today to provide examples of how this technology can make a real difference on the ground. There is one case study that we have recently made available on the Billabung Creek catchment in south-east New South Wales which demonstrates how science can interface with catchment planning to provide reliable, accurate guidance about actions to manage salinity on the ground. Rhonda will outline some of the key points that we would like to make. That will close our opening statement.

Dr Dickson—I will conclude with the key points we have drawn out in our submission. I will summarise some of the things Ian has covered already but I will be quite brief. We just want to highlight the points. The first point is that the Australian government through our two departments is implementing a number of key initiatives for science coordination in salinity to make sure that we do make the best science available to those who need it, particularly regional groups. The second is that nationally consistent data, information and standards are critical and are being developed through the national land and water audit and through ANZLIC, the Spatial Information Council. The third point is that we believe, obviously, that the national coordination of salinity science is vital. We have a fairly limited skills resource base across the country and the scope of the issue and the size of the country are great so coordination is essential. We have set up the arrangements to make sure that decision makers at all levels have access to the evidence provided by science based assessments through the natural resources databases and through the modelling systems.

As Ian said, ABARE and BRS provide key services from the Australian government's perspective in salinity programs through salinity mapping, hydrogeological assessments, land use data, social science and economic information. The Australian government has a key objective of making sure the tools and technologies are available and are being developed to assist the access of those who need it to salinity data to translate the salinity science into management advice. We mention in the submission the recent salinity forum which was an opportunity for regional groups and science providers to set out quite clearly what are the strengths and weaknesses of the salinity mapping methods. There is a user friendly guide soon to be published that supports that work.

Lastly, the Australian government has made significant investments to get in innovative technology such as airborne geophysics, which Ian mentioned and which we will get into further today. This has given us a level of understanding of the Australian landscapes that we have not had before. We think it is a significant advance. We believe that the beneficiaries of all this work are the land managers and the regional planers, and that has been the key thrust of the Australian government's approach.

CHAIR—Thank you. This is about the fifth hearing we have had. We have been out to some of the areas and talked to farmers and others. One of the key things that we are trying to determine is whether the science that we talked about is getting though to the projects being done on the ground, and whether it is the most recent and up-to-date information. As I said, BRS are now doing this other work. It has been going on for about two years now.

Mr Lee—Yes.

CHAIR—It would be true to say that we are getting various reports about how that is all happening, and maybe some states are better than others. Is there confidence within the departments that the best science is making its way to the ground?

Mr Thompson—We believe that we have a framework for enabling the best science to get to the ground. You have received mixed messages. What we say is that our success is mixed as well, because it depends on having the information available at the national and state levels and out of industry bodies in a form that regions can use and access. It also needs regions that have the skills and networks to be able to access it as well. So it does vary. There are some examples

that Mike and others might be able to elaborate on where it has worked, and there are examples where the facilitation network, information brokers and easier access to it, which we are developing, are going to be very important to make it work.

Mr Lee—I point to some successes. A great ingredient in the degree of success is the accessibility of regional bodies to local institutions. The prime example, for me, is the Burdekin Dry Tropics Board. They have a very strong working relationship with both James Cook University and CSIRO in Townsville, and the science underpinning the Burdekin strategy that is emerging is quite superb. The key element in that is the collocation of the regional body and its access to good regional science resources. Elsewhere it is more difficult. But that is perhaps the shining light when I look across the country at regions.

CHAIR—Do you have a failure that you can give as an example so that we can say, 'Why did that happen?'

Mr Lee—A general failure—and I think our colleagues from the Bureau of Rural Sciences would like to talk about this—is our slowness in being able to utilise some of the new technology in relation to salinity mapping, particularly, and getting the states on board to realise the opportunities that exist in using this technology to underpin our investments in salinity. It is happening, but it is happening a lot more slowly than we had expected. There are some good examples of where we have made some progress, but we are all disappointed that it has taken so long to mobilise the states behind these opportunities.

CHAIR—Do BRS want to comment on that? We did get some evidence last week, I think. People were saying that it was wonderful that BRS was doing this work but that they were having difficulty getting hold of it.

Dr Grant—Thank you for the opportunity to present here. I think the issue comes down to perhaps two or three things. The first is that we have a new technology that has been developed quite literally within the last three or four years, and it is becoming more robust and more refined as we use it more. The situation, however, is that it is challenging established beliefs. When you challenge established beliefs, you end up with a need to demonstrate vigorously your capacity and the ability for this information to be interpreted in a way that means things. What we have found is that, when we work closely with land stakeholders directly involved, there is very little concern, and there is a huge interest and a perception of the benefit that it can bring to them as a technology. But when we challenge, as it were, by the very existence of this information some established mores and beliefs, there is resistance to that information.

CHAIR—I will jump in there. Let us take the national action plan for salinity and money that is coming from the Commonwealth and the states through to projects on the ground. They are being coordinated through catchment management authorities or boards—boards as they are in New South Wales, and authorities as they are about to be in others states that are already well established. But I think—and correct me if I am wrong—that it was one of the catchment management boards last week that expressed in evidence scepticism about the BRS technology at Wagga. Is that right? I am pretty sure I was right.

Ms CORCORAN—Yes.

CHAIR—If this is the organisation that is going to coordinate projects related to salinity, and one of its people who is running the show is openly expressing scepticism about new technology, then there is a problem.

Mr Baker—I have been involved with all of the salinity mapping since day one, so I have effectively been at the coalface. I would have to say, for the Murrumbidgee CMB, that we have done no work for them, so their knowledge of the technology might be a bit limited. Certainly, areas in Queensland and South Australia are now using that technology for water resource mapping. In Queensland, the Lower Balonne is an example. So it is not just a matter of looking at where the salt problem is, but at where the fresh water is that they are going to be able to use. We have been doing work in the Riverland in South Australia which involves mapping the Blanchetown clay layer, which will help to restrict the amount of water from irrigation that can seep through into the saline aquifer underneath. People are actually moving their infrastructure onto the holes in the clay so that they can move their irrigation over onto the clay layers. So where we have been able to go into and work with the community at that level, the uptake of the technology has been great.

Dr Grant—By way of giving you some indications of scale, when Peter talks about infrastructure being moved, we have had the experience of one farmer who has moved his barn—there is a productive area on which the barn is situated that he could use but is not using, and an area of about the same size that he cannot use because it is unproductive, so he might as well place his barn across the top of it. Those are the sorts of changes that you can get down to at that scale, because the ability and the resolution of this technology are quite refined. So when we are able to work closely with land-holders, it works, and they are very grateful.

CHAIR—Is there a barrier to getting to those land-holders?

Dr Grant—As you have indicated, it requires the state and the Commonwealth, through all the structural arrangements that exist, to jointly agree to undertake a piece of work in a particular location, to define it, plan it and move forward. Where we have done that—in most places it has been done as a test, and perhaps in South Australia most vigorously adopted—it has been very successful. Where we have hit resistance, it has been a fairly bone-jarring exercise to keep going and to try to convince people of its value.

Mr Thompson—I would not define it so much as a physical, structural or institutional barrier in terms of stopping the information getting out. As Colin said, where there are mores in place so that people have presumptions about their understanding of how the landscape operates and presumptions about the technology that they have used in the past and which they are committed to, it is almost a social change, involving people saying, 'There are some different ways of doing this,' and being convinced that it produces something. People have invested a lot of money in previous techniques, and there is a concern, as with a lot of social matters, to this effect: 'Does that mean everything we have done in the past is wrong?' It may mean it is not wrong but it may mean it does have to be modified and that people have to change approaches. It is a matter of getting the hearts and minds to follow the facts. As Colin said, where you can get close to the land-holders or close to a catchment board and they can see the results, they can trial it for themselves and say, 'Hey, that seems to work; I'm comfortable with that,' and a sea change starts to take place. If you cannot get close to them, it always seems a bit remote: 'There is a scientist

somewhere saying something, but we know the scientist that we worked with before and he's saying it's different.' So I think there is a cultural issue to overcome.

Mr Veitch—There is also the issue that we recognise there are a lot of suggested mapping methods out there, and it is potentially really confusing for people: 'Is this something we can really trust or not?' That is why we embarked on the national review of salinity mapping methods through the Academy of Science and the Academy of Technological Science and Engineering: so that we could get an authoritative assessment of these different methods—what they are good for, what they are not good for, where you can use them and, importantly, the benefits and costs associated with them. So that is meant to be a national authoritative guide to the different methods and, of course, airborne geophysics is included as a suite of methods for that.

Mr Lee—A really important learning that has come out of these programs, which is starting to spread the learning, is that, particularly on the eastern side of the continent, the salt in the landscape is very spatially distinct. It is here, it is there and it is there. So interventions, firstly, need to be highly targeted and closely targeted, and the overall picture is more optimistic than we thought. Because these systems are smaller than we thought, there is less inertia in them and the potential to intervene and do something to rectify the situation is quite high. So we are seeing that the understandings are changing. We are seeing salt stores in the landscape that are very spatially distinct and we are seeing mechanisms of salt transport in the ground, which are emerging through these new technologies; whereas, in earlier days, people would do boreholes and interpolate and see a large degree of salt and not understand the transporter mechanisms.

It is the old adage: if you do not understand how it works, you cannot fix it. We are starting to understand how it works and that understanding is starting to spread. Mr Veitch referred to a very successful exercise with both academies sponsoring this workshop whereby the tools of airborne geophysics are now firmly credentialled in the centre stream of work. So it has taken a couple of years to get there, but that has not necessarily been a bad thing. We are on the way to having a better understanding of the salt phenomenon and how we can intervene.

Mr Baker—I would like to take that up a bit further, if I may. I have a little hand-out here.

CHAIR—Is it this one?

Mr Baker—No. It is an enhanced version of that one.

CHAIR—It is an update.

Mr Baker—Most certainly—we are always moving forward.

Dr Grant—What we thought we might do, with your agreement, is to give you a sense of what we are talking about here when we talk about the level of resolution and also about the ability to pinpoint areas of salt store. Once you know what the salt store is, and provided you know what the transport route is, you can predict where and to what extent the salt will move downstream. What we have tended to do until today, and in a very few examples only—we are working in one place in Queensland, five places quite closely linked in South Australia, one in Victoria and a couple in New South Wales—is to use some historical information sourced from

airborne electromagnetic work that has been flown to some great extent for mineral exploration purposes. When you look at it through, as it were, another filter of information source that is contained within that data, you can pinpoint salinity provided you go out and ground calibrate for salinity. In other words, you can pick up what is called conductivity. Conductivity could be caused by metals or it could be caused by salt. If you bore in a few key locations, you can identify whether it is by the salt or by the metal. We have been doing that and identifying very confined salt stores.

We have also been able to identify through other technologies, radiometrics and others, also airborne—Peter is much more versed in all this than I am—subsurface channels through which water can move. Therefore, if the salt store is near one of these, salt can be mobilised. It tends to break out in river systems and, therefore, you get riverine saline situations. What we have come to understand fairly recently is that, while we now know the way forward, we can work from the end result back. It may sound very simple but, until you actually understand that, you do not realise what the cause is. So one of the things we are thinking about now is involving communities in a very simple but powerful way to monitor their streams and then, when you know in which reach of the stream the salt is a major problem, you can, with some greater certainty, be clearer on where to target your airborne survey. Instead of it being throughout the catchment, it can be in a very specific location within the catchment. We can then work from where the salt is breaking out in the stream back to where its source is. Once we know where its source is there are methods for an intervention of the pathway. They may be biological, such as trees and other vegetation, or they may be engineering. We would like to give you an example of that within a very small catchment.

Mr Thompson—We have made the point about the need for cultural change for people to accept science. Involving the community in doing the first overall level of observation to work out where salt is occurring means you have already engaged them in the process, so they become more willing to think about new ideas. It becomes their process, not that of a scientist in Canberra, Sydney or Melbourne coming in over the top.

Mr Baker—The first map we provided is of Billabung Creek in southern New South Wales, centred around Holbrook and Culcairn, just to the north-west of Albury. The area inside the blue line that you can see on that first map is about 300,000 hectares. With the community we did stream electrical conductivity, or EC, surveys—getting an EC metre, putting it in the creek and taking readings. That is just one example of what we did. If you look to the east of Culcairn on the map, where all the blue and green dots are, you can see that the water quality is essentially good. It is close to drinking water quality or better. Salt was getting into Billabung Creek on the western side, where there are red and yellow dots on the map. That allowed us to identify an area where we would have to fly the airborne geophysics. That is what the pink line on the next map shows. The area inside that pink line is 100,000 hectares, so we have already said, for that particular catchment, 'There are 200,000 hectares inside that blue line which we do not think is an issue towards salinity.'

The next map we are going to move to is of the pink lined area on the current map, so you have a change in scale. The red that you can see on this map is the salt stores. Where it is blue there is no salt in that landscape. So we have 100,000 hectares inside the blue area. The red area equates to about 20,000 hectares. Based on the work that we have done, we believe that 10,000 hectares of that 20,000—half of it—is actually mobile and that is what is producing the salt in

the creek. By going through the process with the community of doing the stream surveys, we have been able to target where we should be doing the salinity mapping work. You can see that the initial area of 300,000 hectares where the problem was being identified has come down to 10,000 hectares you have to worry about.

Ms CORCORAN—This is salt in the ground?

Dr Grant—Yes. This is subsurface salt, so it is very well defined within contained salt stores. The question is how it is getting to the river. We can get to that point and then you can intervene.

Mr ANTHONY SMITH—You can find the travelling point, basically.

Dr Grant—Correct.

Mr Lee—It is very important to know where the salt is not as well as where it is, because if we are asking land-holders to change their farming practices, to have less leaky agricultural systems, to plant trees and reduce run-off, for no good reason it is a terrible waste of investment and public effort. So we are focusing as well on where the salt is not. The converse is often easier to prove than where the salt is.

Mr FORREST—The salt in the red area is there because of something that has happened in the blue area, isn't it?

Mr Baker—There is the potential that the salt has been transported from some of the blue areas into the red areas over geological time, but—

Mr FORREST—What I am saying is that there is land use going on in the blue area that creates a salt accumulation somewhere else.

Mr Baker—That can happen; that is quite true. But in terms of the relative amount that is being caused, the result of the process you are discussing would be tiny.

Mr Veitch—If I understand you correctly, you are saying that land use in the blue area might cause water to move underground, intersect the salt store and move it onwards. That is quite correct. I think when Peter refers to coming down to a much smaller area, the smaller area may not be over the red bits, it may be over the blue bits. That is important.

Dr Grant—You have got it absolutely right. In those blue areas we may need to do some intervention because that may be the source of water that is passing, as it were, within the region of the salt store and moving it on. It may not be, though. It could also be coming from water seeping through on top of the salt store. That is the step that next needs to be understood, location by location. This tells you where the salt is. What we need to do is to take, in each and every individual case, some further work forward to identify where the source of mobilisation is coming from in terms of water transport.

Mr FORREST—That is what I am getting at. It could be an even smaller area than 10,000 hectares.

Mr Baker—You are quite right. I was saying that there was 10,000 hectares where the salt can be mobilised. I am sorry for misunderstanding your question. The next page shows work we are doing with Holbrook Landcare, Culcairn Landcare and West Hume Landcare. We are now confirming those pathways with them—that is the next step listed there. We are working with the community and quantifying the amount of salt that is being mobilised and how we go about those targeting those remediations. I have just put them there as an example. One of the things that has become apparent from this work and from work we have done in a number of other areas is that if you do not plant trees in the right place, then you are going to make it a lot worse.

Mr HATTON—Taking this as an example of a small area, the way you have had to go about it is there has been a deficit to start off with because you have not got the airborne geophysics, because they have not been prospective areas for minerals. You have got the geophysics in areas where we have not got the problems. So you are using local people to try to locally identify because you do not want to spend major money to do large scale and then closer scale airborne geophysics.

Dr Grant—That is precisely the case. We had to work from the source, finding out what the problem was in the broad. Now we have worked out—and we are starting to see evidence of it—that if you do stream survey sampling, in particular, you can work backwards very quickly. That allows you to target and be most cost-efficient as to where you would place your surveying investigations. So instead of a broad kilometrage of surveying, you can refine it down to fairly small areas.

Ms CORCORAN—Having got this map now, what is your next step? You have identified the areas and presumably you know what sort of work you want to do in each of these different areas, planting or not planting trees. What is the next step?

Mr Baker—The next step is we are now working to confirm where the water is that is mobilising that salt.

Ms CORCORAN—Are you going to knock on someone's door tomorrow and say, 'We need trees on your property'?

Dr Grant—You would not arrive at that position without them being involved in the process, because it is effectively a surveying process, part of it by airborne techniques, part of it by sampling on their property. In the event that they are affected—and they are usually affected, because some of this salt is quite closely located to the source of the problem and the source of the outbreak—it would not come as a major surprise. But even if it did affect their property and their property values, their property is probably contributory to the problem and it is also probably suffering from the problem.

Ms CORCORAN—So what you are saying is, 'I have learnt by this because I have seen you around.' I have probably said to you, 'I have got water in my stream.'

Mr Thompson—As Peter and Colin said, right at the beginning they involved community groups in identifying the problems, so they were already aware that there was an issue. They will be working with Landcare groups in looking at the pathways. When you start to look at land use change, whether it be engineering, pasture, cropping regimes or trees, those sorts of land use

systems are things that people in the regions have expertise in, so they would be working with them. What you do about it is where the investments through a catchment board or a catchment authority come in. When you are dealing with 1,000 hectares of a catchment which is providing benefits across a portion of it, one does not expect one individual in a catchment to bear all the costs for something that everyone else is gaining from. We would want to work at the community level in identifying the problem, owning the problem, understanding it and contributing to the solution, but then get the catchment body to work out an investment package to implement measures to address the problem—proper cost sharing, public and private benefit and those sorts of things—and to look at the options. Getting the people involved from day one is critical.

Mr Baker—Whether it is the salinity mapping projects we work on or whether it is the range of things that we do, it is all run by the community. We provide the scientific information for them so that they can make the decisions. It is not my role, as a member of the bureau, to tell them where they should be planting trees; my role is to provide them with the information so that they can make the decisions themselves.

Dr Dickson—The other thing to keep in mind is that salinity is just one of the issues that the catchment boards are resolving. They are also looking at water quality, biodiversity and better sustainable production systems. All of that information has to come to bear in determining a whole range of different actions they are taking. It will not be a question of confronting land-holders for every individual thing. The catchment boards are trying to pool the information in an integrated way.

Dr Grant—I was saying earlier that we are challenging established understanding. The established understanding has been that, in a catchment of that nature, this is a hazard area and there is hazard—that is, a salt hazard—possibly widely distributed—not specifically in that catchment, but it is a broad perception. When you come down to saying it is not that and that it is a much more refined problem than that, it is throwing out and challenging long-held, established views. That is why in many respects the community quite likes it, because it is not a problem for everybody—and that sounds as though it is a very negative outcome—but it is a problem that can be fixed and the costs, therefore, can be borne more broadly. If this is about water quality downstream and about it being for irrigation purposes, the question then has to be asked: who might benefit and, therefore, who might bear some of the cost? It is a very different perception from the perception that we have broadacre salinity and we have to solve that with trees and that would cost almost every land-holder some productive capacity. It is a very different situation.

Ms CORCORAN—You have partly answered my next question—which is on the other side of the coin that the committee has to deal with. We have to satisfy ourselves that best science is being used. I guess this is an example of progress in that sense. Having established your trouble spots, are you satisfied that progress is being made in finding the best ways of dealing with those trouble spots?

Dr Grant—I think that is the point we are at. I think we are at the point of identifying that we can show you where the problem most significantly resides in a particular location. We would have to go and do the work in each location, of course. The next step of dealing with it is the position we are at at this point in time. It is quite a challenge.

Mr Thompson—I think there is also a model here of good science and there is good science in a range of areas. But it is also a model which has worked in this case study of how to get that good science into the local and regional consciousness and into their planning. It is one of the issues that I think is important in this area of applying innovation and science. It is getting the uptake and the uptake does not happen by just telling people; it happens by working with them, getting them to understand it, getting them to take it on board and getting them to change practice.

Mr Lee—In many cases the next step of tools are well researched. There has been a lot of research on different crop types, trees, deep percolation below crops, changes in land practice and all the rest of it. But it has been done in the absence of knowing where to do it. Now we have a much better picture of where to do it, the other science we can bring to bear in a useful way to intervene in relation to these salt stores. The other point I would like to make is that while this is a small area, in many cases these red and yellow dots are quite significant in terms of the overall, say, Murrumbidgee and Murray salinity targets. They are quite high contributors to the overall salinity problem.

Mr Thompson—It is a big part of their make-up.

Mr Lee—And they are localised, so it is a pretty optimistic picture. That is different from Western Australia—and I believe you are going to the west—where there are much larger homogenous systems and landscape salt. But things are looking up for the eastern seaboard. We think the picture is better. This understanding is spreading, and we are seeing a new openness with our state colleagues to talk of these techniques and bring them to bear. Dare I say that the progress of the National Action Plan for Salinity and Water Quality has been slower than we had hoped, but maybe, by dint of circumstance and these new techniques being used, there are some opportunities that we may be able to take up—or may have bypassed running ahead of where we are now.

Mr ANTHONY SMITH—To follow up on what you were saying about this latest technology, which is very informative and great to see, do you have difficulty in challenging some of the conventional wisdom?

Dr Grant—I think it is changing. If you had asked us this question 18 months or even 12 months ago, the answer would have been that we were challenged more vigorously then than we are now. Mike is making the point that we are coming to a greater understanding. For example, I sit on the South Australian mapping board and on the Queensland mapping board jointly with the state officers and colleagues. The information is now being shared. We are going down in the next several weeks to the North East Catchment Management Authority in Victoria, which has invited us down there to talk to the board of that management authority. It is this sort of information that we will impart. My belief is that you only have to get one or two management authorities accepting the technology, applying it, getting in there and starting to address some of the problems, and I think nearby ones will start to want to do it as well. So it is a process.

Mr ANTHONY SMITH—Would I be right in thinking there are probably two challenges to that? There is the challenge to the bureaucratic conventional wisdom whereby you have years of thinking the problem would be solved on more of a macro level, which can be overcome in time.

And there is the issue that this newer technology—not to put too fine a point on it—would not suit the arguments of some vested interests and interest groups.

Dr Grant—I think we are using the term small 'p' politics. In that context, there are certainly parties who would say, 'We have to plant trees. Broadacre planting of trees will solve the salinity problem.' That may not be the case. Others are saying, 'We need you to pay for this, because you're causing the problem.' That is not necessarily the case either. The answer to your question is, yes, there are very significantly vested interests, but sometimes they do not know why they are vested.

Mr ANTHONY SMITH—That is the bit I wanted to draw out of this discussion.

Dr Grant—We think we can help them to understand that.

Mr ANTHONY SMITH—I just think that is an important point. I am not referring to any groups in particular, but the issue is one that has had a lot of resonance in the community in the last three or four years, which is a good thing. But at the same time there are a lot of people that think they can fix it if only they were listened to.

Dr Grant—That is where I think this information can help.

Mr ANTHONY SMITH—With regard to the states and some of those delays, as Ann indicated, we are very keen to hear about whether there were any blockages in the process. You seemed to indicate that it was a bit disappointing that some things were taking a bit longer than originally anticipated, but do you also feel that you are starting to make some progress, or was there anything more to the point that could be done to spread the word?

Mr Lee—I refer to the example of New South Wales. We had a discussion with New South Wales agencies around the table 15 months ago and, for the first time in this context, we had the mineral agency for New South Wales as well. We had a very good discussion with some of my colleagues here, and there was a lot of excitement by the Department of Minerals. They realised that they had some very useful magnetics and radiometric data sets to contribute to this, albeit at larger line spacings. We did embark on designing some projects in New South Wales to be jointly funded out of the National Action Plan on a state level and the Commonwealth. As you are probably aware, all the funding is under joint control between the Commonwealth and the state, so we have not been able to move unilaterally on this.

Those projects got involved in some fairly convoluted internal NSW agency politics and did not resurface for 12 months or so. We are hoping that with the change of approach that is happening in NSW and more autonomous and powerful local authorities in the form of the catchment management authorities it will not be such a monolithic situation and we will be able to work more effectively directly into the catchment management authorities. I expect that some of those state blockages will disappear under the new arrangements, which seem to be shifting power from central state bureaucracies to the new authorities. That is positive.

We had quite a deal of progress in Victoria, but Victorian departmental arrangements changed, one department became two and the interest was split across two departments, so we have seen a lack of progress there, but that sounds like it is—

Mr Baker—But again, I think that is a re-education process. We thought we had got most of the way with one of the departments, but we have got to start a little bit behind the eight ball again and move forward.

Mr Thompson—There are catchment bodies in Victoria who are very supportive of this. One of the pilots was done in the Goulburn-Broken catchment and they are quite keen about it. So it is no surprise that BRS is now going down to talk to the north-east catchment, which is the one next door. We are doing work in South Australia, and I am quite sure there will be people coming across from the Mallee to say how—

Mr ANTHONY SMITH—Once you break through on a few, it will be self-selling, essentially.

Mr HATTON—I am very glad to get this briefing. I am on the industry and resources committee, and we have just finished a review of impediments to minerals exploration. A key focus of that was utilising the airborne geophysics and the existing data sets over time, not just the latest stuff, that Geoscience Australia has put together, and trying to make that available at no cost to the explorers. The costs have already come down, but the essential thing is that if we want people to do things and explore here we had better provide them with the information at relatively little cost. I want to look at two of your key points and run a couple of negatives with the positives—they look nice and positive, but you have already indicated some of the problems with them. The second heading in your submission says:

Nationally consistent data and information databases and standards are being developed ...

They are being developed extremely slowly, and you have no doubt had enormous trouble with all of the states. We heard in evidence earlier—in part, in fact, from Mr Warwick McDonald, in the last group of witnesses, who is helping to run the National Land and Water Resources Audit—that trying to get there proved almost impossible because they could not do what they set out to do and they had to do a range of things inferentially. They had to do that because: firstly, the data sets were not there; secondly, they were not compatible; and, thirdly, the states are virtually using different languages, which causes a real problem in doing it.

One of the things that might counteract that is the fact that if you are acting within a state the data sets that they do have and the language they are using may not be such a problem because they can be focused on a strict geographic basis. But using the existing data sets we have got geologically and using a new filtering mechanism and the satellite imagery we have got and so on, there probably is a very strong case to say that this has been moving forward. My guess is that there is still a long way to go in terms of getting that coordination. This is something that would have to be driven; what might help to drive it is the experience of the minerals area. That relates to your second point. Could you comment on that?

Mr Thompson—We agree with you on that. We are saying that nationally consistent data and information bases are being developed further. We are working closely with Warwick McDonald at the Murray-Darling Basin Commission and Blair Wood at the Land Water Resources Audit, and we work closely with ANZLIC. From a Commonwealth or national point of view, national consistency is important so that we can prioritise. Many of the problems we are dealing with cross state borders. I am sure Warwick showed you some of the examples of the frustrations of

cross-border data incompatibilities and the unfortunate answers you get or the answers you cannot get. So it is something we would like to drive harder and it is a really important issue. There are some difficult blockages in there. Some of them are the sheer investment of data that is in different formats in different places. To make a change costs real money and so it is about working through that. It is one of the big challenges.

Dr Grant—You are absolutely correct. If you can get hold of the data at different levels, for different reasons, you can reasonably rapidly produce something that is very useful to people. That is all surface land use mapping data for 80 per cent of Australia; the remaining 20 per cent is yet to be done but will be done in the next 20 months, or thereabouts, cooperatively with the states. That CD is available to anybody who wants it. It is all of the existing surface land management data that we have available. With additional resources and with additional access to information, we can build into that subsurface information as well so salinity, for example, could go on there but we do not have it on there at the moment.

CHAIR—What scale is that at, Colin?

Dr Grant—It is variable but I think all this has been brought down to 1:250,000.

CHAIR—So to get it right across the nation it is only at 1:250,000 that it actually—

Dr Grant—That is right. What we are also doing—and we were calling this 'Australia mapped in a box'—is this: we are able to do this catchment by catchment with a greater level of resolution. We have done a pilot one for the Snowy catchment. We can build much more detail into it, so if it were not the Snowy it could be somewhere else where there is salinity. Why we are doing this is very simple. In due course, probably within three to five years, broadband will be more accessible to more people in Australia and at that point they will be able to access the databases held by the states and held by the Commonwealth. At the moment they cannot do that. If they are in Gulargambone, they cannot access it.

CHAIR—On a two-way they can do it.

Dr Grant—But not everybody can. So what we are trying to do is provide a portal, nothing more than a portal, so you can access all the information in your catchment. We can provide that for you, provided somebody pays for it, of course, and in that regard it is available and it has direct hyperlinks to some other databases. Two or three years from now, these sorts of things will not be needed but, if it grows demand such that those databases are built and maintained by people, then that will be a good thing.

Mr HATTON—Available at what cost?

Dr Grant—To produce one for any individual catchment, we think we can do it catchment by catchment for in the order of $50,000. Once it has been done once, it is done.

Mr HATTON—Let me go to this sorry story of point 7 about the Bureau of Rural Sciences—represented here—and ABARE providing key services, including integrated salinity mapping, hydrological mapping and all the rest of it. When I saw ABARE's material at the start of the year, there was all of this information of what was going to happen in this area and what ABARE

'can offer you', but it would be at enormous cost because ABARE is charged with actually making money. Information is knowledge and it is power and all the rest of it, but it is also a matter of this: if you can turn a buck you are expected to these days. It is not a counterintuitive thing, but there is a problem in terms of the immensity of these issues and the fact that state instrumentalities want to make money from their data as well. We have got a problem in effectively dealing with these major problems whereby people are trying to make money out of their data, rather than seeing that if you enable people to have access to it then you will be able to solve the problem. It is a different order of magnitude in terms of the minerals area and the problem we are facing but is that here as well? Have you cleaned out your own house in some sense or are you still concentrating on making money?

CHAIR—Perhaps witnesses would answer that in light of the announcement nearly two years ago by the federal government of all data being available at no cost other than the cost of writing it to the CD. Some tell me that has not filtered through in various ways.

Dr Grant—The answer to the question is a very simple one. The data is free. To build an access route and pull it together to assist people—a tool, in other words—costs somebody some money and in many regards what we are doing is putting up cases for funding to Commonwealth and state agencies who will support us to do that. But the data itself is freely accessible.

CHAIR—The problem is that the data is not free at the state level.

Mr Lee—We are finding that most of the states are now making the base data free. We have seen moves on this in Queensland, which has been perhaps one of the slowest states in that regard.

CHAIR—South Australia's response to this committee's last report on R&D—which had a recommendation of making that data available free, other than the cost of writing the CD or whatever—was to agree to all of our recommendations except that one recommendation.

Mr Thompson—It was mentioned that where the data is made available, it is made available free and there are costs for interpreting it or getting it into a format that people can use. In some areas, though, the data is not available. We have been paying, out of the Natural Heritage Trust, to collect the land use information. There is an ongoing cost for collecting vegetation information because it changes. Socioeconomic information, on the scale that you want to use it, is often not available, or is not available in a consistent form. So there are costs in putting that together. That sort of foundation information is one of the things that we are funding through the Natural Heritage Trust. Once we have the information available it is put there. I would not want to speak for ABARE in terms of their cost recovery policy but I do not think there is anyone in the Commonwealth making a profit out of collecting or selling information any more. But there are real costs in collecting new information.

Mr HATTON—That is a welcome move. I was not aware, or only tangentially aware, of a change there. That is important in terms of getting solutions to the problems and getting people to do the sorts of things you want them to do.

CHAIR—That change came out of the action agenda on the spatial information.

Mr FORREST—I would like to get off the geophysical stuff. I think it is fantastic—and world leading, too. Well done on that! I would like to go to some outcomes. I think since the NHT we have planted 27 million trees and now we are being told that perhaps we have not planted them in the right places. I am interested in the outcomes, and in not wasting any money. I am interested in getting close to solving some of our problems instead of just getting people motivated to feel as if they are. I understand there is a review in respect to the land care aspects of what NHT has been funding. Why was the review conducted in the first place? Hopefully it is directed to making sure we are doing things right. When will we know what the outcomes are of that review on land care?

Mr Thompson—The Landcare review was undertaken coming out of last year's budget to review the progress, effectiveness and efficiency of that program so the government could consider its funding into the future. That land care review is part of the budget process, so the results of that, unless senior ministers decide otherwise, would normally be part of the budget process. So a final outcome of that would not be expected to be available until after the budget in May.

Mr FORREST—Is it being driven by Treasury or is it being driven by the need to know whether we are getting it right? It sounds as if it is driven by Treasury.

Mr Lee—There are two reviews going. We are about to embark on a final review of the NHT, which is more an outcomes review. The NLP review is more a process of land care program review. Our investments have been transmitted through the HNT1 and we are just embarking on a final review of NHT1 now.

CHAIR—The Landcare review would have to be finished fairly soon to get into the budget process but we will not know what it actually says until after the budget.

Mr Thompson—Yes. The Landcare review has gone through a public consultation process. An evaluation has been done and reports need to be made to government but the outcome of that, because it is a program review, will become part of the budget process. Mike Lee is referring to a review of the NHT1, overall, to look at the outcomes it delivered. You would be familiar with the comprehensive mid-term review we did of the NHT1; this will be an outcomes review. It is a review to look at what NHT1 achieved, what we learnt and how we can take it forward. Those results are not dependent on any budget process. We are actually looking at the program, looking at the outcomes and promulgating them as widely as possible. It is just about to commence.

Mr FORREST—I suppose what I am getting at is: is it driven by a normal process of 'We'd better review what we've done' or because there are some real concerns about effectiveness? That is what I am trying to get at.

Mr Thompson—In terms of both the mid-term review of the NHT and the Landcare review, many of those programs were about getting engagement, raising awareness and getting people motivated. I think the NHT1 mid-term review showed that the NHT provided a tremendous platform for operations to commence in getting people engaged but it did not necessarily in all cases result in that much work on the ground in terms of real outcomes, because the processes in natural resource management are so long. Subsequently there have been some reviews of some particular areas. I think Rhonda can probably talk about some of the work of NHT1 on Bushcare,

which looked at where the trees were planted, what difference they made, how many survived and how that fed on through into biodiversity. The issues that were examined as part of the Landcare review—while the objectives of the Landcare program were about raising awareness, participation and sharing information—were to look at, as a result of raising that awareness and participation, what people did and what that looked like in terms of the broader scale of problems. The Bushcare ones are available, and they are not dissimilar to Landcare in funding groups to do things. There are some quite useful results on how that worked.

Dr Dickson—That would address your first question about the effectiveness of the vegetation programs. As you know, the vegetation programs were aiming for more outcomes than salinity outcomes. They had biodiversity outcomes, water quality outcomes, erosion mitigation outcomes—a whole range of outcomes. There was a review of the Bushcare program, which was the main one. If you were interested—it is slightly off the topic of this committee—

CHAIR—It is interesting, but I have to say that we are starting to move away from the focus of what we are about here, and time is getting on.

Mr FORREST—I found it a bit more interesting than you did. I have been out there planting trees on weekends. I want to know if we have been doing the right thing. I am looking for assurance.

CHAIR—Invite them all across! You can find that out, but—

Dr Dickson—If you are interested, if you want we can send you a copy of that review.

Mr FORREST—If that is available.

Mr HATTON—How deep are the salt stores and, prospectively, how can we immobilise them? I know we cannot use synroc—I thought it would be useful if we could—but can we mine it? Can we deal with it, intervene, in that way?

Mr Baker—The depth of the salt stores is variable. The example that I gave you is that they were essentially in the first five metres. If you went down 10 metres to 15 metres, you would notice there was very little red in the map I would produce.

Dr Grant—It is low, in other words. It is like cutting through a football if you want, below ground.

Mr Baker—If you go further north—to Barmedman and West Wyalong—it is 20 metres to 30 metres down. It just depends on the geological age and the actual land formations at the time the salt was being deposited. You can get them down 150 metres plus, depending on where you are, but 150 metres down you would not be worrying about it.

Mr FORREST—I have a question about the dissemination of information. There are two problems that we are hearing. One is that you get a good scientist who researches a project and documents it but the language of that is inadequate to get to the coalface, so someone has to write that in a form that is acceptable for the people at the coalface. Then there is another

problem of disseminating that document, so there are two stages of getting information to the coalface.

Mr Baker—We do a series of community presentations, not only to a CMA, but also to the individual Landcare groups. I have actually presented the example that I gave to you there to six different Landcare groups, to be pushing that information out. We are actually doing it in both ways—we are doing a full-on technical report, which is normally a requirement for payment, but we are also making sure that we have that community involvement from day one and are presenting those results so that they can read it at the kitchen table.

CHAIR—Thank you very much. If we have some other questions as we progress further with the inquiry, we will come back to you specifically. Thank you for your time this afternoon and for your submission.

[2.53 p.m.]

BLUMENTHAL, Dr Martin, Program Manager, Sustainable Farming Systems, Grains Research and Development Corporation

PRICE, Dr Philip, External Consultant, Sustainable Farming Systems Program, Grains Research and Development Corporation

CHAIR—Welcome. Although the committee does not require you to give evidence under oath, I should advise you that these hearings are formal proceedings of the parliament. I remind you, as I remind all witnesses, that the giving of false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. I also remind you that the committee prefers all evidence to be given in public; however, at any stage you may request that evidence be given in camera and the committee will then consider your request. We have received your submission No. 29—we have now received more than 60 submissions—and it has been authorised for publication. It is on the public record. Would you like to start with some opening comments, then we will get into questions.

Dr Blumenthal—I will briefly provide an outline of the submission to allow more time for questions. The Grains Research and Development Corporation was formed under the Primary Industries and Energy Research and Development Act 1989, the PIERD Act, with the purpose of investing in R&D for the benefit of the Australian grains industry. Very early on in its inception in 1990 it identified salinity as a major risk to the industry. It has been investing in R&D in salinity since that time.

It has been apparent to us that it is a large problem and not something isolated to the grains industry, so we are a partner player in addressing salinity. We certainly do not do R&D on our own. We have had partnerships with the National Dryland Salinity Program from its inception, the Murray-Darling Basin Commission, a couple of CRCs and other relevant bodies that create R&D in salinity management. Early on we focused on what specifically GRDC can do to address salinity.

Annual cropping had been targeted as a major culprit in the causes of salinity in Australia, so we carried out R&D comparing water use and leakage under annual cropping systems compared to perennial systems. Certainly the data was there that annual systems were more leaky than perennial systems. We moved from there into designing farming systems that used more water, leaked less water and were less of a salinisation risk. The focus was on reducing the use of fallowing, greater use of opportunity cropping, growing better crops, better agronomy and making better use of perennials in farming systems. That was not just researchers; it was researchers working with farmers and, often, farmers leading the way in the approaches that could take place. In some catchments it was not just about plant based solutions; there was also a need for more radical intervention, particularly in Western Australia, where you would no doubt be aware of the debate about whether drainage is an effective and appropriate way, in terms of off-site impacts, to address the salinity problem.

We outlined a few case studies of significant successes in the report. One was an investment with BRS, to which you were speaking earlier, to identify where salt stores are, where water is moving and where land use change is likely to take place. We thought that was a success in the central west of New South Wales and we are applying similar principles in South Australia, aligning NAP investments with airborne geophysics and actually linking that investment with growers, so that they can understand some of the principles behind where salt is occurring, where water is moving and where land use change might take place. They are the major successes.

Of late we are looking more to collaborate with catchment councils or authorities—depending on the state—in our investments. We are certainly looking to partnership investments there. We do have some level of frustration about the length of time it has taken for regional investment to take place. We have certainly been ready to invest with growers in land use change, but the catchment planning processes have been frustratingly slow.

I really want to put the point across that the GRDC and other RDCs are well positioned to provide the link between science and implementation in salinity management. We have close links with farmers, with the grower community, and have had a commitment to participating with them in our R&D and ensuring that that R&D is relevant. I think we are well placed to partner with catchments in salinity management and obviously have something to gain for the industry in doing that.

There are a few other recommendations that we made in our report. There are three key ones. There is a lack of capacity and skills in regions to be able to identify where land use change needs to take place. There is a lot of expertise in government, but it is tending not to be applied regionally. There is an enormous skill shortage of people who understand salt movement, water movement, agronomy and land use change to be able to integrate the processes that need to take place.

We cannot assume that all the knowledge is there and it is just a matter of communication. Certainly on the issue of productive and profitable solutions, if you look beyond oil mallees in some situations and lucerne in others, there are not many profitable options out there for farmers to implement land use change. Whatever we talk about at the catchment scale, ultimately it is a farmer who has to implement the change on his property, so I think that is crucial.

Another area is, where the knowledge is available, those who need to get access cannot access it readily. There is no one database where you can get information about salinity management or information relevant to land use change. The advice you get varies greatly on where you are and whom you speak to. There is very little integration of information or the advice that can come from information. That is a major limitation in the link between R&D and change on the ground.

In addition to these things, there are few economic drivers out there and few profitable solutions. Growers are not going to put in place land use change that is going to be detrimental to them financially. In the grains industry, they need annual improvements in productivity of four per cent to stay ahead of the terms of trade, so it takes a great deal of altruism to protect vegetation or replace arable land with perennials that are going to provide a smaller return. While carbon, salinity and biodiversity credits are being piloted and tested, it is a long way off

before any real markets are out there. In the absence of drivers, there is going to be very little real, significant land use change.

GRDC wanted to provide some challenge for the NAP process. In the regional roll-out of NAP funding, there is a need to move the focus from getting the institutions and the plans right to getting some effective change, through training and adoption on the ground. That is a summary of our submission, and we welcome your questions.

CHAIR—Do you have anything to add at this stage, Mr Price?

Dr Price—Only two things: the first is that GRDC obviously are focused very much on growers, so we are at the coalface. While there is a lot of interesting science around, we are focused on what will encourage or enable farmers to do something differently. The second is to reinforce that GRDC recognises it is just one player amongst many. All of our investments have been collaborative ones. We have not funded any salinity research on our own. We have tried to pick up productive solutions in concert with the National Dryland Salinity Program or the CRC because we recognise that we are just one of many players in the bigger picture.

CHAIR—You also have done some new research through Land and Water Australia. Is that only part of it?

Dr Blumenthal—We were partners in the National Dryland Salinity Program in both phases. We are also partners in the Grain and Graze Program initiative, which does not entirely have a salinity focus, but it is part of that, dealing with issues on the whole farm basis.

Dr Price—We are a core industry partner with the CRC for salinity.

Dr Blumenthal—I am a member of the board of the CRC for Plant Based Management of Dryland Salinity.

Mr FORREST—I will probably get into trouble with the chairman, but I am interested in your submission where you note your disappointment that the terms of reference of this inquiry do not include financial incentives for land-holders. That has been deliberate; we are focusing on the adequacy of the science. My anxiety is that we are out there trying to find outcomes that get results and we are asking land-holders to implement them when we cannot demonstrate that there will be economic benefits for them. I mentioned at an earlier hearing that, at that stage, I had just come from launching a project in the middle of the Mallee. We are still researching old man saltbush and the use of lucerne in a dryland mallee, which we all know is not economically viable for a farmer. It is better for him to walk away and leave his land.

My feeling is that we have to have more carrots for land-holders to engage in this. Whilst it gets environmental outcomes, the land-holder is not going to be motivated if he is trying to make money out of it. We will never be able to prove it is economically viable no matter how long we keep investing in projects. I would be interested in your perspectives on that. I gather the GRDC has given up funding the planting of lucerne in the middle of the Mallee.

Dr Blumenthal—No.

Mr FORREST—Haven't you?

Dr Blumenthal—No. As I said, lucerne is one of the few profitable solutions. Clearly, we cannot plant 20 million hectares of Australia to lucerne; it is simply not profitable. Our colleagues in the meat and sheep industries point out that animal production is becoming more profitable. Better managed pastures do look better, and it is better than walking away from your land. We continue to have a big investment in lucerne—improvement, management and establishment. We are looking at ways to push the adaptation of lucerne into other areas. There is a large investment in Western Australia.

Mr FORREST—In the Western Australian mallee?

Dr Blumenthal—The sand plains mallee in the northern agricultural region and throughout. There is some level of adoption and success can often be related to the year in which you plant it. Some form of seasonal climate forecasting to minimise your risk could assist to maximise your chances of success if you plant it in the right years. We are investing in the CRC for plant based management of dryland salinity because we clearly see that lucerne is limited. It does not grow on acid soils; it does require summer rainfall for survival. We are investing in looking at alternative perennials. Certainly in summer areas there is scope for using opportunity cropping rather than moving to perennials. They actually crop more, you can be less conservative about fallowing and take a few more risks in terms of available soil and water at planting. There are investments that show that over, say, a six-year period your returns are better by opportunity cropping—cropping every four and six years rather than three and six, and getting a summer crop in at some stage depending on climate conditions.

Mr FORREST—We are down to five to six inches of rain a year in the Mallee and the last thing we want is for it to rain in the summer. I do not think there is any hope for lucerne. What about saltbush?

Dr Blumenthal—If there is no hope for perennials in such an environment, then you would look at better management of annuals. When you maximise dry matter production, you are going to maximise water use and reduce leakage. In the Mallee it is largely an episodic event, so it is in those extreme seasons when you get a lot of summer rainfall and you get a lot of drainage below the root zone. Whatever you have there is going to be some leakage even in natural systems.

Mr FORREST—What about saltbush?

Dr Blumenthal—I see saltbush as more of a crop on the saline land end. When you are starting to lose productive land to other more profitable options, saltbush fits into the margins where it is not necessarily absolutely saline. You can lose saltbush on the bottom of the valley floors where it is highly saline, but you can use it on the edges where you have lost it to crop production and it is moving towards a more saline situation. There are far more effective perennials in terms of water use in recharge areas where you can grow it. Lucerne is certainly a better water pump and there is the oil mallee. There is a range of better water use options in recharge areas.

Mr FORREST—It may be a bit parochial, but it seems to me that we should not be wasting any more money researching some of these things. It has been done to death.

Dr Price—One of the options in the Mallee is in fact to get the fertiliser right and actually grow bigger crops and increase the biomass. Some of the work that we have been doing with the Mallee Sustainable Farming Project indicates that it has a higher risk, it needs a higher level of management skills, and it uses much more water. Over a decade, gross margins are double that of what you can get out of a more conservative fallowing approach. But not all growers want to do that of course.

Mr FORREST—It requires a higher input.

Dr Price—A higher input but a higher output too.

Ms CORCORAN—John has moved a little bit away from what we are supposed to be talking about today, but it is actually quite useful. We are talking about a couple of different things—one is how the science actually gets to the land user. John has taken advantage of you being here today, but what about me, his neighbour? How do I find out? How do I ask about old man saltbush? Where do I go to find out these things?

Dr Blumenthal—Are you a member of a grower group?

Mr FORREST—It can be hypothetical.

Ms CORCORAN—No, I am not very interested in anything. I am on my block of land, with a hat on, and that is about it.

Dr Blumenthal—Do you use the Internet?

Ms CORCORAN—Yes. I will go through a—

Dr Blumenthal—Are you a grain grower?

Ms CORCORAN—Yes, I am a grain grower.

Dr Blumenthal—You can get *Ground Cover* magazine quarterly. There is good information in that. In fact, it is the most widely read and recognised rural—

Ms CORCORAN—And that comes out through—

Dr Blumenthal—Through GRDC. In every second issue there is an issue of *Salt Magazine*—

Ms CORCORAN—I have seen that.

Dr Blumenthal—which is a joint investment between NDSP and us.

Ms CORCORAN—Do most of my neighbours have access to the Internet?

Dr Blumenthal—Yes, most do. If you cannot use it, all your children can.

Ms CORCORAN—Yes, I know that—thank you for that. And so can my grandkids—I just thought I would get that in.

Mr FORREST—We are laughing because we have all been put in that position.

Ms CORCORAN—Yes, but not by your grandson! Are you satisfied that the best science is being used to answer these questions?

Dr Blumenthal—Not necessarily regionally—it is an awareness issue. It might not be getting right where you are. In terms of the best science being applied to you, you will get the general information, but you will have to work out the application. It depends where you are and what the interests of local advisers are.

Ms CORCORAN—And deciding what my problems are. Are they going to be doing research to help John and me through our issues or are they doing their own thing?

Dr Blumenthal—No, they are not likely to be able to identify what change might need to take place on your farm.

Ms CORCORAN—So what drives their research?

Dr Blumenthal—There is a whole range of levels of R&D. Obviously there is planning and policy, broader industry objectives, catchment objectives, meeting targets and—

Ms CORCORAN—Set by whom?

Dr Blumenthal—Often boards of which you or your neighbour may be members.

Ms CORCORAN—I am looking for the link between the person on the ground and the scientists.

CHAIR—The grain grower is paying a levy.

Ms CORCORAN—I am paying a levy these days, aren't I?

Dr Blumenthal—Yes. There is a chance that you or some of your neighbours would be in a grower group, and there could be a demonstration or a field site nearby—DPI Victoria have a range of field sites around—if you want to go and see something on the ground that might actually work. I think it is pretty important for the grains industry, if you want to get information, to link with a grower group. If you are not, it is very hard to provide information and advice on R&D one to one.

Ms CORCORAN—Sorry, I did not really mean one to one—I was just using that as an example. I have asked that question a lot of times to different people who have come before us and the answer is often that there are field days and demonstrations, so it seems to me that information is coming down the line. I am searching to find out what flow there is up the line. If you are a grain grower paying a levy, I guess that gives you a little bit of interest in feeding information up the line or maybe an interest in people listening up the line.

Dr Blumenthal—Many of the states have regional advisory committees or groups that can advise on research and collection—panel members.

Ms CORCORAN—In your experience, do they work?

Dr Blumenthal—You can test our investment plan, which has just come out. For example, in Western Australia there was a meeting between grower groups and researchers, and looking at research priorities was part of what the meeting was about. They put up the priorities and, when they looked at them overall, they were in the GRDC investment plan, so that means that the regional advisory committee process had been working—farmers had been getting their priorities into the investment plan. The great strength of GRDC is our regional panels—we have three regional panels led by growers, with grower members. The members are nominated by the state farming federations and are elected in other ways. So there is very strong grower representation and there are strong links. Our chair of the board is a grain grower.

Dr Price—But there is still the issue that I think GRDC—just like CSIRO or the Murray-Darling Basin Commission—is probably not going to come and work in your particular neck of the woods. What a lot of the research does is try to understand the general processes and principles. There is a huge gap between general processes and principles and specific solutions. For example, we understand ground water flow systems, but how do you get from there to what you need to know with your neighbours in your subcatchment so you can work out what is driving salinity in your area and look at what the management options are? Our submission says that there is this yawing gap.

There is some great science out there. We understand some of the principles. We know that all farming systems are just overwhelmed in southern Australia by the winter rainfall but the perennial systems reach into the soil and suck it out again in summer. How do you get all those principles so that you can understand: what could I do in my cropping system or on my property? That is where we think there is a huge gap: there is good science, but it is not really being translated for the individual circumstances of individual growers or even groups of growers—because we can only fund a certain number of grower groups. So there is this big gap. There is all this knowledge floating around out there, and we keep generating more through the internal funding mechanisms of research organisations, but it is not hitting the ground because there is a gap.

Ms CORCORAN—In your submission you talked about creating some sort of spot for all this information to be on.

Dr Blumenthal—That is only a small part of the solution really. I think a good, strong regional capacity is crucial—that there be someone in your region that understood salinity, water movement and where land use change could take place, where those land use change options were available.

CHAIR—Is that the catchment management authorities?

Dr Blumenthal—It could be those authorities or state agencies.

CHAIR—So they present an opportunity to fill the gap you are talking about?

Dr Price—They could be. Some farm advisers have got quite a good handle on it now. There are some interesting tools out there to look at your likely recharge based on the level of pereniality across your whole farm. Advisers can use those kinds of tools. Still I think a lot of the science is not getting back down through that network in a form that growers can pick up and use to make different decisions.

Ms CORCORAN—What about Elders and company—I cannot think of the generic term?

Dr Blumenthal—Agribusiness. I think training of agribusiness is crucial. The CRC is doing that in partnership with Wesfarmers. Having advisers who can not only provide advice about varieties and fertiliser but actually integrate some natural resource issues into the advice that they give is important. Wesfarmers have certainly welcomed that. It has come from the top of their organisation and flowed down right through to the ground. It has been amazingly effective.

Mr HATTON—As I understand it, you have done some of the funding with the Bureau of Rural Science to produce this kind of work.

Dr Price—Yes.

Mr HATTON—In the study done locally in Culcairn science has now identified where the key salt stores are in this particular area and how the systems operate. The problem is, though, that our landmass is so big, and the farmed landmass is so big, that there is a great cost to doing the rest of the scientific work needed. Is that a fundamental problem in terms of going forward?

Dr Price—Yes, I think it is. Whether drainage beneath the root zone becomes ground water rise depends on the discharge capacity of the ground water system. Whether that rise does or does not intersect with a salt store is different in every place and you just have to go out and work it out. As you would have seen in that study, I think there were 16,000 hectares which—if you revegetated it—gave you half the Murrumbidgee salinity reduction target at minimal cost. But you have to go and do it everywhere, unfortunately. You can take the very general principles, but you have to go and do it, it is expensive and it is time consuming. As Martin has been saying, there are not many people to go and do that work in most regions.

Mr HATTON—And fundamentally it has to be ground proofed and you have to have the airborne physics where it is necessary. We do not know where they have gone to, but there are a lot of geologists who are very good at finding things on the ground, working things out and doing proofing and so on. Because of the crash in minerals exploration, a lot of those have gone missing—some overseas, some driving taxis and all the rest of it. Has there been much movement at all—seemingly there has not been—to pick up those people whose skills have otherwise been lost or is there is not enough of an industry based on what has been found yet?

Dr Price—Where are the jobs?

Dr Blumenthal—From the mining sector, the jobs going in natural resources halve your salary—if you are willing to do it. They are used to generous salaries compared to what is paid to people working in regions and natural resources. They apply their expertise to something else.

Mr HATTON—Yes. It can be fairly free ranging.

Dr Blumenthal—Yes.

Mr HATTON—As was evident in the minerals area, the cost of doing the airborne geophysics is high. Here in particular that has been very cleverly got around by saying, 'Okay, we will use other methods in order to find the conductivity of the streams and so on.' That may well prove to be a significant marker in terms of doing this more broadly, a bit like the ants knowing whether a thunderstorm is coming or not. There could be a series of environmental or ecological markers that could help. How much science have we got in relation to those other sorts of markers? Are we still stumbling around in the dark a bit?

Dr Price—It is a relatively underresourced area, I would say. Certainly there is some stream gauging data, but there are an awful lot of ungauged streams even in the south-east. For instance, somewhere like the Goulburn-Broken you know that Hughes Creek catchment is very salty water so you know that a lot of the salt in the Goulburn-Broken is coming out of Hughes Creek, but where exactly in Hughes Creek? You still have to apply the geophysics to tell you exactly where the salts store and the rising ground waters are. But the short answer is that I do not think the use of those surrogates has been investigated much at all. It has been underresourced.

Mr HATTON—It is also probably to do with the use of historical mapping data. It goes to an interesting point you made otherwise. In your submission you say:

A national database that is freely accessible, interactive—

I would agree with that, but you say, very interestingly—

and free of institutional bias needs to be established.

Can you tell me a little more about that institutional bias and the problems associated with it?

Dr Price—Each institution has its own particular perspective which is often related to its funding requirements and so on, but there are discipline perspectives. For instance, if you send a geophysicist you will get a geophysical answer and if you send a hydrologist you will get a hydrological answer. So it is very much dependent on people's individual perspectives. There are very few people who put the big picture together so you can see all the bits of the jigsaw and work out where to invest your limited dollars to best effect. One of the things that is also missing regionally is that when you have a DPI person or one other person you only get the bits of the jigsaw that they are familiar with and relate to their perspective. You do not see the full picture.

Mr HATTON—As a council is your problem greater because you are dealing across states and the states produce different data sets because they have different methodologies? Does that make it harder for you to deal with them?

Dr Blumenthal—It certainly does. There are different state databases, information sources and ways of collecting information. There is very little standardisation. It is very difficult to compare across boundaries. An example is the Mallee Sustainable Farming Systems grower group. It covers three states and has to integrate information from three catchment associations—information collected on water quality and a whole range of issues and in different forms—and integrate that to make useful decisions about land use change. It is certainly very

challenging. But, irrespective of the source of the data, if it was in one place and there was access to it—and assistance to convert data into information and into decision support for regional communities down to individual growers—that could be a tremendous asset in a lot of those areas.

Mr HATTON—As is happening with Geoscience Australia with the minerals data.

Dr Blumenthal—Yes.

Mr HATTON—If it is in one place, I imagine it is not as difficult in terms of trying to stumble around to try to find it. I have a question about soil types related to past use and farming use. We had evidence this morning from Mr Tunstall of Natural Resource Intelligence, who was putting a maverick view. His argument was that the soils are relatively friable where you have got native vegetation in situ and it is undisturbed and so the problem of salt penetration is not there or is not that evident. But with normal farming practice—no matter what it is—there is a fundamental problem with the change in the nature of the soils. Because the soils become much more compacted, there is a great deal more run-off from that compacted layer. He argued that it is primarily the top metre where the problem is occurring, with a deleterious effect for grain growers and others. Do you have any views on that?

Dr Blumenthal—It is very difficult to generalise. I would suggest that with cropping the run-off is actually less than in natural ecosystems. There can be infiltration; soil friability can be greater in woodland that has not been disturbed. There may be some examples where that has occurred, but I do not think it is something that could be generalised. There are some issues about transient salinity with salt in soils and we do do R&D on that. It certainly is an issue that there is salt in soils, but the broader salinity issue is about drainage below the root zone and the rising watertables, where salt is in aquifers that is coming closer to the root zone and to the surface.

Dr Price—Where we have compared native systems with cropping systems in the same location, in southern Australia both of them were completely overwhelmed in winter by the rainfall, simply because it is cold, has low light and neither of them use much water. As I said, the native systems suck it out in summer and dry the profile, which the annual systems do not do. In terms of the amount of deep drainage and the partitioning, I do not think there is any standard difference between crop soils and native soils. There is some variation, but there is not a clear pattern.

CHAIR—Finally, last week when we took evidence in Shepparton one witness said that—and I do not know whether they said this on record or informally afterwards—when you go to Western Australia you will find that they are besotted with drainage and that they think the only solution is drainage. Have you got a comment on that? You mentioned something about a conflict in your early comments.

Dr Blumenthal—There is a tension between plant based management solutions and engineering based management solutions. Certainly in some catchments in Western Australia, some models suggest that you need 80 per cent of the catchment changed to perennial vegetation from annual cropping to actually have an impact on the watertable rise and salt levels on the surface. You can see the drivers as to why the growers would be impatient in the West and would

be looking at engineering options. There have been some successes in terms of converting saline land to profitable, productive agricultural land. That has been a local success. The water may drain to the neighbour or into the nearby stream. By digging the drain, you can expose acidity and affect streams. It is quite a complicated issue. If the off site impact issues could be dealt with, drainage may be part of the answer.

CHAIR—But you are not agreeing that drainage is the be-all and end-all.

Dr Blumenthal—No; the evidence is not that drainage is the be-all and end-all. It can be effective on farm, but especially in the West the key is: where do you take that water?

Dr Price—It is a very different issue in eastern Australia where you have got some important freshwater species. You have got an irrigation industry. I think what you can do in the west and what you could get away with in the east are somewhat different.

CHAIR—They mentioned that massive drains and things were going in. Is that in very flat country?

Dr Blumenthal—Yes, it is; they roll off those low slopes.

CHAIR—That is where they would be finding that that is the best solution and a quick solution?

Dr Price—It is certainly quick.

CHAIR—But not necessarily the best long-term solution?

Dr Price—It is not; and in some of the soils there, because the rate of lateral flow is fairly low, each drain only has a relatively small impact—maybe over five or 10 metres. It works well in some places, but in others you would have to build an awfully big drainage network.

Dr Blumenthal—It depends on the soil permeability. Some can be effective for drains half a kilometre apart; others would need them to be 20 metres apart. It is highly variable.

CHAIR—In flat country they are likely to be quite large and wide to get the effect, so they become much more prominent on the landscape.

Dr Blumenthal—Yes. They use them to manage surface water flows as well as water from the watertable.

CHAIR—Thank you for your assistance this afternoon. Your submission and oral information have been very useful.

Dr Blumenthal—Thank you. I will just leave with you a couple of publications in relation to some of our investments on salinity and grower groups. I do not whether you have had access to this report. It is an economic evaluation of some salinity options. If not, there it is.

CHAIR—Thank you. We have several documents to table, which we will do now. From the Murray-Darling Basin Commission we have received the following documents as exhibits: a table entitled 'Effective salinity management in the Murray-Darling Basin', a table entitled 'Increasing costs of salt interception schemes' and a poster entitled 'Where to plant trees for salinity outcomes'. In addition, we have received Bureau of Rural Sciences publications *Integrated water sciences program* and *How do we know where to address the salinity problem?—the Billabung Creek example*; and from the GRDC we have received as exhibits the publications *Economic evaluation of salinity management options in cropping regions of Australia*, *Farming systems groups: productive solutions to complex problems* and *Productive solutions to dryland salinity*. There being no objection, it is so ordered.

[3.34 p.m.]

STAUFFACHER, Dr Mirko, Research Director, Salinity Directorate, Land and Water Division, Commonwealth Scientific and Industrial Research Organisation

WILLIAMS, Dr John, Chief, Land and Water Division, Commonwealth Scientific and Industrial Research Organisation

CHAIR—Welcome. Although the committee does not require you to give evidence under oath, I should advise you that the hearing is a formal proceeding of the parliament and remind you, as I remind all witnesses, that giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. I also remind you that the committee prefers all evidence to be given in public but at any stage you may request that your evidence be given in camera and the committee will then consider your request. We have your submission, No. 42, in our books, which has been authorised for publication and is therefore on the public record. Perhaps you would like to start with some opening comments and then we will go to questions.

Dr Williams—Thank you very much, Chairman. The proposal you referred to as No. 42 is a submission from CSIRO as an agency, so it incorporates, as you see from the authorship, a wide range of canvassed views. This afternoon Mirko and I will try to bring those together from the CSIRO prospective. The issue of the science behind salinity and its coordination is a key issue to us. If there were two things that I would point to, they are the two dot points that say that there is a tendency towards deskilling in our state agencies and a reduction in state extension service capacity. At some time, despite the best efforts of the drylands salinity program in its coordination, I feel that the research we have been able to resource through that process and those connected to it is less than we need in terms of the magnitude of the problem we face. You may expect me to say that, but I am saying it because I believe it to be important and I believe it to be true.

The issue on our agenda is have we got our research focused on the important issues behind salinity and then have we got it coordinated. I think we need to distinguish between whether the research is focused on treatment of symptoms or on treatment of the cause. Much of the effort today is on treatment of symptoms. The treatment of the cause is usually much longer term and more difficult, but until it is treated the water and the salt will continue to move to the river and to the low points in the landscape. If you want to set about draining the whole continent, that is what you will be doing if you do not treat the cause. We see that as important, that we need to get research capacity that can identify where to put our effort to make sure we get the best outcome for the investment, so there is a need for a triage approach to salinity management. We recognise that. Therefore we need to have better and better tools—and Mirko will speak to that issue at length—to be able to decide what that is. In some instances I think we have great evidence that in fact we are not very good at doing that.

The second thing, and I believe personally the most important, is that there is a limited range of robust, profitable farming biological systems that will reduce recharge to the extent required to make a difference to the salinity problem, that are commercial and that will make sufficient income to generate a healthy rural community. What we need are solutions that address the cause

of the problem in land uses that make money. We do not have very many and we do not have enough research directed towards finding them.

The third point is that engineering will be required in the short term to protect important assets. The problem in many instances—Western Australia has many of them and so do parts of Victoria and New South Wales—is that the problem has got away and we are going to have to intervene in the short term to protect important assets, both man-made and environmental assets. I think we need to have a lot more focused and fundamental research addressing those issues, and Mirko will speak on that in more detail.

I guess that we need to also have a much better understanding of the impacts of salinity on biodiversity, particularly in the terrestrial systems, the floodplains and the wetlands. Let me give you some examples of what I mean. Much of the research to date has been on the effect of salinity on adult organisms, whether it is a native fish or some form of invertebrate. But what we have learned is that that is not giving you a very good measure of what salinity is doing.

There is an increasing amount of good evidence to show that, if you actually measure the functionality that is going on at the biochemical level in the sediment or the soil of a wetland as it is impacted upon by salinity, we are finding that small changes in salinity are sufficient to change the biochemistry and geochemistry of that system so that you switch off some key processes that are fundamental to the health of the ecosystem. So, if you look only at the top of the ecosystem, you do not get a very good warning of what salinity is doing. We need to understand that better. I think that is of considerable importance.

I think we also need a much more focused effort on policy and market instruments that can help drive the appropriate actions. That means that, if we have land uses which are nearly economic, we need to find policy mechanisms to take people over the line in adoption. I think there is a great deal more that we could say on that, but it is an issue. I will leave it at that point. I think Mirko will pick up on these things. He is the specialist; I just wave my arms.

Dr Stauffacher—I will start by giving you an overview of where we are coming from in the CSIRO as far as salinity is concerned. About a year ago I did a little study for myself, just looking at the state of salinity research in Australia, where salinity research is actually coming from and how the process of understanding actually evolved. Interestingly, what I found out was that it has only been in the last 10 years, I would say, that people have really started to realise that, when you look at salinity, you have to look at the whole catchment hydrology issue. In the past, people thought salinity was only a vertical process—you get some water into the groundwater, the groundwater comes up and that is basically the issue and, when you act at a local scale, you are going to get a response.

But what we discovered in the last 10 years—or what became apparent with better modelling tools and better geomorphologic, geological and hydrological understanding—is that salinity is a more complex problem than that. You can do something in one part of the catchment and not suffer salinity, but the impact of what you are doing there may occur somewhere else in the catchment. That, of course, places salinity into a completely different ball game. So, in the last 10 years, a lot of research has been invested in this understanding.

I would argue that only in the last three to four years has an understanding come up about the magnitude of the problem, how big the salinity issue is. I think that the National Land and Water Resources Audit is a good testimony to that. People realised how big the problem is and how difficult it is going to be to address. You might remember that, at one stage, trees were perceived as being the silver bullet. People said, 'Let's put trees back into the landscape and that's going to solve the problem.' But what we realise now is that it is definitely not going to be the case. Trees have their qualities, but they also have some inconvenience. We might expand on that later on—I do not know. But, more and more, what we realise is that the magnitude of intervention needed is pretty big and the solution is actually going to come out of a combination of technologies and techniques. One of these is a biological solution—planting trees and looking at different farming systems. One of them is an engineering solution—digging drains and pumping the water out. The third one is simply living with salt. If we have salt here, let us look at it from a resource point of view—what can we do with it?

Mr FORREST—You're not Israeli, are you?

Dr Stauffacher—No, not really. That is basically the situation we are now in. We realise that a lot needs to be done to sort out and solve the problem. One of the positive responses in recent times was the National Action Plan for Salinity and Water Quality, but that also came with its own issues and problems. For instance, working in CSIRO, dealing on a regular basis with pretty darned good people and interacting a lot with the states—we do a lot of work on projects with the states—we realised that across the states the skills are not all at the same level. That probably has something to do with the extent to which different states are affected by salinity. In Western Australia, where they really have serious problems, the scientists understand the issues very well, whereas in Queensland, where things have not yet happened, the understanding is not at the same level. The next issue is the way we can or cannot interact with different state agencies. With some of them it is easier and with some others it is more difficult. That is an issue and a problem that should be addressed somehow so that the Commonwealth research capability gets better understood or integrated with the state research efforts.

Another issue related to the NAP is that now NRM has been devolved to the regions. Basically the regions have to come up with their own NRM plans, which include not only salinity but a whole range of issues. Very often the regions are not really in a position even to ask the right questions about what needs to be done and how it needs to be done. The overhead cost for an agency like CSIRO to interact with all of the CMAs or CMBs across the different states is extremely high. We have some links with some of them that are very effective, because we have been building up relationships with them over the years, but with some others we do not have contacts, because we do not know the people. We are actually a fairly small player in the game and so we cannot put a lot of resources against this networking. I also perceive that as an issue, because a lot of these regions could probably make very good use of our experience and skills.

That is the broad picture of where we are coming from. As John mentioned, in the salinity issues one thing that is understood now is that the problem is big. It is very likely that we are not always going to find win-win solutions, so we will need to be able to prioritise the work and funding. One first step was a project we led that was funded by the Murray-Darling Basin Commission. The project included CSIRO but also BRS, Geoscience Australia and the state agencies. That was a catchment categorisation project. The aim of the project was to look at the landscape and try to understand how different parts of the landscape respond to salinity

treatment, such as revegetation. It aimed to understand the spatial viability of processes. Once you start to get that understanding, you can then look at the landscape and start to understand which parts of a catchment are more likely to respond to treatment than others.

I would like to put a few documents on the record. These documents were published by the Murray-Darling Basin Commission, and they deal with a framework called the groundwater flow system. You are welcome to the copies I have with me, and I am more than happy to distribute even more copies to you.

I would say this is a first step to triage and prioritisation. This work involved all the states, so, as I said, it was a good start, because everybody was involved. Especially in the regions we are getting extremely good feedback from some of the remaining extension officers, because that is almost the language they are talking with the farmers. They are talking about landscapes: what kinds of landscapes are more likely to respond to treatment? This framework allowed the extension officers to put a good lingo behind it all. Basically, it gives a technical backup to what they have been saying for quite a while. I am not going to take any longer; I think it is better if we start the discussion.

CHAIR—Thanks for that. We have had some evidence over the last few weeks since we started having public hearings that there are conflicts between people about the science. We are trying to get our heads around how you resolve that. For instance, in evidence last week one of the catchment management authorities expressed scepticism about some of the work that BRS are doing—the airborne geophysics techniques. BRS explained today that that could be, in that particular case, because they have not really working with that particular catchment management board up to now to ensure that they fully understand. Does CSIRO take a role in that? Are there good examples of where you have been able to mediate, for want of a better term? People could keep saying, 'My science is better than your science.'

Dr Williams—Yes. Obviously, we have to be careful how we do that, but in the case of, say, the airborne technology used by BRS, that originated in its form from the CRC that CSIRO was part of, and its evaluation was done in the CRC LEME. I think that enough work has been done on that with us to be able to say what its strengths and weaknesses and appropriate uses are. But you may comment further on that, Dr Stauffacher.

Dr Stauffacher—Yes. I understand where these comments are coming from. There was definitely an issue with airborne geophysics and the way the capability of airborne geophysics was sold—and, I would argue, oversold. I think that this was pretty detrimental not only to the whole scientific community but also to the technology involved in these airborne techniques. This overselling basically led to a kind of backlash. The main proponent of this overselling has since left Australia. What CSIRO have done on our side is kept our links with the CRC LEME, and we are now working together. I must admit that since the main proponent left the tone has changed. Now everyone accepts and understands that, while airborne geophysics provides yet another layer of information, it is certainly not the solution.

I would argue that in some cases, in some parts of the landscape, airborne geophysics is probably a very effective tool towards understanding, but in other parts of the landscape it is not going to work. And the people who are currently leading these kinds of projects are perfectly aware of that; this is also the message they are sending out. Once again, at CSIRO we are lucky

enough to be immediately up to scratch on these issues because we can interact, whereas I believe some catchment management boards and authorities do not have this direct line to BRS. So from our point of view I would say that now the situation is much better, and most of the work is done with Geoscience Australia and CRC LEME. But it is obvious that the message needs to go out to the CMAs too.

CHAIR—The current national action plan and the projects that are funded under that come out of bilateral agreements between the Commonwealth and the states. Does CSIRO have some role in testing the efficacy of the science behind the projects that are being funded?

Dr Williams—I will respond first and then Dr Stauffacher can fill in anything I miss. There is no formal process at all. If the regional body asks CSIRO to suggest the way through something or a piece of work to be done, then we do that. But we have no place in the process of resourcing the action in the regional body, other than if we are contracted by either the state or the regional body. I think this might be an appropriate lead to move to a really core issue. Under the National Action Plan for Salinity and Water Quality, the strategy for the actual research effort to underpin that is not apparent to me. Originally the Commonwealth did retain some funds for research and development, but through the process those funds were distributed straight through to states. Then it was always very difficult to ask to bring some of that back into a common pool for a national R&D agenda to underpin the issues. As far as I am aware, there have been attempts to do that, but with little success.

So the official view would be that it is up to the rural industry research and development corporations, which are substantially funded both by grower input and Commonwealth funding; that it is in their mandate to make sure the research to underpin this is in fact done. To me, it is possible for that to work. But the consequence of both of these things is that in some ways a focused, nationally coordinated effort to underpin such an important problem is highly fragmented and, in my judgment, not adequately resourced. I think it would be possible through a funding agency such as Land and Water Australia who, with their very small resources of $11 million or so, have done a sterling effort in trying to bring about some coordination through their sponsorship and facilitation of the National Dryland Salinity Program. I would compliment them highly on that. We are part of that program and have tried to use that mechanism to bring about those outcomes. But I do not think it is adequate.

What often happens is we bring on, say, part of the Rural Industry Research Fund and they will rebadge current work. It is not necessarily work that is directed to the core, hard problems that need to be solved. That, to me, is a major issue. There is one body that, in addition to Land and Water Australia's efforts, has helped CSIRO in working on this problem. We use our own appropriation, as we should, towards this issue and most of it is used in partnership arrangements: we spend 50 per cent of CSIRO money and 50 per cent from wherever we can get it. But that one body that has consistently put effort towards this goal is the Murray-Darling Basin Commission. That has been a mechanism that has merits because it is a partnership between the states and the federal government. I would say that, without that, the sort of work that Mirko passed to you would not have occurred. So, in summary, I think the R&D effort is fragmented, there have been attempts to bring it together and there is some coordination by those states that sit in the Murray-Darling Basin Commission, but of course that is not all of Australia.

CHAIR—So you would say that it would have been better, as part of the bilateral agreement between the Commonwealth and the states, to have had part of the joint funding allocated—

Dr Williams—To a serious research effort.

CHAIR—It would be funded partly by the Commonwealth and by the states as part of that joint agreement.

Dr Williams—Yes. This is not my field but there are a number of mechanisms you can use: the rural industry funding bodies, Land and Water Australia, CSIRO, the Murray-Darling Basin Commission—there are all sorts of ways of doing that. But, whatever it is, my judgment is that the effort to actually deal with the core, hard problems behind salinity—and I argue that both are important: symptom treatment is important, but the causes are also absolutely important—has not been sufficient to the task.

If you like, I will table a couple of documents that set that out. One is called *Effectiveness of current farming systems in control of dryland salinity*, which was done by us for the Murray-Darling Basin Commission. That document highlighted the lack of agronomic solutions to the problem. The Murray-Darling Basin Commission then said, 'Okay, if you say there are not many agronomic solutions, tell me where you think the future solutions might lie.' This document, which is called *A revolution in land use: emerging land use systems for managing dryland salinity*, at page 3 sets out a range of some of the options and may be where the research agenda should be directed. Further, one summary document that you may find useful—you are welcome to have more copies of it but I have only one copy—is a chapter that is pulled together by Glen Walker, Tom Hatton and me and it is on dryland salinisation. It sets out a balanced understanding of the problem.

CHAIR—Is my perception correct that, in terms of most of the projects currently being funded under NAP, decisions are being taken whether this project should be funded more at a state level than at a cooperative level?

Dr Williams—That would be my call. Can you add to that, Dr Stauffacher? You have been intimately involved in evaluating income.

Dr Stauffacher—I do not have much more to add to what you have said, but it is definitely the case that we never had any input into project evaluation. It is true that, especially in some states, there is real control as to what was developed in the regions and as to whom the regions are going to subcontract to do the work. I do not think that that is a very healthy process.

Dr Williams—The programs committee of the state and federal bodies for the national action plan were conscious of this problem that I am addressing. One action that has been taken is to commission the Bureau of Meteorology and the CSIRO to conduct an assessment of the use of scientific information in the development of those plans. That report is being written at the moment by Dr Colin Chartres. It is not complete but it will look at a number of case studies to see how and where the science has been used and how we might come up with a better way of addressing this concern that I have put before you and that I am sure you are aware of.

Ms CORCORAN—I have two questions. You have probably answered one; I tried to pick up the answer but I did not. You say that at the moment it is more important to focus on natural resource outcomes rather than on inputs. Is that the reference you made to focusing on research to find answers to the symptoms rather than to the cause? Is that what that sentence means?

Dr Stauffacher—It basically means that the focus for quite a while was on process understanding, but what everybody wants are outcomes—we want solutions. That is a real shift. For quite a while our focus was on process understanding and so on, but with the national action plan solutions for salinity are expected.

Ms CORCORAN—You see that as a move in the right direction?

Dr Stauffacher—Absolutely, yes.

Ms CORCORAN—This morning we heard some evidence that CSIRO does good research but that it is not so good at disseminating the information that it gathers.

Dr Stauffacher—Certainly not.

Dr Williams—I am sure that we would be the first to admit that.

Ms CORCORAN—Is that because it is not part of your charter or something you haven't—

Dr Williams—No, it is part of our charter. Service and science are one of our tasks. I guess it is because of the mechanisms and the fragmentation of the extension of services and, therefore, to interface directly to make sure that information hits, in New South Wales alone now, 13 different management authorities—it was 26 before, and the same in all the states. We are yet to find—

CHAIR—I think it is 15 in New South Wales.

Dr Williams—Yes, it is now 15. I guess we make every effort to make sure that our works get out, and our web technologies are as good as anybody's in delivering that. But the mechanism of working with consultants or with management authorities is something we really want to lift our game in. We are conscious of that. It is not because it is not in our charter; it is just not a trivial matter.

Ms CORCORAN—Are the results of your research on your web site?

Dr Williams—Much of it is.

Ms CORCORAN—I could go and have a look at it? If I was a scientist, I could understand it but I probably would not understand it unless I was a scientist. Is that one of the problems?

Dr Stauffacher—That is what I wanted to say. The translation of the science into action on the ground is still an issue, because you can go on the web and download the documents you have here but we would argue that then you need somebody, like one of our scientists, to come and explain to the locals or the CMAs. Then you need a follow-up and so on, and the transaction

cost of that is pretty high. I have quite a few examples and that goes back to what I said earlier on. Over the years, we have developed some relationships with some people in some CMAs. It is a very interesting and positive relationship. About 10 days ago, I drove to Cowra with a few colleagues and we met with a DPINR salinity team. We simply know these people. They said: 'All right, you have this ground flow system stuff. We've adopted it; it's fantastic, so how do we advance it? How can we help the farmers with this, that and the other?' Then you start constructive discussion with these people. But, unfortunately, that is much too isolated and we are in a position where it would be actually pretty difficult for us to do the same thing with all the CMAs.

Ms CORCORAN—Is that because of the lack of resources?

Dr Stauffacher—Exactly.

Dr Williams—That is why we deliver some of our better delivery through CRCs where we can. A major part in some of this work was done through the CRC for catchment hydrology or the CRC for freshwater ecology where, in fact, you have partnerships with the state bodies inbuilt into that delivery mechanism. We are looking for better and better delivery mechanisms. I think that the issue of what Peter Cullen would call knowledge brokers is a very important part of this game because it is not a matter of just having the knowledge. Some of the conflicts in science are not because the science is actually in conflict but because there is a need for people to explain the appropriate interpretation for that set of circumstances because science is not just simple rules. In this circumstance, this is true; in this circumstance, the reverse is true. You do need that science broking role and, as we indicated in our submission, this consciousness to find ways to crack the problem. The deskilling in our extension and learning institutions is a big issue.

Dr Stauffacher—I have one more comment about the ground flow systems framework. For instance, the way that the outcomes of this project were disseminated across the regions was actually an interesting one. We used the National Dryland Salinity Program to do that and there was another project in the National Dryland Salinity Program called Tools that was basically dealing with dissemination on the ground of some research outcomes. The Tools project organised probably around 40 workshops where this concept was brought to the regions and explained to them. Then the regions could also feed back their understanding of their landscape and our understanding was then increased by that. This was a very neat process. As you can imagine, you have to have the resources to be able to do it. That was, I would say, a too rare one-off.

Dr Williams—I think that is where the National Dryland Salinity Program would have its greatest effect. It has been a very useful mechanism for the dissemination of information and extension and learning, as Mirko has pointed out, but its resources remaining to come up with some better solutions are quite limited.

Mr HATTON—I am interested in your response to the committee's terms of reference (a). You say:

> ... the last 30 years of salinity research have proven very successful and provide a good platform for the development of management options.

It is a pretty long time, as the member for Mallee would point out, in terms of doing the research and getting to the point. It is three decades and eventually we have a platform there and we might be able to then do a bit more to solve the problems which you have underlined as the key area now in terms of needing action. Has the science been that good if it has taken us 30 years to get to where we are now? Who has done the proving of that in terms of independent refereeing of that science?

Dr Williams—Mirko can fill you in on that, but I had best start at the back. It has been 30 years but, if you went back and calculated the man days or man years that have been focused on some of those solutions, it is not a huge number—although there are a lot who would claim that it is. A lot of it has been defining the nature of the problem, and I think we can do too much of that; it just shows that we have a huge issue. Now that we know the nature of the problem, what we want is some solutions to it. In terms of peer review, the documentation that CSIRO produces is always peer reviewed in the journals, of course—it is an international set of journals—and most of our work is published in that way. It will often be republished in a form that is easier to understand and easier to read, and that is usually reviewed by the people who are likely to use it, as well as by a panel of scientists. Documents do not leave my division without going through a proper process of review and attachment. When it goes to a journal, that, of course, is another process again. In fact, I think that the internal reviewing—and Mirko might comment on this—is probably more thorough than that of some of the journals at the moment, because everyone is doing it as a voluntary activity.

Dr Stauffacher—From a process point of view, each of the documents that we publish, even technical reports and so on, have to be reviewed by at least three people. Going back to the science and how that is peer reviewed, one good example is the Catchment Categorisation Project. All of these big projects have steering committees. The steering committee for the Catchment Categorisation Project had members who were scientists but it also had extension officers, who were basically people from a pretty wide horizon, who had input during the project. For the Catchment Categorisation Project I think the steering committee came together twice a year. They were given the interim research, which triggered discussions on and so on. As I said, these people come from a pretty wide horizon, so that gives us pretty tight control on what we are doing and on what we are producing, and whether everybody agrees with it or not. We often have very strong debates. That gives you a certain confidence that the products you are going to put out at the end of it are definitely robust products. But I would also argue that science progresses simply because it is questioned. It is good to put out some reports into which you have put your heart and soul and then have somebody suddenly stand up and say, 'Listen, guys, I do not think you have quite hit the mark.' You can then discuss it. You might be right, but maybe somebody will identify something, and that is the way research progresses.

Mr HATTON—The key to my asking the question was that our first evidence suggested that most of the people working within this area might be called, as I would put it, 'prisoners of a groundwater paradigm'. That might mean that the questions you are asking are imprisoned within that framework, that the models you have developed on not enough research or on inadequate information have been self-reinforcing, that the problem may be in the first metre of the soil rather than further down, and that different approaches could be taken. Could you comment on that? I know that you have broadly answered that, but those people who have done the self-referencing and peer reviews may in fact be captured. It is the normal way in which science operates anyway: you only get major paradigms shifts when there are breakthroughs.

Dr Williams—Yes, when someone breaks out of it.

Mr HATTON—I will come to that issue shortly with another question.

Dr Stauffacher—How can I answer that? I do not want to be perceived as sitting in this groundwater paradigm but, unfortunately, to a certain extent, that is the bulk of our work, because salinity is a groundwater issue. Even though some people might contest it, when you look at the evidence, it is very hard to contest.

Mr HATTON—You are allowed to defend it.

Dr Stauffacher—When you look at the evidence, you see that the evidence is extremely strong. That salinity is a soil problem was a paradigm for quite a few tens of years. It is, as I said, only in the last 10 to 15 years that people started to realise that it is after all a catchment scale hydrological problem that has been generated by an imbalance in catchment hydrology or a changed balance in catchment hydrology because you replace native vegetation with something else that does not have the same water-use behaviour. Since you change this equilibrium, or the way water moves through a catchment, then you end up with a salinity problem.

I heard you asking a question earlier about this soils paradigm—that everything happens in the first metre of soils. To answer the question, the only thing you need to do is look at soil profiles under agricultural areas. Recently we have been discussing that with our colleagues in Queensland. They have a lot of data that shows that under cropped soils the salt is leached out and that under native plants the salt is basically bulging below the root zone. That simply indicates that, on the contrary, under agricultural areas it is not compacted. There is not more run-off; there is more water getting through the system. There is a lot of evidence like that around. You simply have to read it and look at it to be convinced.

Dr Williams—I worked in country west of Charters Towers where it was virgin woodland. It was essentially the recharge beds for the artesian basin and was often referred to as desert upland country. I was able to do experiments on some of that country before grazing, and on country excluded from grazing because there was a poisonous bush dominant. Cattle were not grazed there because of the danger of loss of cattle. That spongy, highly permeable, virgin woodland soil was the nature of the beast. With agricultural technique you could turn that into something like the top of a table. That is the red earth system. You would move from a soil system that had pretty much every bit of rainfall entering it to a system where it shed it, because of our intervention.

You need to think about the water balance as a whole. The argument is often put to me which says, 'What about salinisation in the Dundas Tablelands in Victoria? It had nothing to do with trees. There were never trees there.' That is right, but there was a change in water balance when we took out the Themeda grassland that shed a lot of water in summer and ended up with a reservoir that could take the autumn and winter rains without developing deep drainage or leakage beneath the root zone. So in fact the salinisation was prevented in the evolution in that landscape by water being shed, not by water being evaporated.

I always say: go back to the fundamental water balance. If you increase the flow of water beneath the root zone in some way and therefore move salt around the landscape, that is the

driver. In the case of the work I did on salinity in Saskatchewan, the cause was that you had a perennial prairie grassland and you then changed that to an annual cropping system. The term of the water balance that changed then, as you probably appreciate, was in fact the interception term—that the perennial grass had a cover all the time and the rain would fall on it, evaporate and go nowhere near the soil. Therefore, the amount going into the system was sufficiently different, but when you came along and put in an annual crop the water all went in. That was enough. It was nothing to do with trees; it was all to do with interception.

Another one will be dealing with changing the run-off term. That can cause it. Another one will be the traditional view, which is evaporation. So we need more knowledge broking that can help untangle the science and interpret it more. That is why those sorts of documents were written in a very simple way. Science must express itself in simple language. I feel that the communication of science in the CSIRO is something that we have worked very hard to improve and interpret.

Mr HATTON—That is very important. In one educational test, they took a group of year 9s and gave them a chapter of Messel. They taught them straight out of that and there was a pass rate of, I think, about 30 per cent on the basis of the test. They then rewrote the chapter into simple English and retaught it and there was an 80 per cent pass rate. One of the fundamental problems in all areas—not just science—is that material is not rewritten enough, the work does not go into it, to make it comprehensible.

Dr Williams—I agree.

Mr HATTON—I just want to go to one other thing quickly, and it is very human and is in terms of the work that went into the airborne geophysics—which CSIRO was part of—which gave birth to the CRC and which eventually gave birth to this work that we have heard about previously, and you were part of that. The human element was very interesting, in that the person who did most to push this—and you said oversold it—has taken off overseas. I would think, though, that there are a couple of questions associated with that. One, I know about that probably because it was oversold then and it piqued my interest when I heard about that research because it gave a way of seeing below the landscape. The other key to that is: prior to those developments in airborne geophysics, was it a case of the water diviners or the salt diviners having to go around to find where those salt deposits were? We were not able to see underneath the landscape, were we?

Dr Williams—No.

Mr HATTON—Therefore we were not able to see them as isolates. So that is still a very centrally important technique.

Dr Stauffacher—Absolutely—we do not contest that at all. Airborne geophysics has been around for a long time. People have been using these kinds of techniques for a while. But, as I said earlier on, it is an added layer of information. I am a hydrogeologist and I am extremely interested in any technique that can tell me what is actually happening under my feet. I also have a remote sensing background. I really enjoy spatial analysis, remote sensing and so on. I am darn keen on these methods, and this is why I was a little disappointed when I saw this overselling, because I knew that ultimately it would be to the detriment of the technology, in spite of the fact

that I am a big believer in it. I know what the limits of it are, but I fully agree that it is an important tool. I am really glad that it is around, but you have to acknowledge what its limitations are.

Mr FORREST—I can get access to John anytime. Your information is good and it is in the right language—and obviously there is one group out there who need that—but there was nothing in that that I was not reading 10 years ago. My Birchup cropping guys want to know a variety of durum wheat that can grow in the salty ground and what varieties of lucerne they can grow. So there are two levels. You guys are working hard to try to create that science—

Dr Williams—But we have not cracked it. In *A revolution in land use*, which you have seen, we tried to highlight where we thought the effort ought to be—for example, can we not breed some of our agricultural plants that will capture the water in the first place? I would rather see the water in the grain than in the ground water causing a salinity problem, if that is the mechanism for that site. We are working with GRDC at this very moment to say, 'This is where your focus in your breeding, your genes and your molecular genetics needs to be.' There is no point just rearranging the current land use in the landscape. That will help us, but we need some new furniture to rearrange. It has been a frustration to me that we have not got enough solutions for you, John. I am disappointed in my discipline and my science that we do not have enough solutions.

Mr FORREST—My fear is that it does not exist and we ought to give up and—

Dr Williams—No, I would not, because we have done enough looking at just the breeding options for, for example, where the possibilities look pretty attractive. But it is only recently that we have realised how major the problem is. If you take our wheat system, what are we doing with our cereals? We have actually got a spring wheat from the Northern Hemisphere which we are using as a winter wheat. That is the genetics we are using. What that genetics expects and why we have got it is because it is disease resistant for rust, in particular, and we can manipulate it. But the point is that, at the end of the day, it is a spring wheat that expects, when it is planted, a rising temperature and increasing radiation—the very things it is not going to get when you plant it in April in southern Australia. So the potential to engineer our plant to capture that water and nutrient in the first place has not been fully exploited.

Mr FORREST—That is good. We know we have to plant perennials, but what do we plant? That is the question. There are two levels. There is a group of people in the upper catchment who need that level of documentation but there are others who are well ahead and they need a product.

Dr Williams—That is interesting that you are saying that, John, because that is exactly the line that Mal Peters and others have pressed on me recently. He made public statements to the effect that CSIRO has lost interest in the farmer, and I thought, 'Goodness, what have we done wrong?' When I spoke with him, he did not feel we had really got sufficient focus on providing sustainable solutions. We had identified the problem but he said that we had not given—as you have rightly pointed out—enough of the solutions. And I am embarrassed to say that it is true.

CHAIR—In another committee that I chaired, which got a bit of publicity in the last few days, it was clear there were differing views within the CSIRO about some aspects of that particular topic. What is the situation within CSIRO on this?

Dr Williams—We certainly have lots of disagreements, and in putting this document together we made sure we attempted to incorporate all points of view. The different points of view you will have in a scientific community, of which CSIRO is just subset, is that the balance between identifying the problem and understanding the groundwater systems and then coming back and saying, 'Can you solve it with a biological solution—that is, a land use option?' The other one is how you get the engineering, on the other hand. There will be a tension between those two emphases and that will be quite real.

The other one follows on from the question Mr Hatton asked. There will be some people who understand that there are small-scale salinisation processes taking place in the landscape that do not easily fit into the big catchment models. One example is in the northern tablelands of New South Wales and in parts of Tasmania, where you have a small-scale salinity where the salt has been leached out of the landscape historically, and we had swamps and streams that had a train of ponds and a lot of wetlands. The salt comes into the wetland and is flushed out of the system and there is no saline scalding. What do we do? We come along and allow the incision of a stream channel, which drains all that wetland and takes the salt into the system, and you start to see the salt scalds. It is nothing to do with trees, nothing to do with anything else; it is about how we have incised streams. Can I get across to the committee that the salinity process has lots of pieces to it and, if we have a comprehensive understanding of landscape function, most of our observations can be put into context.

CHAIR—I have to say that I did not see quite the difference within this document that I did with the previous topic that I was talking about.

Dr Williams—We have been working on it for a few years.

Dr Stauffacher—John's answer was excellent. I do not have anything to add to it.

Mr HATTON—Are you sure of that?

Dr Stauffacher—Absolutely.

Mr HATTON—I was reading yesterday's *Sydney Morning Herald* health and science section. Paterson's curse may be a goer as a crop plant.

CHAIR—Just do not let the horses go near it.

Mr FORREST—The Israeli view is, 'Okay, we have got it; let's use it as a resource.'

Mr HATTON—Apparently, it is rich in omega-3 and omega-6 oils and it has not got the mercury and so on, and there could be an industry in it.

Dr Williams—As do many of the acacia seeds.

Dr Stauffacher—It looks beautiful, too.

CHAIR—The committee has received the following documents: *Drylands salinisation: a challenge for land and water management in the Australian landscape*; *Effectiveness of current farming systems in the control of dryland salinity*; *A revolution in land use: emerging land use systems for mapping dryland salinity*; and *Groundwater flow systems, a framework: essential tools for planning salinity management.* The latter document consists of a summary report and a main document. Is it the wish of the committee to accept these documents as exhibits? There being no objection, it is so ordered.

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

That this committee authorises publication of the proof transcript of the evidence given before it at public hearing this day.

Committee adjourned at 4.30 p.m.