



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**

THURSDAY, 13 NOVEMBER 2003

PERTH

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**HOUSE OF REPRESENTATIVES**  
**STANDING COMMITTEE ON SCIENCE AND INNOVATION**

**Thursday, 13 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 Martyn Evans, Mr Nairn and Dr Washer

**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**

**BELL, Associate Professor Richard William, Associate Professor, School of Environmental Science, Murdoch University .....27**

**COCKS, Professor Philip Stanley, Chief Executive Officer, CRC for Plant Based Management of Dryland Salinity .....15**

**McMILLAN, Mr Andrew John, Director of Policy, Western Australian Farmers Federation .....1**

**MOORE, Dr Susan Amanda, Senior Lecturer, School of Environmental Science, Murdoch University .....27**

**NICHOLL, Mr Colin Jeffery, President, Western Australian Farmers Federation.....1**



**Committee met at 8.56 a.m.****McMILLAN, Mr Andrew John, Director of Policy, Western Australian Farmers Federation****NICHOLL, Mr Colin Jeffery, President, Western Australian Farmers Federation**

**CHAIR**—I declare open this public hearing of the House of Representatives Standing Committee on Science and Innovation for its inquiry into the coordination of the science to combat the nation's salinity problem. The focus of our inquiry is on the application of the best science in relation to Australia's salinity programs.

Today we look forward to hearing from the Western Australian Farmers Federation, the Cooperative Research Centre for Plant Based Management of Dryland Salinity and representatives of Murdoch University. They will be giving the perspectives of those developing the science and those using the science. The committee will hear their views on how that science should be coordinated to combat the salinity problem that affects this state and the rest of Australia.

Welcome, Mr Nicholl and Mr McMillan. Do you have any comments to make on the capacity in which you appear?

**Mr Nicholl**—I also farm at Hyden.

**CHAIR**—I know you have heard this before, because you heard it only a couple of months ago when you gave evidence to my bushfire inquiry, but I will repeat it for the record. 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 Western Australian Farmers Federation submission, which has been authorised for publication, so it is on the record. Would you like to start with some opening comments and then we will move to questions.

**Mr McMillan**—Colin has asked me to start off with some opening comments, and I will make it reasonably quick. First of all, I tender an apology on behalf of Garry English, who is our land management and conservation portfolio holder. Garry is on numerous government committees and is a previous winner of the McKell Medal for his work in natural resource management. He is a key component of our submission, obviously. If I could beg the commission's indulgence, would it be possible at some stage to link a teleconference up to take Garry's evidence? As far as the practicalities of what we are trying to do as an organisation are concerned, he is a major driver.

**CHAIR**—We will take that on board and see how we go with the rest of the evidence. It may be very useful at that point in time, yes.

**Mr McMillan**—That would be great. The big issue we see in relation to coordination of the science in salinity management is bridging the gap that is very evident between the science and the farmers. There is a real issue there, where the science is getting to a certain point and there is nothing between where the science ends and what happens at the farm level. Over the years in Western Australia the Department of Agriculture, particularly, has had its extension service eroded from a very effective interface between farming and government to virtually nothing. We believe that narrowing that gap would be a very effective solution.

There is a need to implement some form of one stop shop for salinity advice for farmers. Once again government changes, through what they call ‘the machinery of government’, have seen numerous agricultural issues divided up between various government agencies, which makes it extremely difficult—even for an organisation like us—to track down who is doing what, let alone a farmer who has a limited amount of time to jump on the phone and try and find an answer to a problem he may have.

There is a need for a major increase in extension services across the board. There is a need to engage all landowners: to initially get them on board and then get them to recognise what they are doing and what they have been doing. Too often the approach starts with pointing the finger at landowners in the wheat belt zone and saying, ‘This is your problem. We are going to have to start from scratch and address that,’ when there has already been a lot of work undertaken.

There is a need for a full commitment not only from federal and state governments but also from industry and environmental groups to work towards a solution, to get money on the ground and not get lost in administration. There is no room in this process for individual agendas, and we believe that that is a major issue in getting the science out there as well.

Western Australia is seen as a major contributor to research and development across the board, through the collection of levies, but our input is often lost in the focus on the Murray-Darling Basin. Despite having the biggest salinity problem in Australia, which is widely recognised, there is very much a perceived imbalance between the dollars paid by growers in levies and the dollars put back into the state in salinity management. There is a general need for researchers and land-holders to work together, not in isolation. I have covered the need to recognise the work done to date.

I think that is a reasonable summary of what we have done. I would ask you to target any questions, particularly from a farming point of view, to Colin before he has to leave.

**CHAIR**—Do you want to say anything?

**Mr Nicholl**—Yes. I would like to complement Andy on what he has said, largely from the practical side because I am a farmer. I have a big salinity problem—a problem that has grown on our farm, but which has not originated on our farm. I am in a catchment group which has been put together in the last few years, but I am at the lower end of the catchment and have the problem of dealing with other farmers’ water in the catchment group. There are about 70,000 hectares, quite a bit of it government land. We also have to deal with Main Roads and shires in the project that we are endeavouring to put together.

There needs to be something like \$12 billion to \$20 billion spent to address salinity in Western Australia. I have calculated that by extrapolating out from my own farm. Initially we have calculated about \$40 a hectare over the whole of the farm, and that is just on one farm where we have a major problem. On a second farm we have much less of a problem with salinity.

Salinity is not the only problem. There is an emerging problem of acidity, to which I do not think a great deal of attention has been given at this point in time. I think that is going to be much harder to resolve. Farmers are getting frustrated with the inability to do things to address the problem. We come up against some of the government agencies that have taken farmers to court when, out of sheer frustration, farmers have said, 'Look, I have a problem here; I'm going to solve it,' and they have gone in and dug drains. Of course, somewhere we have to handle that water.

The problem that the central wheat belt channel committee has is that it wants to drain the central wheat belt from Southern Cross, Kulin and Kondinin down into the Yenyening Lakes. Whenever we get a big flow of water, the Yenyening Lakes overflow into the Avon River, the water ultimately ends up in the Swan River. It is interesting to note that, when the Swan River gets problems of blue-green algae, the first thing that is done is that truckloads of salt are tipped into it to kill the algae. At the same time, there are quite a lot of people in Perth that say they want to keep the Avon River pristine—as fresh as possible—and the same with the Swan River.

That is a big challenge. What do we do with the water? We have to handle it somehow or other. You cannot leave it lying there in the ground, because ultimately it will increase the problem. There are those that believe we can plant trees everywhere and grow high-usage crops. I think they have a role to play, but they are not the total solution. From the perspective of the catchment group with which I am involved, we need to do a number of things. For instance, we need to be able to control our surface water and make sure we can keep that water fresh and flowing and either use it on the farm or have it flow away to where it will not collect. We also have to be able to plant trees. They are part of the solution. A lot of farmers are going into alley farming in an increasing way. The thing with alley farming is that you plant the trees and it takes two or three years before they get going and become visible on the landscape. There is a need for drainage, but there are major problems with that. Where do you put the water when you drain?

As part of the plan that I have had drawn up for my farm, evaporation ponds have been suggested. All that will do is move the salinity from a large area to a more concentrated area. The salinity will still be there, although when we get a big flow from a flood it will move that further down the catchment screen. That seems to be acceptable. I would prefer to have a drainage system right through our farm which connects up through government land and is coordinated. The sheer cost of this is one of the things that turns people away.

Once you start drainage, though, there are areas where you will start to bring in acid water, through iron sulfides in the soil. That is a far greater problem than salinity, but there are solutions. One of them was proposed by Steve Appleyard, who has seen examples in other parts of the world where acid water is run through lime tunnels to neutralise it. I think this is where science can play a role. We, as farmers, are good practical people, but we do not always understand the ways of solving the problems, so we need to be able to interact with the scientists.

Researchers, particularly universities, are brilliant at doing research. They are not very good at getting that research out and applied and getting it into a form where farmers can utilise it in a package which is easy for them to understand and available for them to apply.

**CHAIR**—Thank you, Colin. Can you define what you mean by alley farming?

**Mr Nicholl**—Alley farming is where you plant strips of trees in alleys across an open paddock. There is quite a bit of that being done in many parts of the state, but an area near Perth where it is being done is east of Brookton.

**CHAIR**—The trees are there simply as a break-up of the land? It is not a forestry thing?

**Mr Nicholl**—No. That is another area for research. A lot of farmers are planting oil mallees, but there is a whole different species of eucalypts. We do not know which ones give us the best yield in oil. I know that there is some work being done on that, but I am not sure by whom and what results they have had so far. They also reduce the water level by acting as pumps, and act as windbreaks. In the droughts of the last two years, I understand that the farmers at Kalannie who had enormous dust storms have now decided that they have to do alley farming—these alleys of trees—at right angles to the wind just to protect their topsoil.

**CHAIR**—As part of the role of the catchment management authorities, can they be that connection between the science and the farmers?

**Mr Nicholl**—One of the problems we have in Western Australia is that the Department of Agriculture has been starved of funds. They have had their funding slashed by 17 per cent in the last two budgets. The previous Minister for Agriculture did not like the structure of the Department of Agriculture and really turned it on its head. He put a lot of Department of Agriculture guys on contracts. There has been an enormous cutting of staff. I think they shed 150 staff.

I am guessing here, but the electorate likes to see government spending money on the environment. Agricultural salinity has been taken from the Department of Agriculture and attached to the Environmental Protection Agency. The Environmental Protection Agency has a policing mentality, and it does not have the connections into agriculture that the Department of Agriculture had. We opposed that move in the first place, but lost the fight. There is little interest in agricultural salinity shown by the Environmental Protection Agency. They did not take the personnel across. They took the responsibility across and they took the money with them which enables governments to say, 'We are spending more money on the environment,' but what they do not tell the electorate is, 'We have taken it from agriculture and simply transferred it across.' That has been one of our grievances, but it has fallen on deaf ears. We are paying the penalty in agriculture.

Most of the catchment groups are in their little cells. I am part of the South East Hyden catchment group. We also have the Blackwood catchment group and the Tin Dog Creek catchment group. We have all these little groups out there trying to do the best thing in their own area, but there is no statewide plan to enable the problem to be tackled as one big scene with allocations of money. We are asking them to put more money into salinity.

But as Judy Edwards, our state Minister for the Environment said, it is a bit like salt and pepper. What they are able to put into it is so small in the overall problem that it really has very little effect. I meant to add earlier on, in relation to the \$12 billion to \$20 billion, that even today most of the money is coming out of farmers' pockets, in work that has been done as far as drainage is concerned to combat salinity. The evidence is there to show that drainage in the right places does work. Kevin Jones, a farmer at Bruce Rock, is putting in drains and now planting crops on land that was originally uncroppable and getting quite good yields from it.

In other areas where salinity is not so easy to drain, you need to be able to do more work into salt tolerant pastures that pull the moisture out so we can utilise it and get some return from perhaps stock grazing on that land. I think there are people that have done some work on that and have worked with scientist Michael Lloyd at Lake Grace. There is one farmer that is doing that and has had some success. There is the tendency of some farmers and research workers to think salt tolerant pasture is the way to go, that it is the total solution. It is not. We have to get a whole bag of solutions and we have to apply them collectively in the right places.

From my experiences farming, originally we had soil erosion problems. We went through the contour bank as a solution. We then found that that was not enough to handle big volumes of water. Farmers then formed a WISALTS group and we went into interceptor banks. We are still using a lot of interceptor banks for surface water control. We have now moved to the phase of tree planting and drainage to try and reduce salinity and also saltland pastures, but we do not have a big array yet of options there, particularly in saltland pastures, to be able to make a big impact on the problem and try and turn some of our saltland—which is of no commercial value to us—into something productive.

**Ms CORCORAN**—I am interested in the gap you talked about between the farmers and the scientists. Andrew talked about there being this gap. You have talked about the need for farmers to interact with scientists. In the ideal world, how would that happen?

**Mr Nicholl**—It used to happen through the Department of Agriculture when they had sufficient funds. Their staff used to be around farms interacting with farmers and looking at their problems, having a discussion with farmers as to how a farmer saw it, and giving advice, too. At one stage the Department of Agriculture had the financial and staffing ability to be able to draw up farm plans and incorporate these things into it.

**Ms CORCORAN**—Who would initiate that? Would the farmer do that?

**Mr Nicholl**—The farmer would go to his local departmental office and say, 'I have a problem. Can you come and look at it?' They would put personnel out onto the farm and they would suggest, as they did to me—and I was only a young farmer then—'You need a farm plan. Do you want us to draw one up for you?' They did and I still have those plans today. Those plans have been superseded but today if I need a farm plan, the Department of Agriculture does not have the facility to do that. I have to go to a private consultant and I have just done that. He has revised the plan. That was only done last year. We were fortunate enough in our catchment group to get something like 17 farmers to come together to put together a major plan for the South East Hyden catchment group. The plan is okay on paper, but it will not be effective until we can get those recommendations onto the ground.

**Ms CORCORAN**—Getting those recommendations onto the ground is just a matter of time and money on your part?

**Mr Nicholl**—Yes.

**Ms CORCORAN**—Or is there a lack of knowledge there as well?

**Mr Nicholl**—The two droughts have not really assisted us at this point in time, but I have to do it.

**Ms CORCORAN**—You have raised this one stop shop concept, and many others have raised it with us as well. What is the best form of that? Is that something on the Internet or are there hard copies somewhere? What is the best way? How do farmers get hold of this information themselves?

**Mr Nicholl**—Young farmers are very much at home with handling the Internet and electronic communications. Older farmers like me usually have to rely on their wives. We are more hands-on and less e-commerce literate. I think anything like this has to be driven in a salesmanlike way. I do not know whether we can turn the clock back. We are told we are wasting our time trying to turn the clock back; but if the Department of Agriculture cannot do it, then the EPA have to put people out there on the ground. They have to be able to interact and get an understanding from a farmer's perspective. There has to be one agency to handle that salinity.

**Ms CORCORAN**—Does anything like that exist at the moment at all?

**Mr Nicholl**—No. We have a mishmash. We have private consultants. Some of them are good, some not so good. They have been trained, they have their accreditation but we have to go to them and hope we can get a good one. I believe I have a good one. His surname is Dodd. He has drawn up our plan for our farm and integrated it with our neighbouring farms. Having got the plan done, we have to now interact with the local shire, because as part of the drainage system we have to put a drain under a shire road.

**CHAIR**—What is the qualification of the sort of person you are using for that work? Is it an agricultural consultant or engineer? Do they have expertise in salinity, in drainage?

**Mr Nicholl**—He was originally a farmer's son. He has his own farm, but he has been through a soil conservation course which has been specially designed for that type of person.

**Ms CORCORAN**—Are you typical of farmers in your area, or are you just a bit more advanced than most? Where I am getting to is, would other farm people be as happy as you are to go and seek advice from the department?

**Mr Nicholl**—I am just an average farmer for my area, both in size and style, probably a bit more passionate than some. That is why I am involved in the agricultural political scene, although that runs out in March and I will be back farming full time. The majority of farmers lament the fact that we no longer have this close contact with the Department of Agriculture. If you get the opportunity to read this week's *Farm Weekly*, in the Farmers Federation page at the

back we have a column headed 'Rural rants and raves'. I am raving on about the way I see the future of the Department of Agriculture in that area.

I have grave concerns that the Department of Agriculture, unless there is a major turnaround, will in actual fact disappear as a department and will either be attached to a university or it will be attached to the Environmental Protection Agency; it will only become a policing agency. As soon as you start prosecuting farmers, as the department already has over land clearing, you start to throw up barriers. Then farmers do not trust them because they believe when personnel are out on the farm they are also looking and thinking, 'Has that farmer done some illegal clearing or some illegal drainage?' or something like that. Farmers are very protective of what they have.

**Ms CORCORAN**—What about agents as a source of advice? I am from the east, so I do not know. Are Elders and those sorts of firms sources of advice?

**Mr Nicholl**—No. In agronomy? Yes, in cropping and so on, but only where they make the money, where they sell you the product. In most cases they have agronomists that are free and give free advice on cropping and so on, but their agronomists have to achieve targets and sales—objectives that are ideal for the company, not necessarily for their client.

**Dr WASHER**—Growers levies were mentioned. Are they salt levies? What are the levies utilised for?

**Mr Nicholl**—No. The big funder in Western Australia, and I think right across Australia, is the Grains Research and Development Corporation. That is dealing largely with activities to improve crops and a lot of research into trialling and developing new types of wheat or other grains for rust resistance and things like that. There is the opportunity, and I think they do lend out grants for the salt pasture and so on, but their focus is largely on cash crops that can give a good return. The people that run that—and they are largely farmers on the board—have to be accountable for the money, for the levies that we pay. They do give us good return, I believe. Most farmers would see it that way.

Of recent times, shire councils have applied a levy. I should know how much it is, but my wife has been paying the bills of late. It is about \$500 I think. They apply a levy to us to employ a soil conservation officer, but they tend to be fairly low-key and the turnover for some reason or other is very high. Again, they tend to work in isolation. Each shire has its own. There is no overall coordinator. They partly fill the gap that has been left by the Department of Agriculture, but they do not have the resources to go back to, like the Department of Agriculture. A Department of Agriculture field officer, if he does not know, can go back to his hierarchy and the structure that is there. He will know who to contact and he will get the information. These people are quite often left to their own resources.

**Dr WASHER**—Can I also reinforce that. I get the feeling—and this is science; the science of human behaviour is involved in this—that it makes a big difference to have someone come out, walk around with you personally, handle the situation and motivate you. There is a lot of psychology involved. It is depressing seeing your land go to salt. There is a lot of disappointment. As well as economic factors, where is it worthwhile land? You cannot get that off the Net, sadly. You have to have someone on the ground saying, 'Mate, walk away from that

patch,' or 'Drain this patch,' or 'Grow in that patch,' and do a lot of work. Is that true? Is that how you feel?

**Mr Nicholl**—Yes. It is that personal contact that is so very important. I was shocked recently, when we had a locust plague in Western Australia. The department did some very good work and they really got on top of it. They sent their personnel out, because it was such a big threat to agriculture and, I believe, horticulture and a bigger threat to the lawns and gardens in Perth if they should collect in the metro area. The department went out and squashed them. They had to get them as nymphs, before they got to the wing. I was shocked to find that the department personnel that came onto our farm had never been on a farm before. I think that is an indictment of just how far the department in this state, and department personnel, have got separated from agriculture or the real coalface of agriculture.

**Dr WASHER**—They are certainly the group that have the brand label, so to speak; that farmers tend to work with traditionally and would work with if they had the resources and good scientific advice?

**Mr Nicholl**—Yes.

**Dr WASHER**—We have heard some scientists state here that WA has spent a hell of a lot of money and it has very good salinity science, probably the best in Australia, yet we seem to have this blockage again. We have the research and there is more to be done, but we never seem to get that message out there amongst the people. It is a personnel problem. You cannot just stick it in a library, as I said, and put it away and say, 'We've written the book. Everyone's going to go read the book.' They are not going to do that or look at the Net and sort it out from there. You cannot do it. It does not work that way.

**Mr Nicholl**—I would agree with you. I was one of the foundation members of the Kondinin Group. We got involved with surveying machinery. One of the experiences I had with that group was when we engaged a young engineer student from UWA who knew everything about engineering. We gave him the task of interviewing farmers on the strengths and the weaknesses of their boomspray rigs.

He was a total failure, even though he knew the engineering terms and everything inside out, because he tried to talk to farmers and thought they would understand the engineering terms. Farmers are more basic than that. The best researcher we had was a retired farmer, Vern Anderson. He had good recording skills that he had learnt in the Air Force in the last war. He had the responsibility of surveying the strengths and weaknesses of headers. There was not one farmer who was not prepared to stop their header during the peak of harvesting for an hour while he and the farmer went over the header and discussed its strengths and weaknesses. That was because Vern was a farmer and he was able to communicate with farmers in terms that they knew and understood.

That is one of the problems with the scientists. Scientists have an infinite and very good and detailed knowledge, but they cannot necessarily communicate that knowledge in a form that farmers can understand and is needed. You need a go-between. In this state we have very good agricultural consultants but they tend to concentrate on the inputs and the outputs; the profitability of the business, not so much in the day to day running of the business. They will tell

you whether it is wise to spend money in this area or that area. What tends to happen in salinity is that they cannot give you a dollar return for this year or next year, and so they seem to think you are better off buying a house in Perth or buying BHP shares or something like that. For a farmer, investing money in salinity and similar issues is investing in the future. It could be a long-term future. It does not give him a return in the next few years. It is probably investing for the next generation.

**Dr WASHER**—Acidity is a massive problem. It was mentioned yesterday and I brought it up as part of the issues that we need to address. Are fertilisers that we are using now addressing this? Most of the fertilisers are sulfate based, as well as the soils. I understand there are sulfate soils in mining areas. They were going to put water in from the Collie River and divert it into the mining areas where there are high sulfates. I know we have low phosphates because of the river systems, but what is happening with the fertilisers?

**Mr Nicholl**—The Department of Agriculture has run a campaign which was reasonably successful called Time to Lime. There has been a change in fertilisers. Originally most farmers used the old 22 per cent superphosphate which came from Christmas Island. That did have a quantity of lime in it.

I first learnt about this from Dr Ozone, and I did not fully understand the ramifications of it. In the early 1970s farmer-scientist conferences were held at UWA in January-February. Dr Ozone pointed out to us that, when you grow nitrogenous pasture crops, you increase the acidity of your soil and that, when you apply nitrogenous fertiliser, you increase the acidity of your soil. As a result of that, the pH levels in our agricultural areas are so low that they are starting to interfere with crops, so every 10 years we have been advised to apply one tonne of lime per hectare to keep it neutral, and we are doing that. But everything, including the transport system, has to be geared to handle that. That is a different level of salinity caused by drainage, which is the result of, I believe, the disturbance of iron sulfates. I do not fully understand it, but someone like Steve Appleyard would.

That is one of the reasons why the opponents to drainage are saying, 'You cannot drain. Leave the problem there. Try and manage the problem there.' We believe that drainage is part of the solution and somewhere along the line we must have cost-effective systems to manage that salinity. The question is—and I think this is where science is needed—what do we do with the water when we have drained it? How do we hold it? How can we utilise it? We are critically short of water and we have volumes of water which have something wrong with them. We must, somehow or other, address that and either desalinate or de-acidify the water.

I understand that in a lot of country towns the water level is rising and causing problems under the town. In Merredin, I understand, they have started pumping water out, and they have had to stop because the level of acidity has increased. They were desalinising some of the water, putting it into a comprehensive water scheme and pumping it up to Kalgoorlie because they are critically short of water there. I understand the acidity level has damaged the membranes that they were using to desalinate that water.

**Dr WASHER**—Yes, the pH is 3. That is very low. Thank you.

**Mr MARTYN EVANS**—Doesn't some of this tell us that the science has to be done on a larger scale, too? We are talking about the scale of the problem, the scale of some of the landscapes, the time frames and yet, to some extent, lately we have downsized the science. We have spent a fair bit of money, as Mal has said, on salinity and people have made big commitments, governments have made big commitments, although we might disagree with the way some of the machinery of government has been organised, and we have made comments about that.

**Mr Nicholl**—Can I interrupt. The land that is the worst degraded in this state and is having nothing done about it is government agency controlled land. They are not doing anything. Farmers are planting trees, draining and putting in banks. Government agencies, particularly CALM, have made a massive land grab and have no idea. They have no intention and no plans to combat salinity. I would like to make that point.

**Mr MARTYN EVANS**—Yes, sure. We have been hearing that the science has been downsized to some extent, that the projects now are being initiated at the local level because the funding has been delegated. People at the local level—the catchment management authority level and so on—are initiating research projects and getting the funding approved and CRCs and CSIROs and others are going to them with projects. Yet what you are talking about are multicatchment area problems, drainage schemes that extend into enormous areas, acidity problems that are statewide almost, even though they affect catchment area problems; drainage problems that go from river to river, to Perth, to the sea.

While you must have that interaction between the scientists and the farmers, even if it is mediated by translators, these problems have to be resolved by science; questions that go beyond these local areas and have time frames that extend multiyear. Do you think that, even though we still need to maintain this close connection between the scientists and researchers and the farmers, that can still occur regardless of the scale of the science? Do we need to be looking at mechanisms that allow for the ongoing interaction at the local level so that the farmers' input can flow back up the system, as well as the research down? It has to be two-way.

Do we also need to be looking at ways of ensuring that the scientists have the freedom to operate at that broader, wider level, with longer time frames, to address what are clearly much broader problems than these local catchment management science issues?

**Mr Nicholl**—You certainly need more interaction between the scientists and the end user, the farmer. There is a tendency by state government agencies, whenever money is handed out by the Commonwealth, to say, 'How can we get hold of this?' and I believe a lot of the first round of Natural Heritage money was not very well spent. I have endeavoured to defend the Department of Agriculture, but I will be critical of them here. I think too much of the first round of money went into the hiring of motor vehicles and young staff to come and look at the problems and there was no on-ground action achieved.

There were plans drawn up, aerial photos were taken et cetera, but when the money ran out the vehicles went and the staff went. You look back and think, 'What was the effect of all of that money?' I think there has to be a system put in place and a total plan. How the plans are drawn up and the priorities set will require massive debates. We have no overall state plan to handle salinity—to my knowledge anyway. I do not think anyone has arrived at a figure or attempted to

arrive at a figure of what it will cost to fix this up. We need to be asking ourselves, 'What needs to be done?'

I spent a bit of time in America. Americans are great at putting systems in place. They are able to build national concrete highways. They had a problem with high temperatures in the summer and freezing temperatures in the winter—plus 40, minus 40—and said, 'We need concrete highways. How do we make concrete cheap enough? What do we have to do? What taxes do we have to take off? What inputs do we have to make concrete cheap enough to be able to build that structure?' I think we need the same attitude here. We have a multibillion dollar problem. What do we have to do to solve that problem, to make an effect? If it is going to cost this much, is it going to be cost effective? Is it better to leave it? I hope that is not the answer.

Farmers are nibbling away, everyone is nibbling away at it in little areas. I see too much money wasted, money that has been allocated with good intention. We do not have an overall plan to work on. We need this information coming from science, we need this type of extension to make sure that it is carried out, and it probably needs to be driven from the bottom to the extent of, 'This is the problem. This is what farmers can do. This is what the community can accept,' combine the whole thing, put some costing in there and then work out how we are going to arrive at the total cost.

Some political parties are already looking at whether we should apply a levy. We have shires applying another levy there. From the political parties' point of view, will this levy be acceptable to the wider community? All that needs to be taken into account because it is too piecemeal at the moment. We also need to be including government land.

**CHAIR**—Are there no state salinity strategies?

**Mr Nicholl**—Andy is across this more than I am. It is more of a political document than a practical document.

**Mr McMillan**—It is very much ad hoc.

**Mr Nicholl**—I have to go. I am enjoying it, but I have to go.

**CHAIR**—I have a couple of questions which I am sure Andrew can answer.

**Mr McMillan**—I have made a few notes while Colin has been talking. The vision that governments have at the moment is very short term in relation to funding, in relation to employment of staff in the various agencies. They are on contract employment.

Several years ago, I was in the Northern Territory working for the department of primary industry. Part of my role was to implement the property management planning program in Central Australia. I had the role of rocking up to a station door and saying, 'I'm from the government. I'm here to help you.' The first thing is that you have to establish some credibility in the industry. Once you have done that, you find that things start rolling. What I had supporting me was the fact that I was a permanent employee of the agency, so I did not have the fear of my contract funding running out in 12 months time; therefore, I had better either start looking for

another job or start doing another application to get the funding extended. It distracts you from your core role.

The same focus applies to managing the money in science. If you have an NHT, for argument's sake, that is reviewed every three years and the funding is reviewed, there is no long-term commitment. The impact that has in communities is massive, because if you are trying to get community involvement through LCDs, or whatever the group may be, you must have continuity of funding to enable the momentum to be maintained. Once you have lost the momentum, it takes a lot of work to rebuild and get it going again. I could not agree more with what Dr Washer was saying as far as the human factor goes: it is not given enough credibility in this debate.

That human interface is vital. Farmers are no different from any other sector of the community as far as their knowledge of technology goes. From a communication point of view, in our own organisation, we do a weekly mail-out, a newsletter, to our members. We have a percentage of members on the Internet who are very proficient; emails are a great thing for them.

We have people on fax and we have people that want it in the post. You could not show me anywhere else in society where the break-up is not exactly the same. It is all about longer term vision, whether you are talking about the agency involvement through extension offices, community involvement or the funding of these salinity programs.

**CHAIR**—Colin mentioned farmers being prosecuted for putting in drains. Can you take us through how that has come about; not necessarily the prosecution, but the fact that they get to the point where they do something which is obviously illegal. Why are they driven to that situation?

**Mr McMillan**—As Colin said, it is basically frustration. Until recently, the state's farmers had no clear direction in relation to land clearing, and the drainage issue comes under that umbrella. There is an application process that farmers need to go through. There are no definitive time lines on how long it takes to process an application. Without exception, it gets bogged down in bureaucracy. Farmers are hands-on people. They want to do things. If they see a problem, they want to fix it. We have instances where people have been waiting several years for an answer on an application to clear land, whether it is for draining or otherwise.

The government has recently got through its Environmental Protection Act amendments, and there are pretty horrific penalties that can be applied for illegal clearing. Our belief is simply that the penalties have been made that substantial to act as a financial deterrent, because they have no commitment to having resources on the ground to police the act. As Colin said, it is driven out of frustration. The government at the moment is obviously a very green government, because it relies on the Greens in the House to get anything through. That has implications across the community.

**CHAIR**—But you are saying that the frustration for the farmer is that he has a problem with salinity and he cannot get an answer about how he might fix it, so he thinks, 'Well, I can fix it if I drain this area, so I'll whack in a drain.'

**Mr McMillan**—That happens, but there is a process that they are required to go through as far as applying for permission to put that drain in. Farmers obviously talk to each other, and they are

great at comparing various land management practices across the fence in different districts. If they see something working in one area, they want to have a crack at it. If they have a salinity problem, they want to whack in a drain, but they do not want to be frustrated and lose 12 months, two years or however long it takes to process this application, which may or may not be approved.

**Mr MARTYN EVANS**—In relation to the lack of approval and the farmer's decision to implement a drain, neither of those decisions would be based on the science of salinity, I suspect.

**Mr McMillan**—That is the whole problem with the process. It is a reversal of natural justice. The way it works now is that the farmer is basically assumed to be going to cause environmental harm, so the burden of proof is on him—not on the other hand—which makes it very difficult for the farmer. The scientists should be coming out to have a look and saying, 'Look, if you do this, you're going to cause a problem with salinity, and these are the reasons why,' but that is not happening.

**Mr MARTYN EVANS**—Nor is the farmer, I suspect, making the first decision on the basis of the good science about the drain, is he?

**Mr McMillan**—Once again, you have varying levels of understanding on the drainage side. You have people who are very passionate about it and believe it will work in all situations, and then you have the other people who are more realistic. Colin mentioned one of the gentlemen before, who we tried to get in for today. We have 15 million tonnes of grain out there just begging to be taken off at the moment, and it is very hard to get a farmer.

**Mr MARTYN EVANS**—Yes, I know, but the real problem is a lack of science about all of these issues.

**Mr McMillan**—Absolutely, but there are examples where they work. This particular gentleman has before and after photos taken over three years, where he had basically a saline patch. He whacked in a drain and a few years later he has a magnificent crop growing right up to the banks of the drain. You show that to another farmer and he thinks, 'I want one of those, but I don't want to have to wait two or three years for a bureaucratic process to get it in there.'

**Dr WASHER**—Just to follow up on Martyn's thinking, what would be ideal—I will take the Department of Agriculture as a hypothetical example, because it has been brought up—is where you have an overall coordination program that is bigger than just the catchment area concepts, where they go and look at and assess the economics of it all, because sometimes it is not economical to do, as Colin said; they get a master plan for these areas and say, 'Knowing the soil types and understanding the best science, there are some areas that aren't great to drain, there are some areas that are great to plant the trees and there are some areas where we can still plant wheat.'

I gather from the scientists that they can determine that. They have the technology now to determine this on a fairly wide scale, if you believe what they say, and yet that is not translating onto the ground where it is anecdotal—'I looked over the fence and the soil type where that guy is draining might be different to the soil type where I've planned a drain,' and things like that. With all this money we are about to spend, we want to make it useful and we want to make it

worth while, and we need to have it so it is economically justifiable. We need to walk away from some places, too. Do you agree with those sorts of statements?

**Mr McMillan**—I have no problem at all with that. That is exactly our policy on salinity, as such. It is very much a horses for courses policy. We know various methods will work in varying areas. You mentioned that Murdoch are going to be presenting here. A couple of our councils were hosted out at Murdoch a few weeks back. They have this vision for the amalgamation of the research facilities in Western Australia, which is a government push at the moment, and we were pretty impressed with what they proposed. We asked them, ‘What about the extension side of things?’ and they recognised that as a core component of the way forward.

Having had past experience in implementing that, I know it works and it is the only way to do it. As Dr Washer alluded to, there are some farmers who are quite happy to use the Internet and get all the information they need off that, but there are those who still prefer the face to face across the kitchen table approach. As old-fashioned as it might sound, it is the most effective way of doing things.

**CHAIR**—Which department is responsible for the approval of putting in some drains?

**Mr McMillan**—I am guessing here, because the machinery of government, as I mentioned before, has really blurred the lines. It used to be the Department of Agriculture, because it was an agricultural issue. As Colin mentioned, a lot of these functions have been transferred over to the Department of the Environment. I know they exchange notes now.

**Dr WASHER**—I think it is Water and Rivers now.

**Mr McMillan**—Once again, Water and Rivers have now been swallowed up into the department of the environment.

**CHAIR**—If it takes 12 months to two years to get approval, you wonder what happens in that period of time.

**Mr McMillan**—You wonder about the commitment of the agency, first and foremost.

**CHAIR**—And also whether the approval of any drains is in line with good overall planning anyway. I understand the problem, I think. Thank you, Andy. We appreciate your submission and evidence today.

**Mr McMillan**—Thank you for the opportunity. Garry is over in Adelaide this week looking at environmental management systems—Senator Troeth’s new proposal—otherwise he would have been here.

**CHAIR**—When we have a hearing in Canberra maybe we could do a telephone hook-up, just to get some words from him. Thank you.

**Proceedings suspended from 9.50 a.m. to 10.01 a.m.**

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**COCKS, Professor Philip Stanley, Chief Executive Officer, CRC for Plant Based Management of Dryland Salinity**

**CHAIR**—Welcome, Professor Cocks. 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 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 received the submission from the CRC and also an exhibit. They have both been authorised for publication, so they are on the public. Would you like to start with some opening comments and then we will go to questions from the committee?

**Prof. Cocks**—Thank you very much. I thought I would make a few comments about the CRC itself and then go on to the sorts of things that I think need to be put into place if we are to achieve the change in the landscape that is necessary to manage salinity.

The CRC, briefly, has 11 partners across four states. If we had Queensland included, we would be truly national, but I think we are very close to national anyhow. The partners include the state agencies of agriculture and conservation in most of the states, three universities and CSIRO. We have a communication and education program, which I will return to later, and our other programs range from basic research into the way that our natural ecosystems manage the water in the landscape, through to germ plasm improvement—that is, breeding new plants—biodiversity, the effect of new farming systems on biodiversity, and the whole raft of issues involved with socioeconomic factors affecting adoption.

I would like to talk briefly about the need for landscape change. Hydrologists have indicated to us that something like 50 per cent of the landscape would need to be planted to perennials if we are to redress the current imbalance in the water, which I am sure you understand. This is a fundamental component of the CRC. Alongside that is a recognition that any new farming system involving perennials has to be profitable enough—probably more profitable than existing farming systems—if we are going to get adoption.

The third thing I would like to say is that we believe that the existing technology to put these ideas into place is not really available; it is not on the shelf. This is one of the areas where the CRC would probably disagree with the designers of the National Action Plan, who fundamentally believed that the science was in place. We would certainly say that, for example, there are no perennial pasture plants for the wheat belt that are sufficiently attractive for widespread adoption. Similarly, farming systems involving agroforestry are not well understood. How much water do the trees use? Does the water travel laterally to the trees? Some of these are really important issues that we do not understand.

Then there is the whole issue of biodiversity. If we introduce new plants, will they become weeds? What positive effect can we have on birds and animals by introducing trees into the landscape? These are the sorts of issues that I think need research and development.

Finally, I would like to touch briefly on the whole issue of adoption, which is going to be one of the major constraints that I think we have to recognise. Farmers will adopt something in the short term, if a subsidy is large enough to encourage them to do it, but at the end of the day they will only adopt systems that keep their incomes up, or preferably improve their incomes. That is not to say that they are not concerned about the environmental issues, but many of them simply cannot afford to adopt things that cost them money.

The kinds of constraints that they face are a lack of resources, particularly smaller farmers—and this is probably more important in eastern Australia than it is here in the west—and the innate conservatism of many farmers. They want to see pretty cast-iron proof, preferably on their neighbours' farms, before they will adopt. Again, I think that is probably more a situation in eastern Australia than Western Australia. Most importantly, there is a lack of appropriate information flow to them about the new ideas. There has been a substantial running down of resources for agricultural extension in most of the states of Australia. I am sure you are aware of that, but that is certainly impacting on our ability to get our message through.

There is a poor understanding, I think, by both government bureaucrats and scientists alike of the complexities of farming systems. Scientists of course tend to be discipline oriented, but farmers are systems oriented, and sometimes those two do not match up terribly well. I think you could say the same thing about bureaucrats, who often mouth the words of the systems but do not really understand the complexities of it.

I would like to highlight one innovation that the CRC has taken to at least redress this issue of information flow, and it leads to one of the recommendations that we made. There is an opportunity for governments, particularly state governments, to form partnerships with agribusiness, such as Landmark or Elders, who do have the capacity—because they have large numbers of agronomists and agents throughout Australia—to get on a face to face basis with almost every farmer in Australia. It is worth remembering that Landmark is the biggest employer of agronomists in Australia. I will conclude my introductory remarks.

**CHAIR**—Thank you for that. Thank you particularly for making some specific recommendations. It is very useful in these sorts of inquiries to have some things put to us in that way, that we can test against the criteria. I am a bit surprised that the CRC does not have any private company involvement. Is there any move for that? I would have thought that part of what you are trying to achieve as a CRC is some saline resistant plants and various other things, and that ultimately there has to be a commercial benefit there somewhere.

**Prof. Cocks**—You are referring to private seed production.

**CHAIR**—Yes.

**Prof. Cocks**—And plant breeding agencies. The fact of the matter is that the kinds of plants we are dealing with at this stage are not sufficiently economically attractive for the private breeding companies to get involved. We have a bit of a case of market failure, I think. The

process that we use does involve the private companies. We are currently breeding for a salt and waterlogging tolerant weed, which may well be attractive at the end of the day. When we come up with a new variety of plant, we would involve private companies in the production of seed and we would probably give a private company rights to sell their seed to the farming community.

**CHAIR**—I still think it is a bit short-sighted of those companies not to be investing in the CRC.

**Prof. Cocks**—Landmark is, of course. They are a supporting partner.

**CHAIR**—They were not listed as one of the partners.

**Prof. Cocks**—They are not one of the core partners. That is probably a factor which is associated with the changing role of what was Wesfarmers, now Landmark, in the CRC. At the beginning, we saw them as a kind of commercial link that was important to us, and we wanted them to be committed to the process, but it was since they became committed that we developed this very strong partnership. It may well be that, if we had understood the full ramifications of that partnership, we would have involved them as a core partner.

**Ms CORCORAN**—What is your relationship with Landmark?

**Prof. Cocks**—Landmark are what we call a supporting partner. This means they make a cash contribution to the running of the CRC. They have a place on the board of the CRC and, more recently, it has meant that they are operating with us in one of our projects and are contributing in-kind people to that project. They are approaching very closely what the core partners would do.

**CHAIR**—That is very promising. The previous witnesses today from the Western Australian Farmers Federation talked about the gap between science and the farmers. Dr Hatton from CSIRO suggested there are a lot more situations where farmers are working much more closely with researchers and scientists as well, and this seems to be, if you can achieve that, an optimum situation. How do you see this gap being not only narrowed but closed? Are the catchment management authorities the appropriate mechanism for doing that? What is your view?

**Prof. Cocks**—Firstly, just to comment on what Dr Hatton said: it is very important, when you are developing new technologies, to work with farmers, at least in field based research, because that gives the researchers a basis in reality. However, that does not mean that you are getting through to the majority of farmers. We might have a project involving a farming community—and we do have. It is only a small community and, while they might in the long run act as champions, their influence is still fairly restricted. That is a very important process, but I do not think it will result in overcoming that gap between the science and adoption.

I think the catchment management authorities are a good way of involving farming communities in that part of the research, and the CRC is certainly doing that. We have research proposals in which we will be contributing substantial funds to research in at least three catchment management authorities—one here in Western Australia and three in eastern Australia, so that is four. Again, they are very useful in helping us to identify the appropriate farming

community groups and they do give us a lead into their particular catchments. But it still means that, unless you form that sort of alliance with every catchment management authority—that is very expensive—you are going to miss out on most of the farming community.

I think we still have to use the conventional methods—the state government extension agencies—but I would reiterate what I believe is the importance of this partnership with private industry. It need not be just Landmark; there are a number of other private companies. They have the capacity to have face to face relationships with virtually every farmer in Australia. That is certainly not true of the state agencies.

**Mr MARTYN EVANS**—You were saying in your submission that the category 2 research, which is scientific research aimed at developing technologies and applications to address salinity, is not addressed by the National Action Plan at all at a state level; aggregated at a higher level, but that funding has to come from the very bottom level, and therefore you cannot really aggregate it beyond the most micro level, which makes it much harder to address these problems at the kind of scale which one needs to. Therefore, it cannot be aggregated to fund CRCs like yours, which have had to come through the CRC program.

You comment that it was resisted by the administrators of the NAP to have that addressed at a higher level. Why do you think it is so? Why do you think it was resisted particularly? Why is there this reluctance to aggregate it at a higher level, when clearly these problems are faced in common across a much broader level? The science will be the same. The west has different problems to the Murray-Darling and so on but, with the plant based solutions, many of these issues are the same. Why do we face such resistance in aggregating the scientific research?

**Prof. Cocks**—I can only speculate, of course.

**Mr MARTYN EVANS**—Of course.

**Prof. Cocks**—The ideal in the National Action Plan is to devolve as much of the resources as possible to the catchment communities who are directly involved.

I have no argument with that. I think there is a lot to be said for empowering the people who are directly affected by dryland salinity. The issue really comes up when there are major issues of research that might be limiting the success of the solutions that are being proposed. One might argue that plant breeding is one of those things. Some of the hydrological aspects of research which are in category 1 are certainly part of that. Some of the socioeconomic constraints probably also fall into that level.

The way it stands at the moment is that a catchment management authority has to make a decision to support a research project in its catchment. Although \$1.4 billion sounds a lot of money, their resources at catchment level are fairly limited and there is a strong expectation that the money will be spent for on-ground works, so getting them to contribute to a significant statewide or national research effort is very difficult indeed. The bureaucrats in Canberra have certainly resisted the idea of skimming a certain amount of the National Action Plan money off for research on the state or Commonwealth level.

There has been a bit of money set aside in New South Wales and I understand that is under threat. There does appear to be, as I understand it, some success in South Australia—I am not too sure how that happened—in setting up a system where the state can coordinate the research. Even there, I think, one of the CMAs can veto the research even though the rest of the CMAs might want it to go ahead. There is a problem there, I think, that the Commonwealth really needs to address if it firstly accepts that there is a need for research and then if it wants that research to be conducted without allocation of additional funds, other than the National Action Plan.

**Mr MARTYN EVANS**—Plant based solutions are obviously a very significant contribution to make to the actual on-farm solution, because you would be offering a variety of alternatives. You would be offering a mechanism which would integrate possibly into the farming economy while at the same time offering at least a partial and hopefully a substantial contribution to dealing with the watertable, and perhaps also offering a degree of salt tolerance. Presumably you are investigating the economic aspects and the salt tolerance and breeding towards that end.

I take it, therefore, that you are looking at existing plant species in doing that, but not finding a lot of success, as you reported in your submission, with an existing range. In relation to the existing profitable plant species that you refer to, when I looked at the reference it referred to some of the eucalypt species, which I take it is the oil outcomes. That is very much a non-traditional crop. I am sure the eucalypt oil has a good market in that respect, but it is very much outside the normal range here. Is there a range of other things? You mentioned the salt tolerant wheat, but are we looking at this as being also able to address a broader range of crops, do you think? Is this going to be able to meet a mainstream response in the longer term?

**Prof. Cocks**—You have absolutely hit the nail on the head in the sense that we need crops that are going to be adopted widely, and are like 50 per cent of the landscape, and we are going to need a range of crops to do it. It is probably not going to be sufficient to focus on crops that have only niche markets. The oil mallees are a very interesting case. I do not know whether anyone has spoken to you about the development of the oil mallee industry.

**CHAIR**—We will be having a look at it this afternoon or tomorrow.

**Prof. Cocks**—You will probably hear all about it in that case, but it is certainly going to depend on the development of appropriate infrastructure. This is something that I have been saying to anybody who will listen to me: that our current rural industries depended on significant development of infrastructure in the sense of roads and rails. Back in the 19th century it is just staggering what governments did in the sense of building infrastructure to develop the rural industries. Now we are trying to develop a new industry. Relatively simple policy issues, like increasing the requirement for renewable energy, would have a huge impact on the oil mallee industry. If we increased it from two per cent to five per cent, then biomass energy from eucalypts, as you will see at Narrogin—I presume that is where you are going?

**CHAIR**—We are going to Narrogin, yes.

**Prof. Cocks**—You will see the plant there. That sort of plant, multiplied 10 times in the Western Australian wheat belt, would make a very significant contribution to renewable energy, would have a significant effect on regional communities by providing employment and would address the salinity problem. Furthermore, I think that particular technology is more appropriate

to eastern Australia where you have substantial regional communities than it is here in Western Australia where most of our regional communities are pretty small and do not require that sort of decentralised generation of power in the same kind of way.

As far as other crops are concerned, we are very interested in perennial wheat. Perennial wheat is unlikely to have as good a yield as annual wheat, because so much of the plant's energy goes into the production of the permanent root system, but it can be used for grazing during the summer, so you get a double whammy from it. We do not know enough about it to know how the economics would match up with ordinary wheat, but that is a possibility.

The whole saltland pasture issue of course is a very interesting one. Here I do not think we will have anything like the same problem in getting adoption as we do in the so-called recharge areas, because at the moment this land is almost wasteland, so if you can develop options for farmers to make use of that land, they will adopt it fairly quickly. That is exactly what we are finding with saltbush and puccinellia. You all know about puccinellia in South Australia. There is quite rapid adoption of those technologies as they become available.

**Dr WASHER**—Professor Cox, could you tell me what is really involved in salt resistance in a plant? Is it its ability to excrete salt through the leaf? By what mechanisms do plants become salt tolerant?

**Prof. Cocks**—They have different mechanisms. Some plants try and avoid salt, so they have mechanisms to not take it up. Other plants take it up and excrete it in their leaves. The latter have some problems when it comes to using them as grazing plants because it means that the animals grazing them have to get rid of the salt. They do that by drinking lots of water and excreting it. That causes problems in itself. Also some of those plants are fairly indigestible because of the high ash content. Both methods exist. Saltbush is certainly a good example of a salt uptaker, a salt accumulator in its leaves. Most of the salt tolerant grasses exclude salt right from the beginning, so they do not have those problems.

**Dr WASHER**—Is there a place, do you feel, for deep-rooted perennials alternating with wheat crops over a period of time? Instead of looking for a salt resistant wheat, what we do is as in the old days, where you used to let the land lie fallow, or plant it to some nitrogenous crops before we had nitrogenous fertilisers. We would plant that for a few years, wipe that out, plant out wheat, then cycle it back through. Is there any future in that pattern?

**Prof. Cocks**—We certainly believe so in the recharge areas where farmers are currently growing wheat. That is where we have to get 50 per cent of the landscape sown to perennials. We hope that we can do it without getting rid of wheat and that we would have a rotation of wheat and perennial pastures. The perennial pastures, particularly lucerne, give every evidence that they may be more profitable than annual pastures, so we are pretty hopeful that that will be taken up. If the farmer sowed all of his pastures to perennials, that would be 50 per cent of the landscape because after three or four years he would then change over to wheat. Technically it is interesting and in fact works, because in the lucerne phase the soil is dried out, really dried out, and it forms a buffer. It takes a lot of rain to fill that soil up and make it wet again. With the wheat it seems to take two to three years before the subsoil becomes saturated again and there is no buffer. At that stage, you go back into your lucerne. Hydrologically, the system does seem to work.

**Dr WASHER**—From the tree point of view, we heard of alley farming before as a phenomenon, and it was mentioned that a lot of that benefit was not only for the actual tree to be harvested for fuel, as you suggest, but also as a windbreak material. In other words, what I guess Colin was saying was that soil erosion and stress on plants certainly make them more susceptible to problems with salinity.

**Prof. Cocks**—Yes, this is a rather complicated issue. The alleys compete with the crops for water. Remember, we are talking in water limiting environments, in spite of the fact that there is too damn much water there, so they do compete with the crops, in particular, for water. If you look at a cross-section of a crop between two alleys, its best yield is in the middle and it declines as you get closer to the alley itself, but that is less important in areas of high rainfall than it is in areas of low rainfall. There is certainly a benefit to livestock industries from the point of view of shelter in agroforestry systems. There is equally certainly a benefit in wind erosion control. At this stage we do not know enough about the whole system to really be able to say to what extent there is a benefit and to what extent there is a cost to the rest of the farming system in having alleys, but one thing is certain: the alleys themselves must be profitable in their own right. I do not think farmers in sufficient numbers are going to go into alley farming systems unless they are profitable.

**Dr WASHER**—Professor Cocks, we also heard a slight criticism of CALM, in that CALM did resume a reasonable amount of land from farmers where biodiversity was thought to be threatened, but there was an impression given that the areas are being neglected to some degree; no-one is really looking after them.

**Prof. Cocks**—I am not really able to comment on that. It is certainly a possibility. CALM, like other government agencies, has its problems with budgets, but I cannot comment specifically on that because I simply do not know.

**Dr WASHER**—If we create islands of isolation is there some value in creating tracts of land where native species are planted back for movement of animal species et cetera across there? Would that help biodiversity?

**Prof. Cocks**—It is interesting you should say that, because that was one of the bases of our application for supplementary funding to look at the whole issue of biodiversity. We believe that the possibility exists that exactly that could happen, particularly for bird species. Scientists know how large an area is necessary to sustain a given number of bird species, particularly those kinds of species that are threatened in the wheat belt. One should remember that there are some bird species that benefit from agricultural landscapes—galahs and twenty-eights in Western Australia—but there are certainly others that do not.

We believe it is likely that, if you connect existing remnant vegetation by trees that are used commercially, there would be benefits to biodiversity. But there would be many ecologists who would disagree and there are dangers in doing it, particularly if you were introducing tree species that are not native to the area. There is the possibility, if they are eucalypts, of hybridisation with trees in the remnant areas. All these questions are certainly legitimate, but we do not really have the answers.

**Dr WASHER**—Thank you.

**Ms CORCORAN**—I was going to ask you if a tree is a plant. But I take it it is, from what you have just said.

**Prof. Cocks**—Yes.

**Ms CORCORAN**—You talk about the need for socioeconomic factors to be taken into account when you do your research. I would like you to talk a little about that. Are your comments about the perennial plants being rotated with wheat an example of that? Why would you rotate if perennial plants do so well? Why would you not continue to run them all the time? Is that an example of them not being as economic as the annual crops?

**Prof. Cocks**—I will address that question first. The problem with continuous cropping—if you cropped all the time—is that it becomes unsustainable for a number of reasons. First and foremost amongst those reasons is the weed problem. Continuous cropping implies a fairly heavy use of herbicides. Plants have an amazing ability to adapt to difficult environments and being sprayed every year by herbicide is one of them. If you have one in 10,000 plants that have some resistance to the herbicide, it does not take very long for that plant to become the dominant plant in the population. That is what we have found: weed populations rapidly become resistant to the herbicides that are available.

To digress for a minute: this is one of the issues involved with genetically modified plants that are modified to resist herbicides. Constant spraying with that herbicide is going to modify the weed population as well and could lead to a more serious problem in the future. If you change from a crop to a pasture, then you have all sorts of new opportunities to control the weeds. You can control them by grazing; if it is a perennial pasture, most of the annual weeds do not do well in competition. All of a sudden you can turn an unsustainable system into one that is sustainable. Most farmers do recognise this and would prefer to have a rotation in which they can manage their weeds. Quite apart from the benefits to salinity, I rather suspect that the major reason why farmers would take up perennial pastures would be to manage their weeds. That is good for us, of course, too. Does that address the first question?

**Ms CORCORAN**—Yes, it does. Thank you.

**Prof. Cocks**—Regarding socioeconomic factors, we have a strong socioeconomic program and we expect it to do a number of things. We expect it to tell us what sort of impact our new technologies will have on farming systems: will they benefit the farmer economically? We also ask broader questions like, ‘Are the off-site effects sufficient to ask or suggest to government that they should develop policies which encourage a particular technology?’ Those are the sorts of questions we would ask of our economists. We also ask them to look at the whole raft of policy issues. The CRC believes that it has a role in assisting federal and state governments in formulating policy. We are only a young CRC so we have not had a great deal to do along those lines, but my presence here is an indication that we are trying to influence it. Our economists must do that, too.

We have an experimental economics program, where we are looking at ways of valuing the environmental services. One of the big issues that we have is that it is very difficult to evaluate environmental services economically, including biodiversity and off-site effects of agriculture. These are quite difficult to evaluate, so we expect our economists to help us there as well.

Then there is the kind of issue that I referred to briefly earlier when I was talking about differences between farmers in eastern Australian and in Western Australia. It is not as simple as that, of course. What is the capacity of farmers to change? That is an absolutely critical question that we have to ask ourselves. It is no good coming along with an idea that is brilliant technically if the farmers do not have the capacity to adopt it. We need to know the constraints to adoption. That is a social question as much as it is an economic question. To give you one seemingly absurd situation: if you ask a farmer to have more pastures and therefore more sheep on his farm, that means it puts his summer holiday by the beach at risk. If you come from Merredin, four or five weeks at Albany is pretty attractive and you do not want to change your farming system if you have to give that up. That might be a simple thing, but it is quite important.

**Ms CORCORAN**—All of those things are taken into account as you go through your research?

**Prof. Cocks**—Yes, that is right.

**Ms CORCORAN**—We hear a lot about the need for databases to be easily accessible by researchers as well as by farmers. Could you comment on that. Also, how easily is data shared amongst the research community?

**Prof. Cocks**—Data is not shared amongst the research community as well as it might be. Traditionally, researchers have published their results in scientific journals. That gives us some results. It does not give another scientist direct access to those results, although, generally speaking, if he writes to the author of the paper, the author will make his results available. All of that is pretty clumsy. There is not very much doubt that there should be some form of data sharing amongst scientists, but it is not as easy as all that because the issue of intellectual property rears its ugly head, even if it is at a relatively simple level of who gets the credit for something. Scientists are just like the rest of us and they tend to be very careful about that sort of thing. You would need a system that takes that into account.

Within the CRC, of course, we are setting up systems so that that can happen, because our projects generally speaking extend across institutions and state boundaries. We have systems where our scientists can enter their data into databases that are managed by the Internet. What I think is needed is something like this managed by an organisation something like the National Dryland Salinity Program, which is a body constituted by the states, the Commonwealth, and other interested people. I make the point in my submission that there is some question about its continuation and I would certainly urge you to consider the future of the National Dryland Salinity Program. This is one area in which I think it would act very well indeed.

**Ms CORCORAN**—Thank you.

**CHAIR**—We have had other evidence on salinity in relation to irrigation, and urban salinity as well. Do you think that body could act with respect to those other issues of salinity, as well as the dryland problem?

**Prof. Cocks**—Its mandate would have to be enlarged to include irrigation salinity. I think it already covers urban salinity.

**CHAIR**—Does it?

**Prof. Cocks**—It would certainly need to have its mandate broadened. I am not too sure that that would be wise. Dryland salinity and irrigation salinity are substantially different, although they are connected. Increasingly, the root cause is dryland salinity; the expression of it is irrigation salinity. Some of the management issues are very different and I am not sure that one coordinating body would be best. I have not really given that a great deal of thought, to be perfectly honest, but I am concerned about the future of a coordinating body for dryland salinity.

**Ms CORCORAN**—You make the difference between dryland salinity and irrigation salinity. For the person on the land, does that distinction matter? Is it clear to them? Can they have both sorts? What follows from that is, if there is just one source of all this information, is that then better for the user?

**Prof. Cocks**—They can only have both sorts if they have both dryland farms and irrigation farms. I suppose it is possible under those circumstances, although most of our irrigation areas are in very low rainfall areas. We are looking at the Murray-Darling Basin. Dryland salinity comes from poor management of land in the higher rainfall parts of the western slopes. That leads to increased salt levels in the streams leading into the major river systems. Salinity in the river systems themselves is currently being managed by engineering solutions, but I think the Murray-Darling Basin Commission believes that that cannot continue indefinitely. That is the connection between the two: dryland salinity is a problem generated many kilometres away from where it is expressed in the irrigation areas.

Irrigation salinity is really caused by irrigating the saline water. There can be some similarity if, by irrigating too much, the groundwater level starts to rise and the groundwater is salty. That is when the causes would start to be similar. I do not think that is the problem in most cases; it may be in some cases.

**CHAIR**—To come back to your comments about using agribusiness organisations like Landmark, Colin Nicholl, President of the Western Australian Farmers Federation, said earlier today that one of the difficulties with the extension work being done by people replacing the traditional Department of Agriculture is that at the end of the day they have to improve their sales, so are you unlikely to get the sort of unbiased extension that we are really looking for, plus you will get in one particular region certain farmers who are contracted in some way to Landmark, others who are contracted to Elders et cetera, and they could be all in the one catchment.

**Prof. Cocks**—Yes. You would need to come to arrangements with more than one agribusiness. I agree that there is an issue of credibility here, exactly for the reasons that you outline. For those reasons, agribusiness is keen to get involved in natural resource management because they are seen to be becoming involved in issues that do not lead directly to profit, or not so obviously anyhow. I think they would still see themselves as not spending a great deal of time on something if it did not lead to some profit; that is understandable.

It has to be considered as second best. If we had state agencies with the kind of extension services that maybe they had when I first became an agricultural scientist, then I do not think it would be an issue. But the simple fact of the matter is that they do not have them any more. We

have to look to alternatives. There is another alternative—and we should not forget it—and that is the use of consultants. A lot of farmers, particularly in Western Australia, do use consultants, and they do belong to an organisation called the Australian Institute of Agricultural Science and Technology, so a partnership with them might be worthwhile investigating. But it is probably more difficult to manage than one with agribusiness.

I have been a little but surprised, I must say, by the way Landmark is managed. If senior management wants something to happen, then it happens, whereas in the university where I come from, if senior management wants something to happen, it just hopes it will happen. You had better not quote me on that!

**CHAIR**—That is on the record now. Yes, I think we understand. My last question is probably not within our terms of reference, but just out of interest, is there any GM work being done in the CRC, as far as tweaking some of the plants that you are dealing with?

**Prof. Cocks**—At this stage we made the decision not to go along that track because of the problems with GMOs. We would be a little bit concerned that we would spend a lot of time working on them and not get adoption, for reasons that have nothing to do with the quality of the product. We also believe that there are technologies where you can avoid the GM route. What we are doing—and it may interest you a little—is crossing wheat with sea barley grass. Sea barley grass is a horrible little grass that grows in salt flats and can survive some inundation with water. You would not think that sea barley grass would cross with wheat but it does, and you get a most peculiar looking plant as a result, and then through back-crossing we hope to get something that is of value. We believe that is a better route to go at this stage than the GM route.

**CHAIR**—You think that is not GM?

**Prof. Cocks**—No, it is not GM.

**CHAIR**—Some might argue otherwise.

**Prof. Cocks**—I do not think so.

**Mr MARTYN EVANS**—It will have different DNA, I suspect.

**Prof. Cocks**—It will have genes from an alien species in some senses but the mechanisms that you use are natural.

**Mr MARTYN EVANS**—The Greens can live with it.

**Dr WASHER**—We have seen the sea algae blooms in saltwater rivers and obviously we have some problems where inevitably drainage programs are going to wind up in some saltwater lake systems. People propose growing fish and other creatures in these lake systems. Has anyone looked at algae in terms of carotene productions, for example, which is in quite high demand.

**Prof. Cocks**—There has been some examination of that, and the fish, but I would just emphasise that these solutions are not going to be adopted on a broad enough scale to have a large impact. They are more niche industries. I think there are a number of niche industries that

you could be examining and they will be good for the people involved in them but I do not think they will have sufficient effect to really manage dryland salinity.

**CHAIR**—Thank you very much for your assistance in the inquiry, for your submission and your evidence today. We really appreciate it.

**Prof. Cocks**—Thank you.

**Proceedings suspended from 10.50 a.m. to 10.56 a.m.**

**BELL, Associate Professor Richard William, Associate Professor, School of Environmental Science, Murdoch University**

**MOORE, Dr Susan Amanda, Senior Lecturer, School of Environmental Science, Murdoch University**

**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. I remind all witnesses that the giving of false or misleading evidence is a serious matter and may be regarded as a contempt of the 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 submission from Murdoch University which has been authorised for publication so it is all on the public record. First up, would you like to make some opening comments and then we will go to questions from the committee.

**Prof. Bell**—Yes, just briefly. The reason there are two of us here is that I think I can speak more on the biophysical aspects of salinity, whereas Sue represents more the social science aspects. She would particularly like to draw attention to what we perceive as perhaps a lack of balance in the terms of the inquiry vis-a-vis those two components.

There were six academics from Murdoch who put together the submission. There are probably two or three others who have an active interest in the area but, for reasons of time, were not available. There is about 20 years of prolonged experience in aspects of salinity and through our research programs we are fairly widely connected in Western Australia and, indeed, nationally in the research that we do, so we speak with that experience but from the perspective of a university. We do not claim to have a view on everything or to have a complete understanding of all of the issues.

A couple of points: the scientific base should not be regarded as static. It is a moving process. Our knowledge and understanding continues to change. Some of our understanding of best practice and processes is quite different from what it would have been 20 years ago, and in 20 years time I imagine we will have some quite different views also, so we should not turn off the tap with our research endeavour.

As a university we have two main interests, I suppose. One is in teaching undergraduate students, many of whom go out into work that is directly related to salinity, particularly in the landcare area. You will probably see some of our graduates in the next day and a half in your travels in the field. We think it is very important that, as academics, we are very engaged in the process so that we can teach those students the up-to-date debates and understanding of things. Then we also have a major mission in training at PhD level, actually generating the next level and generation of research that is going to inform our understanding.

We collaborate with many different agencies and we see that as a critically important part of what we do in our contribution. I would make one observation here, that the ARC Linkage

Program is one that is very important to us and has really been quite a successful scheme in engaging universities and industry. We are increasingly finding, though, that the pressure on budgets and state government agencies is making it difficult for them to participate as partners in those programs and one that I am currently trying to put together, our state government agency, is struggling even to find \$5,000 per year of cash to be a partner in that. That is a concern. It is obviously a state-level matter but it should be part of the overall thinking, because the Commonwealth funding is not going to work if the state government is not really able to contribute people to join in those programs.

The final point we would make is about regional NRM groups, which is an innovation and quite a radical change in the way in which investment in natural resource management and salinity issues is going to take place. Personally, I applaud the moving of decision making into the regions, but we have significant concerns that these regional groups do not and will not have access to the best science with which to make the important decisions that they are going to make. I will hand over to Sue to make some extra points.

**Dr Moore**—Thanks, Richard. Thank you for the opportunity to appear before the inquiry on Murdoch University's behalf. In my brief statement I will focus my spoken comments only on the first term of reference, although the written submission does of course cover all three. What I want to particularly focus on was that the salinity science base must include the social sciences, in addition to the biological and physical sciences that are listed in the inquiry information document.

There are five reasons why we need to include the social sciences. The first of those is our national and international concern with sustainability. The international conventions to which Australia is signatory require that we consider sustainability. Sustainability is based on the triple bottom line, which means that things need to not only be biologically and physically possible but they also need to be economically feasible and socially acceptable, and so we need to take consideration of the social sciences in terms of that economic and social component. It is not sufficient just to look at the physical and biological sciences.

Secondly, another reason for focusing on the social sciences is that it is very unlikely that the findings from biological and physical sciences are going to be adopted unless there are economic and social conditions that are conducive to adoption. The previous witness mentioned that as well. For example, no amount of research into a salt tolerant crop is going to lead to its adoption if it is not economically feasible, so we need to understand the economics. Although we know we need to have dramatic changes to agricultural landscapes to deal with dryland salinity, without understanding the concerns, the values, the aspirations of the people in those landscapes, it is very unlikely that the findings of physical and biological sciences are going to be picked up.

The third reason for social sciences, and this is a concern and interest worldwide, is that we need social research to determine the best way of organising ourselves as a government interacting with non-government organisations and with groups such as the recently formed natural resource management groups. We need to do research to understand the best ways of organising those arrangements. How do we best organise ourselves to get some changes on the ground? Such institutional research is commonplace in countries like the United States but we seem to have been very slow in Australia to pick up that sort of research.

The fourth reason why we need the social sciences is to conduct policy research. We need to be able to evaluate policy options. Are people going to respond better to the stick or to the carrot or will they respond better to both? We need to do that very fundamental research to determine whether we need regulatory approaches, incentives, education or do we need some mix? It is very important.

The fifth reason why where we need to conduct social research, which has been neglected until recently, is to look at examining sustainable futures. The whole area of futurist research is only just being adopted in Australia, and there the work of Land and Water Australia, within their social and institutional research program, is to be commended. They are starting to develop project briefs looking at future landscapes and they recently advertised a raft of research projects, looking at where are we going in the future, and where might we be going.

**CHAIR**—Thank you for that. Certainly the point of economic feasibility has come through loud and clear from not only the witness before us but a number of witnesses. The farmers themselves acknowledge that they are not going to be able to do what someone might want them to do on their farm unless they can remain viable. We are very conscious of that. That aspect, along with the social change that you talk about, probably brings into play the importance of this extension officer as well. Do you think that role, if it is done by the right sort of people, could be more than just simply informing the farmers of the science or the techniques that are available to overcome their problem? They could act in a much more global sense.

**Dr Moore**—Yes, definitely. In terms of the extension that is being provided through NAP and NHT2 by the community support officers, a fundamental part of their role is community capacity building and that is capacity building for change. They are not only providing information to land-holders but a central mandate of both of those programs is this so-called capacity building, and that is capacity building for change.

**CHAIR**—Most of the evidence we have seems to be telling us that the CMAs are not filling the gap well enough between science and on the ground. I guess we are in one sense looking at how you make that work better, or is there a better model or other things that should be being done?

**Prof. Bell**—Yes, I could comment on that. I think the relationship between extension and the community has changed a lot; that is, the old extension officer tended to be seen as the expert who came along to deliver wisdom and the farmers were relatively passive recipients, who were expected to receive this gratefully and implement it. But the CSOs are in a very different relationship because they are often employed by the community to work with and serve the farmers, and that changes the power relationship, if you like, in that they are working for the community rather than coming in from outside. I think that is a good change because they are there as resource people to access the information, to bring in the experts where there is a lacking of knowledge or understanding in particular areas, to do some of the running around and finding out what published information already exists and the like.

I think where it falls down is that these people are mostly very young and inexperienced graduates. I was with one of our former students on Tuesday. She graduated with honours late last year; a very good student. She is fantastically enthusiastic and energetic and in four months has established a great relationship with the community and has plenty to do, but she still is only

a fresh graduate who has not had time to really learn the area. She is not from a country area so she has a lot to learn about rural communities and how they function. Chances are, at the end of a year or two years, she will be gone. She may stay in Landcare in a different area so that that expertise is captured and built on; she may end up in a completely different area and the next graduates will go through the same learning process. Somehow we are not capturing that knowledge and expertise that is building amongst those people to allow it to mature and to really become local experts who know all the ins and outs of, not just the social systems, but the farming economy and also the biophysical processes, so that they can be real expert advisers on what can be done, what is feasible and how to move forward.

**CHAIR**—That fits with what we have been told in various parts of the country, by farmers particularly, who have been on the land for maybe several generations. They look at those sorts of people with some suspicion; that they are out of academia not all that long and have not built up those relationships. You can find the person who may have been through various parts of the Department of Agriculture, has been around for some time, already has some credibility and then takes on that role and then there is a completely different attitude. If those positions are being taken by fresh graduates, is it the sort of salary that is available that will tend to attract those sorts of people? Is there a problem in that sense?

**Prof. Bell**—I guess that is the primary reason. It is salary and it is continuity of service. Most of the contracts would be for one to three years maximum.

**CHAIR**—A young person who is looking for experience is happy to do that, whereas somebody a bit older, with more experience, is looking for more secure tenure?

**Prof. Bell**—Also, with their experience and the growth of a private sector providing consulting services in agribusiness and natural resource management, these people are reasonably well sought after once they have three to five years experience, and they are going into more lucrative positions as consultants and the like.

**Mr MARTYN EVANS**—I would like to ask a question about the science funding. Clearly, a lot of devolution has taken place to the lower level of these structures, because government has wanted to devolve it to the catchment management authorities. That has worked in terms of local projects on the ground, but we have had substantial evidence that people expect to see the funding used in their local area, of course, and people jealously guard that. While that is appropriate in terms of capturing that funding for those local projects, it does not allow for the broader science and research to take place at the level at which much of that needs to be done.

Your university, for example, and the CRCs and the like—CSIRO—would have some difficulty in garnering research funds to undertake research which covers a broader ground, which would be applicable on a much larger scale. Is that your understanding of it? How do we capture back some of that funding to allow a broader scale of science to take place, which then can be fed back down into the system? Obviously, you have to maintain, as scientists, those links with the farming community, but you cannot undertake this research just on the basis of the needs of individual local management authority needs. It has to be on a broader scale as well.

**Prof. Bell**—Where we can contribute is at the level of knowledge building and the more generic research, as opposed to the very site-specific research, but they are not mutually

incompatible—that is, you need science and you need enthusiastic groups that you can work with. Many of these local communities that have projects are the ones that we can work with, but usually they do not have sufficient funds to carry out this generic broad scale of research that we need to build the knowledge base.

We form partnerships, and that is a very valuable part of what we do, but if that was the only funding that was available to do research you would end up with a lot of very ad hoc disconnected work, from which it would be difficult to distil the general messages.

**Mr MARTYN EVANS**—Your research funding comes from where? Is it ARC funding?

**Prof. Bell**—It is a combination, yes. As universities, we can apply for ARC funding, and I think the linkage program has been very successful.

**Mr MARTYN EVANS**—Do you get any salinity specific research funding?

**Prof. Bell**—Yes. We are also doing projects for the National Dryland Salinity Program and the GRDC. For example, one of the National Dryland Salinity Program projects that we are doing is the Flowtube project. I do not know if you are aware of the background, but in 1999 the state government did a major review of salinity and where it was going and came up with a salinity strategy. Until that time there had been a view that the control of salinity could be accomplished through better farm management—that is, better crops, controlling weeds and fertilising where you need to.

This review with the Flowtube project showed quite convincingly that unless you made very radical changes to land use you were not going to get anywhere near to solving the salinity problem. That was a real mind shift in the way in which, in Western Australia, we started to think about salinity and how radical the changes would need to be. That program originally was in a FORTRAN form—that is, you needed a computer specialist to drive it. This project is trying to turn it into a simple Windows style program, where everything is ‘click and drag’ and it can be used, essentially, on the kitchen table between an adviser or a hydrologist and a farmer in scenario planning: ‘I would like to do this; will it have any effect?’ ‘No, you perhaps need to consider something more radical; let’s try these options and see, relatively, which one is the most effective.’ Then we can look at the economics of that and see which ones fit into the farming system.

That project is a nice link between science that had a very big impact on public policy and developing tools that can be used to implement some of the change that is needed to solve the problem of salinity.

**Mr MARTYN EVANS**—But I do not get the impression, looking across the board, that we are able to pull together the research funding at a broader level very well with the targeting of research funding across all of the programs that are available, compared to what we do nationally with NHMRC and ARC funding where there is quite good national coordination of priorities and targeting of research funding with various programs and program groups. There is good priority setting. Scientists and others talk to industry, talk to groups and target the research funds reasonably well.

With salinity, it seems to be ad hoc and there appears to be a lack of reasonable targeting of the research funding. It seems to be broken down across a wide range of groups. It then depends a lot on what can be extracted back from the very base of the system, dragged back up a bit and aggregated by an enthusiastic group to tie it back together. Are we doing well enough at trying to target the science at that research level? I know we have done quite well over 20 years in building a reasonable science base. I am not saying that. I am asking are we doing well enough at aggregating that research money to get a reasonable ongoing set of answers?

**Dr Moore**—I suppose one area where we could do better—and I am thinking more of that translation of science into management and on-the-ground actions—is in terms of how we are using the NHT and NAP moneys. There has been a history of limited attention or a limited level of funding for science, for research, and there is certainly the opportunity, as we move towards—and have moved towards—these regional natural resource management groups, to use that level of administration as a point at which we could translate science into management.

In our submission, we commented that we should be thinking about the possibility of having science brokers in those positions, where they take this often disparate science and bring it together and focus on the problems that those groups are having, and they have the carriage of responsibility for on-the-ground outcomes. For us, that is an opportunity that has yet to be realised.

**Prof. Bell**—There are some success stories in this area. The CRC for plant-based solutions is still in its early stages, so proving it is going to provide outcomes is still ahead of it, but it is a means of trying to aggregate resources and expertise to tackle what we recognise as one of our key problems—generating enough plants that we can use in our landscapes, with economic benefits, to solve the salinity problem—so I see that as being a success.

The National Dryland Salinity Program, I think, has been a success. They have tried to take a strategic view, but there was not a lot of money involved in it. Therefore, they had to pick and choose projects that they thought gave them some coverage of the issues and involved the key people, but it is still widely spread and there are a lot of gaps there. The move towards regional natural resource management groups runs the risk that the focus on the problem becomes very local and, therefore, nobody is looking at the big picture and what are the common elements between different groups that perhaps need an overarching research program to tackle.

GRDC—Grains Research and Development Corporation—has changed in its attitude towards its responsibilities for research funding. Even five years ago I think they saw themselves as exclusively directed towards production issues. I think they now accept that part of their responsibility is to fund research into sustainability issues, and their latest call looks at water balance issues in catchments and off-site, as well as on-site, effects.

The ARC programs have the potential to look at some of these generic issues, but I made the point earlier that some of the state government agencies are really struggling to be active partners in that process because they are so cash strapped that even a few thousand dollars is beyond some of these programs now and so they simply cannot be involved.

**Ms CORCORAN**—I wanted to ask you about the link, or lack of, between scientists and researchers and the end user. We have skirted around this a number of times through our

discussions about the need for socioeconomic focus, extension officers and all that sort of stuff. Is there a link between what you are trying to do and what the end user needs? Does the end user see any value in what you are doing, to be a bit blunt? Do you want to comment on that?

**Dr Moore**—As you would be aware, this is not a problem that is unique to Australia. There is a wealth of literature talking about this problem in the United States, in Europe and in Great Britain, not only in natural resource management but in forestry and fisheries.

**Ms CORCORAN**—This problem being the link between researchers and end users, not salinity?

**Dr Moore**—End users, yes, and more broadly. It is not only in natural resource management, within which salinity sits, but also in terms of forestry, fisheries and so on. It seems to be a problem that plagues all of us. One of the areas in which we are getting some better outcomes is in these national granting programs, such as ARC Linkage, where we need to link with partners who are often end users or have very close relationships with end users. Another way that this is being dealt with—a way that is, at least, partially effective—is that over the last five years many of these Commonwealth fund providers have required us, as researchers, to be very explicit about diffusion and adoption, to detail how we are going to do that, the funds that we put towards it and who we are going to be dealing with. It is being recognised as a problem, and I think we are partially addressing it through those sorts of approaches.

**Prof. Bell**—I would expect to see a cultural change over the next 20 years. A lot of researchers grew up in the school of thought that you just did your research, you published the results and somebody would do something with them eventually. It is clear that that does not lead to adoption and the way in which we try to engage the community. Even 10 years ago when engagement was still fairly artificial—that is, in order to get funds from NHT or some of these other bodies you had to have a community member and the night before you would ring up somebody and say, ‘Do you think this is a good idea? Can I put your name down on the application as supporting it?’ and they would say, ‘Oh, I suppose so,’—that was the level of consultation. As Sue said, funding bodies now are much more serious about that discussion and I think the whole issue of regional natural resource management groups is trying to force this issue and give decision making to these groups so that researchers really have to come and talk to these people about their research and get them on board. The way in which we train our students now is quite different from the past. In the environmental sciences, we teach them about decision making and we teach them about stakeholders so, at least coming out of the environmental science background, our graduates now have an expectation that what they do needs the consent of the community, that they need to talk to the community and they need to be engaged with the community.

I am optimistic that we are perhaps in the transition, but the next generation of scientists will understand that process a lot better. But it is a problem for us insofar as we tend to generate a project to do the research and we still do not have very realistic mechanisms for that transfer of knowledge. We still do not actually fund that part of the project. It is acknowledged that it needs to be done, but the funding bodies do not contribute to allow it to happen—except, I think, NSDP tried to by having in each state a science communicator who worked closely with the projects, to try and make sure there were always articles and information out there in the public domain. That may be a model that needs to be expanded and developed a little bit more,

recognising that while researchers are good at research they are not necessarily the best people to be delivering that information to the community, but they need to be closer to that end than they have been in the past.

**Ms CORCORAN**—What about the other end of the process? What drives your decisions when you are thinking about what sort of research you are going to do? When you lie in bed at night and dream up tomorrow's project, what are the things driving that process? Does the end user get a say in there somewhere somehow?

**Dr Moore**—This is the stock, standard academic phrase, 'It depends.' It depends on the individuals but there are certainly general attributes. These days, particularly in universities, we are chasing money, so many of us will go where there is money. I suppose we are very economically rational, from that perspective. Many of us have a passion in a particular area, an obsession, and we will pursue that no matter what. That may be completely independent of the money available. A number of us have large research groups which have students or staff in them that we are seeking projects for or funding for. It can be any one or more of those three elements, that really influence where we might go.

I should add a fourth element: we are, in some ways, being influenced by the request from the Commonwealth government that we develop areas of research strength and to focus on those particular areas of research strength. Some of us are increasingly focusing in that area. The area that Richard and I sit in is ecosystems management and restoration. We are more inclined these days to focus our research into that area, to build the strength of our university. That is one of our seven areas of research strength.

**Prof. Bell**—Adding to that and reiterating some of the points, I think you will find that most researchers nowadays in universities are very responsive to what the demand is. At the ARC level we are encouraged to do more blue sky research. There is scope there for us to be dreaming up what we believe to be good ideas that need investigation. The linkage program puts us a little bit closer to end users and relevance. Then when you get into the industry funded sources, National Dryland Salinity Program and Grain Research and Development Corporation, each of those have their own process of trying to identify priorities. Researchers are out there looking at what is being requested and then trying to match their interests, form alliances with other people to address the needs the funding bodies have identified. There are very few places now in science where you have the luxury of simply pursuing your dream or your passion solely. There has to be some mix between passion, vision driven research and being responsive to what the needs are and what the community—however it is defined—is prepared to fund.

**Dr WASHER**—Richard, I think you mentioned before we started here, we have never had a population so educated. I think you are probably right, but do you think the people in Perth—which is a city of over a million people—really understand the problem of salinity which so badly affects them? It is not just the droughts. We have an ocean of water between here and Africa and we have oceans of water beyond the scarp that we can utilise and yet we cannot water our gardens. We are living in a country where people's expectations are not to have a desert. They want gardens. There is going to be an increasing cost, as we know, for water because desalination is a reality. Also, there is improvement in the agricultural regions by addressing the salt problem effects and run-off—and we discussed Collie River and the Wellington Dam—in that we cannot utilise the water at the moment because it is too saline. So we have plenty of

water, it is just the quality. That does affect the city, but I guess the question is: how many of these million people are able to comprehend that they are surrounded by seas full of water that is unusable and the cost is going to go up?

**Prof. Bell**—I think there is very little understanding. Perhaps even one generation back most people in the city had some link, through relatives and family friends and so on, with rural Australia, but I think that link is pretty much severed. Most people in the city have little direct experience and therefore limited appreciation. I would say a very small proportion of Western Australians actually drive beyond the Darling Scarp and see what is out there in the wheat belt. Certainly that is my experience. I teach a large second-year unit in environmental science and I take them out into the wheat belt because I want them to see it. For most of them it is their first experience of going out into that environment.

But there are some things that are likely to change that. You have mentioned access to water. In June this year we had serious algal blooms in the Swan River and that is believed to have been triggered by nitrates which possibly have been sourced from the agricultural zone. That created a lot of unrest and unhappiness in the community, so when people start to see those connections between their environment in the metropolitan area and what is happening in the agricultural zone, more interest will be provoked.

The Water and Rivers Commission some years back did a modelling study of what the likely impact of salinity in the agricultural zone would be on flood levels. If you go from 10 per cent of the agricultural zone being salt affected and essentially waterlogged, to 20 per cent or 30 per cent, what it means is that instead of 90 per cent of the landscape being able to absorb rainfall when it happens, only 70 per cent will, so extra water runs off into streams and they predicted a fourfold increase in flood events in the rivers in Western Australia. If and when those floods start to impact on the low-lying areas of the Perth metropolitan area, then we will see a great deal of interest in what is happening.

**Dr WASHER**—That is why I live north of the river; south is a problem.

**Prof. Bell**—Yes. When people in the metropolitan area see their lifestyle and their environment directly impacted, the interest will rise.

**Dr WASHER**—Why I asked that question is also because there is a slight impression that the National Action Plan was really based as a rural problem and yet the Murray-Darling and Adelaide has major problems coming, too. Perth also has similar problems. In reality, it has become a problem of some of our major cities and some of our most affluent cities which do not depend on agriculture. It is great to have a good farming economy out there, but they depend on water. I guess until we make them aware of that big picture we really need from government thinking, it will not be addressed to say, 'Look, if we do it on a small catchment-by-catchment basis, we are not going to help the water supply of Perth, which is experiencing an increasing, exponential demand.' It will never be resolved unless, as I say, we put in massively costly, desalination plants et cetera which I think we will have to anyway. How should we educate this city population and say, 'It's your problem as well'?

**Dr Moore**—Really, that leads into a recognition of the need for social research; probably two elements of social research. One of those is, firstly, determining how much people do know or

do not know and what are their attitudes and how does that suite of attitudes then translate into behaviour? We really need to know that. We need to have a much clearer idea of whether there is an enormous chasm between urban and rural people and, if so, how big that chasm is. Until we really know what that level of knowledge is, what those values and attitudes are, we cannot then move to the next stage, which is the one you mentioned.

Secondly, we need to look at education as one of a number of policy options and, again, we need research to look at which policy instrument will work best. Is education going to work? Is regulation going to work? Is increased taxation of urban people to support rural people going to work? We need to do the policy research to find out which of those are going to be palatable to which populations and which is going to be effective in achieving the outcomes. We need to do that research before we then move on to deciding what we are going to do to try and address that very real problem of our large urban centres that are not aware of the problem.

**CHAIR**—I want to come back to the big picture scenario as well, which I think Richard referred to previously: there is not that focus. I notice, Dr Moore, you are on the NRM Council in Western Australia. When I look at the terms of reference of that council, amongst many things that council is obliged to do, it includes coordination and delivery of national NRM programs, in particular the National Action Plan on salinity and water quality; National Heritage Trust 2, including accreditation of regional strategies. Is it still too young? Does it not have the resources? Does it not have the influence or is it the wrong formula?

**Dr Moore**—I am trying to remember your list of questions. I will go through them and if I have left any out, do let me know. The council has been operational now for some 18 months. It may be a little bit longer. The initial priority task, which they achieved, was to sign a memorandum of understanding between the regional national resource management group chairs and the state government, to try to get some sort of structure in place so the regional chairs had a relationship with government as we moved into considering NAP and NHT2.

The second task which the NRM Council undertook—and they were asked to do so by the state government's standing committee on environmental policy—was to say what were the priority natural resource management issues for the state and what the government could do about them. Over the last two months we have briefed that cabinet committee on those priorities. Two of the higher order priorities related to salinity and one of those was the need to get greater coordination to move towards implementing our existing policies: the salinity action plan and the state salinity strategy. We also had a salinity task force and subsequent government response.

One of the recommendations we took to the cabinet committee—of which Judy Edwards, the Minister for the Environment, is chair—was that we needed to move towards that. The other recommendation which will be of interest to this committee was that the government establish a natural resource management office. They are in the process of doing that. It has not yet been formally announced, but informally they have staff moving within government to set up and run that office.

**CHAIR**—Which portfolio will it come under? The environment portfolio?

**Dr Moore**—That was one of the reasons why it was taking a while to progress. It is currently within the Department of Agriculture and that has been agreed by the directors-general of the relevant departments.

**CHAIR**—From evidence we received today that seems like a smart thing to do.

**Dr Moore**—Yes.

**CHAIR**—The farmers out on the ground have—certainly in the message being sent to us—is real concern about many of the responsibilities and roles that were traditionally within agriculture now sitting under environment and they become much more regulatory, rather than advisory as a result.

**Dr Moore**—Yes.

**CHAIR**—Getting back to your carrot and stick, they do not really like the stick very much.

**Prof. Bell**—I do quite a bit of work with mining companies on rehabilitation. I am continually struck by the very different regulatory environments in which mining operates, compared to agriculture and other primary industries—fisheries and forestry. There is hardly anything you can do on a mine site without reference to regulation or a law or a report that you have to submit and yet there is very little of that in agriculture.

**Dr Moore**—One of the fundamental reasons for that is the perceived rights in our society associated with private land and most agricultural land is privately owned. I keep coming back to this. We need social research, because if we cannot give land-holders what they want to some greater degree, and be aware of their aspirations and their opportunities and constraints, we are not going to achieve anything. Salinity is a vexed problem because it is so much an issue of private land. Whether legally or otherwise land-holders have absolute rights, their perception is that they have absolute rights to their land and so they are going to act accordingly. To really make any progress on this, we need to understand how they see the world and how they are going to act in that world.

**CHAIR**—In the longer term, though, the Natural Resource Management Council can help fill some of the gaps that we keep hearing about. If the role of the council is to ensure that regional strategies are correct, then surely it has an opportunity as a council to make sure that there are not just little bits happening; that there is some sort of coordination, which others have told us this morning does not seem to exist. I would think that this, in a theoretical sense, presumably was formed to avoid that occurring.

**Dr Moore**—It certainly was. There are really two issues associated with the council. Firstly, it is non-statutory, so it does not have any legal teeth in what it can do. It can coordinate but it cannot enforce. Secondly, one of the areas that we identified for the WA cabinet that needed attention was our legislation. We have very piecemeal legislation in relation to natural resource management and to salinity. One of the areas that we advised state cabinet that they should be looking at was a revision of their natural resource management legislation—to set a process in train that would do something about these pieces of legislation all over the place.

Coming back to your question, we can make a start with the Natural Resource Management Council but there are some other things that need to happen as well, and they would be moving towards some greater statutory coordinating role based in law, rather than the non-statutory role we have at the moment.

**Dr WASHER**—There is the query on human behaviour, whether fear or punishment or reward is the most successful. Sadly, fear is far more effective. We have identified that; there is no question about that. The constructive way to do it is always the fear of failure. Personal fear of not succeeding is the single thing that motivates humanity the most from a medical point of view. We capitalise on that.

**CHAIR**—Thank you very much again for your submission and the evidence this morning. It has been very useful for us as part of the overall inquiry.

**Prof. Bell**—Thanks for the opportunity to make a presentation.

**Dr Moore**—We wish you all the best.

**CHAIR**—Thank you.

Resolved (on motion by **Mr Martyn Evans**)

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

**Committee adjourned at 11.45 a.m.**