Chapter 8

Future Research and Solutions

8.1 This chapter discusses ways forward for a number of key problems identified in previous chapters regarding the management of the Murray-Darling Basin. Although it does not prescribe specific solutions to these problems, the committee considers that the evidence it received shows that further research in the areas identified is likely to make a substantial contribution to the improving social, economic, and environmental outcomes for the Basin.

8.2 The committee considers that there are five key areas of further research that have the potential to provide significant benefit for the Basin or where current research needs to be more fully integrated into the implementation of the Basin Plan. First, improved water efficiency is essential to sustaining the Basin system and research into and the development of crops that can produce better yields with less water offers promising medium to long-term benefits for the Basin.

8.3 Second, the management of water in the Basin could be improved by more research into the rainwater interception and run-off effects due to changing farming practices. Further use of existing research in this area in the modelling the water flows in the Basin should also be considered.

8.4 Third, the level of scientific understanding of surface water and groundwater connectivity in the Murray-Darling Basin needs to be urgently and substantially improved. As the Basin Plan is moving ahead with increased groundwater extractions and the 2750 GL/y proposed reduction in take in surface water, the committee considers it essential that greater knowledge of this issue is developed so that ongoing management groundwater and surface water resources is based on better information than is currently available.[1]

8.5 Fourth, the committee received evidence about potential benefits for the Murray-Darling Basin through the use of better practices for managing agricultural soils. The committee considers that further government-funded research in this area would be beneficial to the Basin and elsewhere. The committee is mindful that the management of the Murray-Darling Basin needs to cover all areas of sustainable agriculture and not solely water resources.

8.6 Fifth, the committee heard evidence that further research and development (R&D) was required so that water infrastructure projects would improve water efficiency in the Murray-Darling Basin. Furthermore, the committee heard evidence of the cost of such projects and the need to consider how such money should be best spent to achieve optimal outcomes for the Basin.

---

1 'Increased groundwater extractions' refers to increases in the Basin Plan from those identified in the Guide to the proposed Basin Plan (the Guide). See chapter 3 table 3.1.

8.7 Overall, the committee is of the view that further R&D funding is essential to implementing a robust and workable Basin Plan. The committee has already noted in chapter two that further research into the possible effects of climate change on water run-off is needed. The committee was disappointed that even where significant knowledge gaps were identified by the Murray-Darling Basin Authority (MDBA) and government departments, more was not or is not being done to address the gaps and improve the information available to policy makers, stakeholders and the public. While the committee's view on the key knowledge gaps is listed below, the committee is also of the view that the government should give greater priority to research that can improve agricultural productivity, environmental outcomes and efficient use of water resources across the Basin. The committee is of the view that government should develop a clear and detailed research strategy for the Basin that incorporates the specific areas of concern listed below.

Recommendation 20

8.8 The committee recommends that the government develop and publish a detailed policy for agricultural productivity, environmental and water resource R&D in the Murray-Darling Basin. This policy should reflect a greater priority in this area and incorporate the specific research areas identified in recommendations throughout this report.

Key areas for future research and solutions

Water efficiency

8.9 Given the competing social, economic and environmental interests inherent in managing water resources in the Murray-Darling Basin, the committee took evidence about possibilities for future improvements in the efficiency of water use by the Basin agricultural sector. To examine this issue, the committee looked into the farming of non-paddy rice as a case study.

8.10 In particular, the committee heard evidence from Dr Peter Snell, a Rice Breeder, at the New South Wales Department of Primary Industries. Dr Snell explained that currently the direct water productivity of paddy versus non-paddy (aerobic) rice was similar. However, he also noted that other factors needed to be considered:

> **CHAIR:** … if I was to grow a paddy rice crop and it was, say, 10 tonnes, it would require 10 megalitres of water, roughly.
>
> **Dr Snell:** Yes.
>
> **CHAIR:** If I was to grow an aerobic variety and it went eight tonne, how much water would I need?
>
> **Dr Snell:** You would probably be looking at seven or so. It depends on the delivery system and evaporation and transpiration.
>
> **CHAIR:** So you are saying there is no real water saving?
>
> **Dr Snell:** There is, in a way, to marry the production potential. There is if you shorten the duration. A lot of the work they have done is on full-season

> varieties, and I stress those full-season varieties—and this is again adaption—will lengthen them. Even though you are saving on water but still reaching parity on the production to consumption—
>
> **CHAIR:** Per hectare.
>
> **Dr Snell:** Yes, per hectare. You are probably making rice still untenable in the farming system. The big thing we sell on water productivity of rice is that it is not just the water for the rice; it is the following crops. For aerobics that is another thing: you can use centre pivots or things. You will grow corn or vegetables et cetera and have the flexibility of not having to pull up banks.[2]

8.11 The committee was told that although further work was required, the potential for greater water efficiency in rice growing was significant and that the development of water-efficient varieties would give rice farmers greater confidence in planting their crops:

> **...**[a move to non-paddy rice] is a little way off. Having said that, I think I am closer than anyone has been before. My colleague has just moved on from breeding. In our paradigm rice was at the centre like the big cash crops—cane, cotton et cetera. To me rice has to be a bit more flexible because it is not dollar per hectare, it is dollar per drop at the moment. You need to adjust the breeding program accordingly—whether it is aerobic adaption, so you can use rice on ground where you grow corn or soya beans, or shortening the seasons of commercial varieties to allow the farmer to get his winter cereals off and then plant rice with more certainty. I assume with the scheme, regardless of how it is rolled out, farmers will be a lot more confident about the allocation of what water they have—and a lot of the rice is being grown on saved water later on in season, so they can make that decision later on. We do not tell them to grow rice; it is up to them to do their gross margins and see if it is worth it.[3]

8.12 Dr Snell also told the committee that the potential long-term success of the development of programs such as commercially viable non-paddy rice could benefit from changes to the way that research funding was provided:

> **Senator NASH:** …It comes back to the point about research that we have been talking about for the last two days: that there is not enough of the research dollar being applied out there so that in the future we can actually be sustainable and get to those opportunities we want to. Would you agree with that?
>
> **Dr Snell:** I would agree… As to researchers…publication is important but publications generally do not encompass the big picture. You have to be a really loyal researcher to do that. And when you have academic 'publish or perish' on your mind, you are more on short-term things: 'I can show I am

---

2 Dr Peter Snell, Rice Breeder (Professional Officer), New South Wales Department of Primary Industries, *Committee Hansard,* 24 April 2012, p. 49.

3 Dr Peter Snell, Rice Breeder (Professional Officer), New South Wales Department of Primary Industries, *Committee Hansard,* 24 April 2012, p. 52.

> unique in the literature,' et cetera. Breeders, and even marketers, want us to respond to market fluctuations over a six-month period with a seven- to 10-year breeding program. So we are used to saying: 'See the big picture: that stuff on the horizon that we need to do we need to start on now. We will get you the grain and let you taste it, and then you will see if there is a market,' because the funny thing about the rice that we produce—and it is of a high quality—is that it is generally saleable. So you need that practicality.[4]

8.13 In this regard, Dr Snell indicated the importance of allocating funding between practical research and more theoretical research:

> …there is research for research's sake out there. I am not running it down; that is key scientific learning. But you have to get the balance right. You have to employ the right researchers. [For example, the Australian Centre for International Agricultural Research]…in 2008 came to us because they knew departments were better with the grey publications in terms of doing work that can be taken on by farmers... I would warn that, yes, more money needs to be applied to research but you have to be mindful of where that research dollar is going.[5]

8.14 Representatives of the Wentworth Group also noted the need to develop better long-term water efficiency for farming in the Murray-Darling Basin and that research into non-paddy rice could be an important feature of this. As the following exchange shows:

> **CHAIR:** …What would be the cost benefit analysis of converting the rice industry to non-paddy rice?
>
> **Mr Stubbs:** One of the key things the CRC [Cooperative Research Centres] for Irrigation Futures and before that the rice CRC tried to get the temperature…in the plant. What you are trying to do is get the plant to be able to cope with the low temperatures without having to use the water as a thermal blanket. There was quite a lot of progress on that. To me, clearly, that is the area to remove the actual need to pond the rice. That has made some progress but it has not got to the stage—
>
> **CHAIR:** They are the things I presume we need to do because regardless of whether we put 4,000 or 2,700 [Gl/y] back, the scientists are saying by 2050 we are going to lose more than that anyhow so we are going to be back to where we started.
>
> **Mr Stubbs:** That is right. We certainly need to do those sorts of things. I was on the board of the CRC and argued very strongly for that research program but it has basically become stationary.

---

4 Dr Peter Snell, Rice Breeder (Professional Officer), New South Wales Department of Primary Industries, *Committee Hansard,* 24 April 2012, p. 51.

5 Dr Peter Snell, Rice Breeder (Professional Officer), New South Wales Department of Primary Industries, *Committee Hansard,* 24 April 2012, p. 51.

CHAIR: Well, that is where we ought to put some dough.[6]

Committee view

8.15 The committee is encouraged by the evidence it received about the possible future developments for non-paddy rice farming in the Murray-Darling Basin. However, the committee is concerned that research funding structures as well as the levels of funding available for research are creating impediments to innovation in this and other areas of agricultural research.

8.16 The committee also notes the finding of the Senate Education, Employment and Workplace Relations (EEWR) References Committee's inquiry into *Higher education and skills training to support agriculture and agribusiness in Australia* that the extension of research to agricultural practices are in decline.[7] This committee supports the EEWR References committee view 'that extension services play [an] important role in both improving productivity and also creating closer links between the farming industry and researchers and should be encouraged.'[8] The committee considers that a comprehensive approach towards R&D to benefit the Murray-Darling Basin needs to cover both the conduct of research and the take-up of research by the agriculture industry.

8.17 The committee considers that the government should give greater priority to agricultural research that can improve agricultural productivity through more water efficient crops while at the same time improve the long-term sustainability of the Basin's water resources.

Recommendation 21

8.18 That the Government commission the Australian Bureau of Agricultural and Resource Economics and Sciences to undertake a cost-benefit analysis of potential water-efficient crops (including non-paddy rice) in the Murray-Darling Basin.

Water interception

8.19 Determining the extent of water interception, and the possible historical changes in water interception, from different land use practices such as forestry plantations was another key area where the committee heard evidence that further

---

6 Mr Tim Stubbs, Environmental Engineer, Wentworth Group of Concerned Scientists, *Committee Hansard*, 10 September 2012, p. 19.

7 According to the EEWR report extension 'refers to the practice of researchers presenting their findings to businesses and operators currently working in the field.' See Senate Education, Employment and Workplace Relations References Committee, *Higher education and skills training to support agriculture and agribusiness in Australia*, June 2012, p. 43.

8 Senate Education, Employment and Workplace Relations References Committee, *Higher education and skills training to support agriculture and agribusiness in Australia*, June 2012, p. 44.

research was required to properly inform the management of water resources in the Murray-Darling Basin.

8.20 The MDBA indicated to the committee that the volume of water from interception due to farm dams and commercial plantations was significant. In an answer to question on notice the MDBA stated that its:

> …current best estimate of the impact of commercial plantations and runoff dams on surface water yield (runoff) is 2720 GL/y. This is comprised of 2384 GL/y for runoff dams and 336 GL/y for commercial plantations.[9]

8.21 The committee heard evidence from a variety of organisations about this issue. For example, the CSIRO, while acknowledging that significant water interception assessments had taken place, expressed reservations about the level of the knowledge that the MDBA had for interception activities when developing the Basin Plan. As Dr Bill Young from the CSIRO told the committee in reference to the Basin Plan (November 2011):

> The proposed plan, as part of the supporting documentation, provides an audit, if you like, of the current take, the current use, of water in the basin. I forget the exact numbers; there are about 13,000 gigs a year, I think, and of that about 11,000 or so is irrigation diversions, and about 2,000 is really interception take. In our submission we have some concerns about the methods, about how [the MDBA] have come at some of those interception numbers, and the consistency with the modelled water, but that is a side issue. But [the MDBA] have assessed, therefore, the current farm dam interception, and current commercial forestry interception. So [the MDBA] are trying to put a baseline on the total amount of take. How state governments manage take into the future under an SDL is up to them under their water resource plans. Ideally, under the National Water Initiative, you would get to all of those interception takes being entitlement based and allow trade between different forms of take.[10]

8.22 The MDBA's representatives, while stating that the Basin Plan was based on the best available information at the time, acknowledged that there is significant room for improvement in the knowledge of future interceptions in the Basin. As Dr Rhondda Dickson, the MDBA's Chief Executive conceded:

> ...the plan itself was based on the historical climate and the best available estimate of interceptions that we have at the moment. We would be the first to acknowledge that the estimate of interceptions can be improved, and there are large areas of uncertainty about future interceptions, about the interplay of climate change and losses to the ground, between temperature as well as the interception changes. However, what we have done in the plan is, as the chairman said, used as the starting point the best available

---

9 MDBA, answer to question on notice 23April 2012, (received 7 June 2012). The MDBA also noted here that 'runoff dams include farms dam used for irrigation purposes and farms dams under basic rights (e.g. farm dams used for stock and domestic purposes).'

10 Dr Bill Young, Director, Water for a Healthy Country Flagship, Commonwealth Scientific and Industrial Research Organisation, *Committee Hansard*, 23 April 2012, p. 59

> information where we do have confidence, which is the historical record. Because it is a 10-year planning framework, that gives us the opportunity to get a lot more certainty about some of those estimates.[11]

Committee view

8.23 The committee is concerned with the gaps in detailed scientific information of interception in the Basin. The committee acknowledges that interceptions (including from runoff dams and commercial plantations) have been considered in the development of baseline diversion limits. However, the committee is not convinced that the reliance on historical data of interceptions in the Basin takes into account the future changes that may occur in the rates of water interception due to evolving land management practices.

8.24 Furthermore, the committee notes that there were occasions where scientific evidence has not been included in the development of the Basin Plan when it reasonably should have been. This issue is also discussed in Chapter 2 where the committee recommends that further research is warranted into future water interception scenarios.

Surface water and ground water connectivity

8.25 As discussed in chapter three, the committee heard evidence that the scientific knowledge of surface water and groundwater connectivity in the Murray-Darling Basin has some significant limitations. The MDBA defended the level of knowledge on which it based its decisions regarding surface water and groundwater connectivity. As noted in chapter three, the MDBA released two major reports detailing its approach to groundwater extraction including the issue of surface water and groundwater connectivity.[12] The MDBA also told the committee that in developing its sustainable diversion limits for groundwater, the MDBA categorised the level of connectivity with surface water resources.[13]

8.26 However, the evidence of other witness highlighted some significant gaps in the knowledge of surface water and groundwater connectivity. For example, Dr Bill Young from the CSIRO stated that the understanding of the impacts of surface and ground water connectivity was incomplete and that future review would improve knowledge of the issue:

> …The surface water impacts from the groundwater take, as I said, will take a long time to emerge. There is a review process that has been put in place. There may be no demand for that increase in groundwater use to happen in

---

11 Dr Rhondda Dickson, Chief Executive, Murray-Darling Basin Authority, *Committee Hansard*, 23 April 2012, p. 2.

12 The two reports are: Murray-Darling Basin Authority, *The Proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, 2012 and Murray-Darling Basin Authority, *Addendum to the proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report*, July 2012

13 MDBA, answer to question on notice, 23 November 2012, (received 28 November 2012).

> a hurry, but that does not necessarily mean it is scientifically defensible. But it does not mean it is necessarily risky either. There is an opportunity to review this. If the authority follows through with its commitment to adaptive management, we will be monitoring the increases in use, we will be monitoring the impacts on stream flows and we will be monitoring the consequences and outcomes for environments across the basin.[14]

8.27 Dr Young also noted that there were a number of areas where the connectivity between surface water and groundwater resources remained unknown and that, furthermore, the MDBA was moving away from precautionary approaches to managing these resources. As Dr Young put it:

> …there are many different levels of connectivity between the alluvial systems, the fractured rock systems and other things. The authorities made different types of assumptions on connectivity. Compared to what [the MDBA] presented in the guide, [the MDBA] have moved to perhaps less conservative assumptions around connectivity. There are many areas where the connectivity is quite poorly known, and our view is that in those cases a precautionary principle would be appropriate, particularly if there is not the evidence at the moment of a strong demand for extra use.[15]

8.28 Similarly, the Wentworth Group told that committee that while there was good knowledge about some aspects of groundwater and surface water connectivity some important gaps remain and that the MDBA's approach relied on 'some very big assumptions': As Mr Stubbs noted:

> I think we know enough about some aquifers. We definitely know enough to know that it is very dangerous to make the massive increase in groundwater extraction without really serious and clear understanding of all those aquifers and of how they interact with the river. One thing that we need to raise is that there are quite accurate and robust models for about 13 of the 76 groundwater units that the [MDBA] has looked at. There are models there. The [MDBA's] approach has gone against earlier identifications of what needed to happen even in those areas. In the other areas the [MBDA] has used a modelling tool which was only ever meant to prioritise aquifers. It was never developed as a tool to accurately predict volumes and recharges and, hence, levels of extraction. There are some very big assumptions that have been made that are based on models that were not intended for the use that they have been used for.[16]

8.29 With the release of the final Basin Plan in November 2012, the Wentworth Group reiterated the scientific uncertainties regarding the MDBA's approach to groundwater and surface water connectivity. As the following exchange suggests:

---

14 Dr Bill Young, Director, Water for a Healthy Country Flagship, Commonwealth Scientific and Industrial Research Organisation, *Committee Hansard*, 23 April 2012, p. 62.

15 Dr Bill Young, Director, Water for a Healthy Country Flagship, Commonwealth Scientific and Industrial Research Organisation, *Committee Hansard*, 23 April 2012, pp 60–61.

16 Mr Tim Stubbs, Environmental Engineer, Wentworth Group of Concerned Scientists, *Committee Hansard*, 23 April 2012, p. 19.

> **Senator NASH:** With that 1,700 [Gl/yr groundwater extraction under the Basin Plan], what is your understanding of why the groundwater increase was included?
>
> **Mr Stubbs:** It is a bit unclear. It is like: why was 2,750 the starting number [for reduced surface water take] when that first draft of the Basin Plan came out? There was a 2,600 gigalitre increase [groundwater extractions].
>
> **Senator NASH:** ...So what is your best guess about why that has happened?
>
> **Mr Stubbs:** I would love to know. There are a lot of grey areas that do not have science to support them. Why did it start at 2,750? Why did the groundwater extraction initially in the first draft of the Basin Plan increase by 2,600 gigalitres? Why was there a one-day workshop that shaved 900 gigalitres off that, back to 1,700 gigalitres? And where is the science and information to justify any of this and make it clear the level of impact that increase is going to have on surface water flows?[17]

8.30 A number of other witnesses expressed similar concerns about this issues. Mr Grant Rigney, Chairperson, Murray Lower Darling Rivers Indigenous Nations stated that there 'really needs to be a lot more research done into what is the connectivity of ground and surface water in the artesian basins and [in reference to mining and aquifers] what types of poisonous materials we are putting into these spaces…'[18] Ms Beverley Smiles, President, Inland Rivers Networks, referred to the knowledge about groundwater and its connectivity with surface water as being 'new' especially in comparison to understandings about surface water.[19] A third example was Ms Juliet Le Feuvre from Environment Victoria who stated that:

> Any consideration of increased [groundwater] extraction should be delayed until a thorough assessment of characteristics, surface groundwater connectivity, groundwater dependent ecosystems and resource sustainability can be carried out.[20]

8.31 Ms Le Feuvre also expressed concerns with the way that the MDBA developed groundwater extraction figures using its recharge risk models:

> [The MDBA's figure for the groundwater extraction] is based on the recharge risk assessment model, which estimates on a very broad basis what recharge to groundwater is. [The MDBA] say that they have taken a precautionary approach and halved it and halved it again, but there is no

---

17 Mr Tim Stubbs, Environment Engineer, Wentworth Group of Concerned Scientists, *Committee Hansard*, 23 November 2012, p. 29.

18 Mr Grant Rigney, Chairperson, Murray Lower Darling Rivers Indigenous Nations, *Committee Hansard*, 23 April 2012, p. 44.

19 Ms Beverley Smiles, President, Inland Rivers Network, *Committee Hansard*, 24 April 2012, p. 20.

20 Ms Juliet Le Feuvre, Healthy Rivers Campaigner, Environment Victoria, *Committee Hansard*, 24 April 2012, p. 25.

> scientific review of the model that they have used, so it would not be a precautionary approach at all.[21]

Committee view

8.32 While there is significant information about groundwater and surface water connectivity in certain parts of the Murray-Darling Basin, there are many areas where it is not comprehensive. The committee considers that the conservative approach that should have been adopted until further information was available has not been taken by the MDBA.

8.33 The committee considers that the limitations of the scientific knowledge regarding surface water and groundwater connectivity to be one of the key risks in delivering an effective Basin Plan. While the committee acknowledges that the MDBA is further developing its knowledge in this area and some positive steps have been taken, the committee remains of the view that the information gaps that still exist has the potential to undermine the effective management of the overall water resource across the Basin.

8.34 Therefore, the committee is of the view that increasing the scientific knowledge of surface water and groundwater connectivity should be a major priority for the government and the MDBA. Furthermore, the application of any new knowledge on this issue should be given the strongest priority by the MDBA in its adaptive management of the Basin. The committee has made a recommendation regarding this issue in Chapter 3 of this report.

Soil use

8.35 The committee heard evidence that some innovative soil use practices offered significant opportunities to increase agricultural production while using less water. The primary example provided was from Mr Richard Hazelton who had more than 20 years' experience in a fertiliser-spreading business. His general argument was:

> …about how healthy soils go hand in hand with a limited supply of water. What I believe has been overlooked in the Murray-Darling area discussions is the importance of healthy soils. If we put somewhere between 10 and 15 per cent of water back into the environment without affecting the productivity of the irrigation areas, what a result for our food bowl, rural Australia and every Australian![22]

8.36 To support this argument, Mr Hazelton focussed particularly on the strategic use of lime for improving soils, which would, in turn, have a water benefit:

> The areas I am familiar with are the Macquarie, Lachlan, Murrumbidgee and Murray river systems. The reason for our rapid expansion was innovation. We built purpose-built conveyors and added eight per cent

---

21 Ms Juliet Le Feuvre, Healthy Rivers Campaigner, Environment Victoria, *Committee Hansard*, 24 April 2012, p. 31.

22 Mr Richard Hazelton, Private Capacity, *Committee Hansard*, 23 April 2012, p. 46.

> moisture to the lime and this eliminated the dust problem and stopped the fine lime from blowing away and allowed us to spread a wider pattern. After much trial and error with reversing spinners, we built special spinners and frames for spreading moist lime. I cannot stress enough the importance of spreading lime evenly to show big results. We spread hundreds of thousands of tonnes using this method. Although lime is important to the soil, today I will be primarily discussing calcium and magnesium percentages and the setting up of a truly independent agronomy trial. I first became aware of water efficiencies when we limed half of [a client's] centre-pivot irrigation area on his property south of Dubbo. The pivot at the time was the third largest in Australia and was on a consistent soil type. We limed half the area of the pivot. When we returned the following year to lime the other half of the pivot, [the client] informed me that the corn on the lime section had a 10 per cent increase in yield and everything else had remained the same. I knew then that there were a lot of soils that would show a bigger increase as [the client's] soils were of a high standard. For those who are not familiar with soil science, magnesium controls photosynthesis and in high percentages makes the soil tighter. Calcium causes structure, improves water infiltration and generally leaves soil in a more friable condition. [23]

8.37 Mr Hazelton also noted that irrigation areas have higher pH levels than other farming types and that if this issue can be managed, there are opportunities to improve the effectiveness of fertilisers for increasing agricultural output. As Mr Hazelton explained:

> Our soils in Australia are among the oldest in the world. We have a huge variation of soil types, from the Great Dividing Range, where there is a calcium-magnesium deficiency, to the predominantly high-magnesium, low-calcium soils of the irrigation areas of the Murray-Darling. Soils in the irrigation areas often have an artificially high pH because they are high in magnesium, potassium and sodium. Magnesium has about 1.5 times the neutralising value than that of calcium.
>
> The good book states you cannot lime a high pH soil, because you make nutrients and trace elements unavailable. I started to question this information because of the results we were getting. On the dump sites where we tipped the lime, if you cleaned them up properly, the concentration of lime on the ground would be 10 to 20 times what was spread on the field. The crop on the dump site sometimes was actually better than on the rest of the field. This is where the controversy starts. When you lime these soils you displace the magnesium, potassium and sodium, which have a high neutralising value. There is a pie chart which is used in agronomy. If you put, say, calcium into the pie chart you have to take something out. In this case, calcium and magnesium have two positives. You push out magnesium and, if in excess, you will take out potassium and sodium. This is how we manage to keep the pH in check, and because the soils usually have a heavy exchange capacity this also

23 Mr Richard Hazelton, Private Capacity, *Committee Hansard*, 23 April 2012, p. 46.

> helps to keep the pH in check. The heavier soils require a heavier rate to correct the imbalance, and the lighter soils require a lighter rate to correct the imbalance.[24]

8.38 Mr Hazelton further noted that having the correct chemical balance in the soil improves fertiliser efficiencies. He recommended that an independent agronomy trial take place that could demonstrate the benefits for the Basin system:

> When in balance, the fertiliser efficiencies improve. One unit of nitrogen will grow one bushel of corn. When out of balance, it takes one-and-a-half units of nitrogen to grow one bushel of corn. Drip irrigation has a big role to play in the irrigation areas. Having the correct calcium-magnesium balance improves the ability of water to disperse through the soil profile. Biological farming may well have a big role to play. They also heavily depend on calcium. The cost of a truly independent agronomy trial throughout the Murray-Darling that would show the correct balance on how to gain greater water efficiencies, I estimate, would be around $6 million. With the productivity increase created, a return on investment would be in a five-year period. If someone can improve on what we have achieved—I might add, with the help of many others—I will welcome this. The Murray-Darling is so important for the growing of food and fibre in our nation.[25]

Committee view

8.39 The committee does not consider that it is appropriate to express a view on the merits of particular practices that improve agricultural productivity from soil management techniques. However, the committee considers that further R&D into innovative soil practices and the potential improvements in agricultural productivity and water efficiencies should form a significant part of the overall government strategy to managing the Murray-Darling Basin.

Recommendation 22

8.40 The committee recommends that the government commission research into innovative agricultural soil use and farming practices that will improve agricultural productivity and water efficiency in the Murray-Darling Basin.

Effectiveness of water infrastructure

8.41 The committee heard evidence that water infrastructure improvements formed a major part of the government's plans to implement the Basin Plan.

8.42 The National Farmers' Federation (NFF), in particular, made strong and compelling arguments about the importance of R&D into water efficiency in the Basin and its relationship to the overall strategy of water infrastructure. As Mr Jock Laurie, President, NFF told the committee:

---

24 Mr Richard Hazelton, Private Capacity, *Committee Hansard*, 23 April 2012, p. 46.

25 Mr Richard Hazelton, Private Capacity, *Committee Hansard*, 23 April 2012, p. 46.

> Our view has been that we need to make sure that, as the Basin Plan goes ahead, it delivers a balanced outcome. In many ways we think that can be achieved maintaining the economic capacity in those communities, providing that the government go down the path of delivering good infrastructure spend, continuing with R&D to make sure that they actually deliver water efficiencies back in through that system, identifying environmental works and measures and getting water to those efficiently, and putting a lot of those systems in place and then making changes as time goes along.[26]

8.43 Furthermore, Mr Laurie told the committee that R&D funding was central to the long-term solutions for the Murray-Darling Basin:

> If you go through everything I have said on the Murray-Darling Basin over the last 12 months you will see me mentioning R&D and its importance in this whole thing. As far as I am concerned we can get to where we want to get to by looking in the mirror and seeing the changes we have made and the water savings and water efficiencies we have made and having a look to see what we can do in the next 10 to 15 years. But that is going to be based on a commitment with R&D. There is no doubt about that.[27]

8.44 On a similar note, Mr Laurie explained that any reduction in R&D spending at this time would be to the detriment of Basin communities:

> …The R&D is going to be a really critical component to be able to deliver the water that the system wants. What we have been saying regularly is that, with the infrastructure spend, the environmental works and measures and the R&D component, by lining those all up time-wise I think you can make sure that you are saving communities and at the same time delivering that water outcome. That is absolutely crucial. To reduce R&D spend now, when you are asking communities to deliver more with less, I think would be extremely damaging to the communities.[28]

8.45 The strong advocacy from the NFF for R&D in the Murray-Darling Basin stemmed, in part, from the current way that water flows throughout the Basin are managed. In this respect, Mr Laurie argued for R&D alongside the need to update the Basin's water infrastructure:

> Obviously, efficiencies in delivering water are absolutely crucial. I think everyone understands that there are far better ways of delivering water than the open channel system. We have been saying pretty regularly that we should be looking at it valley by valley, and getting locals to be part of the decision-making process is also a very important part of it. I think we could end up having a lot of stranded assets on the end of some of these channels,

---

26 Mr Jock Laurie, President, National Farmers' Federation, *Committee Hansard,* 23 April 2012, p. 27.

27 Mr Jock Laurie, President, National Farmers' Federation, *Committee Hansard,* 23 April 2012, p. 36.

28 Mr Jock Laurie, President, National Farmers' Federation, *Committee Hansard,* 23 April 2012, p. 29.

> which could be a real problem. We are talking about delivering infrastructure into well planned regions, which I think would help the whole process... It is about delivering infrastructure which delivers better water efficiencies per farm—less seepage, less evaporation and all of those things. When we talk about environmental works and measures, obviously identifying and understanding how we should be watering some of those environmental assets is crucial. If we are talking about delivering efficient watering systems throughout, that also means delivering efficient environmental systems. So it is not just about delivering efficiency to irrigation systems; it is about delivering efficiencies to the whole thing. That also means going into towns' water supplies. There are a whole range of areas that we need to be covering off on.[29]

8.46 The committee also took evidence directly about the Northern Victoria Irrigation Renewal Project (NVIRP), which is one of the major water infrastructure projects in the Basin. In response to a question about the scope for future R&D in water management, Mr George Warne, the CEO of NVIRP noted the progress made in recent years for water infrastructure while acknowledge the significant scope for future improvements:

> Since these schemes were built in south-eastern Australia, typically between 1910 and 1940, a lot has happened but not much in the irrigation infrastructure. The irrigation infrastructure in the 1990s throughout the Murray-Darling Basin in these big, expansive group schemes resembled the technology that the Egyptians would have been very familiar with—that is, drop-boards in concrete panels and people putting letters in boxes about water orders eight days in advance. So there was a lot of room to move using technology that was available, say, in the oil industry in the 1950s and 1960s about real-time monitoring of water levels and that sort of thing.
>
> To that extent, Goulburn-Murray Water has led in its adoption, although, for a fully completed system, Coleambally Irrigation probably leads in terms of having the automated remote sensing and control. We have now completed what we have defined as the backbone of the system—that is, the 3½ thousand kilometres of channel we want to keep, with gates and remote systems and sensing—and we are progressively working through the farm outlets and turning them into remote sensing; better, more accurate metering; and real-time control for farmers to actually control the water supply from their own office, so we are moving a long way towards that. We have not completed that yet, and not until we get the last farmer in a connection of 30 farms together can we decommission the old channel, so we still have some way to go.
>
> But the potential for improved performance of the system is enormous—and something we are seeing repeated, really, across the Murray-Darling Basin. In New South Wales there is a thing called the Computer Aided River Management system on the Murrumbidgee River being implemented right now. That project will lead to modest but significant savings in river

29 Mr Jock Laurie, President, and Ms Deborah Kerr, Manager, Natural Resource Management, National Farmers' Federation, *Committee Hansard*, 23 April 2012, p. 29.

> operations year in, year out, and lead to a lot better understanding of floodwater, inflows from tributaries and how much water is being taken out at any time. We are seeing improvements occurring in leaps and bounds, largely as a response to investment by the federal and state governments.[30]

8.47 Mr Warne also noted that the improvements to water infrastructure delivery were coupled with some improvements in farmers' water management practices. However, he also acknowledged that there was a need to widen the scope of water efficiency in this area:

> What we are seeing in some cases is that the new connection acts as a catalyst for the farmer to change the whole way he thinks about his farm. In some examples they say: 'Well, if you're going to knock the old spur channel out and you're going to take five of my Dethridge outlets, why don't I supply the water to my farm with a low-pressure poly pipe across my neighbour's paddock and put it straight into a centre pivot? I might use a third of the water to get the same or increased farm production.' We are seeing examples of that. It is not as widespread as we would like.
>
> Some of that has been subject to on-farm investment partnerships with catchment management authorities and others. Where you get the benefit of the two—that is, the new farm connection, the new real-time sensing, properly metered, high-volume or high-pressure outlet, along with on-farm investment—the performance of the combination of the new irrigation scheme and the on-farm efficiency can save many megalitres. We are seeing that adopted and we are holding field days now at some of these properties. You have to say that the best farmer is getting further and further ahead of the worst. We really have a responsibility to try and pull them all up.[31]

Committee view

8.48 The committee is of the view that significant opportunities exist for improving water efficiencies in the Basin through the development of improved water infrastructure. The committee supports the development of water infrastructure under the government's Sustainable Rural Water Use and Infrastructure program (SRWUIP). The committee also considers that R&D is a key aspect of maintaining effective water infrastructure in the Basin in the future.

Recommendation 23

8.49 The committee recommends that the government prioritise R&D into water infrastructure to meet the needs of farming communities, agricultural production, and the environmental health of the Murray-Darling Basin.

---

30 Mr George Warne, Chief Executive Officer, Northern Victoria Irrigation Renewal Project, *Committee Hansard*, 24 April 2012, p. 34.

31 Mr George Warne, Chief Executive Officer, Northern Victoria Irrigation Renewal Project, *Committee Hansard*, 24 April 2012, p. 34.

Senator the Hon. Bill Heffernan

Chair