

PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA

Making every drop count

Inquiry into water use efficiency programs in agriculture

House of Representatives Standing Committee on Agriculture and Water
Resources

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CANBERRA

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Terms of Reference

The Committee will inquire into and report on water use efficiency in Australian agriculture. The inquiry will have particular regard to:

- adequacy and efficacy of current programs in achieving irrigation water use efficiencies
- how existing expenditure provides value for money for the Commonwealth
- possible improvements to programs, their administration and delivery
- other matters, including, but not limited to, maintaining or increasing agriculture production, consideration of environmental flows, and adoption of world's best practice.

Abbreviations

ACRI	Australian Cotton Research Institute
ATSE	Australian Academy of Technological Sciences and Engineering
BI	Barossa Infrastructure
BOM	Bureau of Meteorology
CEWH	Commonwealth Environmental Water Holder
COFFIE	Commonwealth On-farm Further Irrigation Efficiency
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAWR	Department of Agriculture and Water Resources
EOI	Expression of interest
GBCMA	Goulburn-Broken Catchment Management Authority
GVIA	Gwydir Valley Irrigators Association
HWIA	Harvey Water Irrigation Area
IIOs	Irrigation infrastructure operators
MDBA	Murray-Darling Basin Authority
MI	Murrumbidgee Irrigation
MIA	Murrumbidgee Irrigation Area
NCEA	National Centre for Engineering in Agriculture
NFF	National Farmers' Federation
NIC	National Irrigators' Council
NWC	National Water Commission

NWI	National Water Initiative
NSW-DPI	New South Wales Department of Primary Industries
OFIEP	On-farm Irrigation Efficiency Program
PIIOP	Private Irrigation Infrastructure Operators Program
PIIP-SA	Private Irrigation Infrastructure Program – SA
RD&E	Research, Development and Extension
RGA	Ricegrowers' Association of Australia
RIC	Regional Investment Corporation
SARMSP	South Australian River Murray Sustainability Program
SRW	Southern Rural Water
SRWUIP	Sustainable Rural Water Use and Infrastructure Program
STBIFM	Sustaining the Basin – Irrigated Farm Modernisation program
WUE	Water use efficiency

List of Recommendations

Recommendation 1

4.51 The Committee recommends that the Department of Agriculture and Water Resources conduct an internal review of water use efficiency (WUE) programs to address the following issues:

- minimising delays following submission of expressions of interest to securing agreement and approvals,
- assisting program delivery partners to determine administrative costs and consider mechanisms to reduce up-front costs borne by those delivering programs,
- reducing impediments for smaller irrigators to participate in programs,
- providing mechanisms for irrigators to apply for an extension to program timelines, given the impact of weather and other uncertainties,
- undertaking baseline measuring of regional ground or surface water systems at the commencement of each program, and then ongoing measuring to determine impacts of changed water practices resulting from WUE funded projects,
- ensuring that the assessment process includes consideration of the project life cycle contribution to the financial independence and long-term resilience of the irrigated agriculture sector, and does not skew market crop decisions or create reliance, and

- ensuring defined regular evaluation points to monitor and assess achievement against a long term objective of financial independence for the irrigated agricultural sector.

The Department should provide the results of this review to this Committee no later than 1 June 2018.

Recommendation 2

- 4.54 The Committee recommends that the Auditor-General consider conducting a performance audit of Australian Government funded water use efficiency programs to assess the design process, evaluation arrangements, and effective and efficient administration of these programs. The Committee recommends that the audit take place in 2018.

Recommendation 3

- 4.60 The Committee recommends that the Australian Government act expeditiously in response to the final report of the Productivity Commission's Review of the National Water Initiative (due to be provided to Government by 31 December 2017) and ensure that:
- the final report is promptly made available for public release,
 - the recommendations are considered and an Australian Government response is made public by 31 March 2018, and
 - recommendations requiring national agreement are considered by COAG at its first meeting of 2018.

Recommendation 4

- 5.54 The Committee recommends that the Australian Government establish and provide seed funding for a coordinating Research, Development and Extension (RD&E) body to work with the agriculture sector in order to:
- Accelerate the adoption of existing cutting-edge irrigation technologies, and
 - Promote innovation and the development of new water efficiency technologies.

Recommendation 5

- 5.79 The Committee recommends that the Australian Government investigate mechanisms to address factors such as the rising cost of electricity and cost of alternative energies which may act as impediments to the adoption of water use efficiency technologies in irrigated agriculture.
- 5.80 The Committee suggests that this research be conducted by the Research, Development and Extension (RD&E) body set out in Recommendation 4.

Recommendation 6

- 5.83 The Committee recommends that the Bureau of Meteorology make additions to its weather radar services to ensure up to date forecasting and coordinated information is available in all required irrigated areas.

Recommendation 7

- 6.26 The Committee recommends that the Australian Government establish an integrated taskforce to assist Regional Development Authorities to:
- develop targeted initiatives to assist regional communities which are impacted by the local irrigated agriculture sector transitioning to water use efficiencies, and
 - ensure ongoing monitoring of the social and economic health of these communities.

Recommendation 8

- 6.39 The Committee recommends that the Australian Government require any water efficiency infrastructure funding or assistance provided to set out:
- the defined public good benefit,
 - detailed plans for the full lifecycle costings of the infrastructure, including asset depreciation and replacement, and
 - a detailed intention of how these lifecycle costings will be funded.

1. Introduction

- 1.1 Water is a ‘fugitive resource’¹, but also critical to the sustainability of our environment, urban and regional communities, and agricultural production. Effectively calibrating the efficient use of water as a resource is a complex and continuous task.
- 1.2 Growing demand for water and fluctuating weather patterns mean we are required to do more with less – to maximise water productivity for the balanced benefit of the environment, communities and agriculture.
- 1.3 To this end, successive Australian Governments have made substantial investments in water use efficiency programs. The efficacy of these programs, their administration and achievement of long term sustainability goals for the environment and for agricultural production is the subject of this inquiry.

Conduct of the inquiry

- 1.4 On 9 February 2017, the Standing Committee on Agriculture and Water Resources (the Committee) agreed to conduct an inquiry into water use efficiency (WUE) in Australian agriculture. The inquiry was referred by the Minister for Agriculture and Water Resources, the Hon. Barnaby Joyce MP.
- 1.5 The terms of reference for the inquiry were as follows:

The Committee will inquire into and report on water use efficiency in Australian agriculture. The inquiry will have particular regard to:

 - adequacy and efficacy of current programs in achieving irrigation water use efficiencies

¹ Professor Lin Crase, *Submission 26*, p. 1.

- how existing expenditure provides value for money for the Commonwealth
 - possible improvements to programs, their administration and delivery
 - other matters, including, but not limited to, maintaining or increasing agriculture production, consideration of environmental flows, and adoption of world's best practice.
- 1.6 The Minister for Agriculture and Resources, the Hon. Barnaby Joyce MP, also noted that the House of Representatives Standing Committee on Environment and Energy would be conducting an inquiry into the management of Commonwealth environmental water resources and therefore suggested that the Committee on Agriculture and Water Resources 'may wish to limit its consideration of environmental flows in order to avoid duplication'.
- 1.7 The inquiry was advertised on the Australian Parliament House website and on social media. The Committee sought submissions from State and Territory governments, agricultural and irrigation representative groups, environmental groups, academics, and interested individuals.
- 1.8 The Committee received 50 submissions, six supplementary submissions and one exhibit. The submissions and exhibits are listed at Appendix A.
- 1.9 The Committee held 12 public hearings in Canberra, Toowoomba, Narrabri, Harvey in Western Australia, Adelaide, Melbourne and Griffith in New South Wales. A list of hearings and the people who participated in them is at Appendix B.
- 1.10 The Committee held a number of site inspections which provided valuable insights into the implementation of water efficiency initiatives and new technologies. These are outlined in a number of text boxes throughout the report.

Other water policy reviews

- 1.11 Water policy is one of the most heavily scrutinised policy areas in Australia, which is appropriate given its vital importance to regional Australia and the broader Australian economy.
- 1.12 As such, in addition to this inquiry, there are a number of reviews of different aspects of Australia's water policy underway or nearing conclusion. One of the most significant is the Productivity Commission's triennial review of the National Water Initiative (NWI).

1.13 The NWI is Australia's 'blueprint' for ongoing water reform and management. It was agreed by the Council of Australian Governments in 2004, and aims to bring a nationally-consistent approach to the management, measurement, pricing and trading of water. In its submission, the Department of Agriculture and Water Resources (DAWR) noted that:

Under the NWI, governments have made a number of commitments, including to:

- Prepare comprehensive water plans
- Achieve sustainable water use in over-allocated or stressed water systems
- Introduce registers of water rights and standards for water accounting
- Expand trade in water rights
- Improve pricing for water storage and delivery
- Better manage urban water demands.²

1.14 The NWI was initially reviewed by the National Water Commission (NWC) every two years. However, after completing reviews in 2007, 2009, 2011, and 2014 (following a change to triennial reviews), the NWC was abolished in 2015 and its assessment functions transferred to the Productivity Commission.

1.15 The Productivity Commission is currently conducting its 2017 review of the NWI. A draft report was released for comment in September 2017, and the final report will be presented to the Government by 31 December 2017. It will be published in the first half of 2018.

1.16 The Productivity Commission is also required to conduct a review of the effectiveness of the implementation of the Murray-Darling Basin Plan at five-year intervals, the next of which must be completed by 31 December 2018.

1.17 In addition, the Murray-Darling Basin Authority (MDBA) is conducting an interim evaluation of the progress of the Murray-Darling Basin Plan. In its submission the MDBA said that the review:

will be broad-ranging, including analysis of: environmental water planning, management and outcomes; implementation of water trade rules and the water quality and salinity management plan; implementation of the adaptive management elements of the Basin Plan (such as the Sustainable Diversion Limit Adjustment Mechanism); the progress with Commonwealth water

² Department of Agriculture and Water Resources, *Submission 18*, p. 2.

recovery (including the on-farm and off-farm infrastructure improvement programs); and the social, economic and cultural outcomes from all these activities.³

- 1.18 The MDBA submission also noted that the Murray-Darling Basin Ministerial Council agreed in March 2017 to commission an independent analysis of efficiency measures – that is, measures which aim to recover water for the environment in ways that have no adverse social or economic impacts. The MDBA advised that the report is due to be presented in December 2017.⁴
- 1.19 The Committee also notes that a number of administrative and judicial reviews commenced in 2017 in relation to alleged maladministration of water allocations.

Scope of this report

- 1.20 Collectively, the Australian Government's WUE programs total more than \$15 billion in spending.⁵ In this report the Committee considers the operation of these Australian Government funded WUE programs. In particular, the Committee is focussed on the efficacy and cost-benefit returns for irrigators, primary producers, communities and the environment.
- 1.21 The Committee considers the administration of these programs, and whether there are improvements that may be made to increase their effectiveness and efficiency.
- 1.22 It is important to note that while this report necessarily refers to irrigation in the Murray-Darling Basin area, this is a national inquiry and considers the implementation of and impediments to water efficiency across agricultural production in Australia. The Committee has sought the views of irrigators from around Australia, and the report includes wide ranging discussions of water use efficiency initiatives and issues experienced in both the Murray-Darling Basin and other areas of the country.
- 1.23 It is also important to note that this report does not examine the Murray-Darling Basin Plan. The inquiry has been conducted during the Plan's implementation period, which is set to conclude in 2020. The Committee supports the Plan and encourages all Basin stakeholders to work towards its goals and assist in its implementation. While the Committee has reviewed

³ Murray-Darling Basin Authority, *Submission 36*, p. 2.

⁴ Murray-Darling Basin Authority, *Submission 36*, p. 2.

⁵ Department of Agriculture and Water Resources, *Submission 18*, p. 5

WUE programs which are designed to recover water under the Plan, its recommendations go to systemic operational issues of WUE programs, administration concerns and long-term achievement and sustainability objectives.

Structure of the report

- 1.24 Chapter 2 considers the definitions of WUE and outlines the rationale for Government spending on water use efficiency programs. It provides a brief outline of water use efficiency programs funded by the Australian Government.
- 1.25 Chapter 3 describes the objectives of WUE programs, and summarises the various views on the effectiveness of this approach.
- 1.26 Chapter 4 considers the efficacy of WUE programs, particularly the design, delivery, administration, and evaluation of the programs.
- 1.27 Chapter 5 considers improvements that may be made to gain greater environmental flows and drive implementation of WUE technologies.
- 1.28 Chapter 6 addresses sustainability concerns of regional communities impacted by the transition to WUEs and the future effects of funded infrastructure.

2. Water use efficiency programs

- 2.1 This chapter sets out some key understandings of the term water use efficiency (WUE), and outlines the purpose of various Government funded water use efficiency programs. It provides an overview of the types of programs in operation, and the distribution of funding across Australia.

Definitions of water use efficiency

- 2.2 The term WUE can refer to many different approaches, and submissions to the inquiry have used the term in a range of contexts.
- 2.3 The Department of Agriculture and Water Resources (DAWR) noted that WUE can be defined in two main ways – efficiency in the use of water, and in the production of crops:

There are a number of different ways in which water use efficiency can be defined including technical efficiency and economic efficiency.

Technical efficiency can arise from improvements in technology or the methodology employed by farmers or water delivery bodies, including for example moving from flood irrigation to spray or drip irrigation which results in maintaining or increasing production levels with less water.

Economic efficiency where higher value crops can be grown, multiple crops can be grown over a year or through the operation of water markets whereby supply and demand forces enable water to be traded and used to achieve higher value outputs.¹

- 2.4 Dr David Adamson, Dr Adam Loch, Associate Professor Sarah Wheeler and Professor Jeff Conner provided a range of definitions relating to irrigation:

¹ Department of Agriculture and Water Resources, *Submission 18*, p. 4.

Water-use efficiency can be defined via agronomic, engineering or economic approaches. Irrigation efficiency is the ratio between water diverted and water consumed by crops; field application efficiency is the ratio of crop irrigation water requirements and water delivered to fields; water-use efficiency is crop yield per unit of water diverted (e.g. kg/m³); while water-use productivity refers to the dollar value of water produced per unit of water applied. From an economic and farm perspective, water-use productivity is probably the most important measure as it represents the actual net dollar value earned by the farm(er).²

- 2.5 Professors Quentin Grafton and John Williams discussed this topic by reference to irrigation efficiency, which permits like-for-like comparisons:

For the purpose of this submission we define water use efficiency as irrigation efficiency. Irrigation efficiency is the physical ratio of the amount of water beneficially consumed by growing crops to the volume of water either extracted from the water resource or the volume of water actually delivered to a farmer's field.³

- 2.6 The Gwydir Valley Irrigators Association, by contrast, defined WUE in terms of the amount of crop that can be produced per unit of water:

Irrigation water use efficiency is best defined as production per megalitre of applied water. To enable equitable comparisons between irrigation systems in assessing their ability to provide water use efficiency outcomes whilst maintaining production, the GVIA utilised and therefore, recommends the adoption of Gross Production Water Use Index (GPWUI). This index combines total seasonal water use (rainfall and irrigation) with soil moisture and yield. This index means that comparisons can be made across years and across farms. The higher the GPWUI the more water efficient the crop.⁴

- 2.7 Similarly, Mr Peter Smith characterised WUE in terms of production per megalitre of water applied to a crop:

Water use efficiency is defined as the amount of production per unit of water applied. (It is not really a true 'efficiency' because it does not compare categories with the same units – it is better termed a 'water use index'.) Irrigation efficiency is defined as the amount of water applied compared to the amount of water used productively (it is a true 'efficiency'). The quest for improved irrigation efficiency as a way to improve water use efficiency is premised on the notion that too much water is currently being used in the

² Dr David Adamson et al, *Submission 19*, p. 5.

³ Professor Quentin Grafton and Professor John Williams, *Submission 2*, p. 1.

⁴ Gwydir Valley Irrigators Association, *Submission 11*, p. 5.

production of produce i.e. that overwatering or excessive losses are occurring. Where this is the case, improving irrigation efficiency will be achieved by reducing water use while maintaining or perhaps improving productivity, which amounts to an improvement in water use efficiency (or water use index).⁵

- 2.8 The Committee has the view that the primary purpose of this inquiry is to assess the efficacy and value for money of the WUE programs funded and implemented by the Government. As such, this report will consider how those programs have affected irrigators' production per megalitre of water (their water use efficiency) as well as the ratio of water consumed to water diverted (irrigation efficiency). This approach takes into account the balance of environmental, community and agricultural outcomes and cost-benefit returns.

National Water Initiative

- 2.9 The National Water Initiative (NWI) aims to bring a nationally-consistent approach to the management, measurement, pricing and trading of water. As mentioned in chapter 1, it has been subject to ongoing reviews since its agreement in 2004. The Productivity Commission is currently conducting a review of the NWI, with its draft report released for comment in September 2017 and the final report due to be presented to the Government by 31 December 2017.
- 2.10 The Productivity Commission has been tasked with the role of monitoring the progress of the NWI. The current review is the first activity in an ongoing program of work which includes assessing progress against the objectives and outcomes of the NWI every three years. The Productivity Commission has noted that:
- For this first review the terms of reference have been widened to consider future reform priorities and the scope for improving the NWI to enable necessary reform.⁶
- 2.11 The Intergovernmental Agreement on a NWI sets out the objective of the Initiative, stating that:
- Full implementation of this Agreement will result in a nationally-compatible, market, regulatory and planning based system of managing surface and

⁵ Peter Smith, *Submission 43*, p. 1.

⁶ Productivity Commission, *National Water Reform, Draft Report*, Canberra, September 2017, p. 3.

groundwater resources for rural and urban use that optimises economic, social and environmental outcomes by achieving the following:

- i. clear and nationally-compatible characteristics for secure water access entitlements,
- ii. transparent, statutory-based water planning,
- iii. statutory provision for environmental and other public benefit outcomes, and improved environmental management practices,
- iv. complete the return of all currently overallocated or overused systems to environmentally-sustainable levels of extraction,
- v. progressive removal of barriers to trade in water and meeting other requirements to facilitate the broadening and deepening of the water market, with an open trading market to be in place,
- vi. clarity around the assignment of risk arising from future changes in the availability of water for the consumptive pool,
- vii. water accounting which is able to meet the information needs of different water systems in respect to planning, monitoring, trading, environmental management and on-farm management,
- viii. policy settings which facilitate water use efficiency and innovation in urban and rural areas,
- ix. addressing future adjustment issues that may impact on water users and communities, and
- x. recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource.⁷

2.12 The Intergovernmental Agreement also sets out the following eight key elements to achieving these objectives:

- i. Water Access Entitlements and Planning Framework,
- ii. Water Markets and Trading,
- iii. Best Practice Water Pricing,
- iv. Integrated Management of Water for Environmental and Other Public Benefit Outcomes,
- v. Water Resource Accounting,
- vi. Urban Water Reform,

⁷ Department of Agriculture and Water Resources, *Intergovernmental agreement on National Water Initiative*, <http://www.agriculture.gov.au/SiteCollectionDocuments/water/Intergovernmental-Agreement-on-a-national-water-initiative.pdf>, pp. 3-4, accessed 16 November 2017.

- vii. Knowledge and Capacity Building, and
- viii. Community Partnerships and Adjustment.⁸

- 2.13 The Productivity Commission's draft report concludes that, as a result of past water reform, there have been significant improvements to 'the way in which water resources are managed and water services are delivered, and this has resulted in significant benefits for the community'.⁹
- 2.14 In regards to current progress, the Commission notes that 'progress has slowed [which] is inevitable given that many key water reforms have, to a large extent, already been implemented'. However the Commission goes on to add that 'there are key areas of reform that remain unfinished'. The draft report provides a summary of progress which is set out in Box 2.1.¹⁰

Box 2.1

1. Water access entitlements and planning frameworks

All jurisdictions, except Western Australia and the Northern Territory, have created statutory based, clear and secure long term water rights for consumptive uses.

Water planning arrangements have been established for the majority of areas of intensive water use across Australia. Most jurisdictions have more than 80 per cent of water use managed under water plans. This means the sharing of water resources between consumptive uses and the environment has been established in consultative processes, informed by scientific and other assessments.

2. Water markets and trading

Water markets have been established that have allowed water to be traded to higher value uses and other steps have been taken to improve the efficiency of water markets, most notably in the Murray Darling Basin.

3. Best practice water pricing and institutional arrangements

Urban service providers are generally pricing at the levels required by the NWI, despite some instances of underpricing.

Independent economic regulators set prices or revenues for major urban water

⁸ Department of Agriculture and Water Resources, *Intergovernmental agreement on National Water Initiative*, <http://www.agriculture.gov.au/SiteCollectionDocuments/water/Intergovernmental-Agreement-on-a-national-water-initiative.pdf>, p. 4, accessed 16 November 2017.

⁹ Productivity Commission, *National Water Reform*, Draft Report, Canberra, September 2017, p. 5.

¹⁰ Productivity Commission, *National Water Reform*, Draft Report, Canberra, September 2017, p. 5.

suppliers in New South Wales, Victoria, South Australia, Tasmania and the ACT. Western Australia, the Northern Territory, Queensland and regional New South Wales are exceptions in various forms.

Cost reflective pricing outcomes are generally being achieved for most existing irrigation infrastructure, but new irrigation infrastructure has tended to be underpriced. Queensland, Western Australia and Tasmania could make better use of economic regulation.

There is inconsistent recovery of water planning and management costs from users across Australia.

4. Integrated management of water for environmental and other public benefit outcomes

Environmental sustainability has been supported by formal provisions of water for the environment and progress has been made on rebalancing overallocated systems.

All jurisdictions have managers with responsibility for environmental flows, and some arrangements are in place to coordinate water use in shared resources.

5. Water resource accounting

Water metering, accounting and compliance systems are in place in all jurisdictions.

6. Urban water reform

Water reuse, water use efficiency, water sensitive urban design and innovation has improved since the introduction of the NWI.

Jurisdictions have taken action to address water quality issues, with some evidence of success.

7. Knowledge and capacity building

There have been advances in knowledge and capacity across areas identified in the NWI.

8. Community partnerships and adjustment

All jurisdictions have set in legislation, or policy, minimum requirements for stakeholder engagement and consultation when developing and reviewing water plans.

State and Territory Governments have delivered improved decision making through open and timely consultation with stakeholders. This has been

supported by the publication of supporting information at key decision points.¹¹

Commonwealth water use efficiency programs

- 2.15 DAWR argued that ‘Australian Government policies and programmes to promote improved water use efficiency, which are underpinned by NWI principles, almost invariably lead to improvements in the productivity of water, with consequent improvements to local and regional economic performance’.¹²
- 2.16 Water productivity is a key element of WUE programs which are designed to address the twin problems of environmental sustainability and declining water delivery infrastructure in rural Australia. In demonstration of the importance of water efficiency gains, DAWR cites the estimate that, in 2008-09, 34 per cent (1 888GL) of water supplied by irrigation in the Murray-Darling Basin was lost.¹³ Reducing that proportion will serve to allow more water for environmental purposes or to be used productively on farms in the region. As DAWR notes, ‘More efficient use of available environmental water allows for higher [Sustainable Diversion Limits], and, hence a reduction in the Basin Plan’s 2 750GL environmental water recovery target, thereby reducing the social and economic impacts of water recovery’.¹⁴
- 2.17 DAWR stated that Australian Government investment in WUE programs is designed to follow three primary themes:
- ‘Reducing existing over allocation of water systems through more efficient use of available water resources’,
 - ‘Capturing surplus water in systems to enable irrigation agriculture to expand through programmes’, and
 - ‘Enhancing water security and resilience to meet the challenges associated with system and flow variability’.¹⁵

¹¹ Productivity Commission, *National Water Reform*, Draft Report, Canberra, September 2017, p. 6.

¹² Department of Agriculture and Water Resources, *Submission 18*, p. 3.

¹³ Department of Agriculture and Water Resources, *Submission 18*, p. 2.

¹⁴ Department of Agriculture and Water Resources, *Submission 18*, p. 11.

¹⁵ Department of Agriculture and Water Resources, *Submission 18*, pp. 4–5.

2.18 This section outlines some of the main categories of WUE programs in Australia and the level of funding they receive. Collectively, the Australian Government's WUE programs total more than \$15 billion in spending.¹⁶

Sustainable Rural Water Use and Infrastructure Program

2.19 The \$10 billion Sustainable Rural Water Use and Infrastructure Program (SRWUIP) is an umbrella program funding over 50 individual programs with the objective of helping to 'secure a long term sustainable future for irrigated agriculture and communities, deliver substantial and lasting returns to the environment and improve the health of rivers, wetlands and freshwater ecosystems'.¹⁷

2.20 Projects funded under SRWUIP include on- and off-farm irrigation upgrades and projects supporting rivers and wetlands, as well as those that improve water knowledge and market reform.¹⁸ The DAWR website identifies three components of the SRWUIP:

- Irrigation infrastructure projects,
- Water purchase measures, and
- Supply measures.¹⁹

2.21 Mr John Robertson, an Assistant Secretary in DAWR's Water Division, explained that SRWUIP has 'a high-level monitoring and evaluation plan' for the program as a whole, as well as specific monitoring and evaluation processes for the individual projects which make up SRWUIP.²⁰

Irrigation infrastructure projects

2.22 While irrigation infrastructure works can be classified as either on-farm or off-farm, many of the projects funded by the Australian Government involve elements of each. That is, different programs may fund not only overarching off-farm infrastructure (such as network supply channels) but also projects for specific upgrades on individual farms.

¹⁶ Department of Agriculture and Water Resources, *Submission 18*, p. 5.

¹⁷ Department of Agriculture and Water Resources, *Submission 18*, p. 6.

¹⁸ Department of Agriculture and Water Resources, *Submission 18*, p. 6.

¹⁹ Department of Agriculture and Water Resources, *Sustainable Rural Water Use and Infrastructure Program*, <http://www.agriculture.gov.au/water/mdb/programs/basin-wide/srwuip>, accessed 17 October 2017.

²⁰ Mr John Robertson, *Committee Hansard*, 25 May 2017, p. 3.

On-farm irrigation upgrades

- 2.23 Over 2 000 projects designed to improve on-farm water efficiency have been funded in the Murray-Darling Basin under SRWUIP. Examples of the types of works included are 'laser levelling, reconfiguration of irrigation layouts, installation of new infrastructure such as recycling systems, piping, and drip or spray systems to improve in-field application systems'.²¹
- 2.24 DAWR notes that on-farm projects 'have made it possible to access significant volumes of water that would have otherwise been lost to seepage and evaporation'.²²
- 2.25 Irrigators receive funding under SRWUIP for on-farm projects and then provide a proportion of the consequential water savings to the Australian Government for environmental watering. DAWR noted that irrigators, on average, retain approximately 30 per cent of the water saved through the upgrades.²³
- 2.26 Overall water efficiency, as calculated from over 1 000 projects funded under the On-Farm Irrigation Efficiency Program, is expected to increase by an average of 18 per cent.²⁴ This program has funded over 1 500 individual projects (to October 2017) and total Australian Government funding across five rounds was \$559 million.²⁵

Off-farm irrigation upgrades

- 2.27 DAWR detailed the purpose of off-farm irrigation projects:

Australian Government off-farm programmes delivered in the Basin aim to improve the efficiency and productivity of water use and management of private irrigation networks. These programmes deliver water savings by reducing the loss of water from irrigation networks and farms through seepage, evaporation and escapes and contribute to the Australian Government's water recovery task.²⁶

²¹ Department of Agriculture and Water Resources, *Submission 18*, p. 9.

²² Department of Agriculture and Water Resources, *Submission 18*, p. 9.

²³ Department of Agriculture and Water Resources, *Submission 18*, p. 9.

²⁴ Department of Agriculture and Water Resources, *Submission 18*, p. 9.

²⁵ Department of Agriculture and Water Resources, *Submission 18*, p. 24.

²⁶ Department of Agriculture and Water Resources, *Submission 18*, p. 7.

- 2.28 The work undertaken under such projects includes, in the Murray-Darling Basin, the modernisation of over 900 kilometres of irrigation network channels.²⁷
- 2.29 The nearly \$1 billion Goulburn-Murray Water Connections Project Stage 2 is the largest Australian Government irrigation infrastructure project under SRWUIP. DAWR estimates that the upgrades – including the modernisation of supply channels and establishment of direct connections for customers – will increase system delivery efficiency from 70 per cent to 85 per cent.²⁸
- 2.30 The New South Wales State Priority Project – Private Irrigation Infrastructure Operators Program in NSW has received \$879 million of Commonwealth funding for a combination of on- and off-farm projects including channel modernisation, improved irrigation delivery infrastructure and upgrading of pumps and on-farm infrastructure. Fourteen overall projects and 514 individual irrigator projects have been included.²⁹

Improved water knowledge

- 2.31 A further form of project funded under SRWUIP serves to increase water efficiency through improved water knowledge and science.
- 2.32 The Irrigation Hotspots Assessment Program (\$2 million) and the Irrigation Modernisation Planning Assistance Program (over \$6 million) are funded through the SRWUIP. The programs served to identify ‘key areas of water loss’ and provide the basis for modernisation plans.³⁰
- 2.33 The Irrigation Hotspots Assessment Program ran from 2008 until 2011, and funded 12 projects.³¹ The funding was provided to nine irrigation water providers to identify their sources of water loss; all providers received funding under the Irrigation Modernisation Planning Assistance Program to develop a plan to respond to the identified hotspots of water loss.³² Six of the

²⁷ Department of Agriculture and Water Resources, *Submission 18*, p. 7.

²⁸ Department of Agriculture and Water Resources, *Submission 18*, p. 9.

²⁹ Department of Agriculture and Water Resources, *Submission 18*, p. 24.

³⁰ Department of Agriculture and Water Resources, *Submission 18*, p. 6.

³¹ Department of Agriculture and Water Resources, *Submission 18*, p. 8.

³² Department of Agriculture and Water Resources, *Irrigation Hotspots Assessment Program*, <http://www.agriculture.gov.au/water/mdb/programs/basin-wide/irrigation-hotspots-program>, accessed 18 October 2017.

projects received funding from the Private Irrigation Infrastructure Operators Program in New South Wales to implement those plans.³³

- 2.34 The Irrigation Modernisation Planning Assistance Program began in 2008 and concluded in 2013, in which time it funded 23 projects.³⁴ Project funding enabled the providers to receive independent expert assistance in developing a modernisation plan.³⁵

Water purchase projects

- 2.35 The Water Purchase Programme (previously known as Restoring the Balance in the Murray-Darling Basin Program), provides funding (\$2.973 billion) to purchasing water entitlements in the Murray-Darling Basin.³⁶
- 2.36 Water purchase limits are capped at 1 500GL. As DAWR's submission noted, the Australian Government has shifted its focus away from water entitlement purchases towards spending on infrastructure projects, and stated that 'Government investments in the Basin go beyond water recovery; they are strategic investments in the future of irrigation in the Basin'.³⁷

Supply measures

- 2.37 DAWR defines supply measures as 'works, river operations or rule changes that enable the use of less water while achieving equivalent environmental outcomes'. \$1.265 billion has been committed to supply measures projects, with the aim of saving 650GL from the Basin Plan's recovery target.³⁸

South Australian River Murray Sustainability Program

- 2.38 Funded by the Australian Government and delivered by the South Australian Government, the South Australian River Murray Sustainability Program (SARMSP) is funded to \$265 million, including \$120 million for

³³ Department of Agriculture and Water Resources, *Irrigation Hotspots Assessment Program*, <http://www.agriculture.gov.au/water/mdb/programs/basin-wide/irrigation-hotspots-program>, accessed 18 October 2017.

³⁴ Department of Agriculture and Water Resources, *Submission 18*, p. 7.

³⁵ Department of Agriculture and Water Resources, *Irrigation Modernisation Planning Assistance*, <http://www.agriculture.gov.au/water/mdb/programs/basin-wide/irrigation-modernisation-planning>, accessed 18 October 2017.

³⁶ Department of Agriculture and Water Resources, *Submission 18*, p. 12.

³⁷ Department of Agriculture and Water Resources, *Submission 18*, p. 15.

³⁸ Department of Agriculture and Water Resources, *Submission 18*, p. 12.

irrigation efficiency improvements and water purchase and \$120 million towards irrigation industry assistance. The remaining \$25 million is for regional economic development.³⁹

- 2.39 One hundred and eighty six proposals have been assessed to September 2017.⁴⁰ The South Australian Government is responsible for the assessment process, including technical due diligence to ensure that the proposed works will result in water savings and that the works are properly costed and fit for purpose.⁴¹

National infrastructure programs

- 2.40 Beyond SRWUIP, the Australian Government has committed \$2.5 billion towards two national programs to fast-track the construction of water infrastructure: the National Water Infrastructure Development Fund (\$500 million) and the National Water Infrastructure Loan Facility (\$2 billion).⁴²
- 2.41 The Development Fund is a ten-year program consisting of a feasibility component and a capital component. \$59.5 million was committed to 39 feasibility studies – including approximately \$40.4 million for northern Australian projects – to inform investment decisions on new or augmented water infrastructure programs including dams, pipelines, weirs and managed aquifer recharge.⁴³
- 2.42 The capital component (\$440 million) of the Development Fund is available for state and territory governments ‘to accelerate and co-fund the construction of economically viable water infrastructure that will provide water to underpin the growth of regional economies and communities’.⁴⁴
- 2.43 Seventy six expressions of interest (EOI) to the Development Fund had been assessed (to September 2017). DAWR noted that EOIs are assessed by the Department, an independent panel of technical experts and an Australian Government interdepartmental governance board.⁴⁵

³⁹ Department of Agriculture and Water Resources, *Submission 18*, p. 27.

⁴⁰ Department of Agriculture and Water Resources, *Submission 18.2*, p. 13.

⁴¹ Department of Agriculture and Water Resources, *Submission 18.2*, p. 15.

⁴² Department of Agriculture and Water Resources, *Submission 18.2*, p. 8.

⁴³ Department of Agriculture and Water Resources, *Submission 18*, p. 14.

⁴⁴ Department of Agriculture and Water Resources, *Submission 18*, p. 14.

⁴⁵ Department of Agriculture and Water Resources, *Submission 18.2*, p. 14.

- 2.44 To October 2017, six projects, totalling \$293.1 million, had received funding commitments under the National Water Infrastructure Development Fund.⁴⁶
- 2.45 The Loan Facility provides access for state and territory governments to concessional loans to co-fund the construction of economically viable water infrastructure.⁴⁷ EOIs are currently assessed in the same way as for the Development Fund; in 2018 management of the EOI and assessment process will be transferred to the Regional Investment Corporation (RIC).⁴⁸

Distribution of funding across Australia

- 2.46 DAWR noted that 'There is no specific pool of funding for activities outside the Murray-Darling Basin; funding is allocated to achieve government policy objectives'.⁴⁹ Of the \$2 billion allocated to water infrastructure modernisation and efficiency improvements by the Australian Government since September 2013, \$1.8 billion has been on projects in the Murray-Darling Basin.⁵⁰
- 2.47 However, the National Water Infrastructure Development Fund and National Water Infrastructure Loans Facility are both available for projects where needed.⁵¹ As noted above, \$40.5 million of the \$59.5 million allocated to feasibility studies under the Development Fund has gone to projects in northern Australia.
- 2.48 DAWR also noted that funding under SRWUIP has been used in non-Murray-Darling Basin projects, including 13 irrigation schemes in Tasmania, two pipelines in Western Australia and several urban water projects.⁵²

Committee comment

- 2.49 There is no doubt that Australian Government investment in WUE programs is substantial. While funding is concentrated in certain regional

⁴⁶ Department of Agriculture and Water Resources, *National Water Infrastructure Development Fund*, <http://www.agriculture.gov.au/water/national/national-water-infrastructure-development-fund>, accessed 19 October 2017.

⁴⁷ Department of Agriculture and Water Resources, *Submission 18*, p. 14.

⁴⁸ Department of Agriculture and Water Resources, *Submission 18.2*, p. 14.

⁴⁹ Department of Agriculture and Water Resources, *Submission 18.2*, p. 8.

⁵⁰ Department of Agriculture and Water Resources, *Submission 18.2*, p. 9.

⁵¹ Department of Agriculture and Water Resources, *Submission 18.2*, p. 9.

⁵² Department of Agriculture and Water Resources, *Submission 18.2*, p. 8.

areas, water use efficiency is a national issue and a range of different programs are funded across the country.

- 2.50 With such a substantial and ongoing financial investment, measuring and evaluating the impacts of these programs is critical. However this is also a complex and shifting task. The next chapter sets out evidence received regarding the effectiveness of water use efficiency programs – in particular in achieving long term sustainable environmental, community and agricultural outcomes.

3. Assessing WUE program effectiveness

- 3.1 As outlined in chapter 2, Australian Government expenditure on water use efficiency (WUE) programs is substantial, and forms part of the National Water Initiative framework. Given the extent of this expenditure and its concentration in certain regions and to certain segments of the agricultural sector, the Committee sought to assess the overall effectiveness of WUE programs as an approach to drive water agricultural productivity, and so recover adequate water for the environment.
- 3.2 The Committee received a divergent range of evidence on the effectiveness of WUE programs against these objectives. This chapter summarises the following range of evidence received, including:
- increases in on-farm water productivity from WUE programs,
 - alternative approaches, such as water buybacks,
 - environmental flow-on effects from WUE measures, and
 - impacts on cropping decisions.

WUE programs and water productivity

- 3.3 Submissions from governments, irrigators, irrigation infrastructure operators (IIOs) and agricultural groups were almost uniformly positive when describing the efficacy of WUE programs. Evidence from these groups has focused on the efficiency gains made by irrigators and IIOs as a result of the Australian Government's programs, and pointed to environmental benefits arising from the water entitlements transferred to governments under the programs.

- 3.4 The Department of Agriculture and Water Resources (DAWR) argued that WUE programs have wide-ranging positive impacts:

Australian Government policies and programmes to promote improved water use efficiency ... almost invariably lead to improvements in the productivity of water, with consequent improvements to local and regional economic performance. This can range from more reliable crop production in the face of variable water supply, improved management of water resources including through water metering; better land-use planning; better use of information for improving business efficiencies (such as use of medium-term weather forecasts); improved irrigation or industrial process scheduling to account for rainfall variability.¹

- 3.5 Similarly, the South Australian government submission argued that:

Case studies of on-farm efficiency projects show that participating agribusinesses are now benefiting from greater productivity, crop diversification and quality. Many agribusinesses now have increased flexibility and resilience, which will enable them to adapt more easily to future climate change and market conditions. Improved irrigation efficiency has also led to land management benefits, such as reduced water logging and improved salinity management.²

- 3.6 The New South Wales Department of Primary Industries (NSW-DPI) highlighted the following benefits of WUE programs:

It has been estimated that increasing the water productivity of NSW rain-fed and irrigated agriculture by 2% by 2020 could contribute up to \$226 million annually to the NSW economy. The majority of this increase would be due to productivity gains resulting from improvements in water use efficiency and adoption of best management practices ... Water recovered as a result of infrastructure modernisation is shared between the irrigator and the environment, providing farm scale productivity and profitability outcomes in addition to environmental outcomes sought by the Basin Plan.³

- 3.7 NSW-DPI also drew the Committee's attention to improvements in WUE which have already been made under the Sustaining the Basin – Irrigated Farm Modernisation program (STBIFM):

¹ Department of Agriculture and Water Resources, *Submission 18*, p. 3.

² Government of South Australia, *Submission 39*, p. 2.

³ New South Wales Department of Primary Industries, *Submission 28*, p. 4.

Positive local and regional social and economic outcomes have been achieved through investment by STBIFM proponents in irrigation related industries ... An analysis of STBIFM's expected benefits has indicated that:

- capacity building activities will result in a \$6.3 million per annum increase to productivity across the irrigation industry across the northern valleys,
- an increase in productivity on modernised irrigation area by \$24.7 million (15 percent per annum) as a result of improved water use efficiency, and
- an increase in production of \$11.9 million per annum as a result of water savings retained by the participants.⁴

3.8 Farmers and irrigator groups also argued that WUE programs are generally effective in improving farm efficiency and productivity, although some questioned the value of returning water to the environment as part of the programs. The Queensland Farmers Federation, for example, noted simply that:

Financial support provided by the Queensland Government has been effective in encouraging irrigators to invest to make system and practice changes on farm.⁵

3.9 The National Irrigators' Council (NIC) similarly argued that WUE programs have had a substantially positive impact on productivity:

NIC contends that the on the ground evidence shows conclusively that Australia is gaining the benefit of increasingly efficient use of water for irrigated production, and the sector should be acknowledged as being among the most efficient and productive users of water in the world ... Evidence from industry is that farmers have significantly improved their per hectare product.⁶

3.10 Murray Irrigation, an IIO which provides irrigation water to more than 2 000 farms in southern NSW, was certain that WUE programs have been effective:

There is no doubt that the efficiency programs that Murray Irrigation has been involved in have contributed to greater water use efficiency for both the company itself and our customers.⁷

⁴ New South Wales Department of Primary Industries, *Submission 28*, p. 4.

⁵ Queensland Farmers Federation, *Submission 9*, p. 2.

⁶ National Irrigators' Council, *Submission 13*, p. 11.

⁷ Murray Irrigation, *Submission 35*, p. 3.

- 3.11 The Goulburn-Broken Catchment Management Authority (GBCMA) argued that the programs have helped to modernise irrigation infrastructure and have improved the operation of many farms:

[Irrigators] have been able to take advantage of modernised regional delivery systems to improve technology on their properties, resulting in water savings, increased productivity and labour reduction.⁸

- 3.12 GBCMA noted irrigators' view that the improvements made under WUE programs have led directly to improvements in irrigators' confidence and resilience:

Irrigators reported improved confidence in the future, such as increased farm succession, business expansion, improved farm business resilience and the ability to take advantage of higher service levels from the GMW [Goulburn-Murray Water] Connections Program ... Many farmers have indicated that they would not be able to do the works without the funding assistance.⁹

- 3.13 Outside the Murray-Darling Basin, Southern Rural Water (SRW) also argued that government programs have improved productivity and reduced the amount of wasted irrigation water:

Off farm WUE programs in the Macallister Irrigation District have generated significant improvements, and when ongoing and planned investments in WUE programs are completed, SRW expects to see total system efficiencies improve from 60 per cent before the works to beyond 85 per cent ... In the Weribee and Bacchus Marsh irrigation districts, SRW notes that upgrades are planned to address substantial seepage and leakage problems caused by ageing infrastructure.¹⁰

- 3.14 SRW also noted that on-farm water savings in its district have been substantial. Its submission highlighted studies which have found that on-farm irrigation efficiency programs have 'led to water use savings of up to 30% on farm'.¹¹

- 3.15 SmartRivers, representing irrigators in Queensland's Condamine-Balonne catchment in the northern Basin, noted that the community expects that irrigators will not waste water, and argued that WUE programs have helped irrigators meet those expectations:

⁸ Goulburn-Broken Catchment Management Authority, *Submission 8*, p. 3.

⁹ Goulburn-Broken Catchment Management Authority, *Submission 8*, p. 6.

¹⁰ Southern Rural Water, *Submission 15*, pp. 1-2.

¹¹ Southern Rural Water, *Submission 15*, p. 3.

There is private and public benefit gained in the implementation of water saving measures which deliver good value for money for our region and beyond ... Irrigators believe the availability of funding and cost share ratio of the program is fair. The initiative offers support for a suite of water use efficiency mechanisms that modernize our irrigation systems, aligning to community standards as being as efficient as possible.¹²

- 3.16 Growcom, the organisation representing Queensland's horticulture industry, has been a provider of WUE programs since the late 1990s. It has been funded under programs like the Rural Water Use Efficiency Initiative. Growcom argued that the program has been a success:

The program has been very successful both in delivering measurable water savings but has also greatly improved the output of many of the growers involved in the program. The program has been held up as one of the most successful government and industry partnerships with clear benefits to industry and the broader community.¹³

- 3.17 Growcom noted that the program has generated \$200 million of value in water savings and increased productivity, with very broad uptake and widespread adoption of industry best practice among participants.¹⁴

- 3.18 Cotton Australia noted the importance of WUEs in its submission, arguing that:

The success of the Australian cotton industry to date, and its future, is to a large extent dependent on continual improvement of water use efficiency (WUE).

As an industry we are focused on "More Crop Per Drop", and this is achieved through improved varieties, improved management and the adoption of cutting edge WUE techniques and technology.¹⁵

- 3.19 The Ricegrowers' Association of Australia (RGA) argued that the Australian rice industry 'leads the world in improving water use efficiency', including 'using 50 per cent less water than the global average to produce each kilogram of rice'.¹⁶

¹² SmartRivers, *Submission 23*, p. 2.

¹³ Growcom, *Submission 25*, p. 1.

¹⁴ Growcom, *Submission 25*, p. 1.

¹⁵ Cotton Australia, *Submission 24*, p. [1].

¹⁶ Ricegrowers' Association of Australia, *Submission 21*, p. 10.

- 3.20 The RGA noted that the On-Farm Irrigation Efficiency Program has 'led to the adoption albeit by a relatively small proportion of irrigators of improved management systems. It has incentivised participants to upgrade their water infrastructure, often within a shorter time-frame than would otherwise have been achievable for many participants'.¹⁷
- 3.21 Individual farmers in the rice industry have therefore 'reported either a reduction in average water use (per tonne of crop) and/or an increase to yields and are generally pleased with the outcome of their respective projects'.¹⁸ For those reasons, and noting the aim of recovering water for environmental purposes, the RGA described infrastructure spending programs as 'a more palatable alternative' to government water purchases.¹⁹

Box 3.1 The Murrumbidgee Irrigation Area

On 21-22 February 2017, the Committee visited Griffith, NSW, to conduct site inspections in and around the Murrumbidgee Irrigation Area (MIA) at the invitation of Murrumbidgee Irrigation (MI). MI is the irrigation infrastructure operator that supplies farmers in the MIA with water.

The MIA is one of Australia's largest and most diverse irrigation areas. Large amounts of wine grapes, rice and other cereals, and citrus fruits are grown there, and in recent years new industries including cotton and aquaculture have been grown in the region.

The Committee's visit to the MIA highlighted the importance of irrigation modernisation, as well as some of the complications it can cause. MI has been an active participant in the Government's recent water use efficiency programs and the Committee viewed some of its recently upgraded channels and storages. MI explained how, in addition to reducing losses to evaporation and seepage, it has implemented better monitoring, management and automation systems to improve its supply of water to farmers. Although MI must wait 7 days for water it orders to move downriver from the storage at Burrinjuck Dam, its system is sufficiently flexible to supply its farmers on 48 hours' notice.

During the visit, the Committee also met with broadacre rice and cotton farmers, citrus growers, winemakers and aquaculturists. Committee

¹⁷ Ricegrowers' Association of Australia, *Submission 21*, p. 3.

¹⁸ Ricegrowers' Association of Australia, *Submission 21*, p. 4.

¹⁹ Ricegrowers' Association of Australia, *Submission 21*, p. 4.

members were impressed with the improvements irrigators have made to their water productivity. However, the visit also highlighted the difficulty irrigators may face when upgrading to more efficient but more energy intensive irrigation systems. Irrigators explained to the Committee that high energy prices can make more water efficient systems uneconomical to use, particularly in years of constrained water supply. This was to become a common theme at site inspections around the country as the inquiry progressed.

An alternative approach: water buybacks

3.22 The evidence from irrigators and groups representing them argued that WUE programs represent the better approach to providing that sufficient water is allocated towards environmental purposes, rather than the policy of ‘buybacks’ where governments purchase water rights off irrigators. They argue that investing in irrigation infrastructure offers a more comprehensive approach than buybacks, with flow-on effects such as positive socio-economic consequences for regional Australia.

3.23 The NIC, for instance, pointed to research which has found that buybacks have negative economic and social results for the broader community:

Independent studies conducted to inform the development of the Basin Plan showed that buybacks have greater localised negative social and economic impacts on irrigation dependent communities than investment in water efficiency projects. Past Governments’ ‘no regrets’ water buyback regime was ill-considered and is leaving a social and economic legacy that will need to be addressed.²⁰

3.24 The Murray-Darling Basin Authority (MDBA) also noted research, via the Northern Basin Review, which found that ‘environmental water recovery through investments in more efficient water use can lead to very different social and economic outcomes compared with buybacks’.²¹

3.25 This Review, the MDBA said:

... has served to reinforce the MDBA’s view that water recovery from improvements to water use efficiency – both off-farm and on-farm – should be prioritised over buybacks. A water recovery strategy built around this position will allow for the re-balancing of water use in the Murray-Darling Basin and

²⁰ National Irrigators Council, *Submission 13*, p. 9.

²¹ Murray-Darling Basin Authority, *Submission 36*, p. 2.

deliver the best outcome for communities by keeping the social and economic impacts to a minimum.²²

- 3.26 DAWR explained that Australian Government spending has been developed in line with the approach that infrastructure spending is a superior way of recovering water for the environment:

... prioritised investment in productivity-enhancing water infrastructure rather than purchase of water entitlements, with more than \$8 billion being invested in infrastructure and water efficiency measures. This policy aims to minimise any adverse impact of water recovery as a result of the Basin Plan, as well as increasing the sustainability of irrigated agriculture across the Basin.²³

- 3.27 The MDBA, while in favour of investment in infrastructure and other WUE programs rather than buybacks, noted that the former is considerably more expensive:

... water recovery through investment in infrastructure will generally be preferable to purchasing entitlements from a perspective of maintaining productive capacity in a given region. However, the cost to taxpayers of this method of water recovery is high – in the order of 2 to 3 times as much per gegalitre – so governments need to strike a balance as to the overall mix of recovery methods.²⁴

- 3.28 Likewise, the NIC acknowledged that water purchases are cheaper in dollar terms than infrastructure investment, but argued that the direct price is only one factor in the equation:

If you consider the simplistic litre for dollar equation, then Government would just go ahead and purchase water on the water market, thereby removing it from the productive pool. To do that on the basis of ‘value for money’ however, would be to completely ignore the responsibility of Government to the people it serves.

Investment in infrastructure is in the short term more expensive, but if well targeted and designed, it will avoid the massive negative impacts on communities and can produce long term gains for a region’s productive capacity and product.²⁵

²² Murray-Darling Basin Authority, *Submission 36*, p. 2.

²³ Department of Agriculture and Water Resources, *Submission 18*, p. 6.

²⁴ Murray-Darling Basin Authority, *Submission 36.1*, p. 2.

²⁵ National Irrigators’ Council, *Submission 13*, p. 15.

3.29 The National Farmers' Federation also argued that criticism of infrastructure spending is based on a too-narrow recognition of the impacts of the programs:

This narrow view fails to acknowledge that in addition to just water recovery, other benefits are "purchased" or other costs avoided by investing in infrastructure rather than straight buyback. These additional benefits include a more productive and efficient irrigation business, maintained productivity with associated benefits for input suppliers and downstream processing, and the social and economic flow on benefits associated with the spending stimulus.²⁶

3.30 Other witnesses, however, argued that buybacks, in addition to costing substantially less than investments in infrastructure, are a more reliable way of ensuring that water is allocated for environmental use. They argue that the environmental benefits of WUEs have tended to be overstated and in any event are difficult to accurately quantify.²⁷

3.31 The Inland Rivers Network also pointed to the comparative costs of buybacks and WUE programs to argue that the latter essentially represents a transfer of wealth from governments to private irrigators:

... current expenditure, while providing significant private benefit, is a very expensive method of returning water for environmental and broader public benefit. The cost per ML returned to the Macquarie River system through water efficiency measures was more than three times the market value.²⁸

3.32 DAWR was asked by the Committee to explain the rationale for preferring infrastructure investment programs over buybacks. Their response argued that infrastructure investment serves to fill three policy aims: increasing agricultural productivity, supporting the socio-economic viability of regional communities, and allocating water to environmental purposes:

Since 2014, the government has prioritised investment in efficient water infrastructure as a means to return water to the environment over the purchase of water entitlements (or 'buyback'). In part, this is because community and industry stakeholders have expressed clear and strong concerns with the potential adverse social and economic impacts of non-strategic water purchasing undertaken through broad public tender processes.

²⁶ National Farmers' Federation, *Submission 34*, p. 13.

²⁷ See, for example, Dr David Adamson et al., *Submission 19*, pp. 9-10; Professor Quentin Grafton and Professor John Williams, *Submission 2*, p. 3.

²⁸ Inland Rivers Network, *Submission 16*, p. 2.

For example, stakeholders have raised concerns that purchasing creates a 'Swiss cheese effect' in irrigation communities, potentially putting cost pressures on remaining water holders because of gaps in water delivery in the surrounding regions. We note that the government legislated a 1 500 GL cap on surface water purchasing in response to such concerns in 2015.²⁹

Environmental flow-on effects

- 3.33 The evidence from irrigators, IIOs and governments demonstrated a strong view that WUE programs are effective in recovering water for the environment while assisting irrigators to reduce water wastage and improve water productivity.
- 3.34 However, evidence provided by economists, environmentalists and academics questioned the overall benefit of WUE programs and whether gains were limited to the agricultural sector with the environment effectively receiving less water.

Unintended consequences of WUE programs

- 3.35 While acknowledging that increased productivity and less wasted water were desirable outcomes, the evidence focused primarily on the effect WUE programs have had on water flows at the Basin scale, and on whether they are meeting the government's environmental policy objectives. Viewed through this lens, it was suggested that the outcomes being generated by WUE programs are much less uniformly positive.
- 3.36 Professors Quentin Grafton and John Williams argued that WUE programs are not typically associated with reduced water use or increased environmental flows:

There are many myths related to irrigation efficiency. One of the greatest myths is that increased irrigation efficiency associated with more capital intensive irrigation methods always results in: (1) farmers either applying or consuming less water and (2) water 'savings' that flow back to the environment in the form of increased stream flows.³⁰

- 3.37 In their submission, Grafton and Williams distinguished between beneficial consumptive water use (water used by the plant to grow, or transpiration), non-beneficial consumptive use (water lost to evaporation), and runoff or

²⁹ Department of Agriculture and Water Resources, *Submission 18.2*, p. 2.

³⁰ Professor Quentin Grafton and Professor John Williams, *Submission 2*, p. 1.

stream flows, which they characterise as beneficial non-consumptive use since the water is 'relocated to another part of the basin system (for potential re-use)'. They also characterised seepage as a beneficial non-consumptive use, since it recharges groundwater systems.³¹

- 3.38 According to Grafton and Williams, the problem with WUE programs is that they tend to reduce 'beneficial' losses:

Higher irrigation efficiency is, typically, associated with reduced runoff and seepage to groundwater, especially in stressed river basins. This is because water that previously was able to infiltrate soils and seep past crop root zone to replenish groundwater and base flow of stream flows after being applied to farmers' fields (such as through flood irrigation) is diminished with more capital-intensive methods of irrigation, such as drip irrigation.³²

- 3.39 Professors Grafton and Williams argued that the academic evidence strongly suggests that WUE programs do not help to achieve environmental outcomes:

The overwhelming evidence from Australia and many other places in the world is that providing subsidies to increase irrigation efficiency does not, by itself, result in water 'savings' at a basin scale ... Indeed, if maintaining stream flow is an important goal then such subsidies, by themselves, can result in unintended consequences and actually reduce stream flows and groundwater recharge.³³

- 3.40 The Professors argued that the 2016 Australian State of the Environment report supports this proposition.³⁴ The report found 'poor or deteriorating' trends in Australia's inland water ecological processes and 'widespread loss of ecosystem function' in the Murray-Darling Basin.³⁵

- 3.41 Along similar lines, the Australian Academy of Technological Sciences and Engineering (ATSE) submission provided a thorough argument indicating that WUE programs may be having counterproductive effects on environmental flows:

³¹ Professor Quentin Grafton and Professor John Williams, *Submission 2*, pp. 1-2.

³² Professor Quentin Grafton and Professor John Williams, *Submission 2*, p. 3.

³³ Professor Quentin Grafton and Professor John Williams, *Submission 2*, p. 6.

³⁴ Professor Quentin Grafton and Professor John Williams, *Submission 2*, p. 6.

³⁵ R. M. Argent, *Australia state of the environment 2016: inland water, independent report to the Australian Government Minister for the Environment and Energy*, Australian Government Department of the Environment and Energy, Canberra, 2017, p. 56.

Water conservation technologies have been promoted as a practical means of improving WUE and maintaining environmental flows in river systems. However, there is increasing evidence that, somewhat paradoxically, WUE gains often contribute to intensification of water use by irrigators and a reduction in return flows to streams and groundwater. This occurs when one or more of the following outcomes transpire:

- increased crop yields coupled with increased consumptive water use (transpiration);
- improved efficiency, productivity, and profitability encourages farmers to increase the area cropped, or adopt multiple crop cycles per year or dual cropping systems.

In both cases, the net effect is an increase in annual evapotranspiration that, particularly in areas of increasing water scarcity, can reduce environmental flows.³⁶

3.42 ATSE noted that unless these increases in evapotranspiration are taken into account in the design of WUE programs, the programs may have detrimental effects on river ecosystems:

An increase in beneficial water consumption in crop transpiration is usually associated with reductions in deep-drainage that recharges groundwater and in return flows to streams. Unless WUE savings are reflected in an equivalent or greater reduction in extraction from the water resource, downstream flows will actually be reduced.³⁷

3.43 ATSE further argued that WUE programs are unlikely to provide solutions to the over-allocation of water:

Due to the complex interactions between agricultural and water systems it is essential that the Committee considers the broader impacts of WUE programs at system/basin-wide scales. WUE can help to reconcile trade-offs between tensions in the food-water nexus. However, it is unlikely to resolve the overuse of water and maintain, or more importantly, improve environmental flows.³⁸

3.44 Consequently, ATSE recommended research into WUE programs so that we gain a better understanding of their effect on river and groundwater ecosystems:

³⁶ Australian Academy of Technological Sciences and Engineering, *Submission 20*, pp. 3-4.

³⁷ Australian Academy of Technological Sciences and Engineering, *Submission 20*, p. 4.

³⁸ Australian Academy of Technological Sciences and Engineering, *Submission 20*, p. 4.

It is essential to establish the hydrological impacts of WUE on surface and groundwater systems, and to ensure that policy development is informed by sound hydrological research.³⁹

- 3.45 In the same vein, the submission by Dr David Adamson, Dr Adam Loch, Associate Professor Sarah Wheeler and Professor Jeff Conner argued that WUE programs like the Sustainable Rural Water-use Investment Program (SRWUIP) can have unintended impacts on environmental flows:

The SRWUIP is a process where submissions are made to upgrade water infrastructure (new or existing). Funded submissions will eventually share efficiency savings 50-50 between farmers and the government. Where nothing is known about prior losses, the true quantity of water recovered will be unknown. When combined with the rebound effect (i.e. where total irrigated area increases) and reductions in return flows, total river system flows decrease. This net reduction in flows means:

- The Plan goals are placed under increased risk; and/or
- There is downward pressure on the reliability of all water entitlements.⁴⁰

- 3.46 At a public hearing in Adelaide, Dr Adamson noted that in the past inefficient irrigation systems have effectively returned some of their water to the environment through 'beneficial' losses, and that WUE programs might be disrupting that process:

We don't always use all the water we apply for irrigation. This has a benefit to the non-farmers, to the soil profile, to the groundwater, to the return flows back into the system. As we encourage people to become more efficient, we are actually drying up the system. This is not just our issue; it happens around the world. We've done plenty of studies on this sort of stuff. We can see it in Europe and we can see it in America. To become more efficient, we stop those flows going back into the river, which other people will be using.⁴¹

- 3.47 Dr Adam Loch noted that the DAWR submission, while listing WUE programs' benefits in terms of agricultural productivity and rural socio-economic factors, does not advance a strong argument that the programs are actually beneficial to the environment:

I look with great interest at the Department of Agriculture and Water Resources' submission to the inquiry. It's full of wonderful examples of how

³⁹ Australian Academy of Technological Sciences and Engineering, *Submission 20*, p. 4.

⁴⁰ Dr David Adamson et al, *Submission 19*, p. 10.

⁴¹ Dr David Adamson, *Committee Hansard*, 23 August 2017, p. 13.

we've invested a great deal of money and recovered a great quantum of water, but I see all of that, funnily enough, talking about productive gains—irrigators, socioeconomic value et cetera. There is not a lot of any detail in here about the environmental gain. In fact, there are no details, that I was able to find through a reread of it today, suggesting how this has been demonstrably beneficial for the environment.⁴²

- 3.48 Dr Adamson noted that in time Governments will be asked to justify the amounts of money they are spending on WUE programs:

The Murray-Darling Basin Plan is what was in the national interest. The national interest is wider than irrigators—it is the community, the society and the environment. As Adam [Loch] has alluded to, we are not 100 per cent sure what benefit we have gained from water use efficiency, but sooner or later someone is going to ask what we got and if there is a better way of getting it.⁴³

- 3.49 In order to address this issue, Dr Loch argued that the Government should conduct a cost-benefit analysis to 'get at the heart of what was being lost before we begin to assess whether we have made genuine savings through these programs':

I don't say that these [programs] are not returning savings, but we have no idea of what was being lost. If as our literature would suggest it is around 30 per cent on average across different production systems et cetera, the environment would have been getting a good healthy slug of that.⁴⁴

- 3.50 Professor Lin Crase also raised concerns about the benefits of WUE programs. He noted that because policymakers are not informed by a detailed hydrological picture, investments in WUE can have unintended consequences:

The published literature in this area shows that investments in water use efficiency in most parts of the world usually lead to an expansion of irrigation, not a contraction. That's usually because we don't fully understand where the water goes when we start to invest in efficiency.⁴⁵

- 3.51 Further, Professor Crase argued that WUE programs in Australia have not been built on a firm empirical foundation:

⁴² Dr Adam Loch, *Committee Hansard*, 23 August 2017, p. 15.

⁴³ Dr David Adamson, *Committee Hansard*, 23 August 2017, p. 22.

⁴⁴ Dr Adam Loch, *Committee Hansard*, 23 August 2017, p. 22.

⁴⁵ Professor Lin Crase, *Committee Hansard*, 23 August 2017, p. 1.

[I]f you look at what we've done with water accounting in this country, you see we've done a very poor job of counting where it goes. Even though we've invested very large sums of money through the Bureau of Meteorology to improve our accounting systems, largely we don't account for a lot of water that leaks.⁴⁶

- 3.52 Professor Crase argued that the Government's lack of data on the extent of beneficial losses is a consequence of conscious policy decisions made by past governments:

[In Australia] the focus is very much just on observing consumptive use, whereas, if you look at the US system, you see that, if the person on the end of the table sells water to the person at the other end of the table, there are all sorts of investigations that have to occur around that trade to understand any other impacted parties between those trades. In Australia, largely we don't do that, and that's largely because we took a view that increasing the volume of trade would be better ... I think overwhelmingly it's more efficient, but what we haven't done is build sufficiently robust instruments around those trades to account for where the water is moving.⁴⁷

- 3.53 Professor Crase also noted that while the trade in water has been of great benefit to irrigators, enabling many to survive drought or other shocks, it is fundamentally undermined by the lack of accurate water measurements:

[M]arkets only work well to the extent that governments are able to validate the resources that are exchanged. What I'm suggesting to you is we're not doing as good a job as we might in measuring some of those resources.⁴⁸

- 3.54 The submission provided by the NIC pointed out that the study used to provide baseline data and justify the need for the Murray-Darling Basin plan (the sustainable Rivers audit) was one of the first activities cut by the Murray-Darling Basin Authority when faced with budget cuts.⁴⁹

- 3.55 Given the amount of money being spent on WUE programs, Professor Crase suggested that a better understanding of the effects WUE programs are having should be a priority:

These are non-trivial sums of money that we're spending on this. To do so without actually measuring where the water's going and where we're taking it

⁴⁶ Professor Lin Crase, *Committee Hansard*, 23 August 2017, p. 1.

⁴⁷ Professor Lin Crase, *Committee Hansard*, 23 August 2017, p. 2.

⁴⁸ Professor Lin Crase, *Committee Hansard*, 23 August 2017, p. 2.

⁴⁹ National Irrigators' Council, *Submission 13*, pp. 9-10.

from seems to me bizarre, particularly at a time when governments simply don't have a lot of money at their disposal to waste.⁵⁰

- 3.56 At a public hearing in Canberra, Professor Grafton also concluded that in implementing WUE programs as it is, the Government may not be achieving the environmental outcomes which are their primary purpose:

[W]ith water policy we are in danger of carrying on with business as usual, spending billions more dollars for no public purpose and no result. Sadly, the challenges and past mistakes made in water policy and water use efficiency are not isolated. They represent a bigger problem and malaise in Australia, where bold statements are poorly implemented and the public good is captured by special interests.⁵¹

Arguing benefits of efficiencies

- 3.57 Governments and irrigators responded to these arguments of diminished returns and reduced environmental benefits in a number of ways. The Committee asked DAWR to provide a detailed response to the claim that WUE programs are not meeting their primary goal – that is, that they are not functioning to increase the amount of water available to the environment. DAWR responded:

The department is aware of recent claims that the Australian Government's water use efficiency programs are not returning water to the environment because they are reducing 'return flows' to rivers. The department does not agree with these claims and does not consider that the evidence supports the conclusion. Return flows are when excess water from irrigation runs off the surface and back into the river system or leaks into the ground. The claim made is that more efficient water infrastructure means there are less excess water and therefore there is less return flows available for the environment.

While return flows can be reduced by more efficient irrigation infrastructure, this is usually a good thing. Return flows can cause environmental damage, particularly where irrigation surface run-off contains high levels of nutrients, salt or other pollutants; or seepage due to inefficient watering causes rising water tables and salinisation of our rivers and landscape.

The Australian Government's irrigation efficiency programs in the Murray-Darling Basin recover at least 50 per cent of water savings as water entitlement held by the Commonwealth Environmental Water Holder (CEWH). The

⁵⁰ Professor Lin Crase, *Committee Hansard*, 23 August 2017, p. 1.

⁵¹ Professor Quentin Grafton, *Committee Hansard*, 30 March 2017, p. 1.

CEWH is able to use this water when and where it can have the most benefit to the environment. This represents a much better environmental outcome than ‘return flows’, which are typically of poor quality and by their nature are not able to be directed to best environmental effect.

As we have seen over time, irrigators who strive to improve their efficiency have less wastage and reduced salinity and water quality issues. Irrigators could fund these efficiency improvements themselves and retain all of the water savings. Instead, through Australian Government-funded programs, we are ensuring that water savings are shared between farmers and the environment.⁵²

- 3.58 At the Committee’s public hearing in Narrabri, Dr David Mitchell from NSW-DPI argued that it is difficult to know whether the criticisms of WUE spending have merit:

[WUE] might not give you any more water in the system, but it will probably give you more product. It is a multifaceted concept which is probably a bit nuanced in that respect. From a global situation or that whole basin approach, you have a certain amount of water going in and a certain amount of water coming out and then the transpiration and the product produced ... The trick there is really trying to figure out where the losses are occurring within a spatial system. Water cuts across lots of spatial layers, from a basin level through to a farm and field level. Trying to account for losses between those spatial scales can be quite a difficult concept. You can improve water efficiency at a field scale, but that may not increase water use efficiency at a farm scale. It is just the way the system works—a series of nested spatial scales. It can be quite complex to measure those different particular water balances at those particular spatial scales.⁵³

- 3.59 Dr Mitchell also noted that, although it is complicated, the concept of ‘beneficial’ losses is not helpful in a practical sense, since the water referred to is officially allocated to productive use and should not therefore be counted on for environmental outcomes:

Real water savings are when you can actually recover water and reuse it. An unreal water saving would be if there is a return flow. So, if you extract water from a river and you irrigate and there is a return flow somehow, through groundwater or some sort of irrigation offtake, and you save that water, then

⁵² Department of Agriculture and Water Resources, *Submission 18.2*, pp. 2-3.

⁵³ Dr David Mitchell, *Committee Hansard*, 6 April 2017, p. 24.

that is not a real water saving, because you are double dipping, or there is an accounting error there.⁵⁴

- 3.60 Similarly, the NIC argued that farmers using their water more efficiently is just good business practice, and that farmers should not be expected to pay for water which they are not using:

Where critics of WUE programs suggest that 'reducing run off has negative consequences': Irrigators would suggest that was in fact an indicator of good economic management from farmers and that given the high prices they now pay for water, they cannot be expected to pay for water that is excess to their productive requirement.⁵⁵

- 3.61 The GBCMA submission was the only submission which suggested that it is doing the necessary work to understand the catchment-level impacts of WUE measures:

An important part of this planning process has been to assist irrigators to understand their place in their local catchment, the region and the Murray-Darling Basin. Planning helped them appreciate the potential impact of their actions on their own properties, the local catchment and the wider region (particularly downstream).

Irrigators have been encouraged and supported to develop Whole Farm Plans for their properties which include the natural features of the property together with details of the improvements planned for their irrigation systems. This ensures the efficient application and movement of water across the land, meeting the required crop water use.

Planning for these changes provides an opportunity for irrigators to take advantage of advice and recommendations from irrigation designers and Government extension officers through incentive programs to encourage the adoption of planning and best practice.⁵⁶

- 3.62 By way of response to Professors Grafton and Williams, the Cotton Australia submission argued that their contention that WUE had not resulted in reduced total water use or a reduction in water applied per hectare were 'two very flawed metrics':

⁵⁴ Dr David Mitchell, *Committee Hansard*, 6 April 2017, p. 24.

⁵⁵ National Irrigators Council, *Submission 13*, p. 14.

⁵⁶ Goulburn-Broken Catchment Management Authority, *Submission 8*, p. 4.

[T]he amount of water applied per hectare is irrelevant. The measure must be: what production is being achieved per megalitre of water? ... [T]he Australian cotton industry can show a 40% improvement in WUE over the past decade.

Secondly, the amount of total water applied in any one year is largely driven by climatic conditions. When water is plentiful, normally more will be used, either in that year or in the years following, similarly a dry sequence will reduce total water use. The Professor's short-term snapshot was insufficient to overcome these variations. What is completely and undeniably true is that the Commonwealth purchased and WUE programs have as of now collectively reduced the amount of water available to agriculture on average by 2000GL.⁵⁷

Crop production

- 3.63 While water use efficiency is generally regarded as a positive, some witnesses highlighted that increased efficiency of irrigation can also have potentially negative outcomes, including intensification and a shift to high water-use, high-value perennial crops.
- 3.64 Intensification refers to irrigators taking advantage of improved infrastructure and efficiency of water to increase the size or frequency of their crop. While this process improves the productivity of both land and water, some witnesses argued that there is evidence of it consequently reducing beneficial environmental run-off.
- 3.65 The National Farmers' Federation noted that, while it may seem counter-intuitive, WUE programs can lead to an intensification of agriculture as farmers seek to grow their business using their new infrastructure;

The implicit assumption behind programs that invest in on-farm water use efficiency is that demand for water decreases as the farmer can produce the same with less water. Straight buybacks were often associated with people either exiting the industry or scaling back operations – thus demand for water was equally offset by the reduction in supply. Participants in on-farm programs however tend to be those farmers that are in the industry for the long haul, and keen to make capital improvements and to grow their businesses. So demand for allocation may actually be unchanged by the program, adding pressure to an already tight market as supply falls without a change in demand. Furthermore, to ensure a return on the capital investment

⁵⁷ Cotton Australia, *Submission 24*, pp. 10-11.

made in on-farm improvements means that many growers are now willing to pay more for water.⁵⁸

- 3.66 Along the same lines, the Chair of Murrumbidgee Irrigation Mr Frank Sergi told the Committee that investment in WUE programs has led to intensification and therefore higher demand for water:

Without a doubt, the investment has enabled a quantum change in how water is delivered and utilised in the area. With increased efficiency has come increased production and, ironically, a greater demand for high flow rates and water for further production. What this means is that we are seeing less water per tonne of product and, as we had expected—or as we had not expected—more demand for water and production.⁵⁹

- 3.67 Environment Victoria also noted this trend, arguing that ‘Efficiency upgrades can also have the perverse impact of driving up water use even as it is used more efficiently’.⁶⁰

- 3.68 As the Committee also heard, there is a concern that increased water use efficiency will change the nature of the Australian agriculture sector as more irrigators turn from annual crops to higher value perennial crops. As perennial crops tend to be less flexible and more water-intensive, this may put upward pressure on water prices and could reduce resilience or heighten the risk of a shock during the next extended dry period.

- 3.69 The problem was outlined by Dr Adamson et al:

As efficiency increases, an irrigator’s ability to adapt to future ‘bad’ (e.g. drought) shocks decreases, particularly if they invest in or already irrigate higher-valued perennial crops. Perennial crops require water every year to maintain capital investments.

Growing global demand for high value perennial crops has been driving a structural change in the Basin at the same time as irrigation efficiency investment by the Commonwealth.

If entitlement reliabilities decrease in response to prolonged drought shocks, but the total area of perennials in the MDB has increased in response to growing demand and commodity returns, demand for water from high value

⁵⁸ National Farmers’ Federation, *Submission 34*, pp. 6-7.

⁵⁹ Mr Frank Sergi, *Committee Hansard*, 15 September 2017, p. 8.

⁶⁰ Environment Victoria, *Submission 31*, p. 2.

perennials could be higher than in previous droughts; where loss to perennial capital stock in the Millennium drought (2000-2010) was already high.⁶¹

[...]

If farmers transition towards perennial production systems that require water in all years and states of nature (i.e. dry, wet or average conditions):

- Constant water requirements will reduce irrigator capacity to adapt to adverse climatic conditions (drought) through access to water trade supporting yield preservation;
- Below yield preservation, if there is insufficient water to maintain the root stock, capital investments in perennial crops will rapidly become exposed to loss; and
- If perennial crops are lost across an increased total area coverage, there is the potential for rural debt to significantly increase in a relatively short period.⁶²

3.70 At the Committee's hearing in Adelaide, Dr Adamson further explained the consequences of a shift from annual to perennial crops, noting that the increased costs of the latter are subsidised by irrigation infrastructure programs:

A perennial producer requires a volume of water every year just to keep the rootstock alive. As we increase the number of hectares associated with perennials, so does our fixed water supply increase. We need that water. Without that water, the capital invested in that rootstock dies. We can't replace that overnight. It leads to irreversible losses in a community.

Annuals, on the other hands, provide great flexibility within the system. We can rip them in; we can rip them out. When water supply is plentiful, we can expand our irrigation area up north overnight. We respond to those conditions. Irrigation efficiency, however, can leave us in a situation where we overinvest in perennials, especially when we are subsidising the capital investments.⁶³

3.71 A further consequence is that, having taken advantage of subsidised infrastructure to invest in higher-value perennial crops, irrigators will be

⁶¹ Dr David Adamson et al, *Submission 19*, p. 2.

⁶² Dr David Adamson et al, *Submission 19*, p. 3.

⁶³ Dr David Adamson, *Committee Hansard*, 23 August 2017, p. 13.

willing to spend more to secure water rights during droughts, thus driving up the price of water in the region.⁶⁴

- 3.72 Mr John Robertson of DAWR commented on this issue too, noting that the inflexibility of perennial crops means that irrigators will be forced into purchasing water at whatever price the market has decided:

The other factor is that, in a drier period, if you are growing annual crops you can decide not to put the crop in this year—you lose a year's profit but that's about it. But if you have permanent plantings of fruit trees, citrus or stone fruit, you need to keep them alive because of the investment. Therefore, when water is short, they are willing to pay premiums; it is the market working.⁶⁵

- 3.73 DAWR was asked about whether WUE programs have encouraged irrigator investment in perennial over annual crops. The Department responded:

The government's investments in water use efficiency have benefited both annual and perennial production systems. For example, co-investments with rice growers under the government's On-Farm Irrigation Efficiency Program have helped to improve rice production and cropping flexibility. Cotton growers have also benefitted from investments on on-farm infrastructure, allowing them to more efficiently store and apply water for annual cotton crops.⁶⁶

- 3.74 Further, DAWR argued that the market result of increased water for high-value (including perennial) crops was to the benefit of both high and low value crop irrigators: the former were able to keep irrigating their crops, the latter to sell their water entitlements for greater profit than their crops would have brought:

The increase in prices experienced in dry years did allow a shift in the allocation of water resources from low to higher value producers. This shift occurred as the opportunity cost/benefit from selling allocations became greater than on-farm revenue, typically for lower value, labour intensive operations.

For example, annual crop producers and pasture irrigators who retained permanent water rights were able to sell their annual water allocations, allowing them an income stream during the drought. Conversely, higher value, capital-intensive operations with a greater capacity and willingness to

⁶⁴ Dr David Adamson and Dr Loch, *Committee Hansard*, 23 August 2017, pp. 17 – 19.

⁶⁵ Mr John Robertson, *Committee Hansard*, 7 September 2017, p. 8.

⁶⁶ Department of Agriculture and Water Resources, *Submission 18.2*, p. 11.

pay, acquired allocations and entitlements for crops, such as permanent tree nut plantings, that needed the water to survive.

Water markets are fulfilling their intended role to allocate scarce water resources to higher value uses, as intended in the National Water Initiative (NWI) and as recommended in the Productivity Commission's recent draft report on the NWI, refer to Question 1. As water moves economically, it also moves between industries and regions, and some industries and regions experience adjustment impacts.⁶⁷

3.75 However, noting that there has been a shift in crop types, DAWR recognised that longer term effects should be monitored:

While the current policy arrangements provide considerable flexibility for water users to respond to climate, market and other events, we recognise that some recent expansions of perennial production may impact on the system. Relevant jurisdictions and Basin officials have commenced consideration of issues that may arise.⁶⁸

Committee comment

3.76 The Committee notes that there are divergent views on the effectiveness of WUE programs, and particularly whether water efficiencies are providing a benefit to environmental water levels.

3.77 Increasing water productivity is a necessity – we must value water as a resource that sustains our environment and our agricultural sector. However, whether increasing water productivity and reducing water wastage should be taken to mean 'increasing yields from current water allocations', or whether it should be 'producing using less water' has divided much of the evidence received to this inquiry.

3.78 It is the Committee's view that national water objectives should not subscribe to this simplistic dichotomy. The long-term objective must be to both 'produce more' *and* 'reduce water use' if we are to have a thriving agricultural sector into the future, and a thriving water environment surrounding it.

3.79 In pursuit of these long-term objectives, the Committee concludes that WUE programs are an effective approach to drive change in irrigation practices and implement efficiencies. While this may reduce water run-off and returns

⁶⁷ Department of Agriculture and Water Resources, *Submission 18.2*, p. 12.

⁶⁸ Department of Agriculture and Water Resources, *Submission 18.2*, p. 12.

in some instances, this brings with it both positive and negative impacts, and monitoring these impacts should be a key element of the holistic management of the NWI.

- 3.80 Similarly, intensification or changes to perennial crops must be monitored to ensure short-term cropping gains are not sought at the expense of long-term water efficiency gains. While acknowledging and in many instances agreeing with some of the concerns raised, the Committee considers that the current approach of funding WUE programs is effective in driving water efficiencies and productivities. However, there are a number of environmental impacts which must be closely monitored, and a number of complementary measures which should be in place to improve environmental outcomes. These are discussed in Chapter 5. A focus of this inquiry is that the design and administration of WUE programs are well aligned with long term objectives of environmental water flows and agricultural productivity, and do not give rise to unintended consequences.
- 3.81 Issues of WUE program design, delivery and monitoring to ensure sustainability of long term objectives are considered in the following chapter.

4. Reviewing program design, delivery and administration

- 4.1 The evidence received to this inquiry indicates the complexity and interdependence of water systems – adjustments to water allocation, water returns, water pricing and water productivity can have a range of dynamic and both positive and negative impacts. Further, it is essential that water use efficiency (WUE) programs and Government intervention do not skew commercial market decisions, but rather establish a pathway towards long-term balanced sustainability for the environment, the irrigated agricultural sector, and regional communities.
- 4.2 The suite of Australian Government funded WUE programs is extensive and represents a significant ongoing investment. There are a number of reviews underway to assess some of the regional water plans in place and to assess the operation of the National Water Initiative.
- 4.3 The focus of this inquiry is on how Government program investment is best provided to achieve the balance of long-term goals i.e. achieving adequate and sustainable water levels for the environment through the implementation of efficient agricultural irrigation methods. In addition, there is the expectation that WUE programs will assist in building a productive and financially independent irrigated agriculture sector which is resilient and adaptable to fluctuating weather patterns.
- 4.4 This chapter outlines evidence the Committee has received in relation to the efficacy of WUE programs in meeting these objectives, with particular regard to:
 - program design and alignment with national water objectives, and
 - program administration, monitoring and evaluation.

Program design and water objectives

4.5 Evidence from Federal and State Governments expressed the view that WUE programs are generally effective, and highlighted the effort governments go to in order to ensure the efficacy of programs, particularly in regards to designing programs to meet national water policy objectives.

4.6 The Department of Agriculture and Water Resources (DAWR) noted that data from completed on-farm WUE programs such as the On-farm Irrigation Efficiency Program (OFIEP) indicates that they have had a positive impact:

Data from over 1,000 individual projects funded through OFIEP indicates that on-farm water use efficiency is expected to increase by an average of 18 per cent, based on the annual average volume of water used before project works were undertaken compared with the volume that would be required following infrastructure works.¹

4.7 DAWR pointed to a range of specific positive outcomes the program has generated:

Irrigators are evidencing increases to water use efficiency through a variety of outcomes including producing the same output with less water, through flexibility in the type of crop they are able to produce and/or through the quality of the produce grown. Infrastructure investments are also delivering tangible benefits at the farm gate beyond water use efficiency, such as increased ability for crop rotation, increasing crop diversification and improved soil management.²

4.8 The South Australian Government submission argued that the level of interest from market participants is a good way to measure the adequacy of WUE program design:

A key piece of evidence that demonstrates the adequacy and efficacy of current funding programmes is the level of demand from proponents. Ultimately, the best judges of the merit of a programme will be the market participants themselves. If businesses see it as a good deal, then they will participate.³

¹ Department of Agriculture and Water Resources, *Submission 18*, p. 9.

² Department of Agriculture and Water Resources, *Submission 18*, p. 9.

³ Government of South Australia, *Submission 39*, p. 5.

4.9 The submission went on to note that demand for WUE programs has been and continues to be strong in South Australia, which it argues is a positive signal:

On-farm efficiency funding programmes have received a strong level of interest in South Australia to date:

- Private Irrigation Infrastructure Program – SA (PIIP-SA) provided grants to a total value of \$14.4 million for 28 projects. These projects delivered over 3 GL of water entitlements to the environment.
- On-farm Irrigation Efficiency Program (OFIEP) invested \$60.4 million in 362 projects. In aggregate, these projects delivered 17.3 GL of water to the environment.
- SARMS Industry Improvement Programme (3IP) is committed to investing \$240 million for 40 GL of water entitlements for the environment. Around \$177 million has been committed to over 180 projects so far. Existing projects have already recovered around 35 GL in water entitlements for the environment.
- While the COFFIE pilot programme only commenced in September 2016, the revised programme design has been well received by the irrigation community with over 50 expressions of interest received to date. Significantly, a number of these expressions of interests have been received from potential proponents in other Basin states.⁴

4.10 The South Australian Government submission also drew the Committee’s attention to post-implementation assessments of WUE programs which are showing positive outcomes:

Case studies of on-farm efficiency projects show that participating agribusinesses are now benefiting from greater productivity, crop diversification and quality. Many agribusinesses now have increased flexibility and resilience, which will enable them to adapt more easily to future climate change and market conditions. Improved irrigation efficiency has also led to land management benefits, such as reduced water logging and improved salinity management.⁵

Box 4.1 Barossa Infrastructure, South Australia

On 23 August 2017 the Committee travelled to the Barossa Valley in South Australia. The Committee met with Barossa Infrastructure (BI), a private

⁴ Government of South Australia, *Submission 39*, p. 5.

⁵ Government of South Australia, *Submission 39*, p. 7.

irrigation company which supplies water sourced from the Murray River to vineyards across the Barossa. Committee members were briefed on the history of the BI irrigation system, which was constructed in the late 1990s.

The visit highlighted the benefits that can be derived from an open water trading market. Uniquely among those seen by the Committee during this inquiry, the Barossa Infrastructure irrigation scheme was funded and built privately, without any substantial government investment.

Prior to the system's construction, BI's customers relied on groundwater to irrigate their grapes. As that groundwater depleted and became more saline, irrigators in the area came together to build a pressurised irrigation system. BI was able to purchase additional water entitlements from the Murray River to make use of the system.

Access to additional water provided economic security for Barossa Valley winemakers and enabled BI to construct nearly 200 kilometres of irrigation pipelines over a 450 square kilometre distribution area, including four pumping stations. The BI network represents a substantial achievement.

- 4.11 The New South Wales Department of Primary Industries (NSW-DPI) submission pointed out that improvements in WUE have the potential to deliver large economic benefits to the state:

It has been estimated that increasing the water productivity of NSW rain-fed and irrigated agriculture by 2% by 2020 could contribute up to \$226 million annually to the NSW economy. The majority of this increase would be due to productivity gains resulting from improvements in water use efficiency and adoption of best management practices.⁶

- 4.12 The DAWR submission highlighted evidence of socio-economic benefits for irrigation operators arising from WUE programs:

In addition, there is early evidence that infrastructure modernisation programmes are having positive socio-economic outcomes for farmers who participate. Lifestyle benefits and labour savings reported by irrigators include:

⁶ New South Wales Department of Primary Industries, *Submission 28*, p. 4.

- remote system operation eliminating the need to get up at night to manually manage watering
- the ability to take advantage of night time off-peak electricity rates
- reduction in maintenance requirements
- increased labour efficiency.⁷

4.13 In addition, the South Australian Government submission highlighted the broad economic benefits WUE programs can have, pointing out that they benefit more than irrigators alone:

The benefits of water efficiency investment are accrued by more than just individual irrigators ... Many funding recipients are making it a priority to engage local firms to assist with their redevelopment and local suppliers and construction firms are seeing the benefits. This in turn is creating increased demand in other sectors, such as retail and hospitality.⁸

4.14 DAWR argued that WUE program design prioritises value for money for the Australian taxpayer:

Value for money is a core principle that underpins Australian Government investment in water programmes. Funding under these programmes is provided in accordance with the Public Governance, Performance and Accountability Act 2013 that requires public monies to be used in an effective, efficient, economical and ethical manner.⁹

4.15 The Department submission described its program delivery structure, noting firstly that programs may be delivered through State Governments:

Funding is provided through a range of delivery models, including through States as part of the Intergovernmental Agreement on Murray-Darling Basin Reform 2008 and the Intergovernmental Agreement on Implementing Water Reform in the Murray Darling Basin 2013.¹⁰

4.16 The submission noted that WUE funding provided to State Governments comes with the requirement to meet pre-determined performance standards to ensure program goals are met:

Funding to State governments is provided in accordance with Federal Financial Relations arrangements which aim to support the delivery of

⁷ Department of Agriculture and Water Resources, *Submission 18*, p. 10.

⁸ Government of South Australia, *Submission 39*, p. 2.

⁹ Department of Agriculture and Water Resources, *Submission 18*, p. 17.

¹⁰ Department of Agriculture and Water Resources, *Submission 18*, p. 17.

specified outputs or projects. This is achieved through the requirement for States to meet pre-determined projects milestones or performance benchmarks before an associated payment is provided by the Australian Government.¹¹

Program administration, delivery and evaluation

4.17 The Department and governments argued the strength of WUE programs and their sound processes for administration and evaluation, and this view was generally supported by irrigators, agricultural groups, irrigation infrastructure operators (IIOs) and WUE program delivery partners. However there was also significant evidence that suggested further improvements could be made, particularly with regard to some administrative processes and monitoring/evaluating impacts.

4.18 DAWR noted that it funds some projects directly, with responsibility for delivery spread across a range of bodies:

... the Australian Government also runs its own programmes which are delivered through a wide range of project partners including irrigation infrastructure operators, irrigation industry associations, industry commodity bodies, individual irrigators, catchment management (resource management) authorities and local governments.¹²

4.19 The South Australian Government argued that the delivery model adopted by governments has been one of its best attributes:

A key strength of programmes such as PIIP-SA, OFIEP and COFFIE has been the delivery partner model which has enabled regional staff to act as an effective conduit between the Commonwealth and irrigation community. The ability for regional staff to assist proponents through all stages of the project has contributed to administrative efficiencies. Regional staff have also received positive feedback from proponents about the simplicity of the application process associated with these programmes.¹³

4.20 DAWR argued that the assessment and validation processes applied to project applications are robust and successful:

Applications submitted by State governments or proponents under Australian Government water programmes are assessed in accordance with programme guidelines that align Australian Government objectives and anticipated

¹¹ Department of Agriculture and Water Resources, *Submission 18*, p. 17.

¹² Department of Agriculture and Water Resources, *Submission 18*, p. 17.

¹³ South Australian Government, *Submission 39*, p. 8.

programme outcomes. Applications are subject to robust due diligence processes that may include technical input from other Australian Government agencies, such as modelling advice from the MDBA, and private consultants.¹⁴

- 4.21 In addition, the Department argued that its use of best-practice project management processes has helped to ensure that WUE programs are well administered:

At the project level, the department oversees the delivery of projects through established project management processes. Proponents that receive Australian Government funding must meet reporting requirements outlined in project agreements, including in many instances, reporting on potential ways to improve the delivery of the project. These lessons are captured by the department and are used to inform the design and delivery of subsequent programmes.¹⁵

- 4.22 Further, the Department argued that it has processes in place to monitor project implementation and incorporate lessons learned into future project design and delivery:

The department recognises the importance of continuous improvement and monitors programme delivery to identify and implement improvements to the design, methodology and administration of its programmes ... The department has Monitoring, Evaluation, Review and Improvement frameworks in place for all its programs including those that support the Basin Plan. The monitoring and evaluation in place for SRWUIP supports the objectives of the program and includes monthly reporting on water entitlements, collection of program information and statistics and case studies. It also includes opportunities to apply lessons learnt in previous grant rounds or programs.¹⁶

- 4.23 DAWR also argued that the Commonwealth On-farm Further Irrigation Efficiency (COFFIE) program, which was in the pilot project phase at the time the Department's submission was prepared, has benefited from this improvement process:

As part of the design of COFFIE, the department has sought feedback from industry and participants in earlier programmes. Specific feedback was sought on the elements of previous programmes that had worked well, as well as those elements that could be improved in managing and undertaking projects.

¹⁴ Department of Agriculture and Water Resources, *Submission 18*, p. 17.

¹⁵ Department of Agriculture and Water Resources, *Submission 18*, p. 17.

¹⁶ Department of Agriculture and Water Resources, *Submission 18*, p. 18.

This feedback has been tested with Australian and State government officers and incorporated into the design of COFFIE.¹⁷

- 4.24 The Department noted that the COFFIE program design process involved substantial stakeholder feedback, which it argued was then taken into account to good effect at the pilot phase:

The department released the draft design of COFFIE for public consultation and received 12 submissions and held 30 meetings with a range of stakeholders. Stakeholders at a number of these meetings noted that their previous feedback had been incorporated into the design of COFFIE and considered it to be an improvement on previous programmes. The department has subsequently initiated a pilot programme in South Australia, with initial feedback from participants indicating that the programme design is far more appealing and user friendly.¹⁸

- 4.25 One of the most frequently noted problems was the substantial delays program participants faced in securing government approval of proposed projects. The Ricegrowers' Association of Australia (RGA), for example, noted that:

Most rounds of the OFIEP experienced a significant delay between the participants' submitting the expressions of interests to the Commonwealth, and the Commonwealth approving the projects and funding (up to and longer than 12 months). This time-lag was particularly problematic for participants as the project budget (including both the value of water and project costs) was 'locked-in' at the expression of interest stage and could not be reviewed at time of contract signing. Hence participants were exposed to cost increases incurred during this period. This lead[sic] to many participants either significantly over-spending or otherwise withdrawing their projects.¹⁹

- 4.26 The South Australian Government submission likewise noted that the long delays in some programs have caused problems for participants:

... a key limitation of OFIEP has been the long, drawn out timeframes between submission of an initial expression of interest and execution of a formal agreement. This process has taken up to 18 months and industry

¹⁷ Department of Agriculture and Water Resources, *Submission 18*, p. 18.

¹⁸ Department of Agriculture and Water Resources, *Submission 18*, p. 18.

¹⁹ Ricegrowers' Association of Australia, *Submission 21*, p. 5.

circumstances, such as water prices and commodity prices, can change quite significantly during this time period.²⁰

- 4.27 Its submission goes on to note that the Australian Government's decision to recover water at prices determined using a volume-weighted average price (a measure of the average price at which water is valued over a given time) caused concern:

Use of a Volume Weighted Average Price was also cited as a concern for many stakeholders and considered to undervalue water access entitlements. This issue, in addition to the lengthy approval time, significantly impacted on participation in later rounds of OFIEP in South Australia.²¹

- 4.28 The South Australian Government noted, however, that its feedback on these problems was taken into account by DAWR in the design of subsequent programs, and reported that many of the 'limitations' of the OFIEP have been addressed in the program design for COFFIE, which is in its pilot phase at present.²²

- 4.29 The National Farmers' Federation (NFF) argued that WUE programs were a better way to recover water for the environment than the direct purchase of water entitlements (or 'buybacks') from irrigators:

...investment in WUE for both on-farm and off-farm distribution systems has provided the least-worst outcome for recovering water to implement the Murray-Darling Basin Plan. For this reason, the sector has been a very active participant in past efficiency programs, both as farmer participants, and as delivery partners with the Commonwealth.²³

- 4.30 However, the NFF argued that much of the 'low-hanging fruit' of WUE has been taken by the earlier rounds of WUE programs, and that irrigators will have a much lower appetite for future programs. It pointed to the following factors limiting irrigator involvement:

- temporary water prices are higher, which can make a capital investment in WUE technology uneconomical

²⁰ South Australian Government, *Submission 39*, p. 8.

²¹ South Australian Government, *Submission 39*, p. 8.

²² South Australian Government, *Submission 39*, p. 8.

²³ National Farmers' Federation, *Submission 34*, p. 12.

- energy prices have increased dramatically, and since more efficient irrigation systems generally consume more energy, they cost more to operate
- water prices are higher, making irrigators more reluctant to sell an appreciating asset
- irrigators have generally been profitable in recent years, increasing the likelihood that they will self-fund WUE improvements.²⁴

4.31 The NFF argued that to be successful, future WUE programs should

- include smaller irrigators by lowering the minimum volume requirement of water that can be recovered
- broaden the types of water entitlements that can be recovered, and
- minimise the administrative demands placed on WUE program participants.²⁵

4.32 A number of submissions drew the Committee's attention to the requirement for program delivery partners to determine their administrative costs when applying for project funding, before actual administration costs can be determined. For example, the RGA submission said:

Delivery Partners are required to determine their administration cost at the expression of interest stage of the program. The total administration cost a Delivery Partners can claim is up to 8% of the value of the project delivered ... the actual administration funding received is determined by both the number of projects approved and the value of those projects.

However at the expression of interest stage, the Delivery Partner cannot determine which of the proposed projects will receive funding from the Commonwealth. This means it is very difficult to determine whether or not the administration fee received will adequately compensate the Delivery Partner for the cost of delivery the program.²⁶

4.33 The RGA therefore suggested that the Government should change the way it reimburses administrative costs:

It is therefore suggested that the Commonwealth investigate opportunities to limit the impact of the value of the projects on the total administration funding received by the delivery partner. One option for consideration is to provide the delivery partners with a base (start-up) administration fee and then pay

²⁴ National Farmers' Federation, *Submission 34*, pp. 15-16.

²⁵ National Farmers' Federation, *Submission 34*, p. 17.

²⁶ Ricegrowers' Association of Australia, *Submission 21*, p. 7.

the delivery partner on a project basis, rather than a flat percentage of the total funding received.²⁷

- 4.34 Murrumbidgee Irrigation (MI), an IIO that serves the Murrumbidgee Irrigation Area in southern NSW, noted that its experience with WUE programs had been positive overall. It highlighted the expertise and continuity of program staff as a particular benefit, arguing that this made it easier to adjust program scope as needed throughout the project's implementation period. MI noted, however, that the 'policy-constrained timelines' of WUE programs were a concern:

Our current program of works is complex and integrated requiring significant effort and construction hours. Being driven by a political deadline (June 2019) adds cost risk and increases customer impacts. For example, this year we have extended our usual winter maintenance period from 6 to 11 weeks in order to upgrade all the regulating structures on our Main Canal. The works cannot be done 'in-season' because dry site access is required. Additionally the works cannot be staged over several winter maintenance periods because of the significant program of works that must be completed by June 2019.²⁸

- 4.35 Mr Lindsay Krieg from Central Downs Irrigators Ltd was similarly positive on WUE programs overall, but told the Committee at its public hearing in Toowoomba that constrained program timelines can limit uptake:

Not everybody is going to have the money this year. Not everyone has a good year this year. It may take five or 10 years for somebody to have the opportunity to utilise that offer. Having it one budget process is probably not enough. It is probably something that needs to be longer term, particularly in agriculture with our ups and downs in production.²⁹

- 4.36 In the same vein, Mr Steven Carolan from Namoi Water told the Committee at its Narrabri hearing that his personal experience as a participant in WUE programs had been positive, but that inflexible deadlines can be unhelpful for irrigators:

Being able to have a longer time frame to complete projects would facilitate larger projects being started. The reality is that moving dirt is complex, and if

²⁷ Ricegrowers' Association of Australia, *Submission 21*, p. 7.

²⁸ Murrumbidgee Irrigation, *Submission 37*, p. 2.

²⁹ Mr Lindsay Krieg, *Committee Hansard*, 5 April 2017, p. 23.

weather conditions are adverse then the time frame for doing so can blow out significantly.³⁰

- 4.37 The RGA noted that the administrative burden of participating in WUE programs could at times be too high:

There is a real risk of micro-management of the delivery partner by the Commonwealth, rather than being prepared to contract an outcome (evidenced by processes such as the technical review of projects, the payment processes, the delivery partner audits etc.). It is suggested that the Commonwealth should investigate opportunities to reduce the reporting/administration demands placed on delivery partners, and to provide more guidance regarding the administration costs that can be claimed, and the process of claiming these costs.³¹

- 4.38 Barossa Infrastructure Ltd also argued for a less 'exhaustive' administrative burden, but noted that the staff administering WUE programs had made the process easier to navigate:

What has been the best part of the administration has been the strong support from the agency staff and their support in completion of all necessary documentation. However, the tender process has been exhaustive and is likely to exclude worthy projects. The very nature of it being competitive discourages cooperation and isolates the grower/operator from the technical support from agencies during the project development phase.³²

- 4.39 Netafim Australia cited research indicating that many irrigators were unaware of the water savings that can be achieved by adopting drip irrigation technologies. It therefore argued that WUE programs should include an education component to address this problem:

Given that significant funds are provided to farmers by Governments for on-farm irrigation development, if farmers are not fully aware of the benefits of alternative irrigation technologies that might be applied to their properties using on-farm support funds, the economic and other outcomes of the use of the funds may not be optimal. ... Netafim accordingly wishes to bring it to the attention of the inquiry that there could be justification for some form of education resourcing as part of the process of providing on-farm funds that support decision-making by farmers on the alternative irrigation technologies

³⁰ Mr Steven Carolan, *Committee Hansard*, 6 April 2017, p. 2.

³¹ Ricegrowers' Association of Australia, *Submission 21*, pp. 7-8.

³² Barossa Infrastructure Ltd, *Submission 49*, p. 5.

that are available, and the most appropriate selection of technology for their on-farm irrigation development.³³

- 4.40 A number of submissions noted that rising water prices are making WUE programs less attractive to irrigators, as participation would require them to relinquish what is an appreciating asset. To address this problem, the Goulburn-Broken Catchment Management Authority argued that WUE programs should not require participants to surrender any water entitlement:

There is evidence that irrigators in the GMID are increasingly concerned about the impact of reducing their volume of Victorian High Reliability Water Shares through being involved with a FWP project (a minimum of 55 % of agreed water savings are to be transferred as part of the offer under the FWP for Round 5, and this has ranged from 50-60% depending on what was negotiated for each Round). Some irrigators have decided that the value of the water is greater than the benefits and have decided not to submit or proceed with projects ...

To offset negative impacts from the Basin Plan ... a modification of the water use efficiency program is strongly recommended. The new program would provide funding to improve farm irrigation water use and allow the irrigator to retain all of the water savings on the farm.³⁴

- 4.41 In its submission, Cotton Australia noted the impact high energy prices could have on the adoption of more water efficient irrigation technologies. As a consequence, it recommended that the scope of WUE programs be expanded to take this into account:

The scope should include funding of energy efficiency or generation capacity as a way of helping irrigators manage the WUE/Energy nexus. In some case WUE achievement comes at the cost of needing to pressurise water. Increasing energy costs have in some cases completely negated the WUE gains. This is a matter that needs to be addressed urgently.³⁵

- 4.42 The National Irrigators' Council noted that under the Murray-Darling Basin Plan water recovered for the environment must be socio-economically neutral, as per section 7.17(2) of the Plan:

³³ Netafim Australia, *Submission 6*, pp. 5-6.

³⁴ Goulburn-Broken Catchment Management Authority, *Submission 8*, p. 9.

³⁵ Cotton Australia, *Submission 24*, p. 11.

(b) The efficiency contributions to the proposed adjustments achieve neutral or improved socio-economic outcomes compared with the outcomes under benchmark conditions of development as evidenced by:

(i) the participation of consumptive water users in projects that recover water through works to improve irrigation water use efficiency on their farms; or

(ia) the participation of consumptive water users in projects that recover water through works to improve water use efficiency off-farm; or

(ii) alternative arrangements proposed by a Basin State, assessed by that State as achieving water recovery with neutral or improved socio-economic outcomes.³⁶

4.43 The Council argued that this test is inadequate as it does not take community impacts into account. It therefore recommended that the test should be amended:

[T]he socio-economic impact test must be improved for the efficiency projects as part of any spending on achieving 450 GL 'up-water' ... this test is completely inadequate being effectively a 'single person' test rather than a community impact test. In effect an individual's willingness to accept the money is the only community impact test this involves.³⁷

4.44 Finally, the RGA noted that the level of Government spending on WUE programs has at times inflated the cost of works by distorting markets in irrigation areas:

the program resulted in inflated supplier/contractor costs for participants. This is due to there being a very large increase in the demand for irrigation products and services at the time when participants were required to undertake the individual projects. Hence suppliers/contractors were able to take advantage of this increase in demand by increasing prices. Hence the cost of the on-farm works significantly increased at the time of undertaking the works.³⁸

³⁶ National Irrigators' Council, *Submission 13*, p. 20.

³⁷ National Irrigators' Council, *Submission 13*, p. 20.

³⁸ Ricegrowers' Association of Australia, *Submission 21*, p. 6.

Committee comment

- 4.45 The Committee notes the range of evidence received regarding the efficacy of WUE programs. In general, evidence confirmed that programs were broadly effective in meeting national water objectives and the alignment between program design and policy objectives was generally sound. However, the Committee observes that the primary financial beneficiaries of WUE are irrigators, and the achievement of WUE programs must be considered across environmental and agricultural objectives.
- 4.46 The focus of this inquiry has not been to assess individual WUE programs or to assess their contribution to the different components of the NWI. The Committee notes the comprehensive work of the Productivity Commission Review of the NWI, which released its draft report in September 2017 and is due to provide its final report to Government on 31 December 2017.
- 4.47 Evidence that the Committee received to this inquiry focussed on aspects of the Australian Government's WUE program administration, delivery and monitoring. The Committee is satisfied that WUE programs are robust in their design and that their administration and delivery is generally efficient and effective. However, some issues were raised in regards to:
- delays following submission of expressions of interest,
 - program delivery partners determining administration costs,
 - impediments for smaller irrigators, and
 - constrained program timelines.
- 4.48 In addition, and noting concerns regarding environmental water flows that were discussed in Chapter 2, the Committee is concerned to ensure that the appropriate priority is placed on environmental water and accordingly that there is suitable baseline and ongoing environmental water monitoring. To ensure accountability to the primary policy objective of sustainable environmental water levels, the Committee recommends that, at the commencement of each program's funding, baseline and then ongoing measuring of regional ground or surface water systems is undertaken to determine impacts of changed water practices resulting from WUE funded projects.
- 4.49 Further, the end objective must be the long-term completion of WUE programs, and the achievement of ongoing efficient irrigation methods which operate independently, without government assistance and which are sustainable through fluctuating weather patterns.

4.50 The Committee has some concerns that appropriate end of life cycle consideration is being designed into programs, and notes the need to ensure that programs are building resilience – not reliance – into the future. Given the range and scope of various WUE programs, the Committee sees value in reviewing existing Australian Government funded programs to ensure alignment with key principles and outcomes, and to address administrative concerns raised by submitters.

Recommendation 1

4.51 The Committee recommends that the Department of Agriculture and Water Resources conduct an internal review of water use efficiency (WUE) programs to address the following issues:

- **minimising delays following submission of expressions of interest to securing agreement and approvals,**
- **assisting program delivery partners to determine administrative costs and consider mechanisms to reduce up-front costs borne by those delivering programs,**
- **reducing impediments for smaller irrigators to participate in programs,**
- **providing mechanisms for irrigators to apply for an extension to program timelines, given the impact of weather and other uncertainties,**
- **undertaking baseline measuring of regional ground or surface water systems at the commencement of each program, and then ongoing measuring to determine impacts of changed water practices resulting from WUE funded projects,**
- **ensuring that the assessment process includes consideration of the project life cycle contribution to the financial independence and long-term resilience of the irrigated agriculture sector, and does not skew market crop decisions or create reliance, and**
- **ensuring defined regular evaluation points to monitor and assess achievement against a long term objective of financial independence for the irrigated agricultural sector.**

The Department should provide the results of this review to this Committee no later than 1 June 2018.

- 4.52 The Productivity Commission has reviewed the policy and program framework of the NWI and is due to release its final report. Further to this, the Committee has recommended above that the Department review existing Australian Government WUE programs to address administration concerns, undertake baseline and ongoing monitoring of water impacts, and ensure proper lifecycle planning.
- 4.53 In addition, given the scale of Australian Government expenditure, the Committee considers that detailed external performance scrutiny of WUE programs is warranted. This would provide the public, the Department and the Australian Government with further reassurance regarding the overall efficacy of its WUE programs. While recognising the independence of the Auditor-General in determining audit priorities for any year, the Committee recommends that the Auditor-General give consideration to conducting a performance audit of WUE programs in 2018.

Recommendation 2

- 4.54 **The Committee recommends that the Auditor-General consider conducting a performance audit of Australian Government funded water use efficiency programs to assess the design process, evaluation arrangements, and effective and efficient administration of these programs. The Committee recommends that the audit take place in 2018.**
- 4.55 The Productivity Commission's 2017 draft report for its review of the NWI makes 24 recommendations and 14 findings. The Committee notes that a number of the Productivity Commission's draft recommendations propose adjustments to Australian, State, and Territory government programs to improve alignment to national water objectives. The Committee notes its support for the ongoing review process and, in particular, for the Productivity Commission's draft recommendation for further progressing reform:

Productivity Commission Draft Recommendation 9.1

Australian, State and Territory Governments should recommit to a renewed National Water Initiative through COAG by 2020. This should:

- a. maintain the achievements in water entitlements and planning, water markets, water accounting, water pricing and governance, knowledge and

capacity building, and community engagement delivered by the current National Water Initiative as the key foundations underpinning sustainable water resource management and efficient infrastructure service delivery

b. revise a number of policy settings:

- incorporating extractive industries and alternative water sources into water entitlement frameworks
- water planning to take account of climate change and enable ongoing optimisation
- Indigenous access to water for economic purposes
- arrangements for water trading between irrigation and urban sectors
- better targeted adjustment assistance

c. significantly enhance policy settings relating to:

- urban water management to ensure innovative and efficient provision of services in the future under the combined pressures of population growth and climate change
- environmental water management to ensure maximum return on government investment in this area
- decision making on building and supporting new infrastructure for agriculture.³⁹

4.56 The Committee urges the Australian Government to give close consideration to these future steps.

4.57 The Productivity Commission also makes draft recommendations in relation to environment water management, infrastructure funding, and community structural adjustment. The Committee notes that submitters to this inquiry raised similar concerns. Further concerns were also raised regarding the limitation of WUE in relation to the promotion of water efficient irrigation technologies, the prohibitive cost of energy and its impact on the implementation of irrigation technologies, and managing community social and economic health through this transition. These issues are considered by the Committee later in the report.

4.58 The Committee considers the scope of the Productivity Commission draft findings and recommendations to be positive. National policy coordination and monitoring, and the rebalancing of initiatives should be a dynamic and

³⁹ Productivity Commission, *National Water Reform*, Draft Report, Canberra, September 2017, p. 37.

continual process, given the complexity of water objectives and the multitude of factors at play. Regular reviews and adjustments are vital processes guiding new practices and achieving lasting change.

4.59 However, the Committee also notes that policy and program adjustments can give rise to uncertainty, particularly in the contested area of water policy where they can affect livelihoods and influence commercial decisions with long-term consequences. Accordingly, the Committee urges the Australian Government to act expeditiously in response to the Productivity Commission's final report to ensure that:

- the final report is promptly made available for public release,
- the recommendations are considered and an Australian Government response is made public by 31 March 2018, and
- recommendations requiring national agreement are considered by COAG at its first meeting of 2018.

Recommendation 3

4.60 The Committee recommends that the Australian Government act expeditiously in response to the final report of the Productivity Commission's Review of the National Water Initiative (due to be provided to Government by 31 December 2017) and ensure that:

- **the final report is promptly made available for public release,**
- **the recommendations are considered and an Australian Government response is made public by 31 March 2018, and**
- **recommendations requiring national agreement are considered by COAG at its first meeting of 2018.**

5. Improving environmental flows and irrigation efficiencies

- 5.1 Previous chapters have discussed the effectiveness of the approach of Water Use efficiency (WUE) programs to increase water productivity and drive changed irrigation practices. The efficacy of the administration of WUE programs has also been examined. This chapter considers how further gains for the environment and improvements for water efficiencies may be achieved.
- 5.2 Critical to the long term achievement of WUE programs is sustainable levels of environmental water flows, and in-ground and river water health. WUE programs target how water is used and the quantity of water used for irrigation, in order to maintain or increase levels of water available to the environment.
- 5.3 Improving water levels for the environment and the productivity of that environmental water is a vital objective. However, in the context of this inquiry, the Committee is mindful that consideration of environmental flows is broader than the focus of this inquiry on WUE programs in the irrigated agriculture sector. At the time of referring the inquiry, the Minister for Agriculture and Resources, the Hon. Barnaby Joyce MP, noted that the House of Representatives Standing Committee on Environment and Energy would be conducting an inquiry into the management of Commonwealth environmental water resources and therefore the Minister suggested that this Committee ‘may wish to limit its consideration of environmental flows in order to avoid duplication’.
- 5.4 Accordingly, the first section of this chapter provides a summary review of evidence received regarding environmental flows and complementary measures, and also notes concurrent work being conducted in this field.

- 5.5 The second part of this chapter considers how further improvements to WUE can be driven in the agricultural sector through ongoing research and addressing impediments to implementation, such as energy pricing and improved meteorological forecasting.

Improving environmental flows and river health

- 5.6 In addition to promoting agricultural water productivity through WUE programs, improvements to environmental outcomes can also be sought through making better use of this water. The range of activities to improve environmental water productivity is referred to as ‘complementary measures’. This section explains how these complementary measures form part of the Australian Government’s water use efficiency framework.
- 5.7 DAWR defined ‘complementary measures’ as ‘a wide range of non-flow related measures that are focused on delivering environmental outcomes’ and gave examples such as ‘the installation of fishways, fish diversion screens, release of the carp herpes virus, works to address cold water pollution and riparian management activities and habitat restoration’.¹
- 5.8 The Sustainable Rural Water Use and Infrastructure Program (SRWUIP) provides funding for several environmental programs, including the installation of low flow devices, salinity management, water level management and riverine management.²
- 5.9 More broadly, DAWR noted that the Murray-Darling Basin Authority (MDBA) has an Environmental Watering Plan for the Basin:

The plan is an environmental management framework that sets out key components of environmental watering management, and principles and methods to be applied in environmental watering. Environmental watering is coordinated to achieve the maximum benefit through Southern Connected Environmental Watering Committee (SCBEWC), an organisation of state and Commonwealth bodies with interests in environmental watering.

We note that supply measure projects under the Sustainable Diversion Limit Adjustment Mechanism (SDLAM) will enable more efficient use of environmental water to reduce water recovery from consumptive purposes while achieving equivalent environmental outcomes. Supply measures may include environmental works such as installation of levee banks, changes in river operations and evaporative savings through storage systems. More

¹ Department of Agriculture and Water Resources, *Submission 18.2*, p. 7.

² Department of Agriculture and Water Resources, *Submission 18.2*, p. 6.

efficient use of environmental water allows for higher sustainable diversion limits and hence a reduction in the environmental water recovery target.³

5.10 As DAWR explained, there is ongoing commitment at an intergovernmental level to facilitating these measures:

Murray-Darling Basin water ministers have agreed that complementary measures can provide real environmental benefits and have sought advice from officials on how to better embed complementary measures as an element of Basin Plan implementation. Ministers are regularly updated as this work progresses. Basin water ministers have also made an in-principle commitment, subject to funding availability, to the implementation of a comprehensive suite of complementary measures and other projects (collectively known as 'toolkit' measures) that target improved water management and environmental outcomes across the northern Basin in support of the outcomes of the MDBA's Northern Basin Review.⁴

5.11 As part of the MDBA's Northern Basin Review, the MDBA developed a 'toolkit' of complementary measures intended to improve water management in the northern basin.

5.12 This toolkit will require commitments from the Australian, Queensland and New South Wales governments. The MDBA suggests that these measures will be a 'means of reducing the social and economic implications of the Basin Plan while also providing opportunities for improved water management to enhance the use of environmental water'.⁵

5.13 The aim of the toolkit measures proposed by the MDBA is to 'help achieve river health with less water'⁶ and includes:

- protection of environmental flows,
- undertaking targeted recovery of water,
- a range of event-based mechanisms (including one-off temporary water trade, options over water pumping, and store and release mechanisms),
- promoting the coordination and delivery of environmental water,
- removing constraints in the Gwydir catchment which prevent flows from reaching the Gwydir wetland, and

³ Department of Agriculture and Water Resources, *Submission 18.2*, p. 5.

⁴ Department of Agriculture and Water Resources, *Submission 18.2*, p. 7.

⁵ Murray-Darling Basin Authority, *The Northern Basin Review: Understanding the economic, social and environmental outcomes from water recovery in the northern basin*, November 2016, p. 2.

⁶ Murray-Darling Basin Authority, *The Northern Basin Review: Understanding the economic, social and environmental outcomes from water recovery in the northern basin*, November 2016, p. 4.

- targeting environmental works and measures to promote fish movement and habitat in the northern basin, including construction of fishways and control of cold water pollution.⁷
- 5.14 Irrigator groups in particular argued that complementary measures, and more broadly the more efficient use of water allocated for environmental use, should remain a high priority for governments.
- 5.15 The National Irrigators' Council (NIC) advocated for increased attention to non-flow efficiency measures, including carp control, management of cold water pollution, improved fish migration measures and increased capacity for the Commonwealth Environmental Water Holder (CEWH) to trade water. The NIC argued that the implementation of such measures:
- ... to achieve environmental outcomes (rather than the recovery of more water entitlement) and proper measurement of long term environmental outcomes, is critical to the sustainability of communities throughout the Murray-Darling Basin. This will optimise every opportunity to deliver real environmental outcomes.⁸
- 5.16 Cotton Australia, for instance, argued that 'much more can be done for the river environment by adopting other measures than simply water acquisition', and suggested that complementary measures 'would leverage significant environmental outcomes without the need for further water acquisitions'.⁹
- 5.17 Therefore, Cotton Australia argued that the focus should be 'on the implementation of complementary measures rather than further water recovery'.¹⁰
- 5.18 Cotton Australia suggested the following complementary measures:
- 'mitigating the effect of cold water pollution from headwater storages, improving fish passage, controlling feral animals in riparian and wetland areas, removing carp from our waterways, and properly managing significant wetlands'.¹¹

⁷ Murray-Darling Basin Authority, *The Northern Basin Review: Understanding the economic, social and environmental outcomes from water recovery in the northern basin*, November 2016, p. 52.

⁸ National Irrigators' Council, *Submission 13*, p. 26.

⁹ Cotton Australia, *Submission 24*, p. 9.

¹⁰ Cotton Australia, *Submission 24*, p. 10.

¹¹ Cotton Australia, *Submission 24*, p. 10.

5.19 The National Farmers' Federation (NFF) recommended that the Government 'explore to the full extent possible non-flow complementary measures' to improve outcomes from environmental water. The NFF noted the 'significant investment that has been made in procuring water entitlements for environmental water holders, and the ongoing costs associated with holding them', and argued that 'prudent and efficient management must be a focus'.¹²

5.20 The NFF went on to suggest that:

[b]etter outcomes can be achieved if 'non-flow' issues such as addressing cold water pollution and fish passage, controlling feral animals in key wetland and floodplain areas, and tackling carp infestations. Improving land management in valued ecosystems is also important.¹³

5.21 The NFF criticised the proposed MDBA toolkit of complementary measures as 'narrow in focus', and noted that 'realistic alternatives to achieve environmental outcomes remain largely unexplored'.¹⁴ Expanding on this, Ms Knowles of the NFF stated:

There are six measures in that toolkit in total. We thought that there was potential for it to be broader to address issues like carp control and cold water pollution, particularly in something like the Gwydir River, for example. If you've ever swum downstream of Copeton Dam—I wouldn't advise it!—it's pretty cold to expect native fish to be able to breed in that environment. The Environmental Water Holder holds significant parcels of water in that system. For that to be most effective, addressing something like cold water pollution in Copeton Dam is really critical to achieving native fish outcomes in that part of the world. That's why we were somewhat disappointed with the MDBA's recommendation around the toolkit, because there was potential for it to have gone further than what it did.¹⁵

5.22 The NFF acknowledged that monitoring efficiency of water usage is still a 'relatively new endeavour for Governments, and continuous improvement has been a focus for agencies such as the Commonwealth Environmental Water Holder, and state based equivalent entities'.¹⁶

¹² National Farmers' Federation, *Submission 34*, p. 2.

¹³ National Farmers' Federation, *Submission 34*, p. 19.

¹⁴ National Farmers' Federation, *Submission 34*, p. 19.

¹⁵ Ms Jacqueline Knowles, *Committee Hansard*, 10 August 2017, p. 2.

¹⁶ National Farmers' Federation, *Submission 34*, p. 19.

5.23 However, the NFF argued, 'continued concerted effort is required to ensure that we make the most of the water that has been recovered from production for the benefit of the environment'.¹⁷

5.24 Smartrivers asserted that infrastructure projects to improve environmental water efficiency were just as important as those to support irrigation water efficiency:

The environmental water belonging to the Environmental Water Holder is just as precious as the entitlements held by irrigators. Therefore, it is not unreasonable to spend money on infrastructure that will increase the efficacy of environmental water. This could include infrastructure that enables access to private storages to store and release environmental water and mechanisms to divert environmental water to where it will have the most environmental benefit.¹⁸

5.25 Alongside irrigators, other experts drew attention to the importance of efficient management of environmental water allocations. Dr Adamson stated:

You can treat the environment exactly the same as an irrigation problem. We've got certain wetlands there that always require water, and that makes them like a perennial crop. We've got other wetlands that require a watering every now and then, so they become like an annual crop. When you understand the portfolio of entitlements you have by region, you'll work out, roughly, your water supply and the variability across different times: in droughts and in wet states. When you know what the environmental objectives are by those regions, you can work out if can we actually water these things correctly.

When you start doing this you can then start asking those lovely questions associated with trade. Can we make this system more efficient? Can we trade between the environment and farmers to get maximum benefits?¹⁹

Committee comment

5.26 The Committee supports the evidence that complementary measures to improve the efficient use of environmental water allocations are an important element in the overall management of environmental outcomes.

¹⁷ National Farmers' Federation, *Submission 34*, p. 19.

¹⁸ Smartrivers, *Submission 23*, p. 4.

¹⁹ Dr David Adamson, *Committee Hansard*, 23 August 2017, pp. 15-16.

Given the scale of government investment in water efficiency projects and purchases, the Committee considers it of the utmost importance that this water is used efficiently to achieve its purpose of maintaining the environment.

- 5.27 The Committee also notes and endorses recent work in the area by other bodies, such as the Productivity Commission and the CSIRO. The Committee draws attention to the extensive set of draft recommendations and findings in regards to environmental management made by the Productivity Commission in their September 2017 draft report, and in particular:

Productivity Commission Draft Recommendation 5.1

Australian, State and Territory Government should ensure that their policy frameworks provide for the efficient and effective use of environmental water to maximise environmental outcomes and, where possible provide additional community outcomes relating to water quality, Indigenous values, recreation and economic benefit ...²⁰

Productivity Commission Draft Recommendation 5.6

Australian, State and Territory Governments should improve monitoring, evaluation, auditing and reporting to demonstrate the benefit of allocating water to the environment, build public trust in its management, keep managers accountable and make better use of environmental water over time ...²¹

- 5.28 The Committee also notes the CSIRO report released 2 November 2017 on complementary measures.²² This report provided a scoping study on the assessment of complementary water measures in the Murray-Darling Basin. While its focus was on that region, the application is broader and it provides a valuable addition to holistic environmental water management.
- 5.29 The Committee notes the work that has been undertaken in this area, and also the further inquiry reviews that are anticipated. The Committee encourages the DAWR to take note of the evidence summarised here, and

²⁰ Productivity Commission 2017, *National Water Reform*, Draft Report, Canberra, p. 26.

²¹ Productivity Commission 2017, *National Water Reform*, Draft Report, Canberra, p. 28.

²² Murray-Darling Basin Authority, *CSIRO Complementary Measures assessment method*, <https://www.mdba.gov.au/publications/independent-reports/csiro-complementary-measures-assessment-method>, accessed 28 November 2017.

reiterates the importance of considering complementary measures in achieving long-term sustainability and productivity of environmental water.

5.30 The Committee will continue to monitor the outcomes of these reviews.

Improving the development and implementation of irrigation efficiencies

5.31 Achieving more water efficient irrigation frequently requires implementing more advanced technologies and techniques. These can include pressurised or sub-surface irrigation systems, lateral move or centre-pivot irrigation systems, or may simply involve refinements to existing irrigation techniques that will save water.

5.32 Given the unpredictable and drying Australian climate, the irrigation sector increasingly relies on producing more with less water, and the development and deployment of cutting-edge irrigation technologies is critical to that endeavour. This section will outline the evidence the Committee has received on the state of irrigation research and development, and will discuss some of the factors that can slow the adoption of more water efficient irrigation technology.

Box 5.1 Australian Cotton Research Institute, NSW

On 6 April 2017 the Committee conducted site inspections at the Australian Cotton Research Institute (ACRI) located between Narrabri and Wee Waw, NSW. ACRI is jointly operated by the New South Wales Department of Primary Industries (NSW-DPI) and the CSIRO. The Committee heard that staff at ACRI conduct research to improve cotton production in Australia through the development of advanced strains of cotton and the development of better agronomic practices.

The Committee's visit to ACRI highlighted the benefits of collaborative and integrated research, development and extension. The Committee was briefed on industry, government and academic cooperation to develop new and better strains of cotton, improve yield, water productivity, and fibre quality, and to develop and promote better technologies and agronomic practices.

Committee members heard how effective this research and development work has been for the Australian cotton industry. Australia's cotton farmers consistently achieve world-leading yields and have improved

their WUE by more than 40 per cent in the last 15 years.

Research on water efficiency technologies

5.33 DAWR told the Committee that it is satisfied with the level of research and development work being undertaken in the irrigation space. Its submission referred to the National Water Use in Agriculture Research, Development and Extension Strategy, a project developed under COAG's National Primary Industry Industries Research, Development and Extension (RD&E) Framework. The framework aims to 'encourage greater collaboration and promote continuous improvement in the investment of research, development and extension resources nationally.'²³ In relation to WUE, the strategy's aim is to:

... more effectively deliver research, development and extension outcomes for irrigated and rain fed agricultural industries seeking to maximise water productivity, adapt to decreasing water availability, and increase the capability of water managers and users to help transform the way that water is used in agriculture.²⁴

5.34 The Department argued that WUE research and development is well provided for under existing arrangements, and that there is a good degree of collaboration to ensure that innovation in the area is shared between stakeholders. Ms Mary Colreavy from the Department said:

There is a high level of cooperation already existing between relevant people from those different institutions, especially when they are focused on pieces of research that are similar or have related aspects. There are many cross-cutting committees and wards across government where we come together and share updates on where things are happening.²⁵

5.35 Mr Malcolm Thompson from DAWR noted that a key part of the Government's RD&E policy settings is that they permit irrigators and industries to set their own research agenda:

... the government's science and technology and research priorities are driven through the policies that we have through rural research, development and extension priorities, and they include soil and water ... I don't think we, certainly in the department, would feel that we are stage managing all of that

²³ Department of Agriculture and Water Resources, *Submission 18*, p. 18.

²⁴ Department of Agriculture and Water Resources, *Submission 18*, p. 19.

²⁵ Ms Mary Colreavy, *Committee Hansard*, 7 September 2017, p. 10.

research and development ... That allows the R&D corps, which are typically commodity based, as I said, to get on and have the growers and the farm sector help set their priorities.²⁶

- 5.36 Asked about the possibility of re-establishing a Cooperative Research Centre devoted to irrigation, Mr Thompson warned that it ran the risk of being lost in an already crowded field:

...a CRC would be another entity in a very wide landscape of entities that are involved. I don't think any of those other entities that I have talked to, whether it is CSIRO, the Bureau of Met or the R&D corps, would cede their authority to a new CRC ... I am not sure that it would be a decisive step in trying to coordinate them.²⁷

- 5.37 Similarly, Mr Phillip Glyde, Chief Executive of the MDBA, told the Committee that he was encouraged by the RD&E work being undertaken in the WUE field via the research and development corporation model:

The thing I have taken some comfort from is the existing research development corporation structure. That is an ongoing enduring thing, as you would probably be aware, funded in part by the government and in part by levies on the farmers—or, in this case, irrigators. I would observe that cotton RDCs and Dairy Australia—all of that structure—are looking at every possible way they can maintain their profitability and find efficiency gains ... what we can observe is there is a lot of work going into water use efficiency right through that whole enduring RDC complex. We are certainly encouraged by that.²⁸

- 5.38 The irrigation industry was also satisfied with the current level of irrigation RD&E. Industry groups noted in their submissions that the irrigation industry has worked hard in recent years to improve water use efficiencies, and continues to do so. Ms Jacqueline Knowles from the NFF explained that current gains in water efficiencies are a result of previous research and development investments made by industry and governments:

... investments that we've made in water use efficiency, whether it's about crop varieties, or farming systems, or technologies on farm, or sensors in fields, or technologies that reduce evaporation from storages—whatever it is—a lot of that has come from those past investments in CRC. The opportunity for governments to recover water through water use efficiency was really

²⁶ Mr Malcolm Thompson, *Committee Hansard*, 7 September 2017, p. 10.

²⁷ Mr Malcolm Thompson, *Committee Hansard*, 10 August 2017, p. 10.

²⁸ Mr Phillip Glyde, *Committee Hansard*, 1 June 2017, p. 5.

taking the opportunity that that R&D had created and provided. We'd like to see a continued bipartisan commitment to that rural research and development model. It's one that we cherish and that has delivered huge successes both for the ag sector and for the Australian economy more broadly.²⁹

5.39 The NFF submission noted that past and present industry investment (often in partnership with government) continues to drive improvements:

While the agriculture sector has invested significantly in recent decades to drive improved water use efficiency, the Australian industry continues to strive to better. Under the Government's Rural R&D for Profit Program, the Commonwealth, in partnership with 6 Research and Development partners and 19 farmer irrigation technology learning sites are aiming to improve the profit of 3,000 cotton, dairy, rice and sugar irrigators by \$20,000 - 40,000 per annum by improving water productivity, efficiency and farmer profitability by 10- 20% ... The project will focus on:

- Practical, reliable irrigation scheduling technologies,
- Precise, low cost automated control systems for a range of irrigation systems,
- A network of farmer managed learning sites located in major regions referred to as "optimised irrigation" farms.³⁰

Box 5.2 'Keytah' farm, NSW

On 6 April 2017 the Committee travelled to 'Keytah', a large cotton farm near Moree in NSW. The property is owned by the Sundown Pastoral Company. The Committee met with Keytah's General Farm Manager and staff from the Gwydir Valley Irrigators Association (GVIA) who facilitated the visit.

The Committee conducted inspections of Keytah's cropping operations and was briefed on WUE research conducted at Keytah between 2009 and 2016 as part of the Grower Led Irrigation System Comparison Research project led by GVIA. The project trialled various methods of growing cotton in order to determine their relative advantages and disadvantages.

The research conducted at Keytah compared traditional furrow siphon irrigation methods with more advanced bankless channel, lateral move,

²⁹ Ms Jacqueline Knowles, *Committee Hansard*, 10 August 2017, p. 4.

³⁰ National Farmers' Federation, *Submission 34*, p. 8.

and subsurface drip irrigation systems. It found that while the more advanced lateral move and drip systems could reduce labour costs and provide increased yield per hectare and per megalitre, these gains were offset by increased capital and operating costs (particularly electricity). GVIA concluded that, overall, bankless channel systems provided the best overall balance, combining WUE and yield improvements with lower labour, energy, maintenance, and capital costs.

The Keytah site inspection once again raised the issue of increased operating costs - particularly electricity costs - and highlighted some of the impediments to the adoption of more water efficient technologies.

5.40 The National Irrigators' Council also referred to the contribution that the irrigation industry makes, and has made, to gains in water use efficiency innovations:

Australian farmers have always been innovators; they have looked for solutions when faced with tough climatic conditions. Irrigators are no exception and over recent decades have overcome sometimes inefficient historical designs of irrigation districts to become more efficient. Those substantial efficiency improvements have been both Government and self-funded. Irrigators have embraced research and development and taken advantage of technological change and broadened their knowledge to improve their bottom line, while at the same time increasing their water use efficiency.³¹

5.41 Further, the cotton and rice industries noted the substantial improvements their industries have made in recent years to water use efficiency developments. Ms Rachel Kelly from the Rice Growers' Association (RGA) told the Committee that:

They [ricegrowers] are constantly striving for efficiencies in their water use on their crops. The efficiencies are generally achieved through irrigation practices but also through research and development. In particular, the rice breeding program and irrigation efficiency use is the key objective of the rice industry's R&D program. In addition to the On-farm Irrigation Efficiency Program and the PIIOP—Private Irrigation Infrastructure Operators Program—there has been much private investment in irrigation efficiency across our valleys and

³¹ National Irrigators' Council, *Submission 13*, p. 3.

for our membership. It is important that this is recognised because people are doing that off their own back.³²

- 5.42 The Cotton Australia submission stated that the industry has 'increased its WUE by 40 per cent in the decade leading up to 2012' through a combination of better technology, management expertise and improved varieties.³³ The Gwydir Valley Irrigators Association similarly highlighted cotton research conducted at the 'Keytah' property to the west of Moree in NSW which has sought to compare different cotton cropping systems to assess their strengths and weaknesses. The testing is part of the Smarter Irrigation for Profit program, which arises from National Water Use in Agriculture Research, Development and Extension Strategy.³⁴
- 5.43 While extensive research and development was noted across many sectors, some inquiry participants indicated that there are also gaps in Australia's land and water research program. Much of the research mentioned above focusses on shorter term gains and on the deployment of existing technologies.
- 5.44 Evidence to the inquiry from academic sources indicated that there are substantial gaps in our understanding of Australia's water systems, and that it is simply unknown how our current WUE policies are affecting those systems, highlighting the need for more research. Professor Edward 'Snow' Barlow from the Australian Academy of Technological Sciences and Engineering (ATSE) told the Committee that:

... from the academy's point of view, in terms of the basic hydrological system that we're playing with here—and irrigation is just one part of that hydrological system—we need to establish what are the actual impacts of irrigation water use efficiency programs on the surface and groundwater systems and the agricultural ecosystems that depend on them.³⁵

- 5.45 Likewise, Professor Lin Crase told the Committee that regulators do not measure water use sufficiently well in Australia, and that this undermines the operation of the national water market:

The simple fact is ... that, if you look at what we've done with water accounting in this country, you see we've done a very poor job of counting

³² Ms Rachel Kelly, *Committee Hansard*, 15 September 2017, p. 1.

³³ Cotton Australia, *Submission 24*, p. 3.

³⁴ Gwydir Valley Irrigators Association, *Submission 11*, pp. 8-10.

³⁵ Professor Snow Barlow, *Committee Hansard*, 24 August 2017, p. 27.

where it goes ... largely we don't account for a lot of water that leaks ... We just don't measure this thing very well.

...markets only work well to the extent that governments are able to validate the resources that are exchanged. What I'm suggesting to you is we're not doing as good a job as we might in measuring some of those resources.³⁶

- 5.46 Professor Barlow explained that information-based measurement is critical to the management of Australia's water resources, and there is room for improvement in this regard:

Where we are a bit poor at present is the infrastructure to actually do it on a basin scale to know what every stream is doing, what every irrigation channel is doing, and what the water loss characteristics and the crop uses have been. We'll get there, but that's in the big sense. So I'm saying that there are strong opportunities to use technology effectively to measure our water use and its effectiveness coming forward. It will take time, but we need to have the regulatory authorities in possession of this information ... It has to be an information-based management rather than a finger in the wind.³⁷

Box 5.3 Darling Downs, QLD

On 5 April 2017 the Committee conducted site inspections in Toowoomba, Queensland. The Darling Downs is one of Australia's leading agricultural regions, generating approximately 25 per cent of Queensland's annual agricultural production, and irrigated agriculture - primarily cotton and horticulture - is prominent in the Central Downs. Toowoomba is home to the National Centre for Engineering in Agriculture (NCEA), located at the University of Southern Queensland. Staff from the NCEA accompanied Committee members on site visits to properties in the Toowoomba region.

The Committee's inspections focused on the technology under development by NCEA staff and irrigators in the area. The Committee visited a cotton farm at Yargullen, west of Toowoomba and heard about the design and testing of centre pivot irrigation systems, field sensors, soil and crop models, and the development of autonomous irrigation systems. These kinds of technologies have the potential to greatly improve irrigation efficiency, and new data gathering and analysis tools can help inform decision-making. Smarter, more autonomous irrigation systems can provide time and labour savings of great value to irrigators, as well as

³⁶ Professor Lin Crase, *Committee Hansard*, 23 August 2017, pp. 1-2.

³⁷ Professor Snow Barlow, *Committee Hansard*, 24 August 2017, pp. 27-8.

providing opportunities for greater precision in the application of water and fertilisers.

The Committee also appreciated the opportunity to visit the NCEA campus in Toowoomba and thanks NCEA staff for taking the time to brief members on their work.

5.47 In terms of the structure of Australia's RD&E institutions, Professor Guy Roth indicated that there is a stop-start quality to Australia's research efforts that has prevented Australia from being a true world leader in WUE technologies:

... we have had a CRC that did its time and finished, and we lost momentum. Eventually we had the National Program for Sustainable Irrigation, and that finished. The Rural R&D for Profit program, the Smarter Irrigation for Profit project, finishes in the middle of next year; it may get another year, but we do not know. We always seem to be doing this, and I think there is great potential to, if we want to be, be real world leaders in this sort of technology.³⁸

5.48 Professor Roth argued that the distributed nature of the organisations contributing to Australia's irrigation research made collaboration more difficult, in spite of the participants' best efforts:

If you look at how agricultural research is done in Australia, it is largely done by departments of primary industries, or whatever they are called in each state, the CSIRO and the universities, and public organisations as well. They are fiercely independent. They do try to collaborate, but that is easier said than done.³⁹

5.49 Similarly, Professor Barlow told the Committee that:

... there are 15 commodity-based rural industry R&D corporations at present; they are all commodity-based. There was another, which was Land and Water Australia, which was disbanded probably seven or eight years ago. That had responsibility for soil and water. Soil and water are the basis of all those systems. So I think government does have a role in coordinating this ... there is a gap there that hasn't been adequately filled by the individual corporations. You can see that. The cotton guys or the beef guys would say, 'Why do we

³⁸ Professor Guy Roth, *Committee Hansard*, 6 April 2017, p. 12.

³⁹ Professor Guy Roth, *Committee Hansard*, 6 April 2017, p. 11.

need to fund all of the water research?' There needs to be someone who does that.⁴⁰

- 5.50 Professor Roth also argued that WUE research in Australia is negatively impacted by the absence of an overarching or coordinating organisation which has a longer-term focus:

There are a lot of things on the agenda with water use efficiency: the Murray-Darling Basin Plan, environmental buybacks, the irrigation modernisation programs, there used to be a national groundwater research strategy, and there used to be an urban water research strategy. But there is not the longer term. There is the national RD&E strategy, but it is not resourced long term. ... having a longer term approach to it would use government resources more efficiently.⁴¹

Committee comment

- 5.51 Ongoing improvements to irrigation efficiencies are vital – while there is scope to innovate and develop, progress should not be impeded by gaps in research or a lack of shared knowledge. The Committee was impressed by the breadth of RD&E work being undertaken across Australia and the investments being made by irrigators and industry groups. The drive to innovate was also demonstrated time and again to the Committee during its inspections around Australia. Some of the highlights of these demonstrations are described in Text Boxes through this report.
- 5.52 However, while current irrigation techniques research and innovation is substantive, the Committee notes the importance of coordinating this research and notes that there are some gaps in research areas. Demonstration and dissemination of new research technologies is also critical to drive uptake and implementation.
- 5.53 Given the vital importance of gaining water efficiencies, and the substantial investment undertaken in WUE programs, the Committee considers there is a clear role for a coordinating research body to develop technologies, drive future innovations, disseminate information and assist in the uptake and implementation of new technologies. This would provide an important longer term focus and ensure continuing water use efficiencies across the sector.

⁴⁰ Professor Snow Barlow, *Committee Hansard*, 24 August 2017, p. 31.

⁴¹ Professor Guy Roth, *Committee Hansard*, 6 April 2017, p. 10.

Recommendation 4

5.54 The Committee recommends that the Australian Government establish and provide seed funding for a coordinating Research, Development and Extension (RD&E) body to work with the agriculture sector in order to:

- **Accelerate the adoption of existing cutting-edge irrigation technologies, and**
- **Promote innovation and the development of new water efficiency technologies.**

Impediments to efficiencies

5.55 Evidence to the inquiry highlighted two issues which are currently impeding water use efficiencies. The first issue relates to electricity pricing and the prohibitive cost of accessing alternative energy sources. Farmers are obliged to make commercial decisions that will ensure the financial viability of their enterprises. At times, new irrigation technologies may deliver water savings, but the associated energy costs may be prohibitive.

5.56 The second issue relates to access to accurate meteorological long-range weather and rainfall forecasting. Accurate forecasting enables farmers to utilise water irrigation only when this is required. While most areas are well serviced, the Committee received evidence that there are gaps in some areas which severely impact farmers' capacity to irrigate efficiently.

Energy pricing

5.57 Agricultural businesses are necessarily focused on financial viability, and any increase to operating costs is rightly viewed with concern. In many instances, the operation of WUE technologies may reduce water usage and so the price paid for water, however energy operating costs may increase to levels which make the implementation of water efficient technologies uneconomic.

5.58 In relation to the adoption of WUE technologies, several submitters noted that farmers must decide whether or not to invest in upgrades based on overall business profitability. In this context, the efficient use of water is only one factor among many. As the Gwydir Valley Irrigators Association noted:

To present a balanced perspective of irrigation and water use efficiency in Australian agriculture, consideration must be given to all the production

parameters; soil, crop, and climate, the reliability of the irrigation water resource, the cost to establish infrastructure and to the resources of labour and energy, as well as the key driver for many growers, productivity or yield.⁴²

5.59 Similarly, Professor Guy Roth explained:

It is not all about water. For example there are complex interactions between water, energy, labour, nutrient use, crop agronomy, soils, salinity and the water balance that need to be better understood.⁴³

5.60 Many submitters noted that adopting more water efficient technologies involved trade-offs, primarily associated with higher energy costs. Cotton Australia called this the 'water/energy nexus':

Farmers are changing to alternative irrigation systems such as centre pivots and lateral move systems and it is expected there will be an increasing number of these machines in the future. These systems can achieve labour savings and with some soil types, water savings (about 30 percent), but have significantly higher energy costs associated with water pumping and machine operation.⁴⁴

5.61 Mr Peter Smith reiterated the difficulties of water efficiency versus energy costs:

An improvement in irrigation efficiency can often be achieved by adopting a form of pressurised irrigation. The problems are that the increased operating costs may prejudice the viability of the farm business and that the manufacture and operation of pressurised systems is more energy intensive than surface irrigation systems. The result may therefore be improved water use efficiency but decreased energy use efficiency and perhaps decreased profitability of the irrigated enterprise.⁴⁵

5.62 The NIC also noted the connection between water use efficiencies and energy, arguing that governments have failed to take rising power prices into account when designing programs:

Water efficiency in irrigation is often achieved by piping irrigation networks and pressurising delivery, ideally regulated using smart, automated control systems. Operating such systems, however, entails far higher energy usage than flood and other gravity based systems. State and federal governments

⁴² Gwydir Valley Irrigators Association, *Submission 11*, p. 5.

⁴³ Professor Guy Roth, *Submission 29*, p. 2.

⁴⁴ Cotton Australia, *Submission 24*, p. 7.

⁴⁵ Mr Peter Smith, *Submission 43*, p. 3.

have invested billions in water efficiency programs without addressing the energy part of the equation.⁴⁶

5.63 This concern was reiterated by Mr Steve Whan, NIC Chief Executive Officer, who explained the severe impact energy prices can have on irrigators:

... electricity prices are a real problem for many of our producers. I met an almond farmer in the Riverland in South Australia a few weeks ago whose electricity bill had increased by \$87,000 in a single year. It was \$325,000 prior to that; \$87,000 on top of that. Fortunately for him at the moment, the price of almonds is really good. So he is coping with that. But if you have a product where the market or the terms of trade have turned against you a bit, or one where the margins are not so good—for instance the dairy industry—then that is a real problem.⁴⁷

5.64 Ms Jacqueline Knowles from the NFF told the Committee that high energy prices have led farmers to make regressive choices in terms of how much water they use:

... what we've seen over recent years is that, with escalating power prices, farmers are either reverting to not using the water use efficiency technology, which is power hungry, or they're leaving the grid and dusting off diesel generators. That's not good for anyone, but that's been the most cost-effective way for them to continue to run their pumps and their irrigation systems.⁴⁸

5.65 Growcom, representing the Queensland horticulture industry, argued that high energy prices put pressure on profitability and reduced capacity of enterprises to invest for the future:

Water itself is not a large cost input for most irrigators even though without it most farms cease to operate. For intensive horticulture production systems energy to pump water is currently the main driver for the uptake of water use efficiency and alternative energy sources. As the cost of energy steadily continues to increase over the next few years ... irrigators will find it more difficult to objectively irrigate. As market price takers this will place increasing pressure on farm gate returns and further reduce the ability of the horticulture industry to self invest.⁴⁹

⁴⁶ National Irrigators' Council, *Submission 13*, p. 14.

⁴⁷ Mr Steve Whan, *Committee Hansard*, 22 June 2017, p. 4.

⁴⁸ Ms Jacqueline Knowles, *Committee Hansard*, 10 August 2017, p. 3.

⁴⁹ Growcom, *Submission 25*, p. 3.

5.66 Likewise, the Queensland Farmers' Federation noted the surge in energy prices in recent years, and pointed out its impact on irrigators:

Assessment of electricity bills amongst irrigators has revealed price increases of 300 per cent over the last NSW network determination period (2009–2014). Similar increases have been experienced in Queensland over the same period. The electricity costs cannot be offset as irrigators are price takers in international commodity markets with no ability to dictate returns achieved for their products.

... higher energy costs have become a major constraining factor for irrigators to utilise their water efficient irrigation equipment and have caused individual irrigators to be exposed to electricity price volatility and continuous price increases.⁵⁰

5.67 Submitters had a number of suggestions to deal with the impact of energy costs on irrigators. The NIC argued that although many organisations are addressing power prices, an agriculture-focused irrigation energy program is necessary to assist irrigators:

We argue that a national irrigation energy productivity program funded by ARENA (Australian Renewable Energy Agency) is needed to develop and incentivise adoption of irrigation systems that optimise both energy and water usage. In addition to increasing energy and broader agricultural productivity, the program would help reduce pressure on national bulk water resources, and in so doing may reduce water allocation conflict in the Murray Darling Basin and other irrigation catchments.⁵¹

5.68 Karen Hutchinson from the NIC argued that a whole-of-government approach is needed, to ensure that relevant technology is not excluded from programs for irrigators:

The point that I would make in terms of the energy-irrigation nexus is the real need for a whole-of-government approach when funding programs of such national significance, like what we have seen with the Basin Plan. As part of the on-farm program, solar, for example, was specifically excluded as an eligible activity, which led farmers to move towards diesel and other things for pumping ... it was because of the government departments that were operating the funding buckets; solar did not fall into the right bucket.⁵²

⁵⁰ Queensland Farmers' Federation, *Submission 9*, pp. 3–4.

⁵¹ National Irrigators' Council, *Submission 13*, p. 14.

⁵² Ms Karen Hutchinson, *Committee Hansard*, 22 June 2017, p. 4.

- 5.69 Mr Levy Scheider from Netafim noted that new technologies designed to help irrigators reduce their energy costs were under development, and that other technologies could be also be of assistance:

It is absolutely an issue that is a challenge for us ... What we are doing about it is developing systems that are low flow and low pressure to reduce the pressure, as well as working with pump companies to develop systems that are going to work on solar as well—any other renewable energy, like wind or solar, as well as the storage. At present, storage—and I am thinking about battery storage—is expensive, but it is coming down in big rates.⁵³

- 5.70 The Ricegrowers' Association argued that factors like energy prices should be included in future WUE programs:

... future on-farm efficiency programs should not be focused on a single input/commodity such as water savings. Rather the program should take a broader view and encompass energy and other input savings to ensure that the overall efficiency impact for the business is positive. There are a number of examples where participants have upgraded their infrastructure to achieve water efficiencies however the upgraded infrastructure is significantly more energy intensive.⁵⁴

- 5.71 During site inspections around Australia, the Committee heard numerous times that rising electricity prices are impacting the capacity of farmers to implement more efficient irrigation technologies. In addition, the up-front cost of installing alternative energy sources was considered prohibitively high and so economically unviable – despite the resulting water efficiencies savings from new technologies.

Meteorological forecasting

- 5.72 A further issue brought to the Committee's attention was the reliance on accurate and timely meteorological information, and the impacts on water use efficiency where this information is not available.

- 5.73 The Bureau of Meteorology (BOM)'s submission noted that its:

climate and streamflow forecasting services provide foresight into future water availability and are being used now by irrigation companies and other

⁵³ Mr Levy Schneider, *Committee Hansard*, 24 August 2017, p. 15.

⁵⁴ Ricegrowers' Association of Australia, *Submission 21*, p. 7.

water managers to assist in planning water allocations and managing supplies.⁵⁵

5.74 Similarly, Macquarie River Food and Fibre noted that 'efficient agricultural industry requires access to timely, relevant and accurate [weather radar] information to fully inform production decisions'.⁵⁶

5.75 However, Macquarie River Food and Fibre also observed that there are gaps in coverage:

Improved access to weather radar services is imperative for agricultural producers in central and western NSW who currently operate in a 'black spot' with inadequate coverage from existing radar stations at Moree, Gunnedah, Wagga Wagga and Sydney.⁵⁷

5.76 They also raised the additional concern that there is 'confusion with real-time information (provided by the NSW Department of Primary Industries - Water), and river predictions and flood warnings (provided by the Bureau of Meteorology) made available from different sources'.⁵⁸

Committee comment

5.77 Energy pricing was a concern consistently raised with the Committee during this inquiry, and it was often cited as an impediment to installing and operating new water efficient technologies. The Committee recognises that this issue has significant influence on irrigators' adoption of water efficiency measures and considers that improvements to water use efficiency cannot be fully achieved without addressing energy pricing.

5.78 The Committee notes that energy pricing concerns relate to electricity costs and also the installation cost of alternative energy sources. While addressing these issues is beyond the scope of this inquiry, the Committee considers it essential that further work is undertaken. There may be scope for WUE programs to include within their funding scope the installation of alternative energy sources where these power efficient technologies. The Committee recommends that the Government further investigate the impact of energy

⁵⁵ Bureau of Meteorology, *Submission 5*, p. 1.

⁵⁶ Macquarie River Food and Fibre, *Submission 3*, p. 14.

⁵⁷ Macquarie River Food and Fibre, *Submission 3*, p. 14.

⁵⁸ Macquarie River Food and Fibre, *Submission 3*, p. 15.

pricing on the implementation of water use efficient technologies, and develop a range of mechanisms to address these impediments.

Recommendation 5

- 5.79 The Committee recommends that the Australian Government investigate mechanisms to address factors such as the rising cost of electricity and cost of alternative energies which may act as impediments to the adoption of water use efficiency technologies in irrigated agriculture.**
- 5.80 The Committee suggests that this research be conducted by the Research, Development and Extension (RD&E) body set out in Recommendation 4.**
- 5.81 Accurate and timely weather forecasting is vital for irrigators to ensure the efficient use of water. The value of efficient technologies and investment in new infrastructure is severely depleted if there is not access to coordinated weather radar forecasting and event information across all areas.
- 5.82 The Committees notes that the expansion of BOM services will require some supplementary Government expenditure, however this expenditure will maximise the value gained from investments currently made in WUE programs. Further, the Committee recommends that the BOM work with State government agencies and service providers to ensure more coordinated event information is available to farmers and irrigators.

Recommendation 6

- 5.83 The Committee recommends that the Bureau of Meteorology make additions to its weather radar services to ensure up to date forecasting and coordinated information is available in all required irrigated areas.**

6. Sustaining communities and infrastructure

- 6.1 While Government water efficiency assistance is targeted to irrigators, regional communities are heavily impacted by the funding provided and the consequent economic health of the agricultural sector and infrastructure investment in their region.
- 6.2 The first part of this chapter examines how WUE funded projects impact regional communities, and measures to assist long-term transition and sustainability issues for communities affected by changing water use practices.
- 6.3 The second part of the chapter considers, as an adjunct to ensuring sustainable regional communities, how the investment in water efficient infrastructure impacts the long-term sustainability of communities.

Benefitting regional communities

- 6.4 As outlined in chapter 3, some submitters have argued that investing in efficient irrigation methods, compared to water buybacks, has additional social benefits to the surrounding community. However, others have argued that these programs are an inefficient way of achieving these regional social objectives, and may in fact not provide such benefits.
- 6.5 This section examines key social and economic issues for regional communities which are impacted by water use efficiency changes and investment.
- 6.6 In its submission, DAWR made the case for the broader social and economic beneficial consequences of irrigation infrastructure spending:

Australian Government investment in on-farm and off-farm programmes under the Basin Plan is also having positive flow-on effects into local towns and communities. Increased farm opportunities and profitability is helping to secure the economic base of communities, allowing for more local jobs, businesses and services. For example, investment by Murrumbidgee Irrigation through PIIOP [Private Irrigation Infrastructure Operators Program] Round One resulted in increased business for local contractors and suppliers. This quantum of work for local businesses can be expected to have a localised multiplier effect as they in turn spend a proportion of their increased revenue on other local goods and services.

Further, employment of contractors in the region to undertake the infrastructure upgrade works has also provided short-term economic flow on effects for the community and skill transfer opportunities.¹

- 6.7 The Northern Basin Review included social and economic effects as one of its key considerations, and DAWR noted that the subsequent Northern Basin Taskforce is working to achieve water recovery ‘in ways that deliver socio-economic benefits to communities’.²
- 6.8 The MDBA submission outlined the findings of the Northern Basin Review, highlighting that buybacks can lead to significant change in the broader community:

The socio-economic analysis found that communities in the Northern Basin had been subject to a considerable period of structural change prior to the implementation of the Basin Plan. Consequently, environmental water recovery from buybacks can introduce an additional driver of change for northern communities. The adjustment challenges can be particularly significant when there are sudden changes in irrigation activity associated with the government purchase of large parcels of water entitlements in irrigation dependent communities. A more steady approach to buybacks can somewhat mitigate the social and economic impacts.³

- 6.9 The NIC described the Northern Basin Review’s socio-economic impact assessment as ‘a game changer for the design of future schemes’ and argued that the findings suggest that:

Removal of further productive water will result in a real loss of capacity for Australia to produce the fresh food and natural fibre we use domestically and

¹ Department of Agriculture and Water Resources, *Submission 18*, pp. 8-9.

² Department of Agriculture and Water Resources, *Submission 18*, p. 12.

³ Murray-Darling Basin Authority, *Submission 36*, p. 1.

that generates export income, and that it will produce loss of jobs, loss of income and flow on impacts right through Basin communities.⁴

- 6.10 Smartrivers, a group of irrigators from the Lower Balonne, also pointed to the broad social and economic benefits of water infrastructure spending, noting that:

From the point of view of the community, the program is money well spent. Continued irrigated agriculture means jobs and a sustained local economy whilst maintaining a critical mass in the population base. Delivery of the on-farm projects provides stimulus for local small business suppliers and contractors.⁵

- 6.11 A similar point was made by the Goulburn Broken Catchment Management Authority, which compared the economic and broad social impacts of WUE programs to buybacks and explained that:

Buy back of water often leads to declined productivity on properties with reduced water available leading to reduced production and a greater chance that irrigation ceases on the property. Whereas the water use efficiency programs link the funding available to make water use efficiency improvements leading to productivity increases across the region. The water use efficiency projects and productivity benefits provide an economic stimulus, increased employment and population growth improvements across the region and beyond.⁶

Box 6.1 Harvey Water Irrigation Area, WA

On 22 August 2017 the Committee conducted site inspections in Harvey, Western Australia. Harvey, which lies approximately 150km south of Perth, is the centre of the Harvey Water Irrigation Area (HWIA). The HWIA services approximately 30 000 hectares of irrigated area devoted to dairy, beef grazing and horticulture. Harvey Water manages three irrigation districts in the HWIA – the Waroona district in the north, the Harvey district, and the Collie River Irrigation District in the south.

The Committee inspected Harvey Water's gravity-fed piped irrigation network, which serves the northern two thirds of its customers, those in the Waroona and Harvey irrigation districts. The Committee also heard

⁴ National Irrigators' Council, *Submission 13*, pp.16-17.

⁵ Smartrivers, *Submission 23*, p. 3.

⁶ Goulburn Broken Catchment Management Authority, *Submission 8*, p. 8.

about the problems faced by irrigators in the southernmost Collie River irrigation district, such as saline water in the Wellington Dam. Harvey Water has applied to the Australian Government for funding to help it address this problem.

The visit highlighted how WUE programs can help to drive economic development well beyond the direct recipients of Government funding. The redevelopment of the Collie River irrigation district will likely lead to substantial and positive regional development outcomes, which would not have been possible without joint funding from State and Federal governments.

- 6.12 Against this case, Professor Lin Crase argued that the sheer expense of WUE projects should not be underestimated:

... the quantum of public monies used in WUE projects is itself worrying from a broader economic perspective. At a time when government bemoans the status of budgets and the demands on the public purse increase, it is difficult to rationalise WUE projects. They are costly, ineffective and leave serious challenges for the communities they purportedly support.⁷

- 6.13 Drawing on his research in the area, Professor Quentin Grafton argued that, while some positive social and economic impacts are undoubtedly felt in regions as a result of irrigation infrastructure spending programs, those benefits have not been achieved in an efficient way:

Another stated objective [of irrigation subsidies] was to help irrigation communities. If you take money and spend money — someone else's money; because someone has to pay for it — I have no doubt that, if you spend money in a location and do not spend it someplace else, you will help the location where you have done the expenditure. But does that mean that that has led to an overall improvement in welfare? Indeed, we have a method to make that sort of judgement. It is called cost-benefit analysis. If we did a cost-benefit analysis in the context of irrigation subsidies on farm and off farm, they would fail that test. It is a public interest test.⁸

- 6.14 Professors Grafton and Williams also took issue with the argument that the broad social impacts of WUE programs justify the expense of them, arguing that:

⁷ Professor Lin Crase, *Submission 26*, p. 2.

⁸ Professor Quentin Grafton, *Committee Hansard*, 30 March 2017, p. 4.

If community benefit is a goal of irrigation subsidies, it is puzzling that the communities themselves where irrigators reside have not been allowed to determine how to spend the money rather than have it decided for them in the form of payments to increase irrigation efficiency. It is further puzzling that if a key goal is to help poor and vulnerable in Australian irrigation communities that the most poor and vulnerable in such locations do not receive any direct payments or transfers. Indeed, the opposite is the case, as it is the wealthiest in these communities, the irrigators, who are the direct beneficiaries of the subsidies.⁹

- 6.15 As a solution to this concern, Professors Grafton and Williams suggested that increased community consultation about where and how money is spent should be a priority:

Instead of providing subsidies to increase irrigation efficiency through more capital-intensive technologies, there should be a transparent and deliberative process that includes all relevant Basin communities, stakeholders and interested parties to spend the funds that would otherwise have been allocated for irrigation subsidies. This process should maximise participation to the poor and vulnerable within the MDB and explicitly consider the key bio-physical and socio-economic risks to Basin communities.¹⁰

- 6.16 Speaking broadly about the issue, Professor Crase noted that there is a fundamental structural problem with policies that attempt to achieve disparate and unrelated goals. By seeking to solve environmental, social and economic problems, Australia's approach to irrigation policy has not effectively addressed any of those, Professor Crase argued:

You asked me about the social impacts. More generally one of the problems with water policy in this country at the national level is that we've tried to put everything into one basket. Instead of having a separate set of social policies that are trying to deal with a social problem—a policy aimed at dealing with the environment, reallocating water to the environment—and another thing to do with economics, we've lumped it all in together and called it the Basin Plan. Then we've asked a single authority to come up with a magic instrument that does all of those things. It's little wonder that we've ended up with suboptimal outcomes on just about every level.

If you're worried about people's state of mental health in Griffith, why on earth would changing water policy be the most effective way to do that? I would have thought that, if you were worried about people's mental health in

⁹ Professor Quentin Grafton and Professor John Williams, *Submission 2*, p. 5.

¹⁰ Professor Quentin Grafton and Professor John Williams, *Submission 2*, p. 7.

Griffith, you might want to invest some of that hard-earned taxpayers' money into suitable programs that'd deal with that. The difficulty is that you're trying to achieve multiple outcomes with a single instrument.¹¹

6.17 While the improved productivity and increased certainty brought about by irrigation infrastructure spending may have positive broad social achievements, research from academics at the University of Adelaide into the stress levels of people in the irrigation industry found that 'distress levels of MDB irrigators were higher than Australian farmers in general, but they were also higher than the general population'.¹²

6.18 Within that research, they noted that the main causes of day-to-day stress amongst horticultural irrigators were commodity prices (80.8 per cent) and electricity prices (74.8 per cent).¹³ Notably, they found that:

[i]rrigators who recorded high levels of psychological distress were much more likely to strongly agree that irrigation infrastructure investment had been wasteful, and should have been spent on rural health and/or education services instead.¹⁴

6.19 These findings prompted the academics to suggest a range of approaches to respond to the high level of stress amongst irrigators, including the suggestion that buyback options might prove more beneficial than infrastructure investment:

We suggest beneficial policies in the water space could include reforming termination fees in irrigation districts, supporting exit packages for small irrigators, eliminating irrigation infrastructure subsidies and supporting the buyback of water entitlements (because of the lock-in and path dependent nature of irrigation infrastructure and the flexible nature of the buyback of water entitlements that allows for farm exit), increasing water market information and conducting further research on value-adding opportunities for irrigated farming. Further research on the drivers of irrigators' mental health and their links with key social and economic infrastructure across the MDB is also clearly warranted.¹⁵

¹¹ Professor Lin Crase, *Committee Hansard*, 23 August 2017, p. 5.

¹² Dr David Adamson et al, *Submission 19*, pp. 10-11.

¹³ Dr David Adamson et al, *Submission 19*, p. 10.

¹⁴ Dr David Adamson et al, *Submission 19*, p. 11.

¹⁵ Dr David Adamson et al, *Submission 19*, p. 11.

Committee comment

- 6.20 While the focus of this report has been on the water use efficiencies benefitting the irrigated agricultural sector and the environment, regional communities are also heavily impacted by water policies and WUE programs. The Committee notes the importance of considering the social and economic strength of communities when discussing changing irrigation practices.
- 6.21 There is strong evidence that in some areas water use efficiency and infrastructure investments are demonstrating clear flow-on benefits to communities, and that a robust local economy can drive growth and diversification. This leads to regional resilience and will better equip communities to manage through diverse seasons and rainfall patterns.
- 6.22 However the Committee also notes criticisms regarding attempting to gain diffuse social benefits from WUE programs, and arguments for more direct investment in regional social services. It is clear that water policies and controls have led to changed irrigation practices, and in regional areas any change affecting the local agricultural sector dramatically impacts all tiers of the community. Consequently, driving greater water use efficiency should not be separated from assisting regional communities to also undertake this transition and to build resilience and independence.
- 6.23 Currently there is no consistent monitoring or response to the social and economic impacts on regional communities, and in particular on those communities beyond the Murray-Darling Basin. It is critical to understand how funding in one area may positively or adversely affect a neighbouring community and, just as close monitoring and evaluation of surrounding water systems is required, so governments should be aware of the dynamic impacts of these funding arrangements on regions.
- 6.24 The Committee considers that a coordinated and targeted approach to supporting regional communities through the transition process to water use efficiencies is required. The Committee notes that the Department of Infrastructure and Regional Development delivers a series of regional and community programs, including the Murray-Darling Basin Regional Economic Diversification Program, which are designed to improve regional economic diversity, growth, and resilience.
- 6.25 The Committee considers that the Government response should not be confined to the Murray-Darling Basin, and it is important that all regions

impacted by water constraints and changing water practices are assisted through this process.

Recommendation 7

6.26 The Committee recommends that the Australian Government establish an integrated taskforce to assist Regional Development Authorities to:

- **develop targeted initiatives to assist regional communities which are impacted by the local irrigated agriculture sector transitioning to water use efficiencies, and**
- **ensure ongoing monitoring of the social and economic health of these communities.**

Infrastructure for the future

6.27 The Committee heard that irrigation infrastructure projects, while achieving immediate water efficiency gains, may result in future financial burdens for communities. In particular, infrastructure installed now will require upgrading and replacing in the future. However, there is not always a clear plan developed for how those works will be funded or who should be responsible for them.

6.28 Professor Lin Crase explained that communities which are currently receiving funding for capital infrastructure may possibly inherit significant financial legacy issues. Professor Crase noted that the two key drivers of the price of water are its scarcity value and irrigation capital infrastructure (e.g. pipes, pumps and channels). Governments are effectively gifting infrastructure to irrigation providers, and those new infrastructure facilities are not included in any water pricing structure:

Under the regulatory arrangements, if an asset is gifted to you, you aren't required to include it in the regulatory asset base. In other words, if you're a water utility, you don't have to count it; you can just pretend it fell out of the sky and it didn't cost anything. That means that, when you start to calculate the prices that you pay for the water, you are actually ignoring a big chunk of the cost, because you've just assigned it a value of zero.¹⁶

¹⁶ Professor Lin Crase, *Committee Hansard*, 23 August 2017, p. 2.

6.29 Professor Crase suggested that, without any cost recovery through appropriate pricing, there is little capacity for infrastructure assets to be maintained into the future:

So that raises the obvious legacy question: if we've got all this infrastructure we've invested in, who's putting the money aside to pay for the depreciation and who's putting the money aside to replace it when it all falls over in 10 years' time?¹⁷

6.30 Professor Crase cited an example where the capital infrastructure investment was not accounted for:

The work we did in Goulburn-Murray Water showed that they were already underpricing water by two-thirds. They would have to increase prices by about 300 per cent to fully cover the cost of capital. And now we are giving them more capital that they do not have to count, which makes the situation even worse.¹⁸

6.31 When asked about the necessity for irrigation providers to account for capital infrastructure assets and depreciate them over time, Professor Crase suggested that irrigation providers would simply ask the government of the day for more funding. Professor Crase also suggested that certain groups in the broader farming community may be leveraging more money to fewer people for less benefit.¹⁹

6.32 In response, DAWR argued that investments in water use efficiency are not 'setting up regional communities with unmanageable future costs', since the new or modernised infrastructure 'will result in reduced operational and maintenance costs' in some cases.²⁰

6.33 DAWR further noted that these projects entail no on-going financial commitments from the Australian Government other than that specified in the original project:

We note that projects funded under Sustainable Rural Water Use and Infrastructure Program are intended to improve the efficiency and productivity of water use and management. Program guidelines, for both on- and off-farm sub-programs, inform participants of eligible and ineligible funding conditions and activities. Funding is not applicable to on-going

¹⁷ Professor Lin Crase, *Committee Hansard*, 23 August 2017, pp. 2-3.

¹⁸ Professor Lin Crase, *Committee Hansard*, 23 August 2017, p. 3.

¹⁹ Professor Lin Crase, *Committee Hansard*, 23 August 2017, p. 3.

²⁰ Department of Agriculture and Water Resources, *Submission 18.2*, p. 10.

maintenance costs associated with new or existing infrastructure. Participants are encouraged to take these costs into consideration when drafting their applications.

Participation in all Commonwealth infrastructure programs is voluntary with infrastructure upgrades initiated and owned by proponents who have ownership and responsibility for the infrastructure over time. Feedback from participants in on-farm programs indicates that government-funded works have helped to accelerate the process of renewing old and outdated infrastructure, covering costs that would have otherwise been solely incurred by irrigators.²¹

Committee comment

- 6.34 The Committee notes the importance of infrastructure funding and the vital contribution of these projects to ongoing water efficiencies and productivity. However it is essential that this infrastructure does not result in legacy issues which become a funding burden of communities or for the Government. As has been noted throughout this report, the long-term goal must be financial resilience and independence for the irrigated agricultural sector and for regional communities.
- 6.35 The Committee notes its concerns in regards to infrastructure funding and ensuring this is a capital investment for the future – not a capital legacy requiring support. The Committee considers it would be irresponsible for funding or assistance to be provided which did not incorporate detailed plans for future costs, such as maintenance, repair and eventual replacement. Further, the Government must ensure that infrastructure funded delivers a defined public good and represents value for money against defined outcomes.
- 6.36 To this end, the Committee notes the September 2017 Productivity Commission’s draft report and recommendation on water infrastructure for agriculture:

Productivity Commission Draft Recommendation 7.3

Governments should not provide grant funding for irrigation infrastructure, or that part of infrastructure, that is for the private benefit of irrigators. Rather, Australian, State and Territory Governments should ensure that:

²¹ Department of Agriculture and Water Resources, *Submission 18.2*, p. 10.

- a. National Water Initiative-consistent water entitlements and planning are in place before any new irrigation infrastructure is considered (including infrastructure being financed under the Northern Australian Infrastructure Facility)
- b. government grant funding is limited to those projects, or parts of projects, delivering a public good. Any grant funding should be subject to an independent analysis of the project being completed and available for public comment before any government announcements on new infrastructure are made. The analyses should establish that the project will be:
 - environmentally sustainable
 - economically viable and deliver public benefits that are at least commensurate with the grant funding being provided
- c. government financing (such as loans) for infrastructure generating private benefits should only be provided after:
 - an independent assessment has confirmed the finance can be repaid on commercial terms. The assessment should be released for public comment before any announcement on new infrastructure is made
 - robust governance arrangements have been put in place to deliver merit based decision making and the ongoing monitoring of (and public reporting on) the government’s investment
 - sufficient water entitlements have been sold to reduce the project’s risk profile and provide assurance the finance will be repaid.

Australian, State and Territory Governments should enhance the National Water Initiative to align with recommendations 7.3 (a) to 7.3 (c).²²

- 6.37 The Committee notes its support for this draft recommendation and urges the Australian Government to consider the Productivity Commission’s final recommendation on water infrastructure funding when it is released.
- 6.38 Further the Committee recommends that, where funding is provided for water infrastructure, application assessment should include detailed consideration of the defined public good outcomes, and also account for full life cycle costing, including asset depreciation and replacement.

Recommendation 8

- 6.39 The Committee recommends that the Australian Government require any water efficiency infrastructure funding or assistance provided to set out:**

²² Productivity Commission 2017, *National Water Reform*, Draft Report, Canberra, p. 35.

- **the defined public good benefit,**
- **detailed plans for the full lifecycle costings of the infrastructure, including asset depreciation and replacement, and**
- **a detailed intention of how these lifecycle costings will be funded.**

Mr Rick Wilson MP
Chair

7 December 2017

A. Submissions and Exhibits

Submissions

- 1 Namoi Water
- 2 Professors Quentin Grafton and John Williams
 - 2.1 Supplementary
- 3 Macquarie River Food & Fibre
- 4 Associate Professor David Paton AM
- 5 Bureau of Meteorology
- 6 Netafim Australia Pty Ltd
- 7 John Pettigrew
- 8 Goulburn Broken Catchment Management Authority
- 9 Queensland Farmers' Federation
- 10 Australian National Audit Office
- 11 Gwydir Valley Irrigators Association Inc.
- 12 Mr Barry Croke
 - 12.1 Supplementary
- 13 National Irrigators' Council
- 14 Australian Bureau of Statistics
- 15 Southern Rural Water
- 16 Inland Rivers Network
- 17 The Hon Sussan Ley MP

- 18 Department of Agriculture and Water Resources
 - 18.1 Supplementary
 - 18.2 Supplementary
- 19 Dr David Adamson, Dr Adam Loch, Assoc. Prof Sarah Wheeler and Prof Jeff Conner
- 20 Australian Academy of Technological Sciences and Engineering
- 21 Ricegrowers' Association of Australia
- 22 Coleambally Irrigation Co-operative Limited
- 23 Smartrivers
- 24 Cotton Australia
 - 24.1 Supplementary
- 25 Growcom
- 26 Professor Lin Crase
- 27 Border Rivers Food & Fibre
- 28 NSW Department of Primary Industries
- 29 Dr Guy Roth
- 30 Tasmanian Farmers & Graziers Association
- 31 Environment Victoria
- 32 Robert Caldwell
- 33 Rural Industries Research and Development Corporation
- 34 National Farmers' Federation
- 35 Murray Irrigation
- 36 Murray–Darling Basin Authority
 - 36.1 Supplementary
- 37 Murrumbidgee Irrigation
- 38 CSIRO
- 39 Government of South Australia
- 40 Greater Shepparton City Council
- 41 Northern Territory Government
- 42 Harvey Water

- 43 Peter Smith
- 44 Wyndham City Council
- 45 Australian Lot Feeders' Association
- 46 Harvey Giblett
- 47 Dr Chris Perry
- 48 The Hon Alannah MacTiernan MLC
- 49 Barossa Infrastructure Ltd
- 50 Dominic Wy Kanak

Exhibits

- 1 Netafim

Drip Irrigation's Contribution to Food Security and Climate Change

B. Public hearings

Thursday, 30 March 2017

Canberra, ACT

Private capacity

- Professor Quentin Grafton
- Professor John Williams

Wednesday, 5 April 2017

Toowoomba, Queensland

Growcom

- Mr Scott Wallace, Land and Water Manager

Border Rivers Food and Fibre

- Mr Timothy Napier, Executive Officer

Cotton Australia

- Mr Michael Murray, General Manager, Operations

Central Downs Irrigators Ltd

- Mr Lindsay Krieg, Chairman

Thursday, 6 April 2017

Narrabri

Namoi Water

- Mr Steven Carolan, Vice Chairman
- Mrs Jon-Maree Baker, Executive Officer

Private capacity

- Dr Guy Roth

Gwydir Valley Irrigators Association

- Mrs Zara Lowien, Executive Officer
- Ms Louise Gall, Project Officer
- Mr Nick Gillingham, General Farm Manager, Sundown Pastoral Company

CSIRO

- Dr Michael Robertson, Science Director
- Dr Michael Bange, Senior Principal Research Scientist

NSW Department of Primary Industries

- Mr Rod Jackson, Leader, Northern Irrigated Cropping Systems
- Dr David Mitchell, Technical Specialist, Hydrology Research
- Ms Claire Norris, MERI and Communications Officer, Sustaining the Basin: Irrigated Farm Modernisation Program

Thursday, 25 May 2017

Canberra, ACT

Department of Agriculture and Water Resources

- Mr David Parker, Deputy Secretary, Water Division
- Mr Paul Morris, First Assistant Secretary, Water Division
- Ms Mary Colreavy, Assistant Secretary, Water Acquisition and Markets Branch, Water Division
- Mr Tim Fisher, Assistant Secretary, Water Policy Branch, Water Division
- Ms Amy Fox, Assistant Secretary, Water Infrastructure Northern Branch, Water Division

- Mr Richard McLoughlin, Assistant Secretary, Water Resources Branch, Water Division
- Mr John Robertson, Assistant Secretary, Water Infrastructure Southern Branch, Water Division

Thursday, 1 June 2017

Canberra, ACT

Murray–Darling Basin Authority

- Mr Phillip Glyde, Chief Executive
- Mr Colin Mues, Chief Economist
- Mr Russell James, Executive Director, Policy and Planning Division

Thursday, 22 June 2017

Canberra, ACT

National Irrigators' Council

- Mr Steve Whan, Chief Executive Officer
- Ms Karen Hutchinson, Director

Thursday, 10 August 2017

Canberra, ACT

National Farmers' Federation

- Ms Jacqueline Knowles, Manager, Natural Resource Management

Tuesday, 22 August 2017

Harvey, Western Australia

Government of Western Australia

- Mr John Ruprecht, Executive Director, Irrigated Agriculture, Department of Primary Industries and Regional Development

Harvey Water

- Mr Kevin Warburton, Chairman, South West Irrigation Asset Cooperative
- Mr Bradd Hamersley, General Manager
- Mr Ian Eckersley, Director
- Mr Stephen Cook, Operations Manager
- Mr Geoff Calder, Consultant

Southern Forests Irrigation Scheme

- Mr Harvey Giblett, Chairman
- Mr Mark Bending, Member
- Mr Justin Omodei, Member

Collie Shire

- Councillor Wayne Sanford, Shire President
- Councillor Glyn Yates, Shire Deputy President

Wednesday, 23 August 2017

Adelaide, South Australia

Private capacity

- Professor Lin Crase
- Associate Professor David Paton AM
- Dr David Adamson
- Dr Adam Loch
- Associate Professor Sarah Wheeler

Thursday, 24 August 2017

Melbourne, Victoria

Environment Victoria

- Ms Juliet Le Feuvre, Healthy Rivers Campaign Manager

Southern Rural Water

- Mr Clinton Rodda, Managing Director

Netafim Australia Pty Ltd

- Mr Levy Schneider, Managing Director

Private capacity

- Mr Barry Croke

Australian Academy of Technology and Engineering

- Professor Edward (Snow) Barlow, Deputy Chair, Agriculture Forum
- Dr Matt Wenham, Executive Manager, Policy and Projects

Greater Shepparton City Council

- Mr Johann Rajaratnam, Director, Sustainable Development

Goulburn Broken Catchment Management Authority

- Mr Christopher Norman, Chief Executive Officer
- Ms Megan McFarlane, Manager, Farm Water Program Manager

Thursday, 7 September 2017

Canberra, ACT

Department of Agriculture and Water Resources

- Mr Malcolm Thompson, Deputy Secretary, Water Division
- Ms Mary Colreavy, Assistant Secretary, Water Division
- Mr Charles Edlington, Assistant Secretary, Water Division
- Mr Tim Fisher, Assistant Secretary, Water Division
- Mr John Robertson, Assistant Secretary, Water Division
- Dr Andrea Wilson, Assistant Secretary, Water Division

Friday, 15 September 2017

Griffith, NSW

Ricegrowers' Association of Australia

- Miss Rachel Kelly, Policy Manager

Murrumbidgee Irrigation

- Mr Jody Rudd, General Manager, Asset Delivery, and A/g Chief Executive Officer
- Mr Frank Sergi, Chair

Coleambally Irrigation Co-operative Limited

- Mr Austin Evans, General Manager Operations

Murray Irrigation

- Mrs Janet Manzin, Customer Accounts Officer
- Mr Michael Pisasale, Customer Accounts Manager

AgriFutures Australia

- Dr David Alden, General Manager, Research and Innovation
- Mr Michael Beer, Program Manager, Research and Innovation

Macquarie River Food & Fibre

- Mr Michael Egan, Chairman
- Dr Grant Tranter, Executive Officer