

Productivity Commission
Collins St
Melbourne Vic 8003

I refer to your Inquiry into the Research and Development Corporations model.

The National Program for Sustainable Irrigation (NPSI) is a collaboration between some of the irrigation dependent Rural Research & Development Corporations (Horticulture Australia, Cotton RDC, Grains RDC and Sugar RDC), water companies/authorities, and government agencies such as SARDI. It is, in essence a “joint venture investor collaboration model”. It is not a R&D provider, although does undertake some of its own activities to enhance adoption and uptake of R&D. The Program is managed by a skills based committee. Financial and administration systems are provided by one of the partners, currently CRDC.

The current 3 year Phase 2 of the NPSI program builds on more than 15 years of managed collaborative research in this field, initially through the National Program for Irrigation Research and Development (1994-2003) and then through Phase 1 of NPSI (2004-2007) and Phase 2 (2008-11). Thus, it is possibly one of the longest running agricultural cross industry R&D&E collaborations.

The current phase of the Program was due to finish in June 2010, but has been extended by 12 months so that any future arrangements can be made in light of the many R&D reviews currently underway.

Since 2002, the program has attracted \$18 million in investment aimed at improving the environmental and productive performance of irrigated agriculture and horticulture in Australia. A recent return on investment evaluation of NPSI Phase 1 found a benefit cost ratio of 9:1. For the four projects evaluated, \$1.9 million investments, \$17 million of returns have been generated. These evaluations have also highlighted many public environmental and social benefits as well, such as less salinity in the landscape, improved river health and water quality, and improved human and social capacity. (Source: <http://npsi.gov.au/news/2009/jan/21/investment-irrigation-rd-gives-good-returns>).

The National Program for Sustainable Irrigation’s mission is to provide Australia with leadership through collaborative investment in research and its adoption to improve the productivity and sustainability of irrigation in Australia. It aims to achieve this mission by defining, commissioning and managing research and development projects that produce new information of national importance and facilitate its adoption. The planned outcome is a substantial improvement in the environmental, economic and social performance of irrigation industries around Australia.

NPSI and its predecessors have been supported by a diverse range of partner investors including federal and state governments, research and development corporations and private companies. The current phase has fourteen partners, reflecting the demand for a collaborative approach to irrigation research and development. This diversity is also evident in the range of research funded by the Program such as irrigation water application techniques, evaporation reduction technologies, to issues such as managing irrigation salinity, water planning and risk assessment, knowledge management, through to understanding biodiversity on irrigation farms, demonstrating the wide range of research and extension needs within the industry.

The Program has also made significant investments in supporting projects to develop and manage knowledge for adoption. Our major pathway to adoption is through specific projects and our partner networks. This investment ensures NPSI funded research meets the needs and reaches end users. The Program has produced 40 new publications during the year. The NPSI web site has been upgraded in the last 12 months. NPSI launched a new initiative in 2008/09 supporting six undergraduate student scholarships. The intent of the Scholarships is to assist in promoting and attracting people into irrigation R&D and to assist in capacity building of the R&D industry. The program has initiated or supported other significant forums to bring together industry stakeholders to address sustainable production in a water scarce environment including the Irrigation Australia Conference, workshops on selecting irrigation systems and evaporation science, an irrigation essentials workshop.

NPSI has just completed a knowledge harvest of its project portfolio, known as Irrigation Essentials, which was released in January 2010 by the Minister for Agriculture, Hon Tony Burke MP. A link to the publication and his press statement can be found on our home page www.npsi.gov.au. Importantly, it covers a wide range of industries and is a snapshot of some of the latest research and development that is leading to improved technology, and enabling the sharing of knowledge and practice change across all agriculture commodities and horticultural industries.

Looking to the Future

The Australian Government has embarked on an ambitious water reform agenda which remains one of the Government's highest priority policy reforms. Improving irrigation productivity/water use efficiency and river health are core goals of these reforms. However, there is no R&D&E strategy and associated financial investment to support the many other policy initiatives. Such an investment will lead to new innovations, improve the adoption of current best practice, which in turn will increase water productivity, improve the environment, and strengthen human capacity & regional communities (human & social capital).

NPSI with Irrigation Australia Limited is developing a future vision for irrigation R&D&E and delivery option models. This paper is attached and we hope it is of value to your Inquiry.

Irrigation R&D has made many of our agricultural and horticultural industries the most productive, profitable and innovative in the world. However, as outlined in the attached paper there is a critical need to ensure this continues.

I would be happy to discuss any questions and can be contacted on 02 6792 5340 or 0417 223 179.

Yours sincerely



Dr Guy Roth
NPSI, Program Coordinator
www.npsi.gov.au
guy@roth.net.au

Attached: IAL/NPSI RD&E vision paper

**FUTURE VISION AND OPTIONS FOR IRRIGATION
RESEARCH, DEVELOPMENT & EXTENSION REPORT**

May 2010



EXECUTIVE SUMMARY

The National Program for Sustainable Irrigation (NPSI) and Irrigation Australia Limited (IAL) has developed a framework for future irrigation research, development and extension (RD&E) in Australia, consisting of a vision, priorities, implementation options and immediate actions.

The framework will aid the forward planning of RD&E delivery for the industry and assist the industry to contribute to several Australian Government Reviews considering research and development and extension/knowledge management in 2010. This initiative is particularly important given that there is no proposal for a national irrigation RD&E organisation following the cessation of the CRC for Irrigation Futures (June 2010) and NPSI (June 2011).

Our Industry Vision

Australia's irrigation industry will contribute to supplying the increasing domestic and global demand for food and fibre driven by growing population. At the same time, the following pressures will continue to drive structural change in the configuration and distribution of the industry:

- Securing access to increasingly scarce water resources;
- A maturing water market;
- Managing increasing costs of energy and the trade-offs at the interface between energy, water and carbon;
- The need to sustain natural resources, including increased allocation of water for the environment;
- Labour scarcity; and
- Competitive market pressures.

The Australian irrigation industry has been at the forefront of improved water efficiency by virtue of the inherent unreliability of the country's climate and the necessity of adapting to prolonged droughts. Innovation and adaptation will ensure that the industry responds rapidly and contributes to meeting demand for food and fibre and addresses these challenges by increasing its productivity and sustaining and harnessing its human and natural capital. By 2020 we will be the recognised global leader in profitable, competitive and sustainable irrigation, contributing to regional, national and global well-being.

Our RD&E Vision

RD&E will substantially contribute to Australia becoming the global leader in profitable, competitive and sustainable irrigation, particularly in the integration of on-farm water use efficiency and off-farm irrigation system modernisation. By 2020, Australia will have achieved recognition as the global leader in irrigation knowledge and its application. This will allow the industry to contribute to, and access, international developments and innovations in irrigation RD&E. The industry will be recognised

for its past achievements and innovations and its unique body of knowledge grounded in providing integrative and cross disciplinary solutions.

Industry, government and the research community will work collaboratively, resourced by sufficiently sustainable investment, to focus on key priorities to deliver RD&E that improves productivity and water use efficiency to address food security needs and deliver environmental sustainability. Irrigation RD&E will also manage climate change adaptation through irrigation modernisation and structural change to minimise negative impacts on communities.

R&D will adapt and build on past achievements, achieving broad adoption across the industry and rapid transfer of benefits to users. Australia's system of tradeable perpetual water access entitlements provides a positive environment for future investment in RD&E and improved infrastructure.

Our RD&E Priorities

A "balanced portfolio" of ten RD&E priorities that need to be addressed over the next ten years have been identified:

1. Adaptation and adoption of known improved practices and technologies at farm, irrigation system, catchment, industry and government scales;
2. Irrigation efficiency and agronomic productivity technology and practices;
3. Whole farm planning and management;
4. Plant varieties and biotechnology;
5. Off-farm and on-farm infrastructure modernisation;
6. Catchment and water quality planning and management;
7. Enhance environmental stewardship to minimise environmental footprint;
8. Energy-carbon-water footprints and interactions;
9. Demonstrate sustainability and value of the irrigation industry; and
10. Effective RD&E framework and human capacity linked to a national system of delivery.

Recommended Implementation Option

Four implementation options which can improve the resourcing, coordination, effectiveness and efficiency of irrigation RD&E to ensure it delivers the required support for the adaptation and development of the industry have been identified and analysed (see figure overleaf).

The **enduring joint venture** option is recommended because it engages all stakeholders (government and industry) to deliver on all the RD&E priorities beyond individual funding cycles. This overcomes the commitment, scope/duration limitations, and link/position weaknesses of the other options. The enduring joint venture would focus on opportunities (shared priorities) and gaps (unfunded priorities, capability development, institutional

RD&E Implementation Options				
	National Committee	Time-bound Joint Venture	Enduring Joint Venture	Irrigation RDE Institution
Governance	All stakeholders	Voluntary, some stakeholders	Voluntary, all stakeholders	Representative board
Timeframe	On-going	3-5 years	On-going	On-going
Strategy	Sets/tracks RD&E priorities Facilitation to address gaps	Delivers some RD&E priorities	Sets/tracks RD&E priorities Deliver all RD&E priorities in time	Sets/tracks RD&E priorities Deliver all RD&E priorities in time
Funding	In-kind contribution	Participant contribution	Stakeholder contribution (government & industry)	Enduring (government and/or industry)
Delivery (R&D)	Facilitate alignment and coordination	Alignment and coordination within JV scope	Leverage alignment and coordination	Leverage alignment and coordination
Delivery (Extension)	Facilitate alignment and coordination	Appropriate extension for funded R&D	Appropriate extension for funded R&D Facilitate coordinate and extension network	Appropriate extension for funded R&D Facilitate coordinate and extension network
Capability	Not addressed	Limited to JV scope/ timeline	Some strategic investment	Develop own and support others

and policy matters). The enduring nature allows the joint venture to pursue these opportunities and gaps in the short, medium and long term. Base funding would come from key stakeholder subscription. Additional funding would come from individual opportunities/gaps subscriptions and grants.

Actions

Three phases of action are recommended to implement the recommended enduring joint venture option:

- **Set-up** – establishing joint venture governance and start-up funds through the awareness raising and seeking key stakeholder agreement and commitment;
- **Discovery** – detailed gap analysis with investors, providers and R&D policy reform to clarify RD&E scope and position, formal governance and deliver early wins; and
- **Embedding** – establish the formal governance and implement strategy to deliver on RD&E opportunities and gaps, track and demonstrate progress.

The phases are based on the understanding that this irrigation RD&E framework needs to build on and augment the current irrigation RD&E system and its key stakeholders; inform and be guided by the national RD&E policy reform agenda; and start now, recognising there will be uncertainty and conflict during its development.

CONTENTS

Executive Summary	1
1. Introduction	4
1.1 Background and Purpose	4
1.2 Report Structure and Basis	4
1.3 Irrigation Industry and RD&E Drivers for Change.	4
2. Vision for Future Irrigation RD&E	6
2.1 Definition of the 'Irrigation Industry'	6
2.2 Irrigation Industry Vision	6
2.3 Irrigation RD&E Vision	6
3. Irrigation Industry Outcomes and RD&E Priorities	7
4. Implementation Options	12
4.1 Overview.	12
4.2 Option 1 – National Coordination Committee	13
4.3 Option 2 – Time-bound Joint Venture	13
4.4 Option 3 - Enduring Joint Venture	14
4.5 Option 4 – Irrigation RD&E Institution	14
4.6 Discussion.	15
5. Actions	16
5.1 Set-up Phase	16
5.2 Discovery and Trialling Phase	16
5.3 Embedding Phase.	16
Table Index	
Table 1 Key drivers and implications	5
Table 2 RD&E priorities (adoption)	8
Table 3 RD&E priorities (irrigation application)	9
Table 4 RD&E priorities (irrigation delivery)	10
Table 5 RD&E priorities (industry value chain)	11
Figure Index	
Figure 1 Irrigation industry outcomes and RD&E priorities overview	7
Figure 2 RD&E Implementation Options	12
Appendices	
Stakeholders consulted and project steering committee membership.	17

1. INTRODUCTION

1.1 Background and Purpose

The National Program for Sustainable Irrigation (NPSI) and Irrigation Australia Limited (IAL) has developed a framework for future irrigation research, development and extension (RD&E) in Australia, consisting of a vision, priorities, implementation options and immediate actions.

As water resources in Australia become increasingly scarce and competition for access tightens, irrigation dependent industries will need to adjust and adapt to ensure their sustainability and competitiveness going forward. RD&E will form an essential component of future strategies addressing this, i.e. in boosting productivity and increasing water use efficiency.

In light of this, the irrigation industry has identified the need to strategically plan for irrigation RD&E to ensure it is positioned to operate successfully into the future. This initiative is timely and important given that there is no proposal for a national irrigation RD&E organisation following the cessation of the CRC for Irrigation Futures (CRC IF) (June 2010) and NPSI (June 2011).

This document provides a foundation reference for the ongoing strategic planning development and delivery of irrigation RD&E. It will also assist the industry to contribute to several Australian Government Reviews considering research and development and extension/knowledge management in 2010. In the short term, it will form a basis for communicating with key stakeholders on future directions.

1.2 Report Structure and Basis

The irrigation industry requires a framework to manage and develop irrigation RD&E so that it can meet immediate and on-going demand for irrigation knowledge, and harness the drivers for change in a proactive manner. This framework consists of five related elements, which form the basis of this report:

- Key **drivers for change** and implications for irrigation RD&E;
- A **vision** for the sector and its RD&E;
- **Priorities** for irrigation RD&E, considering irrigation application, delivery and the industry value chain, and the **outcomes** that these will deliver on;
- A **recommended implementation option** for RD&E; and
- **Actions** to progress the framework.

Each element of the framework is based on process that involved a desktop review and stakeholder consultation between February and April 2010. The desktop review analysed documentation relevant to past, current and future irrigation RD&E, considering relevant industry sectors and stakeholders such as irrigation RD&E users, investors and providers. Consultation involved initial individual phone interviews undertaken in February - March 2010 with a range of relevant stakeholders to gain information on

drivers for change, past irrigation RD&E, current capability and future needs and priorities. The initial findings were presented in a discussion paper and workshopped with stakeholders in April 2010 to test and refine draft findings and options in April 2010. The process has been guided by a project steering committee of representatives from key stakeholder organisations¹ and builds on the national workshop convened by NPSI, IAL & CRC IF in 2008.

The following **guiding principles** were iteratively developed during the project to inform the design of the framework and its elements. The framework:

1. Articulates an agreed vision and strategic priorities for irrigation and RD&E;
2. Positions irrigation RD&E within the R&D policy reform agenda and other RD&E frameworks;
3. Engages and commits key stakeholders;
4. Attracts, focuses and coordinates investment on strategic priorities, which:
 - Balances time horizons, uncertainty, value chain beneficiaries and emergent innovations; and
 - Improves funding continuity and diversifies the source of funding, including the private sector.
5. Delivers RD&E to achieve strategic RD&E priorities and vision for irrigation;
6. Builds and sustains the required RD&E capability; including:
 - Facilitating specialisation and resource and knowledge sharing;
 - Supporting trans-disciplinary RD&E where required; and
 - Building the capacity and career paths to attract & retain people in all sectors of the industry related to RD&E.
7. Demonstrates impact for accountability and continuous improvement; and
8. Avoids duplication and is efficient, effective and flexible.

1.3 Irrigation Industry and RD&E Drivers for Change

There are ten key industry and RD&E drivers which are anticipated to change the irrigation industry and associated RD&E in the future (Table 1).

¹ See Appendix A for stakeholders consulted and project steering committee membership.

Table 1 Key drivers and implications

Drivers	Implications
Population demographics	Demand for irrigated produce will increase
Public & private irrigation investment in irrigation modernisation	Need to produce more with less water and labour
Food and water security	Water markets will contribute to restructuring
Water policy reform	Need for more dynamic and diverse irrigation systems to lower risk and produce more with less
Climate change/variability and carbon-water-energy intersect	Environmental sustainability critical
Resource sustainability	There is on-going demand for R&D knowledge
Industry reputation	Limited support & investment in industry & RD&E
RD&E fragmentation	No national governance/focus for irrigation R&D
R&D policy review	Policy reviews are catalyst for change
Irrigation R&D initiatives ending	Business as usual RD&E is insufficient

The industry has an opportunity to develop as the demand for food and fibre increases and domestic and global population grows. A significant proportion of the increased production required to meet this need is expected to come from irrigated agriculture and horticulture. The expansion of irrigation development is particularly constrained by water availability which is affected by changes in climate and water policy. Access to labour is also dependent on industry demographics. Sustainable management of resources (particularly water), and improving the industry's environmental stewardship reputation are also critical in meeting new community expectations and addressing the perception that some sectors are inefficient water users. These drivers, including a maturing water market and irrigation modernisation investment, will accelerate structural change as on-farm practices, farm businesses and irrigation systems adapt.

RD&E will play a key role in ensuring the industry is well positioned to deal with these changes, and is able to adapt and harness opportunities to build a sustainable and competitive sector. R&D will need to be targeted to meet the current and future needs of end users for knowledge and solutions. Delivery and adoption will also need to be needs driven, appropriate and timely to foster adoption.

In addition to delivering on needs, it is also important to note that the extent to which adoption occurs depends on confidence. In the current environment for irrigation RD&E, there is uncertainty in funding and policy directions, which limits confidence in decision making and adoption. The irrigation sector will always be dynamic and carry an element of uncertainty. Whilst RD&E will never be able to fully mitigate this, it can play a role in providing R&D solutions that support decision making, increase certainty and mitigate risk at the farm, irrigation system and industry levels.

Irrigation RD&E is fragmented across commodities, jurisdictions, institutions and regions and this is its greatest strength and weakness. This approach has allowed RD&E to deliver significant and tangible outcomes through focused investment and effort in specific areas. However it has contributed to a lack of vision/priorities, silos, institutional complexity, competition, an ad hoc approach to building and sustaining capability and a lack of commitment to enduring partnerships.

This report outlines a framework for future irrigation RD&E that builds on the current strengths of stakeholders so that the future industry opportunities can be realised while addressing both industry and RD&E challenges.

2. VISION FOR FUTURE IRRIGATION RD&E

A vision for both the irrigation industry and irrigation RD&E is needed, with the former providing the context for the latter. The irrigation industry is a high performing part of Australia's agriculture and horticulture, and will continue to be into the future. However, the industry faces great challenges in responding and adapting to drivers for change. Whilst this may mean a consolidation of the industry and its development, it also represents opportunities for growth.

2.1 Definition of the 'Irrigation Industry'

In this instance, the 'irrigation industry' is referring primarily to irrigated agriculture and horticulture, i.e. rural and peri-urban producers of food and fibre through the application, use and/or management of water. The definition also includes:

- Urban amenity (parks and gardens);
- Urban and rural companies who deliver irrigation services;
- Irrigation suppliers and advisors (public and private); and
- RD&E providers.

2.2 Irrigation Industry Vision

Australia's irrigation industry will contribute to supplying the increasing domestic and global demand for food and fibre driven by growing population. At the same time, the following pressures will continue to drive structural change in the configuration and distribution of the industry:

- Securing access to increasingly scarce water resources;
- A maturing water market;
- Managing increasing costs of energy and the trade-offs at the interface between energy, water and carbon;
- The need to sustain natural resources, including increased allocation of water for the environment;
- Labour scarcity; and
- Competitive market pressures.

The Australian irrigation industry has been at the forefront of improved water efficiency by virtue of the inherent unreliability of the country's climate and the necessity of adapting to prolonged droughts. Innovation and adaptation will ensure that the industry responds rapidly and contributes to meeting the global demand for food and fibre and addresses these challenges by increasing its productivity and sustaining and harnessing its human and natural capital. By 2020 we will be the recognised global leader in profitable, competitive and sustainable irrigation, contributing to regional, national and global well-being.

2.3 Irrigation RD&E Vision

RD&E will substantially contribute to Australia becoming the global leader in profitable, competitive and sustainable irrigation, particularly in the integration of on-farm water use efficiency and off-farm irrigation system modernisation. By 2020, Australia will have achieved recognition as the global leader in irrigation knowledge and its application. This will allow the industry to contribute to, and access, international developments and innovations in irrigation RD&E. The industry will be recognised for its past achievements and innovations and its unique body of knowledge grounded in providing integrated and cross disciplinary solutions.

Industry, government and the research community will work collaboratively, resourced by sufficiently sustainable investment, to focus on key priorities to deliver RD&E that improves productivity and water use efficiency to address food security needs and deliver environmental sustainability. Irrigation RD&E will also manage climate change adaptation through irrigation modernisation and structural change to minimise negative impacts on communities.

R&D will adapt and build on past achievements, achieving broad adoption across the industry and rapid transfer of benefits to users. Australia's system of tradeable perpetual water access entitlements provides a positive environment for future investment in RD&E and improved infrastructure.

3. IRRIGATION INDUSTRY OUTCOMES AND RD&E PRIORITIES

The project has identified ten industry outcomes across three scales which need to be achieved to fulfil the irrigation industry vision. There are a further ten RD&E priorities where RD&E is needed to achieve the RD&E vision and support the industry outcomes and vision (Figure 1).

Figure 1 Irrigation industry outcomes and RD&E priorities overview			
Goal	Profitable, competitive and sustainable irrigation industry		
Scale	Irrigation application	Irrigation delivery	Industry value chain
Industry Outcomes	1. Water use efficiency generating water savings and productivity gains 2. Improved capability and skills of our people 3. Water security to attract and retain on-going investment and participation 4. Effective business systems 5. Environmental benefits delivered and impacts on natural resources minimised 6. Adaptation to climate variability & change 7. Recapitalisation to improve sustainability & levels of service of irrigation infrastructure		8. Improved industry reputation and value 9. Coordinated industry and RD&E leadership and capability 10. Informed water and irrigation policy
RD&E Priorities	1. Adaptation and adoption of existing practices and technologies at farm, irrigation system, catchment, industry and government scales 2. Irrigation efficiency and agronomic productivity technology and practices 3. Whole farm planning and management 4. Plant varieties and biotechnology	5. Infrastructure modernisation 6. Catchment and water quality planning and management 7. Enhance environmental stewardship to minimise environmental footprint 8. Energy-carbon-water footprints and interactions	9. Demonstrate sustainability and value of irrigation industry 10. Effective RD&E framework and human capacity linked to a national system of delivery.

The outcomes and priorities represent a "balanced portfolio" of what needs to be achieved over ten years taking into account the following considerations:

- Irrigation operates at multiple scales;
- There is a lag between R&D and adoption;
- Pure (i.e. generates ideas) versus applied (i.e. delivers an outcome or changed practice) R&D;
- Getting adoption of existing technologies and practices versus R&D;
- Existing versus new R&D (e.g. blue sky and transformation biology);
- Linking productivity and environmental R&D (from farm to catchment);
- The need to balance 'cutting edge' R&D and fundamental/ safe R&D; and
- Given the systems nature of irrigation, researchers need to be focus on individual on component and integrative research in a systems context; and;
- Major initiatives will be required to integrate disciplines (considering scientific technical areas and different research styles).

An additional priority that has been identified, but not included in the tables below, is the development of best practice benchmarks. This will be a tool for delivering on all priorities.

The following tables expand the RD&E priorities and rate the associated urgency/opportunity.

Table 2 RD&E priorities (adoption)

RD&E priorities - adoption

1. Adaptation and adoption of existing practices and technologies at farm, irrigation system, catchment, industry and government scales (*Immediate opportunity to support government policy and industry*)
 - a. Create a national adoption initiative to provide coordinated and networked regional strategies and services. Key features to include:
 - i. Services driven by user needs at the regional level (undertake market analysis to inform needs)
 - ii. Formal mechanisms to foster the interchange of information between regions and across commodity groups
 - b. Tools for delivery and extension may include:
 - i. Personnel to facilitate adoption at the regional level. This may include a mix of people in a range of organisations/ businesses and using leading growers/champions
 - ii. Packaging existing R&D into tools for use by government policy makers and industry
 - iii. Development of best practice case studies
 - iv. Coordinated learning sites of industry champions & RD&E partners
 - v. Establishing a consolidated irrigation resource (a repository for completed irrigation research and source of information on current best practice)
 - c. Building the leadership and technical capacity of the industry
 - d. Communicating irrigation best practice at farm and system scales to policy makers to inform water reform and public and private investment
 - e. Promoting knowledge sharing through industry associations and forums.

Table 3 RD&E priorities (irrigation application)

RD&E priorities – irrigation application

2. Irrigation efficiency and agronomic productivity technology and practices
(Requires immediate on-going R&D and E of existing R&D)
 - a. Improved irrigation application systems
 - b. Enhanced technologies and sensors to measure water in soils and plants, and irrigation distribution systems to improve water accounting and irrigation scheduling
 - c. Water efficient technologies to reduce evaporation & seepage losses
 - d. Knowledge to manage systems change
 - e. Scheduling:
 - i. Sub surface drainage
 - ii. Salt/leaching management (incl. root zone management)
 - iii. Water balance benchmarks
 - iv. Soil/water monitoring
 - f. Precision irrigation (including development and implementation of variable rate spatial and temporal control of application)
 - g. Managing allocation risks
 - h. Better manage water storage
 - i. Managing evaporation
 - j. Soil/crop management
 - k. Re-use systems, recycling and alternative water sources
3. Whole farm planning and management
(Immediate RD&E opportunity, longer term extension and adoption)
 - a. Systems research
 - b. Resilient farming systems (e.g. with diversified annual and perennial cropping choices)
 - c. Soil management
 - d. Development of best practice farming systems/benchmarks
 - e. Farm layout and drainage
4. Plant varieties and biotechnology
(Immediate RD&E opportunity, longer term extension and adoption)
 - a. Climate and soil adapted varieties
 - b. Salt tolerance
 - c. Crop varieties suitable for tropical irrigated agriculture

Table 4 RD&E priorities (irrigation delivery)

RD&E priorities – irrigation delivery

5. Infrastructure modernisation
(Immediate opportunity for D&E)
 - a. Storage
 - b. Managing evaporation
 - c. Delivery (system efficiency, drainage)
 - d. Reuse
 - e. Materials science, e.g. channel and storage lining systems
 - f. Use of remote sensing in forecasting demand
6. Catchment and water quality planning and management
(Immediate RD&E opportunity, longer term extension and adoption)
 - a. Systems research for new areas
 - b. Resilient systems (e.g. diversified operations and enterprises)
 - c. Solutes/nutrient management across different systems
 - d. Water quality management
 - e. Development of water balance benchmarks
 - f. Development of water cycle monitoring and accounting systems (using real time data) for management
 - g. Alternative water sources
 - h. Discharge water and nutrient removal
 - i. Ensure innovation in water trading and markets
 - j. Conjunctive use of surface water and groundwater
7. Enhance environmental stewardship to minimise environmental footprint
(Immediate RD&E opportunity, longer term extension and adoption)
 - a. Clear pathways to prevent undesirable environmental impacts and minimise environmental footprints
 - b. Interaction between built and ecological infrastructure and biodiversity
 - c. Management of environmental water
 - d. Improving salt balance knowledge and management in light of changing irrigation regimes
 - e. Fertiliser practice to minimise nutrient runoff and drainage
8. Energy – carbon – water interrelationships
(Immediate RD&E opportunity, longer term extension and adoption)
 - a. Flexibility and optimisation, considering scale, timeframes and capital requirements
 - b. Renewables and offsets
 - c. Whole of life cycle carbon water and energy accounting

Table 5 RD&E priorities (industry value chain)

RD&E priorities – industry value chain

9. Demonstrate sustainability and value of irrigation industry
(*On-going priority – may need to occur at smaller scales than 'industry'*)
 - a. Socio-economics for understanding and managing structural change
 - b. Communication/education with
 - i. Broader community to manage perceptions
 - ii. Policy makers to understand and inform policy
 - iii. Input to school curricula on benefits of irrigation
 - c. Linkages with CMAs in developing benchmarks consistent with targets in catchment action plans
10. Effective RD&E framework linked to national system of delivery
(*Immediate opportunity*)
 - a. Effective and coordinated industry leadership
 - i. Representative national and regional RD&E leadership framework, including governance, priorities and investment
 - ii. Improved global industry connections (through international partnerships, collaboration etc)
 - iii. Relevant and appropriate extension to ensure adoption
 - iv. Package existing R&D into useful tools
 - v. Inclusion of participatory action research
 - b. Establish an extension framework linking R&D, advisers and government and industry users
 - c. Build and sustain the capability of RD&E professionals
 - i. Professional standards including knowledge and adoption
 - ii. Provide opportunities and a career path for new researchers as PhDs and Post Doctoral appointments
 - iii. Industry fellowships to broaden and share their experience
 - iv. Opportunities for undergraduate students
 - v. Linkages to schools and other initiatives of RDCs/CRCs/universities etc
 - d. Monitoring & Evaluation and adaptive management processes
 - e. Build networks with international irrigation RD&E providers and users.

4. IMPLEMENTATION OPTIONS

4.1 Overview

Future irrigation RD&E will demand greater integration and collaboration to deliver the required systems innovation and ensure best use of available funds and capabilities. This will require a framework that encompasses the governance, strategy, funding, delivery and capability of irrigation RD&E and is based on the follow principles:

- Articulates an agreed vision and strategic priorities for irrigation and RD&E;
- Positions irrigation RD&E within the R&D policy reform agenda and other RD&E frameworks;
- Engages and commits key stakeholders;

- Attracts, focuses and coordinates investment on strategic priorities;
- Delivers RD&E to achieve strategic RD&E priorities and vision for irrigation;
- Builds and sustains the required RD&E capability;
- Demonstrates impact for accountability and continuous improvement; and
- Avoids duplication and is efficient, effective and flexible.

Four implementation options have been identified based on these principles (Figure 2). Each option is discrete and is described along with a SWOT analysis in the following sections.

Figure 2 RD&E Implementation Option

	National Committee	Time-bound Joint Venture	Enduring Joint Venture	Irrigation RDE Institution
Governance	All stakeholders	Voluntary, some stakeholders	Voluntary, all stakeholders	Representative board
Timeframe	On-going	3-5 years	On-going	On-going
Strategy	Sets/tracks RD&E priorities Facilitation to address gaps	Delivers some RD&E priorities	Sets/tracks RD&E priorities Deliver all RD&E priorities in time	Sets/tracks RD&E priorities Deliver all RD&E priorities in time
Funding	In-kind contribution	Participant contribution	Stakeholder contribution (government and industry)	Enduring (government and/or industry)
Delivery (R&D)	Facilitate alignment and coordination	Alignment and coordination within JV scope	Leverage alignment and coordination	Leverage alignment and coordination
Delivery (Extension)	Facilitate alignment and coordination	Appropriate extension for funded R&D	Appropriate extension for funded R&D Facilitate coordinate extension network	Appropriate extension for funded R&D Facilitate coordinate extension network
Capability	Not addressed	Limited to JV scope/timeline	Some strategic investment	Develop own and support others

4.2 Option 1 – National Coordination Committee

Purpose

- Represent irrigation RD&E in the R&D and public policy arenas;
- Establish irrigation RD&E priorities across immediate, medium and long-term horizons and seek additional investment;
- Facilitate and coordinate aligned irrigation RD&E investment and delivery through discussion, deliberation and consensus; and
- Monitor progress towards achieving irrigation RD&E priorities.

Governance

- Enduring independent advisory committee, with terms of reference agreed to by key stakeholders and renewed every five years;
- Memberships open to key irrigation investors, providers and representatives from government and industry users.

Fit

- Independent committee, linking to RD&E system through members;
- Partial overlap with Water Use in Agriculture Strategy under PISC agenda in setting priorities and coordination. However membership is broader than Water Use in Agriculture Working Group.

Resourcing

- Stakeholders fund own participation in committee; and
- Contribute funds to support secretariat and projects to inform the committee's business.

SWOT analysis	
Strengths	Weaknesses
<ul style="list-style-type: none"> • Represents irrigation RD&E value chain (investors, providers and users) • Continuity not linked to funding cycles 	<ul style="list-style-type: none"> • Relies on consensus to be effective • Lacks funds to set strategic directions, facilitate coordination and establish partnerships
Opportunities	Threats
<ul style="list-style-type: none"> • Focal point to attract additional funds • Platform for industry to develop national leadership capacity and evolve a national body 	<ul style="list-style-type: none"> • Overlap with Water Use in Agriculture and peak interest groups • Lacks resources and authority to effectively engage in the national RD&E and policy arenas

4.3 Option 2 – Time-bound Joint Venture

Purpose

- Commission RD&E focussed on shared strategic RD&E priorities using a pool of funds created from existing stakeholders and new sources; and
- Work with providers to ensure effective and efficient delivery and report on impact and implications. Consult with end user stakeholders.

Governance

- New entity with own constitution and board;
- Uses business systems of an existing stakeholder or establishes a new entity;
- Employs management team depending on the size of the pooled funds; and
- Joint venture is time-bound to one funding cycle (3-5 years).

Fit

- Similar position to other R&D joint ventures.

Resourcing

- Start-up investment (establishment costs, investment funds etc); and
- Additional investment from industry and government.

SWOT analysis	
Strengths	Weaknesses
<ul style="list-style-type: none"> • Ability to focus on achieving shared RD&E priorities • Pool of funds demonstrates commitment and provides basis to attract additional investment 	<ul style="list-style-type: none"> • Scope limited to shared rather than strategic RD&E priorities • Not representative if investors are limited
Opportunities	Threats
<ul style="list-style-type: none"> • Greater ability to attract additional investment • Policy representation backed by financial commitment 	<ul style="list-style-type: none"> • Potential investors limited by funding cycles, current commitments, accountability obligations • Competition from other joint venture initiatives

4.4 Option 3 – Enduring Joint Venture

Purpose

- Represent irrigation RD&E in the R&D and public policy arenas and establish irrigation RD&E priorities across three horizons;
- Facilitate and coordinate aligned irrigation RD&E investment and delivery through discussion, deliberation and consensus;
- Commission RD&E focussed on shared strategic RD&E priorities and gaps using a pool of funds created from existing stakeholders and new sources;
- Work with providers to ensure effective and efficient delivery and report on impact and implications. Consult with end user stakeholders; and
- Monitor progress towards achieving irrigation RD&E priorities.

Governance

- New entity with own constitution and board representing all stakeholders;
- Use business systems of an existing stakeholder or establishes a new entity;
- Employ management team depending on the size of the pooled funds; and
- Enduring joint venture, with terms of reference reviewed every five years.

Fit

- Complements Water Use in Agriculture Strategy; and is similar to National Climate Change Research Strategy for Primary Industries partnership.

Resourcing

- Subscription by all key stakeholders for start-up and initial operations;
- Additional investment through further subscription, grants and industry funding.

SWOT analysis	
Strengths	Weaknesses
<ul style="list-style-type: none"> • Stakeholder and financial commitment to achieving all the RD&E priorities • Ability to focus and coordinate investment and delivery and build capability 	<ul style="list-style-type: none"> • Time before start-up costs recouped through additional investment or impact (benefit-cost must be > 1) • Challenge in getting all the key stakeholders to commit to joint venture
Opportunities	Threats
<ul style="list-style-type: none"> • Greater ability to attract additional investment through various means • Policy representation backed by commitment of all stakeholders 	<ul style="list-style-type: none"> • Potential investors limited by funding cycles, current commitments, accountability obligations • Competition from other joint venture initiatives

4.5 Option 4 – Irrigation RD&E Institution

Purpose

- National organisation focused on irrigation RD&E (investor and provider) for government and industry use/benefit.

Governance

- Nationally legislated organisation with own funding allocation;
- Independent board and own management and RD&E staff.

Fit

- Sits alongside CSIRO, Universities and State agencies.

Resourcing

- Own allocation from Treasury or combination of portfolio agencies; and
- Ability to attract additional resources from industry and government.

SWOT analysis	
Strengths	Weaknesses
<ul style="list-style-type: none"> • Independent with a clear focus and mandate • Provides capability. Facilitates trans-disciplinary RD&E 	<ul style="list-style-type: none"> • How to best link national R to local D&E • Balancing industry and government needs
Opportunities	Threats
<ul style="list-style-type: none"> • Focal point for international collaboration and investment • Establish linkages through representation of existing stakeholders' executive and staff representation on board & committees 	<ul style="list-style-type: none"> • Existing investors and providers disinvest in irrigation RD&E (substitution effect) • Scope too narrow and broader structure created – e.g. CSIRO Flagships or national Water Science Agency established through COAG

4.6 Discussion

There is a growing acceptance that greater collaboration between all stakeholders can improve the efficiency and effectiveness of RD&E, which is the subject of current national reviews. However the incentive to collaborate is quite low unless there is a clear mandate, organising framework and reward through recognition or additional resources to leverage against.

This report addresses these issues by establishing the irrigation RD&E vision and priorities and implementation options.

Considerations of which option is the most suitable for irrigation RD&E stakeholders to pursue needs and taking into account the current operating environment and principles outlined in section 4.1 follows:

A **national coordination committee** is the most flexible yet weakest option since it simply commits existing stakeholders to a dialogue mechanism in order to set irrigation RD&E priorities and pursue opportunities as they arise. The committee's effectiveness is limited to what can be achieved through consensus, lessening its influence on RD&E policy, strategy and investment. On this basis it is not recommended.

A **time-bound joint venture** is a replication of existing irrigation RD&E initiatives, such as NPSI and CRC-IF, where stakeholders pool their own and additional investment to commission and deliver RD&E on shared priorities. This option will deliver real benefits to stakeholders who choose to participate through focusing on shared priorities. However these priorities will only be a sub-set of national RD&E priorities, leaving no forum or mechanism through which to pursue them. This is further compounded by the lack of representation of all key stakeholders and the time-bound feature of such joint ventures. On this basis it is not recommended.

A new **national irrigation RD&E institution** is the most difficult option to achieve. It is an enduring leadership structure that can provide on-going investment in both RD&E priorities and capabilities. However it will require considerable government and industry leadership, commitment and new investment to establish. There are also unanswered questions relating to linkages to existing investors and providers. On this basis it is not recommended.

An **enduring joint venture** combines commitment and adaptability to make it the recommended option. It differs from a time-bound joint venture by engaging all stakeholders to deliver on all the RD&E priorities beyond individual funding cycles. The joint venture would focus on opportunities (shared priorities) and gaps (unfunded priorities, capability development, institutional and policy matters). The enduring nature allows the joint venture to pursue these opportunities and gaps in the short, medium and long term. Base funding would come from key stakeholder subscription. Additional funding would come from individual opportunities/gaps subscriptions, grants and industry contributions. The initial start-up effort will be greater than for the national coordination committee or time-bound joint venture options. However the enduring nature and adaptability means it can evolve as required. On this basis it is recommended.

5. ACTIONS

The next step is to raise awareness and seek commitment of key stakeholders to the framework, the irrigation RD&E vision/priorities and the recommended enduring joint venture implementation option in particular.

Three phases of action are recommended based on the understanding that this irrigation RD&E framework needs to:

- Build on and augment the current irrigation RD&E system and its key stakeholders;
- Inform and be guided by the national RD&E policy reform agenda; and
- Start now, recognising there will be uncertainty and conflict during its development.

5.1 Set-up Phase

Purpose

- Establish initial governance and start-up funds for the joint venture; and
- Raise awareness and seek commitment of key stakeholders in industry and government.

Tasks

- Communicate and promote irrigation RD&E framework to industry and government;
- Submissions and letters to review committees and initiatives, including PISC, COAG, PC Review, Rural R&D Council, PMSEIC Expert Working Groups on Food Security and Energy – Carbon – Water Intersect, Chief Scientist;
- Project Steering Committee seek in principle commitment from key stakeholders – board approval and contribution (cash and in-kind) for first year of framework implementation; and
- Establish a Working Group to guide the development of the joint venture.

5.2 Discovery and Trialling Phase

Purpose

The second phase involves the key stakeholders working in partnership to clarify the position, scope and governance of the joint venture. The phase is discovery oriented in recognition that aspects of the joint venture need to be explored and tested before deciding on the most appropriate position, scope and governance.

Tasks

- Analysis of existing and planned RD&E against irrigation RD&E priorities to identify opportunities and gaps. To be conducted individually with each key stakeholder²;
- Explore, determine and agree to the most appropriate governance model for the joint venture;
- Continue to communicate and promote the framework;
- Commission projects to address strategic issues and provide early wins; and
- Develop a strategic plan for the joint venture.

5.3 Embedding Phase

Purpose

- To formally start the enduring joint venture.

Tasks

- Establish joint venture as new legal entity;
- Working Group ceases following appointment of board and staff; and
- Joint venture develops and implements annual operation plan in line with strategic plan.

² This analysis needs to occur at a finer scale than the guiding irrigation RD&E priorities to identify the specific opportunities and threats.

APPENDIX A – STAKEHOLDERS CONSULTED AND PROJECT STEERING COMMITTEE MEMBERSHIP

Project Steering Committee

- Guy Roth, Program Coordinator, National Program for Sustainable Irrigation
- Rob Houghton, National Program for Sustainable Irrigation
- Chris Bennett, Irrigation Australia Limited
- Peter Toome, Irrigation Australia Limited
- Bruce Pyke, Cotton Research and Development Corporation
- Bruce Finney, Cotton Research and Development Corporation
- Peter Hayes, CRC for Irrigation Futures
- Ian Atkinson, CRC for Irrigation Futures

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Stakeholders Consulted

The following stakeholders were consulted via individual phone interviews.

Organisation/industry	Contact
Project Steering Committee members	<ol style="list-style-type: none"> 1. Chris Bennett IAL 2. Peter Toome, IAL 3. Bruce Pyke, CRDC 4. Peter Hayes, CRC for Irrigation Futures 5. Ian Atkinson, CRC for Irrigation Futures 6. Rob Houghton, NPSI
Cotton	7. Adam Kay, Cotton Australia
Grains	8. James Clarke (Chair of Northern Panel, GRDC)
Rice	9. Ruth Wade (Executive Direction RGA) and Ian Mason (Chair of Rice RDC)
Sugar	10. Eric Danzi (CaneGrowers)
National Farmers Federation	11. Deb Kerr (NRM Manager, National Farmers Federation)
National Irrigators Council	12. Danny O'Brien (CEO, National Irrigators Council)
Tasmania Northern Australia Queensland WA	<ol style="list-style-type: none"> 13. Chris Thompson (General Manager of Agricultural Resource Management; Senior Engineering Consultant, Tasmanian Irrigation Development Board) 14. Geoff Strickland (CEO Ord Irrigation) 15. Keith Bristow (CSIRO and CRC for Irrigation Futures) 16. Geoff Calder, CEO Harvey Water (and Chair of Bondi Group)

The following stakeholders attended the workshop.

Participant	Organisation
Chris Bennett	CEO, IAL
Peter Toome	Chairman, IAL
Bruce Pyke	General Manager – R&D Investment, Cotton Research and Development Corporation
Kelvin Montagu	Chair, One Water Many Futures and Knowledge Manager and Education Leader, CRC for Irrigation Futures
Rob Houghton	Chairman, NPSI
Guy Roth	Program Coordinator, NPSI
Anne-Maree Boland	Horticulture Water Initiative; Partner/Principal Consultant RM Consulting Group
Keith Bristow	CSIRO Land and Water/CRC for Irrigation Futures
Kate Fairley-Grenot	Chair, Rural R&D Council
Alison Turnbull	Natural Resources and Climate Manager, Horticulture Australia Limited
Toni Anderson	Natural Resources and Production Extension Officer, BSES
Bruce Finney	Executive Director, Cotton Research and Development Corporation
Sigrid Tijs	R&D/Project Coordinator, Murrumbidgee Irrigation
Danny O'Brien	CEO National Irrigators Council
Jennie Hehir	CEO Murrumbidgee Groundwater
Vern Costelow	Business Development Manager, Water Dynamics
Peter Smith	Leader Northern Valley Irrigation Modernisation Projects, Primary Industries; Industry & Investment NSW
Jim Cox	Principal Scientist, Water Resources & Irrigated Crops, South Australian Research & Development Institute
Chris Thompson	General Manager of Agricultural Resource Management ; Senior Engineering Consultant, Tasmanian Irrigation Development Board
Peter Otteson	General Manager, Crops, Horticulture, Irrigation & Wine Branch, Agricultural Productivity Division, Department of Agriculture, Fisheries & Forestry



CONTACTS

Dr Guy Roth, Coordinator

National Program for Sustainable Irrigation

P: 02 6792 5340 M: 0417 223 179

guyroth@roth.net.au

www.npsi.gov.au

PO Box 802, Narrabrai NSW 2390, Australia

Chris Bennett, CEO

Irrigation Australia Limited

T: 02 9476 0142 F: 02 9476 0792 M: 0439 997 491

chris.bennett@irrigation.org.au

www.irrigation.org.au

PO Box 1804, Hornsby NSW 1635, Australia

