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Irrigation Innovation in a Changing Climate Workshop Report

Tim Cummins
National Program for Sustainable Irrigation

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Postal address GPO Box 2182, Canberra ACT 2601

Office Location L1, The Phoenix
86 Northbourne Ave, Braddon ACT

Telephone 02 6263 6000

Facsimile 02 6263 6099

Email Land&WaterAustralia@lwa.gov.au

Internet www.lwa.gov.au

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Irrigation Innovation in a Changing Climate

Workshop Report

Irrigation Australia, National Program for Sustainable Irrigation and CRC IF – National Approach to Irrigation Research and Development

3 October 2008

Tim Cummins, Tim.Cummins@bigpond.com

Tim Cummins & Associates
355 Ridgewood Rd
RSOEBANK
NSW 2480

(02) 6629 1170

About the Author:

Tim Cummins is the principal consultant of Tim Cummins & Associates. Tim works with rural communities to collect, analyse and synthesise complex data, so that those communities can play an active role in developing and applying natural resource policy. Tim Cummins specialises in written and oral presentations that engage local communities in policy debates. He has an unrivalled reputation for clearly defining issues and for helping community groups to think strategically.

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INTRODUCTION

Irrigation Australia Limited (IAL), the National Program for Sustainable Irrigation (NPSI) and the Cooperative Research Centre for Irrigation Futures (CRCIF) see the need for a paradigm shift in irrigation innovation. This need has been highlighted further by the climatic conditions of the early 21st Century, but it has been evident for some time. Such a shift would enable the irrigation industry to improve its water use efficiency, and to improve river and landscape health, while accruing long term benefits for the people of Australia. IAL, NPSI and CRCIF see the potential for Australia to be a world leader in irrigation knowledge and technology, and they see that this in turn, has the potential to generate significant economic benefits.

To start addressing that need, with the support of the Australian Government, IAL, NPSI and CRCIF jointly convened a workshop titled "Irrigation Innovation in a Changing Climate". The aim of the workshop was to kick off a process to develop a ten-year irrigation innovation strategy. The workshop, held in Canberra on 16 September 2008, attracted about 100 participants from a broad cross-section of the irrigation industry. It included people from urban water organisations, garden irrigation supply companies, irrigators, policy makers, researchers, manufacturers and rural water supply organisations[1].

The workshop was timely. The CRCIF completes its seven year term on 30 June 2010. NPSI also completes its phase two three year term in 2010 and is currently considering future options. There is no clear pathway for future nationally coordinated investment in or delivery of irrigation innovation after that date.

Much has been achieved in irrigation research in Australia; much remains to be done. The pressing need is for a broadly supported, genuinely integrated, long-term national approach to setting objectives for the research and development of sustainable irrigation. This must be coupled with a commitment to funding from both the private and public sectors.

The conjunction of extraordinarily limited seasonal allocations, the perceived over-allocation of water entitlements, increased energy costs, and heightened concerns regarding the potential for climate change has served to focus attention on water-use policy, practice and third-party impacts. This attention has been directed to irrigation and its continued "licence to operate".

Given the scale and exposure of irrigation-dependent industries, this attention is unlikely to reduce and it calls for the irrigation sector, of its own accord, to redesign its future lest others take that responsibility for themselves.

How might this be done? The workshop considered this very issue. This report contemplates that workshop's deliberations.

THE FUNDAMENTALS OF IRRIGATION RESEARCH AND DEVELOPMENT

In some senses the nature of irrigation research has not changed for more than 5,000 years. Irrigation is all about human beings applying water to augment rainfall in the support of crop, pasture or garden growth. Irrigation is about the relationship between the plant, the soil and the human inputs of water required to produce an economic output. As such, irrigation boils down to three basic tasks:

1. **Applying the right amount of water** – the amount of applied water must be enough to meet the irrigator's present economic needs while also providing enough leaching to maintain the irrigator's potential to meet future needs. But the amount applied must not be so much as to cause

[1] Appendix 1. shows a list of those who participated.

unacceptable damage to the environment or an unacceptable reduction in the potential for third parties to meet their economic needs. What is unacceptable and what is enough? These are matters for human investigation.

2. **Applying water at the right time** – water must be applied before plant growth is unhelpfully checked by water stress; and yet it should not be applied before plant growth is helpfully checked by water stress. There is a tension between the roles of irrigation in supporting either floral or vegetative growth. Human knowledge determines how well this tension is resolved. That knowledge is imperfect and must be continuously improved.

3. **Applying water in the right place** – soils vary and their water holding abilities vary; the amount of water applied must therefore also vary according to the land-use potential of the soils being irrigated. Moreover, applying water to only part of the rootzone can help to manipulate the plant's production of plant growth regulators so as to favour economic needs. But the placement of irrigation water is important in other senses as well. For example, applying water to foliage can take advantage of the latent heat of freezing to manage frosts or the latent heat of vaporisation to manage heat stress. By contrast applying water to the soil can help it to act as a heatbank and therefore to influence the nature of the radiating surface during times of frost. The placement of irrigation water is accordingly the subject of ongoing research.

Since time immemorial, irrigation research and development has addressed these tasks. It must address them still, but now more than ever it must address them in the context of the Australian landscape, the Australian climate, the Australian water cycle, the dynamics of global agricultural markets and the tension between critical human needs, private amenity and public amenity in Australian cities and towns.

These three tasks provide the fundamental principles around which any future innovation strategy must be based. With regard to the fundamentals, the strategy must:

- continuously improve existing knowledge;
- develop new knowledge and solve problems; and
- adapt existing knowledge to be used in different crops and in different landscapes.

While the fundamentals remain important; by themselves they are not enough. The innovation strategy must do more than to continue to refine the fundamentals. It must contemplate the fundamentals in the context of the risks and uncertainties of the Australian climate.

INNOVATION IN THE FACE OF RISK AND UNCERTAINTY

There is, and must be, a sense of place in irrigation research. Agriculture (as the name suggests) is an aspect of human culture, and as such varies with the people and the places involved. Wheat growing in a big hot country (with old soils) like Australia is very different to wheat growing in a big cold country (with young soils) like Canada. It is different again in a small wet country like England.

Like most human activities the various approaches to irrigation are largely framed by attitudes to risk. And risk varies from place to place. The big risk in Australian irrigation is highly variable rainfall. This influences both the supply and demand for irrigation water. And recent experience suggests we don't know as much as we thought about the probabilities surrounding rainfall, runoff and water storage in Australia. If you don't know much about the probabilities it means you are dealing with uncertainty rather than risk. (To paraphrase Keynes, there is a lot of risk in playing roulette but not much uncertainty.)

Ultimately irrigation *per se* is about weather rather than climate, and decisions must be made in prospect not retrospect. When water is extremely scarce, as in the recent past in the southern Murray-Darling Basin, the ability to undertake essential farm operations at the right time is challenged. Water trade is one response to this; many of the practicalities of managing water trade in times of drought hinge on arrangements for the limited water to be available when it is most valuable, not just how much water is available. Timing is important in a different sense. Irrigated farming systems vary fundamentally in the length of their investment and production periods, from interruptible annual crops and pastures to non-interruptible perennial horticulture. Dairying, is best described as quasi-interruptible, up to a point, depending on prices and returns, purchased grain and fodder can substitute for irrigated pastures.

By contrast, irrigation research and development is about climate rather than weather. It is about thinking through the needs of the future; it is about thinking through how to generate the optimum economic returns from a seasonally fluctuating resource whose manifold temporal characteristics are highly uncertain. In contemporary Australia this means developing appropriate institutions as much as it means developing appropriate technologies. It also means striking a balance between water for the environment and water for human use. This balance is not just about the volumes to be made available for each, it is about reconciling the variability that sustains Australian environments against the human desire for constancy.

Any future innovation strategy must therefore take account of:

- the risk of low allocations at the start of an irrigation season;
- the uncertainty surrounding the potential for allocations to increase during the course of a season;
- the risk that allocations will fluctuate from year to year; and
- the uncertainty surrounding the total volume of water available for irrigation in the short, medium and long terms.

STRENGTHS AND WEAKNESSES OF THE CURRENT APPROACH TO INNOVATION

As a prelude to the development of an innovation strategy, the workshop participants were asked to jot down their thoughts on the strengths and weaknesses of the current approach to innovation. Their ideas are summarised here[2].

STRENGTHS

Australian irrigation has formidable strengths in each of the 'five capitals' that are sometimes described as underpinning sustainable economies. For example, the **human capital** embodied in the existing irrigation researchers, practical innovators, extension workers and service providers is seen as a strength and a competitive advantage.

Similarly, the **social capital** embodied in the numerous networks for collaborations between end-users and researchers, in the institutions that manage innovation, in the norms and trust that facilitate coordination and cooperation for mutual benefit, are also seen as strengths. All these things help us to maintain and develop human capital in partnership with others.

[2] The full list of ideas is in Appendix 2.

Australia's **manufactured and built capital** is strong in terms of the tools, machines and buildings required in each facet of the irrigation industry. The products available to help apply water to farms and gardens are world-class, and there are pockets of excellence in research facilities.

In world terms, Australia's stocks and flows of **financial capital** are extraordinarily strong. This enables the other types of capital to be owned and traded. In this way it acts as a medium of exchange and a store of value. It also provides the units of account.

Australia is also richly endowed with **natural capital.** It has abundant stocks of cheap land, and until recently it was thought to have reliable, but highly variable, flows of water. A key strength is that it has managed to keep meeting critical human needs, providing base-levels of amenity and producing significant supplies of food and fibre from negligible stocks, and uncertain flows, of water.

WEAKNESSES

Where there are mountains there are also valleys; where there are strengths there are also weaknesses. What is a strength in one sense is often a weakness in another. Over time our greatest strengths can become our greatest weaknesses.

Most of the weaknesses identified by the participants fall into the category of **social capital**. They revolve around a perceived lack of consistency in approach, leadership and commitment to funding. They are concerned with an unwillingness, inability or lack of experience in working collaboratively outside a narrow (commodity-based) range. And they question the relative weighting of resource allocation to administration and innovation.

Many of the weaknesses relate to an inadequate understanding of the **natural capital**. As discussed earlier in this report, there is much that is not yet understood about the risks and uncertainties associated with the stocks and flows of water in Australia.

INNOVATION: OPPORTUNITIES AND THREATS

As a further prelude to the development of an innovation strategy, the workshop participants were also asked to jot down their thoughts on the opportunities and threats surrounding innovation in the irrigation industry. Their ideas are summarised here[3].

OPPORTUNITIES

Concerns about climate change mean that the Australian are open to and accepting of the need for change in the way we go about the business of irrigation. The workshop participants saw this as a once in a lifetime opportunity to bring about a range of improvements. These are seen as imperatives. And the clear common understanding of these imperatives was seen as an opportunity to strengthen our social capital and overcome the weaknesses outlined above.

THREATS

The participants saw the overwhelming threat coming from the existing weaknesses in the **social capital.** Without care, thought and determination, the existing weaknesses could result in the opportunities being missed.

[3] The full list of ideas is in Appendix 2.

INNOVATION: DEMAND-PULL *AND* SUPPLY-PUSH

Innovation is about problem solving and it is about uncovering opportunities. It is not just about one or the other. This basic fact always poses a management dilemma: how best to balance responding to irrigators' needs with accountability for budgets, milestones and outcomes along with the need for creativity, adaptability and the scope for dumb-luck?

Any future innovation strategy must take account of this creative tension.

TOWARDS AN INNOVATION STRATEGY

The workshop participants agreed on the need for a nationally coordinated strategy for investment in, and delivery of, irrigation innovation starting on 1 July 2010. They further agreed that NPSI should lead the development of a strategic framework by the end of 2008, and that this should provide the basis for engagement with industry and government with a view to securing a budget allocation in 2009/10 financial year.

In broad terms they thought the aim should be for $100-200 million over ten year program. It was agreed that funds should come from both the private and public sectors. And it was agreed that the strategy should be developed with input from a broad cross-section of different interest-groups.

The participants had no firm view on the delivery model for the strategy; rather they deliberately left that issue to be resolved by those charged with the responsibility of developing and negotiating the strategy. Nonetheless they saw the need for innovation as being too great to leave to any ad-hoc discretionary funding process.

The participants wanted to see strong linkages between national policy priorities and the innovation strategy: "what big problems does our strategy solve, when, how and at what cost?" They thought it should include, but not be limited to:

- Policy innovation;
- Water resource systems innovation;
- On-farm systems innovation;
- Active environmental watering; and
- Landscape irrigation.

The participants also wanted those developing the strategy to take account of the ideas generated at the workshop. To that end, Appendix 2 of this report provides a list of the ideas presented to, and generated at, the workshop.

INSTITUTIONAL ARRANGEMENTS – OPTIONS FOR THE FUTURE

This workshop was the first step in a longer process designed to hear the views of the irrigation industry and to establish whether there is a clear consensus about the need for irrigation innovation to advance. Clearly there is a consensus. The next step is to consider the institutional arrangements that are most likely to make that advance happen; this cannot happen in a vacuum – much will depend on developments at the Commonwealth level.

The Australian Government is currently conducting a number of relevant reviews and processes. These include the National Innovation System Review, the Primary Industries Standing Committee on Water (DAFF/LWA/CSIRO) and the COAG Climate Change and water group (DEWHA). As discussed during the workshop, irrigation innovation depends on a complex network of providers and investors from both the public and private sector.

NPSI, CRC IF and IAL have charged a small working group with developing some strategy framework options by the end of November 2008. This framework will further develop the strategic directions, scope and needs of both the rural and urban irrigation sectors.

FOR MORE INFORMATION

For more information on the workshop and what happens next contact; Guy Roth, Program Coordinator, National Program for Sustainable Irrigation, 02 6792 5340 / 0417 223 179 or guyroth@roth.net.au.

Funding for the workshop was provided by the National Program for Sustainable Irrigation

APPENDIX 1. A LIST OF THE WORKSHOP PARTICIPANTS

APPENDIX 2. A RECORD OF THE IDEAS PRESENTED TO AND GENERATED AT THE WORKSHOP IN CANBERRA ON 16 SEPTEMBER 2008

Peter Hayes – Chair, CRCIF

- Allocation
- Energy costs
- Climate change
- Food security
- Biodiversity
- Licence to operate as irrigators

Want a National Strategy:

- How do we combine our collective interests?
  - Social credibility
  - Economic credibility
  - Environmental credentials
- Need to avoid crisis/reactive/problem focus
- Need a broader view – look for opportunities.

We need to define what we want:

- Broader scope – social/cultural/market/risk
- Social adjustment – strategic issues need to be included
- Education/professional development/critical mass/coordination
- Longer term view needed – investment commitment >3 years

Rob Houghton – Chair, NPSI

- Endorsed Peter's comments
- Huge challenges, accelerated Government buyback of water will impact on industry
- Irrigators making decisions under huge pressure e.g. selling water and not returning to agriculture
- The biggest change in irrigated agriculture
- We need good leadership – Policy/farm/R&D
- Very important day for irrigated agriculture
- Urban/drought/climate change/energy – Rural – R&D innovation critical element to address.

- R&D is a good return
  - 45% lower water use achieved in rice
  - Benefit/Cost ratio of ten.

Phase II – NPSI – finishes in 2010

- $3M investment not enough, need more

Water for the Future

- $12.9B needs an R&D component that is currently missing
- New innovation needed as part of investment
- Another alternative to just water buy back is needed

Agriculture and Irrigation Innovation – Laurie Arthur, National Water Commission, NFF water policy, Murray irrigator

- Very efficient bankless channels – rice grower
- Crisis of confidence in Southern MDB
- 3rd zero in a row in Murray general security
- Forcing many into government buy backs

  $50M pilot buy back got 0.8% of general security pool

  $3B – will get 50% general security pool
  - Raises a lot of questions for the future of our industry
- Change of critical mass
- New sustainable cap for Murray Darling Basin will impact
- Explosion of cost base – fertiliser/energy costs rising

Traditional irrigation industries such as rice/cotton/dairy have major readjustment

Markets are critical

- E.g. rice 2% of normal production and response has been for growers to buy a rice mill in California as part of and International marketing strategy.
- Dairy industry. Pasture now cut and carried and bought in feed to maintain production and market share.
- Rice and dairy – surface irrigation needs new low cost technology to be economic e.g. may only be used 1 year in 3.
- Depopulation of irrigated areas
  - need very high labour efficiency
- R&D

- Markets need to communicate with plant breeders

- Large investment happening with little R&D back up
- Severe drought has shown we need a mixture of both high and low value irrigation to provide a buffer for crops needing high security.
- New infrastructure in districts is increasing water charges.

An Irrigation Farmer's Perspective – Andrew Parkes

Past	Now and Future
Focus on cotton	Move diversified crops – lucerne, barley, faba beans
Surface irrigation	Mix of irrigation systems
1 bale/ML	1.6 bales/ML
$200/ML	$500/ML
10ML/ha	7ML/ha
	Improved soil and nutrients Carbon accounting

Therefore:

- As water availability declines – need more R&D
- As costs rise – need more R&D

Water Scarcity and the Future Ian Prosser - CSIRO Science Director for Water for Healthy Country program

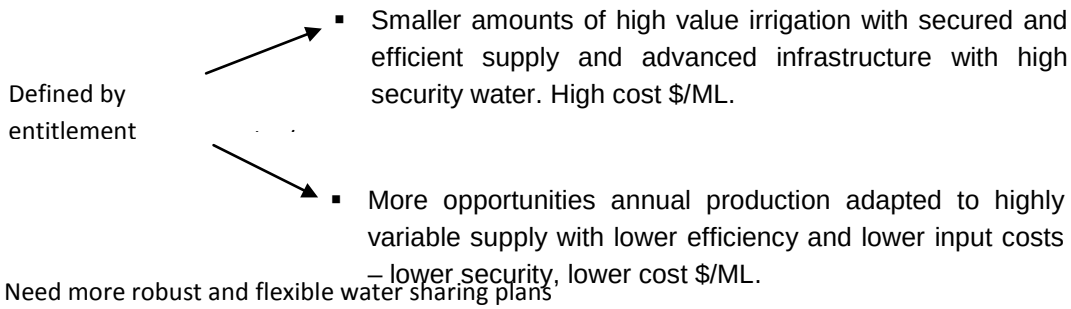
- Sustainable Yield Projects for MDB
- Climate change 2030 mid range (most likely)
  - 2,500GL/yr decrease – climate change
  - 1,200GL/yr decrease – bushfires/forest (more certain)
  - 200GL/yr decrease – more farm dams and plantations
  - 300GL/yr decrease – double accounts of surface and ground water
  - 200GL/yr decrease – irrigation returns (improved water use efficiency)
  - TOTAL = 4,600GL/yr out of 23,000GL/yr in MDB
  - = 20% less water on average – but not uniform sharing
- Southern Basin most affected
- Also diverters/environment/downstream flow affected differently
- Water managed and traded as Gross not Net use. Therefore improved water use reduces return flows to river.
- Not all impacts are delivered downstream e.g. Northern Basin has less influence downstream.

Over allocation:

- Use as a % of total surface water
- 10% to 60% varies valley by valley

Future

- 20% less water
- New urban and environmental demands
- Food security means greater demand for irrigation
- need to demonstrate and achieve greater benefit per ML
- Think of the last 10 years of inflows as occurring 3 x more after in future (extreme scenario)
- Development potential elsewhere – out of basin in long term?
- Choose somewhere between two extremes



- Need more robust and flexible water sharing plans
  - Risk based approach
- How to Re-structure?
  - Market adjustment (no targeting) or systematic refinement of entitlements (targeting)
  - Where do we want to address over-allocation?

The Future of Urban Irrigation Dr. Peter Crawford - Past MD Sydney Water. NSW Healthy Rivers Program.

- 3 or 4 areas for research:
  - Future skills for COAG
    - Need to think beyond current needs to 10-15 years needs
  - Need catchment by catchment understanding and response to define water resource systems to be sustainable.
  - Land and vegetation and water quantity and quality – have not focussed on whole of catchment but managed each separately.
  - Need total system focus not individual issue
  - Otherwise have failing targets when managed individually. Governments reluctant to do this as governments want simple, low cost solutions.
  - Total system is much harder – involves several Ministries

- Water plans
  - Too narrow e.g. water plans did not allow off river watering of stock to improve water quality.
  - Trade-offs between land/water/vegetation not covered.
  - Endless numbers of agencies/interference makes instructional blockage.
- Water pricing – will be an ongoing issue. As water moves to highest value use and recycling occurs. Raw water not appropriately priced and this is a barrier to.

Context for a new irrigation R&D Strategy

Strengths

- Current pressure to final solutions/knowledge levels.
- Conditions have forced/brought forward the need for R&D.
- Opportunity – imperative of the moment.
- Expertise of people in industry.
- People – researchers and innovators, existing linkages.
- People – researchers
- Track record for innovation and adoption of management practices/technology in some sectors.
- Ability to problem solve and provide solutions.
- Talking about it.
- Increased productivity.
- Champions willing to take a risk to introduce new R&D into the industry.
- Lots of areas to develop, innovate, research, ample research skills base.
- A sense of urgency.
- Ample research skills.
- Culture of innovation and opportunism – urgency.
- Champions who spend money and do great innovations.
- Research capacity.
- Innovative
- Adaptability of irrigators, essential productivity (social), profitability.
- Value of the irrigation industry and the nation productivity and production.
- Some players very willing to change.
- Irrigation will be vital to food security into the future.
- The value of production by irrigation is vital to rural communities.
- Productivity.

- Acknowledgment of problems.
- Search for knowledge.
- Productivity/production can get better but is world best practice.
- Technical capacity.
- Productivity
- Food security
- Profitability
- Reliability
- CMA predictability
- Amenity
- High awareness
- Innovating industry track record.
- Very capable, professional people at all sectors of research, extension, farmers etc.
- Being faced by an issue of great importance and focussed by the seriousness of the issue.
- Coordination, community outrage but not war over water (unlike elsewhere)
- Current issue in the wider community – funds available to address the issue.
- World class R&D and high level irrigation farmers which can handle complex systems.
- Impetus for change is there
- Opportunities for farming available.
- Collaborative bodies
- Fundamental importance of irrigation industry to national economy.
- Importance of irrigation – contribution to Australia
- Geographical extent existing adaptation skills
- Paradigm well developed and proven in modelling manufacturing sector e.g. IT Pharmaceuticals etc.
- Awareness of issues
- Talent
- Availability of funds
- Recognition of issue
- Industry itself/skill set is very high
- Current breadth of program in CRC IF should be continued.
- People/level of education – global leaders
- Expertise – technologies available
- National focus on industry – opportunity to introduce policy, ideas, previously not palatable

- Willingness to adopt in production
- Research capacity
- Use past R&D to grade future innovations.
- Communities
- Rates of productivity growth.
- Good research groups in certain areas and commodities.
- National capability e.g. CSIRO
- Existing level of knowledge and innovation
- Smaller areas to manage compared to dryland and rangeland management.
- Good governance and organisation
- Ability to lobby
- Know a lot, credibility in industry
- Irrigation industry is knowledge, innovative
- Knowledge is available
- Diverse skills/multi organisation, multi disciplinary
- Strong links to extension agencies
- History of innovation
- Intensive land use that gives opportunities for innovation.
- Know a lot/have adaptive industries
- Strong technical base and existing knowledge levels
- Policy and legal frameworks related to water entitlement
- Interpretive research
- Current structure
- Awareness of issues we face
- Innovation
- Hope/enthusiasm
- Reconfiguration of a need spend money
- People get hungry every 6 hours
- Good research/resources – within the irrigation/water industry
- Survived the last 10 years
- Capacity to change
- Broad geographic base outside of MDB
- Survived last 10 years
- Some national coordination

- Committed group of people – R&D to growers
- Capacity to innovation
- Broad irrigation sector extending beyond MDB
- Demonstrated ability to adapt on last 15 years
- Currently some national coordination/capacity in R&D

Weaknesses

- Lack of consistent approach/leadership/funding.
- External market forces moving faster than R&D.
- No specific investment source – even though lots of money.
- Lack of clear leadership to develop R&D strategy.
- Past experience (have focussed on maximising production, not minimising risk.
- Lack of leadership especially from government.
- Not equipped for responding to water scarcity.
- Poor planning processes/over-allocation.
- Uncertainty – planning.
- Risk/variability.
- Cross-disciplinary between R&D into industry.
- R&D not getting into the industry without a lot of pushing it into the system as an improvement to current practices.
- Tower of Babel – within research, research/industry.
- Community understanding.
- Industry/research.
- Direct collaboration with industry.
- Lack of available funds for smaller irrigators to become more efficient.
- Sense of denial.
- Governments/institutions, fragmentation.
- Lack of R&D capacity.
- Some players unwilling to change.
- Fragmented by commodities and sectors- agriculture, manufacturing and urban.
- Poor engagement with general community.
- Lack of unity among irrigators.
- Ability to move in and out of new more efficient techniques of irrigation.
- Current R&D models – segregated into industry bodies with short time frames.
- Resource limitations

- Poor community support
- Inadequate engagement with broad community.
- Poor planning processes – they are reactive and highly politicised – addressing the whole of the water/irrigation system
- No national collaborative objectives across R&D in NPSI
- No national representation of the industry from an R&D focus.
- Attempting to get collaboration across competing industries
- Link between opportunities for biophysical and market not in place.
- Currently lack of national collaboration.
- Dispersed sector
- Irrigation not seen as a profession in its own right – more commodity base.
- Traditional R&D model inappropriate for implementation.
- Successful commercial focused research difficult to align – IP sharing
- Gap between R&D and adoption
- Time/linkages between industry and government
- Deployment of technologies – uptake, application.
- Need whole system approach to innovation
- Adoption strategies need to be taken up
- Development of environment/culture of innovation
- Innovation blockages
- Research set within difficult institutional arrangements e.g. research collaboration limited communication is limited.
- Irrigation not engaged well with environmental
- Credibility within government
- Market security
- Not enough flexibility to adjust rapidly to appropriate non-catchment approach.
- Water for Future opportunities (if adequate research/adoption – focus)
- Shallowness of water markets and institutional arrangements inhibiting innovation.
- Fragmented understanding/approaches
- Poor connection between private research and public research
- Not thinking big enough, not prepared to change.
- Industry not recognised
- Funding shortfalls
- Shortage of critical mass of research expertise

- No critical mass of researchers
- Scarcity of water
- Don't have a sectional voice
- Don't have a critical mass/capacity R&D
- Scarcity of water/customers
- See ourselves as commodities not industry
- Not a critical mass of researchers
- Limited number of researchers and field workers to support industry
- Ability of industry to convince policy makers of the importance of irrigation to regional commodities and that the sector is part of the solution not the cause of the environmental problems.

Opportunities

- Current environment open and wanting change.
- Can be world leaders if undertaken covering all aspects e.g. Environment/Market forces/national needs. World focus.
- State of the water industry – necessity driving change.
- Current imperative, strong driver.
- The necessity to do.
- Developing skills and capacity.
- Adapting to water scarcity.
- Exporting knowledge.
- Potential to research new developments to improve the way we engage and look at the value of water.
- Establish the necessity of irrigated production
- Coordinated approach.
- Demonstrate obviously the current good quality of management, practice etc.
- Research outputs from CRCIF.
- Sale-ability of improving how water is used. This is right for making this step.
- The need for improvements in efficiency of water use is obvious here and now.
- Continue efficiency productivity improvements through R&D and high standard practitioners.
- Engage with community.
- Time is right for R&D to lead step change.
- Develop and articulate systematic strategy
- Current debate and interest.

- High public interest in water (and food production)
- Iterative research – i.e. whole of cycle
- Strong integrated research base
- Linking biophysical R&D to social markets – link social and institutional R&D e.g. setting caps on trading.
- National R&D&E implemented.
- Make use of information to make informed decisions – biophysics, socio-economic.
- A national strategy for sector RDE&A, implemented public focus on water.
- Crisis stimulates effort, committed government funding to renewal
- Funds available
- Chance to be the leader in water management and use.
- We have good demonstrated capacity to research and innovate.
- Drought
- Willingness to adopt
- Embrace R&D
- Expert knowledge.
- Connecting learning across groups – joining little ponds, political focus.
- Creative thinking – new paradigms
- New research for water savings, there are still big gains available.
- Need for change now.
- No brick wall hit yet
- Continued adoption to changing climates and markets.
- Do it now, based on existing systems
- Inform what options 3-5yrs out
- Scope for management improvement
- Mechanisation
- Extra funding availability but not for research yet.
- WUE yield from on farm water use.
- More strategic, coordinated approaches.
- Willingness to adapt/adopt
- Public focus on water
- Innovative research
- Crisis – prepares the way for/forces change
- Efficient use of water

- Public focus on water
- Public focus on water
- Public focus on environment
- Awareness of food security
- Recognise that research is needed to support implementation of policy
- Current political awareness of water/irrigation industry

Threats

- Diverse aspect of the industry, competing priorities, loudest has biggest say.
- Funding not being targeted.
- Community/public focus shifts and therefore political/media/community focus shifts.
- Lack of funding.
- Limited funding to R&D.
- Fragmentation of resources.
- Public backlash.
- Plans, Markets – deals made between government (agencies) and primary producers may not provide certainty for irrigators if river/water sustainability has not been the focus of plans, entitlements, markets etc.
- Climate change/variability.
- New R&D going into industry too fast with no back-up need to educate.
- Adding money, same old structures (path dependence).
- Funding in tight times mis-spent (solutions not thought through).
- Not planning on move forward.
- Funding unspent and not thought through.
- Water scarcity, viewed as non-sustainable.
- Misinformation.
- We are too focussed on the MDB alone.
- Misinformation or irrigation being used.
- Failure to take leadership in water policy.
- Failure to set up and sustain R&D platform.
- Policy/governments taking control.
- Public opinion
- Public policy
- Continuing decline in water availability, terms of trade, other use demands.

- Hard to get agreements between social and institutional partners even though agreement between biophysical research.
- Uninformed public and policy development.
- Lack of support for irrigation R&D.
- Institutional
- Sitting here in 12 months and nothing has moved forward.
- Current institutional arrangements and short term funding horizons threaten coordinated longer term research efforts.
- Losing the water to other industries.
- Government buybacks
- People – attractiveness of the industry.
- Delivering investment in R&D
- Fragmentation of research
- Desire for STEP change
- Research capacity – burn out
- Reducing quality of research.
- Politicly expediency
- International markets
- Funding not used sustainably
- Lack of leadership
- Institutional blockages
- Climate change
- Unknown reliability
- Irrigators leaving the industry – no capacity to support R&D
- Lack of support for R&D
- Lack of coordination.
- Limited current support funds for researchers in irrigation
- That government will accept that buybacks and infrastructure change is their only ole in community adjustment.

General

- Scope of question – we are not trying to solve the water management problem as an idle interest.
- However if we said the irrigation community/industry sees that the process is poor and that we could contribute to the methodology, then that's a valid area of work.
- However if industry is not engaged at that level (unfortunate) then leave it alone.

- Research needs to have the context of food supply.

Towards a new R&D Strategy

- Agreement for single National Approach
- Should develop framework by end of 2008 to start engagement with industry and government for budget allocation in 2009/10 financial year. This is too important to leave until following financial year. Not necessarily a CRC structure. Need is too great to leave to a discretionary funding process.
- Should be aiming for $100-200 million over ten year program.
- Irrigation is not an “island”.
- Want a broad cross section of perspectives for a strategy
- Timeframe by Christmas for next year’s budget
- DEWHA want to see industry stand behind it with $ investment
- Policy innovation
- Water resource systems innovation
- Agri on-farm systems innovation
- Active environmental watering
- Landscape irrigation

What the future should hold

Workshop notes – butchers paper

- Rethinking engineering/water harvesting
- Social costs of efficient production
- Future from of tradeable rights
- Effect of non water institutions on ability to implement water reform
- Institutional impediments
- Legal/admin transactional costs
- Missing market for social/environmental values
- Change in how we do to get better update of research e.g. more involvement of end users in developing/evaluating projects
- More focus on unique environments/people in catchments
- Population increase 25% now – 2030. Requires use of saline water for food production.
- Innovation = culture = people. Where will people come from?
- Innovation = capacity and skills. Needs investment.
- Investment into risk management rather than increase production

- How irrigation is used in Australia in context of climate change, uncertainty – supporting adaption of irrigation rather than incremental efficiencies
- Innovation in private sector – encouraging R&D e.g. through tax system
- Look at multiple synergistic uses of water in a system – optimise.
- Increase coordination across people, institutions, commercial sector
- R&D – innovation chain look at other sectors e.g. manufacturing where innovation embedded in manufacturing process
- Innovate the way we innovate based on scale of changes needed now e.g. "networked innovation"
- Politics no = reaction to public opinion not science. Need to educate politicians and public about what is being done.
- Design crops to use less water e.g. dryland rice
- Mechanism to encourage companies to do research in Australia
- Need a policy "research house" between policy, research and irrigation sections.

Individual responses

- Need to do a stock take
  - What existing research?
  - What quality?
- ID gaps
  - Themes
- One obvious theme is urban irrigation
  - Comparison of hand held watering to other irrigation methods – inform policy
- What or where does the irrigation industry wish to go?
- Do they supply a local product or supply export markets?
- We develop best practices these will eventually go off shore so we return back to the start.
- Who fundamentally really requires the water?
- Bear in mind the RDC's review – top priority should be rural innovation and recommendations.
- Make good use of new DAFF Australia's Farming Future program especially Farm Ready grants.
- Look out for RDC changes
- Need systems water infrastructure scale approach at least as much as agricultural water use.
- Engage private enterprise more as they are the implementers of the final products
- Need to include education
- Plant research to reduce water use.
- Water management should be at catchment scale by all authority for that catchment.

- Different users (urban, rural, environmental) all in one policy organisation and then operational separately can be left with current RWA's, councils and perhaps CMA's, but allocations and policy should be central in catchment including groundwater.
- Institutional and legal arrangements for water resources management should be at catchment scale by one authority.
- Flexibility of funding bodies in project management.
- National irrigation vision – strategy – innovation – science push.
- Use a national and coordinated approach to innovation, however, delivery by regional relationships across all players in the irrigation sector – support capacity built in a region and shared between regions.
- Permanent crops with the flexibility and options of annuals uptake.
- Greatest challenges facing innovation in irrigation is an educational challenge. This educational challenge needs to forget all levels of society and industry in general and will influence the way our society thinks and acts on every aspect of water and its future management and usage. End users/policy makers/government.
- Innovation is risk management, dealing with increased variability, institutional agility, capturing market externalities.
- Recognition that R&D has a role in implementation of policy (i.e. R&D is a part of adopting and innovation)
- Needs to assist industry and communities adopt (i.e. remain viable) to the reduction in water availability by improving on-farm productivity.
- Need to build skills and capacity of researchers – longer term focus.
- Stronger cross-commodity focus and national coordination.
- Need financial (tax?) system to encourage greater investment in Australian R&D by multinational and local irrigation companies.
- Refining engineering and water harvesting
- Social costs of efficient production
- Future farm of tradeable water security – property regime.
- Effect of non-water institutions (CMA) on implementation
- Institutional impediments to water reform
- Legal and administrative impediments to water trade
- The missing markets for social/environmental aspects e.g. carbon etc.
- More involvement of end users in research on new technology will be used.
- Acknowledgement on catchment – people engaged catchment by catchment
- Use of saline water for food and fibre production
- Skills and people development – activities/consultant training
- Risk management/variability/uncertainty buffer

- Private sector innovation encouragement
- Synergistic water use and optimising condition of water
- Coordination of knowledge and property across sectors e.g. manufacturing and different industries.
- Innovation of irrigation framework
- Netafim would like to work with R&D bodies
- Business of innovation has changed – needs network
- International perspectives – global approach e.g. dryland rice
- Need involvement in R&D by private consultants and agribusiness
- We need economics to be incorporated into R&D innovation – all R&D needs to be evaluated in an economic context before proceeding with it and the outcomes of R&D adoption need to be evaluated in an economic context.
- We need to have irrigation equipment suppliers involved in R&D innovation.
- R&D innovation strategy needs to be communicating to public and to policy makers.
- Identify, develop and implement five new "Ord-River" type schemes in the tropics – if we build it, they shall come.
- What is the 20 year irrigation strategy?
- Lack of science (evidence) based arguments to inform policy makers and to change current settings is a major problem. There is research elsewhere in the world that can be used, however, often policy makers reject this because it is not locally relevant. A relatively low cost solution to this is to conduct "verification" monitoring on a number of real systems (e.g. domestic urban, open public space etc.)

Improving Uptake and Adoption

Workshop notes – butchers paper

- Need for technologies to be set in different farming cultures = R&D process. Involved at policy setting stage
  - Ongoing and iterative process "ongoing conversation".
- Policy – adapted at regional and industry level
- Opportunities for greenfield sites adopting technologies
- People factor is the key – why do people adopt/change?
- Key to adoption of innovation = institutional pathways aligned with people and technologies
- Does business have capacity to innovate at individual level = scale
- Quantum change likely when "idle" irrigators are able to irrigate again.
- R&D model – most funds when times are good whereas opposite is required
- Scope for adoption/change at water supply authority

- Recognition of time lag between R & A - funding schedule = longer
- Involvement of agribusiness in R,D,E process
- Change can represent threat to water supply authorities e.g. Rubicon technology – focus on people rather than rules and engineering
- Bring people along on the journey from formulating research/policy to implementation
- Adoption is part of system not an "add on"
- Marketing and extension same
- Need something to aspire to, to provide reason for change
- Broader look at drivers – how do we sell a total process?
- Changes come from left of field/lateral
    - Importance of keeping an open mind

Individual responses

- Need common terminology so people can assess whether to adopt. – water use efficiency.
- Common basis/objectives for irrigation and water res. management.
    - Not social value
    - All research should have conclusion re: NSB of outcome
- Some commodity/industry goals are seen as more innovative – how do we develop a culture of innovation within the irrigation industry?
- Need 'space' to allow adopting to occur.
- Need researchers to be allowed to engage with communities on an ongoing basis.
- Move away from strict milestone based projects, allow for adaptation driven by the stakeholders.
- Making irrigators a more valued/appreciated part of society
- Making the wider community realise that "they are irrigators too".
- Young irrigation farmers training, innovation and adoption.
- More water from the North.
- Politicians Vision for future.
- Ongoing conversations between researchers/policy/managers/community.
- Be open and adoptive to innovation issues from other areas.
- National Institute for Water and Irrigation RDEA would be a good focal point – national and international limits.
- Fit-for-purpose use of water.
- Focus on catchments
- Integrated water management

- Targeted extension
- Risk, uncertainty, variability
- WUE under water scarce environments
- Innovation in technologies and management practices
- R&D informing policy
- Irrigation as part of the solution (not the problem) in the catchment
- Understanding farming context
- Responding to needs/drivers of end users
- Adoption of practices – discontent
- Understanding market segments
- Institutional barriers
- Identify/understand context
  - Vision, irrigation vs water, vs food and fibre
- Consider water systems
  - Connection of up and low land
  - Farm catchment
  - farm or connected systems
- Connect RDEA
  - People systems
  - Society
  - Socio-economic
- Irrigators viewed as contributors to the community
- Irrigation considered key industry for Australia's social and economic wealth
- Adaptable and flexible irrigation community equipped to respond to water scarce environment.
- Innovation chain from research to adoption (not strictly linear) needs capacity along its entire length.
- At the scale of individual businesses adoption must be the responsibility of users (growers, installers etc.) there needs to be facilitation capacity.
- End user involvement is setting the R&D agenda (what they want to know!) in the research projects.
- Integrated delivery – strong links investment in infrastructure to planning, tech support, training (% allocation to budget)
- Links public/private partnerships
- Joint learning – partnerships/users researchers/funders. Build partnerships in the project from day one.

- Technical frustration overload
- Many irrigators skills/energy lacking
- Technical support and R&D process needed.
- Risk profile of irrigators due to demographics
- Need for translators
- Look at ideas of social marketing.
- Need to balance tension between collaboration and competition throughout innovation network (R&D, production, policy etc.) productively.
- Industry investment in R&D?
- Focus on catchments not so broad
- Use of saline water for food and fibre production
- WQ adaption
- Optimising in-stream use
- Social costs
- Water property rights
- Effect of non-water institutions on planning
- Institutional impediments to irrigation reforms
- Legal costs to trading
- Missing markets to come on line e.g. carbon is the most recent of these
- People, training, capability to implement innovation.
- Risk management instead of production maximisation.
- Continuing conversation with stakeholders
- Adoption should occur on greenfield sites rather than forcing change on existing practice.
- Need to include larger scale adoption e.g. government management of infrastructure.
- Adoption should be an integral part of any R&D.
- Adoption to be started from day 1 of research and to involve all stakeholders not just those directly targeted or involved.
- Drought proofing is dead. Uncertainty in irrigation systems – how to do better
- 3%/yr productivity improvements generate historically by biophysical research is great but wont be enough. Social/economic/institutional change and R&D is required. And this needs to be integrated with biophysical.
- We need to recognise that Rural and urban water use were historically quite separate (different water products) but increasingly the separation is disappearing, so how do you develop compatible systems? What opportunities does this present?

- Channel irrigation and water resource R,D & E through existing R&D organisations because then R&D work will be integrated into contextual work e.g. WUE for new varieties production systems.
- Similar approach for environmental water use through regional CMA/NRM organisations and urban water use through urban management authorities.
- Major role for IAL in getting water resource training into general school curriculum. Need to work on ways to bring more technical skills through, starting with primary school.
- Social costs of efficient production context over social values.
- The future tradeable water security structures. History of fund. Changes – current confused and chaotic state.
- Non-water legal/institutional context impact on water sector e.g. NRM rules/water enterprise.
- Institutional impediments and supports for significant innovation adoption e.g. lags between potential innovative and actual implemented change.
- Legal and administration transaction costs on trading and operations.
- Missing markets for social and environmental contributions.
- Recognise the R&D has a role in adoption/innovation within adoption programs. Technologies off the shelf need to be set within an entitlement and system context appropriate to different crops and regions.
- R&D is part of the implementation and needs to put into context and scale – bring them in at the start of the process.
- Researchers integrated with end users ongoing conversation
- National approach for innovation with regional delivery for adoption.
- Greenfield sites – opportunity for adoption as a result of water trade.
- Discontent with existing system
- Need to integrate policy and adoption
- Business cases for new technology
- Adoption for off farm system
- Longer funding circles for adoption
- Community involvement in the projects in formulating R&D questions
- Irrigation strategy.
- Economics needs to be critical to adoption
- R&D developments need to be adapted to industries at a regional scale.
- More effort needs to be put into training industry so they are more willing to adopt an innovation.
- Current R&D models utilise industry levies. During times of need these funds deteriorate when they are needed the most.

- This is mirrored at the individual scale when the need to adopt occurs (usually) at the time when funds are at their most critical.
- Focus on the relationship between researcher and adopted.
- Allow for R&D to "develop" and restructure during its life.
- Having all stakeholders involved during the process of developing R&D as well as delivering the R&D.

Delivering R&D

- Coordination body
  - Gap analysis
  - Strategy manager
  - Commissions research
- Levy, matched by government – RDC model
- Need to have a lead body for R&D
- Two arms – one for innovation, one for proving up policy
- Undertakes a gap analysis
- Delivery – should involve all parties
- Define water users or irrigation industries
- Greater coordination/cooperation between:
  - Researchers
  - Irrigators
  - Funders
  - Government
  - Extension
  - Wider community
- Break down state boundaries, and other silo's
- IAL, NPSI and CRC-IF same as above and need for new model in 2010. E.g. CRC-IF and NPSI put up a single bid (to whoever) with partnership and/or support by IAL to form overarching, coordinating body for irrigation RDE and adoption.
- Environmental water use is a valid "industry sector" we need to engage with.
- Where do we tackle the mining and energy sectors?
- Connection of adoption principles/people/clients with research from the outset.
- Connection from the planning phase/ID of research question – onwards.
- Partnering with all water sectors.
- Defining who needs to use the information guarded by R&D.

- Need to get “systems” analysis of who/what will use the information.
- Need to look at conflicting water issues.
- Identifying barriers and drivers.
- No more R&D money needed
- Use what is there
- Do we know the future facts?
- What are other water R&D organisations doing?
  - CRC water treatment
  - CRC eWater (fresh water)
- What about mining?
- What about electricity generation?
- RDC’s – who are the customers/clients?
- Poor incentive mix/skills in research sector to pursue adoption – need different research fund.
- Capability to adopt, part of the design problem/part of implementation program.
- Relationship focus to underpin industry/science research collaborations.
- Different way of managing projects and “who owns the problem and who owns the program – better capability of users to understand their own fundamental needs.
- Need to understand from the start ‘drivers of practice change’ and design this in.
- Adopt the pharmacy model – speed to maximum market share is the research goal.
- Training general space managers
- Soil improvement techniques.
- International markets affecting ability to invest business case vs. environmental case misinformation.
- Preparedness to face the brutal reality
- Segments – one size doesn’t fit all
- Drivers – engage from onset/ownership. Ensure relevance to industry/other stakeholders.
- Enabling innovation – not the same
- Immediate research needs based on user needs vs. blue sky innovation
- Providing accessible information which exposes incentives for change
- Enabling better risk management with best available guidance on an uncertain future.
- Co-generation of research priorities with users and allowing evolution of projects.
- Needs to avoid ‘silos’ within commodities – most progressive irrigators in QLD are those who are not “commodity-locked” anymore e.g. cane growers growing tomatoes.
- Need to foster individual innovation but provide the mechanisms for networking and coordination at greater than local models (i.e. facilitator broader adoption)

- Be careful of single commodity focus as farmers and regions will diversify.
- Will be increased focus on application systems/crop management to reduce labour costs and fertiliser inputs (energy efficiency)
- Reduced water – increased focus on increasing productivity/ML
- Increased focus on use of marginal water quality sources.
- Control/automation/decision support systems increased need.
- Need to ensure build capacity in consulting/advisory sector at some time as conducting R&D and delivering new technologies
- Urban irrigation water use research to give government confidence to move from blunt water demand tools towards longer term management plans.
- Need to engage private sector – involved in research and commercialisation much earlier in process.
- Two levels of R&D – new knowledge/practices and new widgets/products
    - Need to conduct R&D at both levels.
- Need a national coordinated R&D body (not a funder but a provider) with regional delivery and activities (i.e. regional champions)
- Need to focus on building R&D capacity to support irrigation industry
- Investment in irrigation R&D should be an order of magnitude greater than currently occurs.
- Need a levy on water use/production to fund ongoing irrigation R&D (i.e. similar to community RDC's) or commit existing RDC's to pool irrigation collection funds without strings attached.
- Greater space in R&D risk taking
- Support "SMARTS", people, capacity.
- With $3 billion worth of water buy-back there will be less production – less levies for future R&D – need to argue for offset or alternative strategy or funding R&D by industry with government and co funding.
- CRC may not be the answer. Structure too confined.
- Need to aggregate on a national level – too many small players
- Need to involve small industry players in pre competitive phases.
- Desperately need small number of people to take leadership (with support from their institutions to drive this R&D agenda forward).
- Probably need to appoint a full time person (consultant) and bring all players together within leadership groups.
- Federal government wants a consensus view from the whole industry.
- Cant hit everything so pick high value outcomes for R&D delivery
- Ways to involve everyone in the process – inclusive development.
- Considered as a commercialisation process – adopt and adapt from many precedents.
- Much ownership – universities, commerce, private sector, funders.

- Inhibitor – protection of IP e.g. Universities used commercialisation path but they are not good at it.
- More product from less water – WUE but including a wide range of issues especially Markets define. E.g. shifts water use to higher value but cant live on wine. Competitive sustain business that delivers to markets as efficiently as pass – water/carbon.
- Cultivate younger generation – not attractive to youth.
- Too much money spent on "laggards". Identify the early adopters.
- More capacity support for developing management systems
- Laggard identification and termination.
- Incentive funding in conjunction with R&D
- Understand who you are delivering to
  - Farmer – basic
  - Policy – key points
- Champion/case study – on farm proof
- Delivery it during research.
- Cotton/rice challenges in next ten/fifteen years
  - Public perception
  - Food demand over fibre demand
  - Capacity within farm/extension and R&D
  - Scale required for continued efficient industry support to continue
  - Capacity/ability financial and capability to change.
  - Increasing costs
- Benchmarks/competitive analysis
- Clearer pathway to commercialisation
- Uncertain to help uptake of R&D – drivers of R&D institution
- Bureaucrats need to understand issues to help politicians respond responsibly to a public concern. (researchers need to be linked closely to bureaucrats)
- Reduce a scientific paper to a user friendly form where people can see value to them.
- Engagement – researchers to the end user.
- There will be less water and labour available in the future.
- Innovation needs to address these issues (and also the issue of energy conservation as well)
- Growers, agribusiness and consultants should be a part of the R&D process – it needs to be evaluated on farm.
- Incentives need to be part of the process in getting adoption of new technologies.

- Strategic use of incentives via commercial consultants etc. has good on ground impacts and builds commercial capacity.
- Need a delivery system – works through whole R&D&A framework.
- Policy uptake – need one-page summary for senior bureaucrats and politicians.
  - Appropriate communication strategy for public, scientists and policy people
  - Frequent communication with bureaucrats (need a skilled political communicator – employed by industry?)
- Benchmarking appeals to farmers – must be relevant regionally
- Less dependence on government extension, more use of private consultants.
- Coordination of industries
- Need to disseminate the information – existing and new
- Need to train operators with new technology.
- Coordination between institutions and involvement of the commercial sector.
- Better coordination of the water bodies/agencies
- Consolidation of agencies i.e. CSIRO, NPSI, CRC etc.
- Consolidation of government agencies
- Consolidation of water providers
- Reduction of overheads consolidated of R&D funds
- Commercial sector development pool toward R&D.
- Coordination of research
- Consolidation of agencies, government, departments, water providers
- Lot of great R&D by growers existing users – IAL as the vehicle to the masses. – Networking
- Most irrigators are intelligent and practical people and are now our counter parts for irrigation R&D.
- Therefore it makes good sense to listen to and involve irrigators in project development and execution of the research projects.
- Integration of triple bottom. Some aspects in direction of research is important not silo research, and remain open to actual innovating ideas. Do not put R&D in a straight jacket in other words and develop mechanisms to react quickly to uptake new ideas effectively.
- Remove bureaucratic impediments.
- More flexibility in acting to new ideas or failure of not successful research. Adaptive research.
- Accepting and up take of R&D done overseas is important and creating a culture that not only home-grown is good but accepting imported work and then advancing the work further with follow up research.
- Reinvigorating some form of extension service is critical in next 10-15 years

- Irrigators that serve as land stewards delivering a range of products depending on environmental conditions and market pull adaptable enterprises that in tune with evolving Australian landscapes.
- System harmonisation where each catchment has a high tech control centre that supports decision making at a range of scales.
- Need to reinvest in high quality people including good leaders and top scientists (many of whom are difficult to manage but are responsive to good leadership)
- Need to be willing to take risks in research and invest more learning from the failures.
- Need for national institute for water and irrigation. R&D&E&A to integrate across the science/policy/management/catchment community sectors.
- Is it appropriate to break it down by commodities as was suggested? For commodities, irrigation or water is just one element and the other elements of markets, productivity, product differentiation are not common between commodities? Leave all that to the commodity industries. Irrigation R&D should focus on common topics and those central to irrigation itself e.g. irrigation technology, system harmonisation, irrigation futures.
- Delivering R&D can come in these ways:
  - Voluntary uptake of attractive new methods
  - Market based uptake to encourage it i.e. water pricing.
  - Regulatory and compliance to force uptake for the greater good.
  - All methods require a continued conversation to encourage the farmer however if the latter is to be used there should be an understanding by all as to why
- Reduced role States/Governments likely
- Need to private sector to fill gap – value proposition
- Partnerships R&D officers
- Reporting requirements projects vs alternative mechanisms
  - Workshops
  - Training modules
  - Progress reviews
- Those still irrigation industry have adopted (survive)
- Need changes to funding models that involve commissioned work when appropriate (large scale complex issues) and competitive calls for more high risk/innovative projects.
- Need R&D&E&A model that works to a vision but is open and receptive to new innovations from other industries, sectors.
- Balancing competitive and cooperative behaviours productively
- Invest in “smarts” (basic underpinning) to respond to opportunities
- Respond to opportunities (flexibility)
- Build trust – redefine accountability and create space for risk taking.

- Embedded in the research
- Allow flexibility in the research therefore delivery can be met
- Need to embed researchers with communities/stakeholders
- In research projects need 30% extension – then follow on project that is extension that has 30% research.
- Foster productive competitive framework
- Need collaboration in research too
- Need diversity in research, don't just get down to efficiency of research where there is only one group working on an issue.
- According to end user needs
- Needs co-funding
- End users need lead time certainty, where am I 10 years from now.
- Channel through RDC's
- Is matrix framework about dishing out the funds
- Need transfer of research from particular area to be via tailoring to another commodity sector.
- Overcoming funding competition
- Balance cross-sectoral issues
- Overcoming history, baggage, diversify of current players
- Need national strategy and coordination.
- Difficult to overlay "now thing" e.g climate change, on top of existing programs.
- Need to overcome short term reporting and return on investment issues from investors.
- Define the term i.e. an R&D program. The result of an R&D program.
- Seminars to convey processes and benefits of the results.
- Try to influence the application of funds.
- Keep training and educational programs up to date with:
  - Need for R&D
  - Results of R&D
- Results of R&D must be viable or applicable to a viable industry
- Target funding and grants towards improved processes/efficiency, which should drive adoption of R&D
- Remove the barriers to adaptation
- Identify the early adaptions of new processes and technology
- Get the timing right: match and R&D result with a current need.
- Who owns the program? – must be clear
- Use of extension services/industry associations

- Coordination of research programs
- Industry brainstorming.
- Rice, cotton, dairy (mix of water and substitution for water), sugar (commodity price), horticulture, landscape/amenity (technology and lower water quality, policy response to water shortage, stormwater harvesting)
- Horticulture:
  - Water reliability/variability to underpin redevelopment
  - Managing water affordability when scare
  - Soil sustainability and crop performance with high WUE and poor water quality.
  - Higher skills for new technology and development.
- Sunwater
  - Lots of different attitudes in schemes
  - Some areas very responsive, some not.
  - Water sharing rules – capacity shares improves ability to manage own risks
- Trade-offs – environment/irrigation catchment management decisions
- Whole package to practice
- National coordination
- Pool expertise
- Private sector involvement earlier (get incentives for R&D early) to avoid Public v. private competition or crowding out.
- National innovation with commercial and/or regional delivery – capacity building (context)
- Better product – adaptation automatic
- Water shortages – value of water – leads to innovation
  - Re-adjustment out
  - Adapts
- Does the Federal government/Australian government – take up role of extension
- If projects are correct need mix of skills from research to extension – opposite skills.
- Part time farmers be heard to communicate with – need new models.
- Population growth arguments and scenario for R&D needed.
- Offset for the levies are $3B of water out of production.
- Framework for investment in R&D
- Vehicle for farm delivery – farm management delivery
- Inclusive development
- Involvement of many sectors

- More product from less water
- Water/Carbon trade/offs
- Cultivate younger generation
- Focus on new innovation/terminate the laggards
- Break down state boundaries and other silos
- End user driven – partnership with commodity groups
- Coordination work with IAL
- Tailoring innovation across industries
- R&D commissioned work as well as competitive calls
- Learn from failures
- Balancing production and cooperation vs. competition
- Invest in the smarts
- Respond to the opportunity – change direction
- Build trust
- Take risks – create space for R&D
- Invest in what's working
- Stop investing in what is not working

Vision

Irrigators to be viewed by society as providing a good service well.

More young irrigators.

How do we set higher level objectives and define measures of success? E.g.:

- More profitable use of irrigation water – credible, acceptable, promotable – within/across sectors
- Promotion of more adaptable institutional mechanisms directed to efficient/effective/legal-ethical-culturally acceptable.
- More resilient natural resource foundation with appropriate farming and other systems to optimise farmer, environmental and community returns.
- Development of greater human capacity in foundational studies and in ongoing professional development – for operators, managers, policy etc.
- Adaptive farming systems responsive to landscape or catchment imperatives guided by market, policy, economic, social pressuring
- Risk identification, modelling.
- Policy development and management
- Market responsiveness.

- Link government national policy priorities to irrigation strategy– what big problems does our strategy solve, when, how and at what cost?

WORKSHOP ATTENDEES

Anthony, Dave	CCC CRC
Atkinson, Ian	CRCIF
Austin, Nick	DPI NSW
Barbour, Troy	RainBird
Beecher, Geoff	NSW DPI
Boland, Anne-maree	RMCG
Bristow, Keith	CSIRO/CRCIF
Brown, Rachel	Agricultural Resource Management
Cape, Jeremy	CRCIF
Carmichael, Alison	IAL
Carr, Rod	DEWHA
Chester, David	IAL
Christen, Evan	CSIRO
Connellan, Geoff	Consultant
Cowland-Cooper, Simon	Chepalia
Crawford, Peter	Consultant
Cummins, Tim	Consultant
Darroch, Rick	CRCIF
Davey, Peter	Netafim
Day, Diana	CRCIF
Dickson, Andrew	DITRGLG
Durack, Matthew	Stahman Enterprises
Durand, Peter	Netafim
Furness, Lee	MPI
Gilbert, Tim	IAL
Guest, Trevor	Philmac
Hall, Doug	IAL
Hammond, Claire	Sydney Water
Harris, Graham	QLD DPI
Hayes, Peter	CRCIF
Heather, Dianne	DAFF
Hoffensetz, Guy	Netafim
Hornbuckle, John	CSIRO/CRCIF
Horton, Des	CityWest Water
Jefferies, Richard	Blue Scope Water
Jessen, Merv	IAL
Kleiner, Rowena	DITRGLG
Lancaster, Ian	NT Government
MacGregor, Angus	DEWHA
Malano, Hector	CRCIF
Martin, Paul	CRCIF
McKay, Malcolm	CRCIF
McVeigh, Craig	NWC
Mills, Stephen	GMW
Milne, Jeff	DPI
Montagu, Kelvin	CRCIF
Moody, Helen	IAL
Moorhouse, Ian	GMW
Morris, Mike	DPI
Murphy, Chris	Dairy Australia
Oaks, Tony	Rubicon
O'Connor, Jann	IAL
Olsson, Kerry	NWC
Ottesen, Peter	
Parkes, Andrew	NPSI
Parr, Eddie	DPI
Pillar, Trevor	CGS
Prosser, Ian	Water 4 a Healthy Country
Quayle, Mark	IAL
Raine, Steven	USQ/CRCIF
Raisin, Greg	LWA
Regan, Peter	DPI NSW
Ryan, Michael	DAFF
Schmidt, Erik	USQ, NCEA
Schrale, Gerrit	SARDI
Schwecke, Melanie	Sydney Water
Sharp, Richard	SKM
Skewes, Mark	SARDI
Smith, Peter	DPI
Starkey, Glen	CRCIF
Stirzaker, Richard	CSIRO/CRCIF
Thompson, Charles	RMCG
Toome, Peter	Irrigation Australia
Tuteja , Narendra	BOM
Vanderbyl, Tom	SunWater
Vlotmali, Willem	G-MW
Williamson, Bill	NSW DPI
Win, Myo	CSU
Zouch, Tom	MDBC