

INQUIRY INTO RURAL WATER RESOURCE USAGE

Senate Rural and Regional Affairs and Transport Committee

Land & Water Australia Submission

Land & Water Australia is a Statutory Corporation in the Australian Government's Agriculture, Fisheries and Forestry portfolio, established under the Primary Industries and Energy Research and Development Act of 1989. Our mission is *to provide national leadership in generating knowledge, informing debate and inspiring innovation and action in sustainable natural resource management.*

Land & Water Australia is an active investor, broker and manager of research into water resource usage and sustainable agriculture. Over the past decade we have invested in a number of programs that have contributed significantly to the knowledge base underpinning the sustainability of water resource management. Some key outcomes from that work are outlined below as well as new initiatives underway. More detailed information can be extracted through the searchable research databases and downloads available via our website at www.lwa.gov.au

Continual improvement and ongoing structural change in Australia's rural water industries is arguably the highest priority issue for the economic development of irrigated agricultural enterprises, the social advancement of rural communities, and the environmental sustainability of rivers, floodplains and estuaries.

This is reflected in the funding priorities of Land & Water Australia. Approximately 30% of our R&D investment is allocated to river and sustainable irrigation research and development.

The National Water Initiative Inter-Governmental Agreement (IGA) acknowledges significant knowledge needs for its effective implementation. This poses substantial challenges for the scientific community and requires a major emphasis on the prediction and measurement of water resources and their benefits. Areas of knowledge need that have been identified include:

- Regional water accounts, including assessment of water availability through time and across catchments.
- Prediction of changes to water availability with climate and land use change.
- Interactions between groundwater and surface water components of the water cycle.
- Demonstrated ecological outcomes from environmental flow allocations.
- Improvements in farm, irrigation scheme, and catchment scale water use efficiency.
- The application of science through adaptive water management.
- Independence, review and community agreement of the knowledge base.

Science in water is poorly coordinated and resourced. Australia's knowledge providers are highly fragmented with inadequate linkages between them. They see themselves as in competition with each other for scarce research grants. There are many small groups, often disconnected from each other, many dominated by a single discipline.

The clients for water management R&D include water users and consumers, emerging catchment and regional management bodies, water utilities and government agencies. These are similarly fragmented and often lack the corporate memory or expertise to know the current knowledge base, far less to understand and prioritise their future knowledge needs.

The scientific and technical issues of the water debate are multidisciplinary and span well beyond the capacities of any single research institution. They require an unprecedented focus of effort, and level of innovation and rigour. A more strategic and mature relationship is required between water managers, governments and research.

A well articulated, nationally coordinated, and effectively managed knowledge strategy is one of the key contributions that the National Water Initiative can make to complement the current State and regional policies and institutions for water management. There is potential for such a strategy to emerge through several clauses in the IGA, however it is not clearly spelled out as yet.

Other major policy initiatives in the NRM field, such as the National Action Plan for Salinity and Water Quality, have demonstrated that without national attention to the knowledge needs and regional knowledge capacities there is at best patchy and inefficient use of present knowledge when implementing the policy. The improvement of the knowledge base and improved knowledge capacity required to achieve the goals of the National Action Plan were not designed into its original architecture. Consequently, there has been little change in the research agenda to meet the strong knowledge needs of the National Action Plan. The NWI cannot afford to neglect the knowledge dimension of improved water management.

Land & Water Australia has already brought together key stakeholders from across the major water using industries, the conservation sector and research providers to identify and develop the key water science priorities for Australia that arise from the key components of the NWI (Attachment A).

The Corporation's existing R&D investments are highly relevant to the knowledge needs of the NWI. Our research programs have:

- developed innovative technology to reduce water use in high value agricultural crops;
- devised decision support systems for assessing environmental flow needs (including that used to underpin the Living Murray project);
- measured the decline in health of key river ecosystems;
- introduced seasonal climate forecasting into agricultural practice; and
- built the hydrological foundations for integrated water accounts.

We have initiated further investments, notably in Environmental Water Allocation and Tropical Rivers, that will fill critical knowledge gaps. Other areas need further development. These include:

- synthesising the elements of catchment water budgets into fully integrated water accounts for both the regulated and unregulated flow systems;
- demonstrating the outcomes achieved from environmental flow allocations, and incorporating these into adaptive management of environmental water; and
- improved understanding of groundwater-dependent ecosystems and the interactions between groundwater and surface water systems.

Land & Water Australia is seeking to work with the National Water Initiative to maximise the relevance and return on these investments. More detail on specific initiatives follows.

1. National Program for Sustainable Irrigation

Land & Water Australia has invested heavily in water use efficiency research and development since the mid-1990s. Its National Program for Irrigation Research and development (NPIRD), a consortium of a number of state agencies and industry partners, was instrumental in encouraging state agencies to develop industry-based water use efficiency programs. Around \$100m has been committed to these state programs and significant improvements are already occurring in irrigation water use efficiency. The National Program for Irrigation R&D delivered key innovations such as partial root zone drying (reducing plant water requirements in grapes and citrus by up to 50%) and the national irrigation benchmarking scheme which is becoming a world standard. The program was also instrumental in the development and funding of the successful bid for a Cooperative Research Centre for Irrigation Futures, which commenced in July 2003.

The National Program for Sustainable Irrigation (managed by Land & Water Australia) aims to provide the knowledge base for future irrigation systems capable of delivering twice the agricultural productivity using half the current water usage. Many believe that such improvements can be achieved using existing technologies, providing effective policy, legal and institutional frameworks are established. The program is very well grounded in the needs of the irrigation sector, and is funded by the following partners: Australian Government Department of Agriculture, Fisheries and Forestry; Department of Natural Resources and Mines (Queensland); SunWater (Qld); Goulburn-Murray Water (Vic); Sunraysia Rural Water Authority (Vic); Wimmera-Mallee Water Authority (Vic); Department of Water, Land and Biodiversity (SA); Department of Environment (WA); Horticulture Australia Ltd; the Cotton R&D Corporation; and Land & Water Australia.

Initial outputs from the program include:

- A practical, scientifically rigorous method of determining the actual ecological risk of irrigation schemes at catchment scale (rather than the possible/theoretical risks).
- The economic contribution of irrigated agriculture to the Australian economy.
- The value of irrigation to the Goulburn-Broken economy in northern Victoria and a process to design the future for the industry in the region.
- A water decision support framework to minimise water use and maximise productivity with permanent horticulture plantings.
- A common set of terms and definitions to describe and understand water use efficiency, and their acceptance nationally.

2. National Dryland Salinity Program

Dryland salinity remains probably the most important long term threat to water quality in southern Australia, including in irrigation areas.

The National Dryland Salinity Program (NDSP) was initiated by Land & Water Australia in 1993 and has been managed by the corporation over the eleven years since. Over that time, the NDSP has funded about 50 major research projects valued at almost \$25 million. Some 300 researchers, technical assistants, consultants and policy-makers have contributed to the program, significantly enhancing our understanding of dryland salinity and our knowledge of what might be done to manage it.

After ten years generating information, in 2003–04 the corporation and our partners invested in a final year to synthesise this knowledge into forms targeted to key audiences at farm, catchment and policy levels. Major synthesis products delivered include: *Managing Dryland Salinity in*

Australia (full resource kit and CD-ROM); *Breaking Ground: Salinity Key Findings and Research Outcomes* (a guide for policy makers); *Dryland Salinity and Catchment Management* (a guide for catchment managers); and *Dryland Salinity: On-farm Decisions and Catchment Outcomes* (a guide for leading farmers and their advisors). These resource directories essentially make several hundred research reports easily searchable and interrogable through clear menus and a few mouse clicks. This is the world's best compendium in salinity science, and the CD-ROM sets a new benchmark in science communication for this type of product.

These products were launched by Senator Judith Troeth in Melbourne on 5 July. Demand for them has since been intense, with most of the 5,000 initial production run spoken for. A resource kit is attached for the information of the committee.

3. Environmental Water Allocation

Land & Water Australia is commencing a new \$3m program on Environmental Water Allocation, focusing on measuring, demonstrating and improving the ecological outcomes obtained from environmental water allocations in stressed river systems, the iconic case being the River Murray. A review of knowledge also highlighted the need to develop robust methods to assess water needs of poorly understood ecosystems such as groundwater-dependent ecosystems including baseflow river needs, estuaries, monsoonal rivers, and salinised rivers. These knowledge needs are formally recognised in the CoAG agreement for the National Water Initiative.

4. Tropical Rivers

Land & Water Australia will launch a new R&D program on Tropical Rivers in 2005. A preliminary phase of the program, funded by the Department of Environment and Heritage, produced a comprehensive analysis of existing datasets and knowledge relevant to Australia's tropical river systems and their associated catchments, floodplains and wetlands. This very attractive compendium (attached) is in effect a new 'Atlas of the North'.

Focus on new water resource development over coming decades is increasingly turning to tropical northern Australia where current consumptive uses are lower than in southern Australia and where potentially there are greater resources. These resources will require careful management, however, because of their extreme seasonality (much of the run-off occurs during a short period of the year), high evaporation rates, and competing uses. All rural land uses in tropical Australia are linked by use of water and these include diverse uses such as indigenous uses, commercial fisheries, recreation and tourism, mining and dryland and irrigated agriculture. The rivers of this region are largely unaltered and some are internationally significant ecological assets. Through improved understanding of these systems and parallel research into sustainable land use practices, we have an unprecedented opportunity to design smarter water resource developments that protect river and estuarine ecosystems. The history of southern Australia has shown that protecting assets is far more cost effective than later reclamation and restoration.

5. National Land and Water Resources Audit

The National Land and Water Resources Audit, managed by Land & Water Australia, has assessed Australia's land and water resources in a number of studies and prepared a range of assessment reports. The *Australian Water Resources Assessment 2000* (a copy of which is attached) assessed the quantity, quality, use, allocation and management of Australia's surface water and groundwater.

The assessment concluded that water availability and quality are at the centre of economic development and environmental management for Australia. The assessment supported initiatives with water management authorities to focus improvements on groundwater characterisation,

water use efficiency, increased and scientifically based environmental water provisions, improvements to water quality monitoring, and understanding and managing combined surface and groundwater resources.

The assessment found that approximately 26% of catchments are close to, or over-allocated. These catchments account for 55% of the total water use in Australia, and include the majority of catchments where water resource development is a viable option. Approximately 75% of catchments are at low to medium levels of development, but many of these have limited capacity for significant development, particularly the more arid catchments of Australia. The assessment also found that 30% of groundwater basins are fully allocated or over-allocated, and that substantial increased effort is required to improve the management of Australia's groundwater resources.

6. Commissioned research on rural water resource management

2.1 Investigating an effective system of defining water property titles

In 2002, COAG noted that substantial progress is being made on national water reforms and reaffirmed the importance of water property rights based on the separation of water from land. As a first step in clarifying these issues, jurisdictions agreed to report to COAG on opportunities and impediments to better define and implement water property rights.

Land & Water Australia, in partnership with Agriculture, Fisheries and Forestry Australia, commissioned a project to investigate an effective system of defining water property titles and to provide advice on the future development of optimal water resource management and registration regimes. The project report (attached) was launched by the Deputy Prime Minister at the Outlook conference in March 2004.

The project explored the definition of water property and its relationship to existing property rights; the development of an appropriate titling system that recognises links between water and land while enabling each to be flexible and independent; and recommended protocols for the use of water property and the integration of independent water property within the existing regulatory system. In essence it concluded that it is feasible to develop a water titling system analogous to the Torrens Title system pertaining to land.

2.2 Improving Water Use Efficiency - A Study of Institutional Arrangements

In 2002, Land & Australia commissioned Marsden Jacob Associates to examine the institutional issues associated with rural water use efficiency (a copy of the report is attached). Funding for the project was provided by the Department of Agriculture, Fisheries and Forestry (DAFF).

The reform of the Australian water industry has led to significant changes over the period since the COAG water reform meetings in 1995. A primary tool for this change, and one of its main achievements, has been the adoption of greater efficiency in delivering water and drainage services through the corporatisation or privatisation of the main irrigation businesses.

This study reported on the policy, legal and other institutional factors under which irrigation water agencies are established, and which operate to promote or impede greater water use efficiency and sustainable water use.

Irrigation water providers (eg Murrumbidgee Irrigation, Murray Irrigation Ltd, Goulburn-Murray Water, Wimmera-Mallee Water, Sun Water, Central Irrigation Trust) potentially have a critical influence on behaviour on-farm. This is achieved through extension and information provision, pricing policy, self regulation and licensing.

The external framework of legislative and administrative arrangements for Irrigation Water Providers is set by the relevant State, although Commonwealth taxation, legislation and administration also has an impact. Each State has established the roles of irrigation water providers very differently, with those differences relating to ownership and legal structures, roles beyond water delivery, roles in land and water management planning, the licensing arrangements, nature of bulk water entitlements, and the ease with which conditions can be placed on water use.

The report concluded that it is not necessary that there be uniformity between the States, but rather that the critical roles in water use efficiency exercisable by an irrigation water provider are recognised and explicitly assigned to a responsible entity. As a principle, the comprehensive licensing of irrigation water provider activities has the advantage of providing a disciplined and certain framework for both governments and the irrigation water provider, while allowing governments to amend the conditions of the licences at periodic reviews.

Price continues to be one of the most important instruments for achieving change in water use and efficiency, where price can include the cost of water, subsidies, incentives, penalties and other market based instruments.

For example there is a significant variation in the return for water between different agricultural sectors. Low margin activities such as irrigating pasture to fatten livestock returns \$30-\$120 per megalitre while viticulture returns \$600-2000 per megalitre. At present some 12% of water in the southern Murray-Darling Basin is used to irrigate pasture to fatten livestock. Pricing water at a higher rate would promote a shift to higher value uses and sectors with greater water efficiency. Although it should be noted that the high value uses tend to require more expensive and sophisticated infrastructure and thus more secure water allocations, whereas irrigated pasture requires relatively little infrastructure and tends to use low security water.

Within sectors there is also a significant variation in water use efficiency, for example there is a ten fold difference in grape yield per megalitre between growers, and a three fold difference in dairy fat generated per megalitre between dairy farmers. Raising the performance of the least efficient farmers within each sector could achieve major water savings. Water charges are likely to be significant driver of farm decisions in the lower value sectors such as rice and dairy rather than the higher value sectors such as horticulture and wine grapes, where the cost of water is a lower percentage of the cost of production.

It is important to note that improvements in water use efficiency on-farm only equate to improvements in river health if the water 'saved' is returned to the environment in an appropriate flow regime. Further, some inefficiencies or losses are environmentally beneficial, as the project below underlines.

2.3 Improving Water Use Efficiency – A Study of Conveyance Losses and Investment Strategies

In 2002, Land & Australia also commissioned Marsden Jacob Associates to examine conveyance losses and private investment strategies associated with water use efficiency. Funding for the project was provided by Agriculture, Fisheries and Forestry Australia.

The report into investment strategies and conveyance loss examined the scope for private sector investment in water savings from irrigation schemes, and options to improve water use efficiency by reducing conveyance losses.

Irrigated agriculture accounts for approximately 70% of water consumption in Australia. In 2000-01 according to industry statistics, about 29% of the water taken into irrigation schemes was

lost between the irrigation district inlet and the farm gate, representing a potential source of water savings. The report had a close look at the make up of those losses and reported on the potential for savings to be achieved.

In all water supply systems some proportion of the water diverted is lost in conveyance to the consumer. Outfalls or water flowing from the downstream end of the system often flow back into rivers and are available for downstream users and/or for environmental flows. Hence some 'losses' are environmentally beneficial. Water meter inaccuracy can systematically under-record the volume flowing through the meter, or un-metered usage can understate the water actually used on farms. **Leakage and seepage from channels and evaporation losses are the 'real' losses of water and make up only a small proportion of the recorded conveyance losses in irrigation systems.**

The report concluded that each source of water loss in conveyance systems requires different policy and management responses, and that not all these losses are unequivocally, or uniformly bad. The report recommended a range of options for improving conveyance efficiency.

The study also examined the scope for private sector investment in water savings from irrigation delivery schemes. Historically, the private sector has had little involvement in operating irrigation projects. In urban water supply systems there is a trend to public-private partnerships. The study explored whether there was similar scope to involve the private sector in rural irrigation systems.

A survey of investment banks suggests there is considerable interest in irrigation infrastructure projects, however significant issues need to be overcome to attract private sector investment. These include: the operational complexity of the system; designing projects that are large enough to attract capital; producing long term predictable cash flows; defining clear risk sharing arrangements (typically low project credit risk with government security); and establishing single agency agreements rather than multiple landholder agreements.

Other factors that are relevant in the broader consideration of investment in irrigation infrastructure include the looming cost of financing the replacement of ageing irrigation supply infrastructure, building specialised infrastructure needed to manage environmental flows, water trading reforms, structural adjustment in the agricultural sector and reforms to water rights.

7. Climate Variability

A fundamental driver of rural water resource usage is the variability of the Australian climate – the most variable on earth. As a result of extreme climate variability, Australia has the world's most variable and least predictable rivers. This in turn means that Australian water storages need to be about four times as big on average in comparison with those in other countries, to offer the same security of supply for irrigation or other purposes. Such large storages (within the Murray Darling Basin total storage capacity exceeds average annual flows) have obvious implications for river health, particularly lower in the catchment. Accordingly, understanding the drivers of Australia's variable climate, and improving our ability to forecast seasonal climatic conditions and consequently to better manage the risks associated with extremes of climate (droughts, floods, fires etc) is a critical research priority for Australia, more so than for any other country.

The Managing Climate Variability Program (funded by the GRDC, DAFF and several other Rural R&D Corporations including Land & Water Australia, which manages the program on behalf of the partners) invests in world-class research to develop and apply seasonal climate forecasts in a wide range of industries including agriculture, urban water supply and water resource management.

The program was established at a time of major drought in 1992, to give farmers the ability to use seasonal forecasting in decisions such as how much crop to sow, appropriate rotations, stocking rates, destocking strategies, supplementary feeding and so on. The research focus has broadened from drought to better managing the risks and opportunities that come with an inherently variable and changing climate. A decade on, close to forty percent of Australian farmers are taking seasonal climate forecasts into account in decisions about their enterprise.

One of the first projects funded enabled the Bureau of Meteorology to add the Indian Ocean influence to that of the Pacific in seasonal forecasts of rainfall and more recently temperature. The program has allowed for forecasting the probability of above or below average rainfall over the near future, using historical climatic information from the Bureau of Meteorology and improved research and monitoring of the El Niño - Southern Oscillation or (ENSO) phenomenon in the Pacific.

Australian Rainman is one of the flagship products of the program, which gives farmers the capacity to analyse local rainfall and to incorporate their own records. The combination of relevant information and analyses readily done by the user is a powerful management tool. A new supplement with data for 400 Australian rivers now gives the capacity to forecast streamflow. This is a valuable new tool with a range of applications from irrigation planning to managing environmental flows.

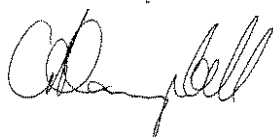
In northern NSW and Queensland, a majority of cotton and sugar cane growers take seasonal forecasts into account in a variety of farming decisions, from irrigation to cash flow management based on yield prospects. While forecasts can help farmers and natural resource managers to reduce some of the worst impacts of droughts and floods, they are not a panacea. They contribute to improved management of risks and opportunities through better informed decisions. Better information on the season ahead will over time contribute to improved profitability with less risk to the farmer's capital and natural resource base.

Australia, with exceptional rainfall variability, needs to be a world leader in the application of climate science to sustainable management. Australian researchers through an outstanding collaborative effort lead the world in applications to better manage climate variability. Close links between a limited number of researchers in agriculture, climate and ocean sciences has been the key ingredient in the rapid development of our capacity.

Interest in climatic forecasting has typically been greatest during droughts. Climate change brings new challenges and Australia's world-leading research effort in managing climate variability needs to keep meeting these challenges. We are close to finalising a new partnership involving the Managing Climate Variability program, the Australian Greenhouse Office, the Murray Darling Basin Commission and the Victorian Government, to fund a major (\$4m) research project exploring the implications of climate change and climate variability for water resources and water management in south-eastern Australia.

I would be happy to expand on any of these points in person.

Yours sincerely



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1 July 2004