6
Water sustainability of agribusiness activities in **Australia**
The Murray-Darling Basin

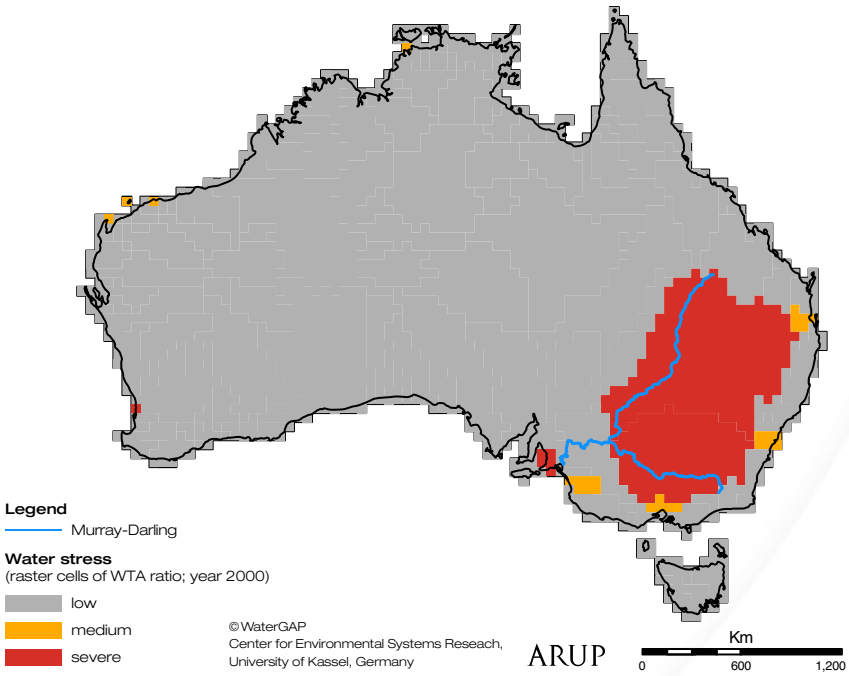
6.1 Local water challenges

The Murray-Darling Basin (MDB) inter-jurisdictional area is managed by the Australian Government, Australian Capital Territory and the States of Queensland, Victoria, South Australia and New South Wales (Figure 2). The Australian Capital Territory and the States all rely on and share its water resources. The MDB contains much of Australia's best farmland.

The River Murray supplies, on average, more than two-thirds of the Basin's water resources for irrigation, industrial, stock, domestic and environmental purposes. Around 75% of the water from the River Murray in the State of South Australia is used for primary production, such as water for stock and irrigating crops. An overview of irrigated land within the MDB is given in Figure 3. Overall, agriculture accounts for about 96% of the water consumption in the MDB which provides 41% of Australia's gross value of agricultural production.[2]

Figure 2

Location of the Murray-Darling Rivers and overview of the water withdrawal-to-availability ratio calculated by WaterGAP. This shows low, medium and severe water stress in river basins across Australia.



6.1.1 Water availability

Overall, human water consumption and climate change induced reductions in rainfall (see below) have reduced average annual stream-flow at the Murray mouth by 61%. Over the 1895 to 2006 period, the average annual flow to the sea has declined by almost 40%.[3] The MDB must be considered an acutely water stressed basin, as shown in Figure 2.

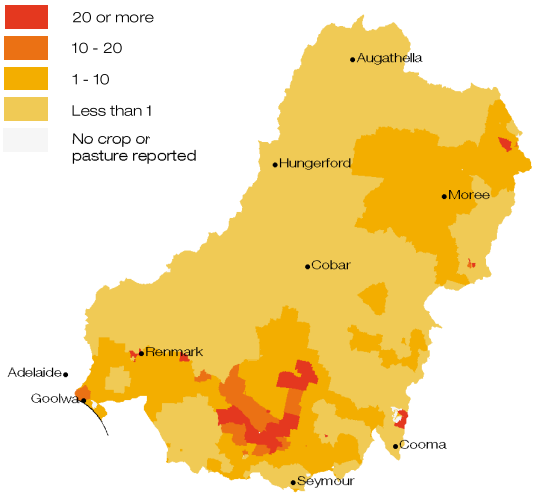
6.1.2 Climate change impacts

Recently, water availability has been severely affected by exceptionally hot and dry years.[4] In 2007, a 117-year low of water inflows to the MDB river system together with historic low storage levels resulted in drought throughout the basin. Delivery volumes of rural water service providers in New South Wales and Victoria decreased by 51% between 2006-07 and 2007-08 and irrigators have received low allocations of water entitlements.[5] These dramatic water bottlenecks are making agribusiness operations in the region less profitable and viable; especially those that are particularly water intensive.

Such resource pressures are only expected to sharpen in the future. Surface water availability across the entire MDB is expected to decline further as a result of climate change. Likely scenarios by 2030 suggest an 11% reduction in average surface water availability across the MDB: 9% in the north and 13% in the south.[6] The reduction would be greatest in the south where the majority of the runoff is generated and where, therefore, the impacts of climate change are expected to be greatest. This is shown in the map of the area given in Figure 4.

Figure 3

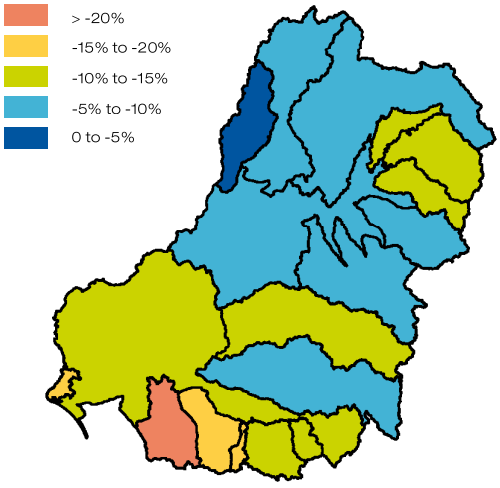
Percentage of crop and pasture land irrigated in the Murray-Darling Basin.



Sources: Geoscience Australia 2004, Australian Bureau of Statistics 2006 (ABS Water Account, 4610.0)

Figure 4

Changes in water availability under the median 2030 climate in the Murray-Darling Basin.



Sources: CSIRO (2008) Water availability in the Murray-Darling Basin, A report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project. CSIRO, Australia, p 45.

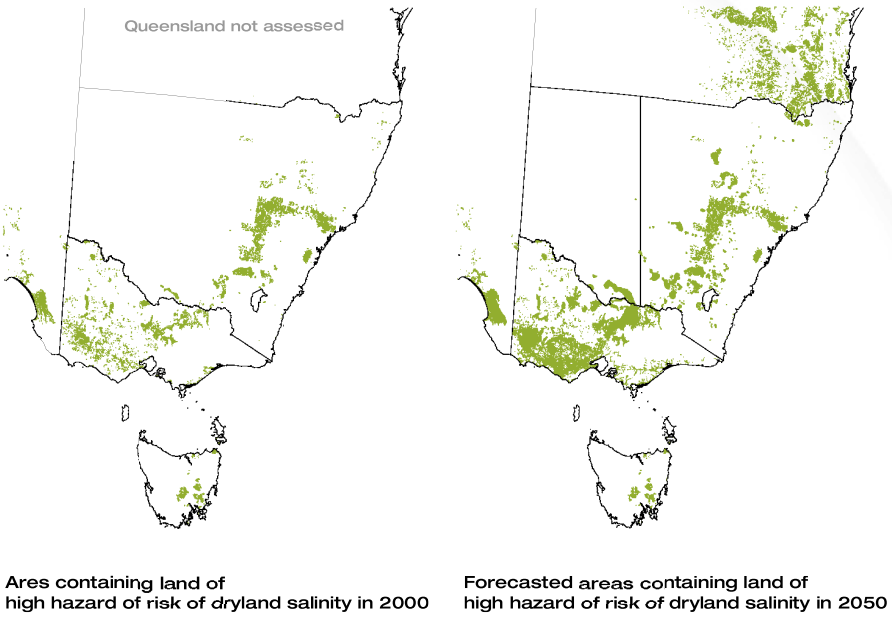
6.1.3 Water quality

Changes to the native landscape in the MDB have resulted in the widespread and growing problem of dryland salinity. Farmers are among the first to be affected, through the salinisation of rivers and agricultural land. Areas containing land at risk of dryland salinity in the South-East of Australia are shown in Figure 5. A Basin Salinity Management Strategy has been put in place to control salinity in the MDB and protect key natural resources. **Financial institutions should take into consideration the location of agribusiness activities subject to dryland salinity and encourage clients to monitor/reduce their contribution to irrigation salinity.**

See PIs 5a and 5b at the end of this chapter

Figure 5

Areas containing land at risk of salinity in the South-East of Australia. The map broadly captures the Murray-Darling Basin.



Source: National Land & Water Resources Audit, a programm of the Natural Heritage Trust, © Commonwealth of Australia 2001; reproduced by permission; http://www.anra.gov.au/topics/salinity/risk-hazard/index.html

6.1.4 Institutional/regulatory context

Surface water diversions from the MDB have been capped since 1 July 1997 to prevent further increases in water withdrawals. While this cap is not necessarily sufficient for the sustainable functioning of the basin ecosystem, it is considered an essential first step towards more sustainable water management; the compliance of each of the basin states with the objectives of the cap is monitored annually.[7]

Reacting to the ongoing drought, the Australian Government has initiated policy changes to the management of water resources in the MDB as part of its National Water Initiative, Water for the Future program and is introducing new legislation, such as the Water Act 2007. The latter facilitates the operation of efficient water markets and enables water trading between irrigation districts in the basin.[8] **In light of sharpening environmental regulation in the MDB and beyond, financial institutions have an interest to encourage clients, irrigators and farms to comply with regulation which is likely to emerge but not already in place yet.**

See PIs 8 & 10

Regulatory efforts include the availability of public funding and incentives for water-efficieny investments as set out, for instance, in the recent Intergovernmental Agreement on MDB Reform between the states and the Australian Government.[9] Programs include the Rural Water Use & Infrastructure program which aims to upgrade irrigation infrastructure and improve river management.[10] **From a financial institution perspective, the receipt of funding from such government programs can be a good 'proxy' for: the awareness the client has about the issue; the initiative the client is taking to address the problem; as well as the actual level of water efficiency in the farm or the water irrigation system covering the farm.**

See PI 1

In addition, a Restoring the Balance in the Murray-Darling Basin program has been installed through which the government has committed AUD 3.1 billion to purchase water in the MDB over 10 years in order to restore environmental flows; this includes a recently announced package of 'exit grants' for irrigators.[11]

See PI 8

The Irrigation Hotspots Assessment project identifies the nature, location and amount of water losses in existing channel and piped irrigation delivery systems. **Farms, irrigators and financial institutions should ensure that operations are not located in or affected by a 'Hotspot'. If so, measures should be explored to halt water losses.**

See PI 7

Furthermore, the Australian Government, through its Private Irrigation Infrastructure Operators program, has committed to modernizing irrigation infrastructure and sharing the achieved water savings (from improved water use efficiency) between irrigators and the Commonwealth Environmental Water Holder, which is responsible for holding environmental water entitlements.[12] In May 2009, the Murray-Darling Basin Authority, for instance, started to buy back water on the market from licence holders. This water will help restore environmental flows in drought-affected wetlands in South Australia in order to rehabilitate the provision of environmental services, including to agricultural activities.[13]

See PI 8

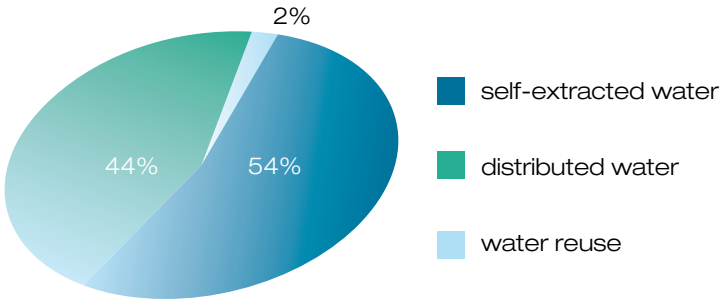
6.2 Water use in irrigated agriculture: grapes, cotton and rice

6.2.1 Sources of water and water trading

Most of the water consumed by the Australian agriculture industry in 2004–05 was self-extracted water (54%), with distributed water (44%) and reuse water (2%) accounting for the remainder. **An increase in the exploitation of alternative and sustainable sources of water (such as water reuse and rainwater harvesting) can have positive impacts on the cost structure and the drought resilience of agribusiness operations.**

See PI 11

Sources of water in the Australian agriculture industry



Water is directly extracted from bores, small farm dams, rivers and their tributaries or supplied by government, private or irrigator-owned water providers. The distribution of types of irrigation infrastructure in the MDB is shown in Table 1. Special attention should be given to the promising concepts of water recycling and re-use systems: these are most widespread in dairy operations and broad acre operations; only 6 % of horticulture farms have water re-use systems in place.

Table 1 On-farm irrigation infrastructure in the Murray-Darling Basin in 2006-07[14]

	Dairy	Broad acre	Horticulture
Percentage of farms with			
River pumps	22%	34%	37%
Ground water pumps	36%	28%	18%
On-farm irrigation storage	55%	34%	15%
Tile drains	0%	1%	16%
Other drainage reuse systems	**48%**	**38%**	**6%**

Note: Large potentials for the further development of drainage re-use systems remain untapped across agribusiness classes, but predominantly in horticulture operations. Financial institutions can contribute to the exploitation of such potentials.

See PI 11

Overall, 23% of the farms in the MDB participate in water trading. **Access to and participation in such trading-schemes can enable producers and irrigators to flexibly adapt to changing water availabilities and irrigation needs: shortfalls of water supply can be compensated through the purchase of additional water rights. Achieved water savings can be sold, which may open new revenue streams for farms and additional incentives to increase water efficiency.**

See PI 10

An overview of irrigated areas is shown in Figure 3. In total, the area of irrigated land in the MDB decreased by 8% from 2000/01 to 2004/05. Nationally, the largest decline in irrigated area was for rice, with volumes down more than 81%, followed by cotton (50%) and pasture for grazing (30%). **This signals that farmers are increasingly turning from water-intensive to water-efficient and drought-resistant crops. Agribusiness operations as well as financial backers will have to continue adapting to these new water-stressed circumstances.**

See PI 9

6.2.2 Grapes

Three types of grape (table, dried and wine) are grown and approximately 90% of land used for grapes is irrigated. Grape vines are usually grown under deficit irrigation and are intentionally water stressed to produce desired combinations of size and taste. Irrigation rates and timings are often, but not always, a decision which balances quantity of harvest (i.e. amount of yield) versus quality (i.e. grape content of vitamin C, acids, etc.). Having access to irrigation when desired is therefore critical from a crop management perspective.

Substantial efforts have been made by farmers as well as industry and research in Australia to address water management in viticulture, including research into crop response, irrigation techniques and scheduling. Most vines are already drip-irrigated and use either surface or underground techniques which are considered to be highly efficient but require high levels of expertise to manage effectively.

See PI 6

6.2.3 Cotton

Cotton production remains heavily reliant on rainfall and crops are predominantly grown on laser graded fields using furrow irrigation. The average cotton output is approximately 7.8 bales/hectare.[15]

In a multi farm assessment of water use efficiency in the upper reaches of the MDB, water productivity was found to vary between regions, individual farms and between seasons.[16] On average, during the 3-year period, values of water productivity ranged from 4500 m^3/t to 3500 m^3/t. **Through asking the right questions, financial institutions can play an influential**

See PIs 2, 6 & 9

role in promoting higher water productivity levels and shifts towards more water-efficient crops.

The Cotton Australia Best Practice Manual, which many farmers comply with, identifies measures to improve water productivity and the use of agrochemicals[17] . Further support is available from Cotton Australia, which is the leading body for Australia's cotton growing industry. A Managing the Drought information Kit is also available to farmers.[18]

See PI 9

Case study 1

Renmark Irrigation Modernisation Project

Renmark is a town situated on the Murray River in the Riverland region of South Australia. Irrigated horticulture in the area is dominated by high-value crops such as grapes, citrus and stone fruit. The water supply to farmers is managed and operated by the Renmark Irrigation Trust (RIT), an irrigator-owned water provider. Renmark and RIT hold South Australia's largest single water licence (Licence No. 1) which provides up to 47.9 GL in water entitlements.

With support from the Government's Water for the Future Plan, RIT has undertaken irrigation modernisation planning for the Renmark area and its infrastructure Ü see PI 1. The plan identifies options to modernise RIT's irrigation infrastructure as well as to improve on-farm irrigation practice. Furthermore, it takes into account expected climate change and regulatory developments. Some of the expected results are tabled below:

Table : On farm irrigation practice in 2004-05 and projected changes by 2012

Year	2004-05				2012	
	Drip	Micro-sprinkler/under canopy	Flood/Furrow	Other/None	Drip	Micro-sprinkler/under canopy
Irrigation Method	90%	80%	50%	50-65%	92.5%	85%

A key take-away is that the availability of government support for investments in water infrastructure and efficiency, coupled with careful planning on the basis of climate change expectations and other long-term developments, can be visionary and lead to strategic improvements in the drought-resilience of agribusiness operations.

Source: Renmark Irrigation Trust: Modernisation Plan.

6.2.4 Rice

Rice production in Australia is comparatively efficient and the industry has a strong research program to incentivise further water savings. As an example, paddy rice is often grown as part of a crop rotation system, enabling residual moisture to be maximized by follow-on crops.

Water productivity for yields is in the order of 1000 m^3/t (which is a 50% improvement from 1985). Despite these efficiency improvements, growers are constrained by the on-going sequence of droughts. Without adequate water supply, growers will be increasingly forced to reduce paddy rice area, as well as to turn to other production strategies and/or more water efficient crops.[19,20]

See PIs 2 & 9

6.3 Performance indicators

Based on the current context of water challenges and agribusiness operations in the Murray Darling Basin, 11 tailored PIs are presented. These aim to support financial institutions in starting to assess the water-performance of farms and agribusiness operations.

	Description	Rationale and materiality
PI 1 **Has the client received funding for water efficiency improvements from public sources: the Water for the Future program, the Private Irrigators Infrastructure Program in New South Wales or the Australian Irrigation Modernisation Planning Assistance Program?** **Or is the client serviced by an irrigator who has received this type of funding?**	These programs make funding available to rural water projects to improve the efficiency and productivity of water distribution, water use and management. They help irrigation water providers to: I.) develop modernisation plans for their districts, II.) upgrade irrigation infrastructure and III.) assess options to adapt to a future with less water. Clients may, however, have implemented such measures without Government support. In New South Wales, clients may have received funding from the Water Wise on the Farm Program.[21]	• The receipt of funding from such government programs can be a good 'proxy' for: the awareness the client has about the issue; the initiative the client is taking / has taken to address the problem; the actual level of water efficiency of the client or the water irrigation system covering the client. • Clients may have been able to fund such investments without government support. • Mere eligibility to participate in such government programs is a proxy for good practice and client compliance with certain sustainability criteria.
PI 2 **What is the client's crop-specific water productivity performance?**	High levels of water efficiency may not be a sufficient condition for sustainable water management, but a necessary one. Water productivity is usually measured as m^3 per ton of harvest or unit of turn-over. The level of water efficiency of a given operation will depend on a wide range of local factors. National or regional averages (or benchmark values) can, therefore, only serve as proxies. **Reference values** Benchmark values of water productivity in Australia are: **Grapes** Wine grapes: 400-303 m^3/ton Sultana grapes: 752-247 m^3/ton (1997 data) **Cotton** 4500-3500 m^3/ton **Rice** approx. 1000 m^3/ton	In addition to environmental benefits, high levels of water efficiency have positive impacts on the cost- structure and drought-resilience of agricultural activities.
PI 3 **What is the expected decline in water availability within the client's area of operation?**	Not all regions in the MDB will be affected by climate change and declining water availability equally: it appears that some regions will be affected more strongly than others. *See Figure 4 on page 18.* **Reference values** See Figure 4 on page 18.	In addition to an assessment of current water availability, the viability of an agribusiness operation will also depend on the forecasted availability of water over the medium to long term.
PI 4 **Has the client conducted an assessment of the security of sustainable water availability in quantitative and qualitative terms?**	Assessments (confirmed by a 3rd party) may allow for a refined understanding of the security of water supply. They may also identify alternative sources of sustainable supply such as rainwater harvesting, re-use of water and water trading. Assessments should also include local demand projections.	A better understanding of the availability and constraints of water supply is key for business success. Together with a regional assessment of water issues, a local assessment at the farm level will provide a basis to identify bottlenecks, adverse developments as well as possible measures and promising solutions.

PI 5 **a.) Is the area of production exposed to dryland salinity risk? If yes, are responsive measures being implemented by the client?** **b.) Are measures in place to minimise the risk of irrigation salinity?**	Salinity results from watertable rises from irrigation systems (irrigation salinity) and from dryland management systems (dryland salinity). Guidance on the latter is availabe for on-farm decisions. Figure 5 on page 19 identifies areas at risk. **Reference values** See Figure 5	A better understanding of the exposure to dryland salinity risk and the implementation of response measures will influence business success in the medium to long term. Dryland and irrigation salinity adversely affect crop yields and quality of output.
PI 6 **Does the client use best available water-efficient irrigation systems/ techniques?**	Drip and micro-sprinkler/under canopy systems are both economically viable and highly water efficient. In contrast, microspray systems, portable irrigators, large mobile machines, solid set under canopy sprinklers, and furrow irrigation are less water efficient.	The use of efficient drip and micro-sprinkler/under canopy systems enhances irrigation efficiency relative to other conventional techniques. It reduces exposure to water risks and input costs making an agribusiness operation more resilient, profitable and solvent.
PI 7 **How does the location of the client's operations 'perform' under the Irrigation Hotspots Assessment Project? In other words: is the client located in one of the hotspots and, as such, experiencing water losses?**	The Irrigation Hotspots Assessment Project identifies the nature, location and amount of water losses (known as 'hotspots') in existing channel and piped irrigation delivery systems. **Reference values** WELL (operations not in Hotspots) / BADLY (operations in Hotspots)	If the client's operations are located in one of the 'hotspots', this may have adverse cost, regulatory as well as reputation consequences on the irrigation system and the farms it covers.
PI 8 **Have steps been taken to mitigate impacts on ecosystems and the environment?**	Steps may include natural pest management, low water fertilisers and addressing the question of whether the production area is located in or near a site of ecological importance.	Good environmental practice may have positive impacts on financial performance in light of tightening environmental regulation. Agribusiness operations that already today comply with emerging environmental regulation (Restoring the Balance in the MDB Program) will be at a clear advantage relative to peers. The implementation of such considerations may also have reputational benefits for financial institutions in light of consumer preference increasingly shifting towards 'more sustainability'.
PI 9 **Has the client assessed the appropriateness of the crop cultivated relative to local water conditions?**	Water resource conditions include local water availability, precipitation patterns, salinity levels as well as water and air temperature. Crops that are suitable for a specified environment can be identified using the FAO Ecocrop.[22]	Replacement of water-intensive with – efficient and drought-resistant crops is a key opportunity; it can have positive effects on cost structure and business resilience over the medium to long term.
PI 10 **Does the client participate in water trading and/or salinity trading? Or is the client covered by an irrigation scheme that participates in water or salinity trading?**	Water trading between irrigation districts in the basin and between individual irrigators exists on both a temporary and permanent basis.** (Salinity trading schemes exist e.g. at the Hunter River and there is a trial program in Bet Bet in Victoria).***,[23]	Participation in trading-schemes can enable producers and irrigators to flexibly adapt to changing water availabilities and irrigation needs: shortfalls of water supply can be compensated through the purchase of additional water rights. Achieved water savings can be sold, which may open new revenue streams for farms and additional incentives to increase water efficiency. Overall, environmental markets have proven to be flexible, user-friendly and effective means to address environmental problems and resource constraints.

PI 11 **What proportion of the client's total water consumption is from sustainable water sources?**	Sustainable water sources may include harvested rainwater and re-used water. **Reference values** The average proportion of re-used water across the MDB is 2%. As per Table 1 on page 21, the potential to increase water re-use remains largely untapped especially in horticulture operations: there only 6% feature respective drainage systems.	Albeit only limited in scope, such alternative practices, if exploited meaningfully, can provide additional water resources at little (or no) cost and make an enterprise or farm more drought resilient.

Note:

Abbreviations after company name refer to company 'Tickers'. Click on company name to link to Investor Relations web page. Source: www.corporateinformation.com and www.google.com/finance Figures quoted on 15th September 2009

* The successful applicants who have received offers of funding are: Bringan Irrigation Trust, Marthaguy Irrigation Scheme, West Corurgan Private Irrigation District, Western Murray Irrigation Limited, Coliban Water Corporation, South Burdekin Water Board, North Burdekin Water Board, Tatalia Water Supply Inc., Jemalong Irrigation Limited, The Renmark Irrigation Trust, Wimmera-Mallee Water, Tenandra Irrigation Scheme, Trangie-Nevertire Cooperative Ltd, Harvey Water, SunWater, Murrumbidgee Irrigation Limited, Goulburn-Murray Water, Murray Irrigation Ltd and Southern Rural Water.

** Temporary trade – purchase or sale of an annual allocation of water, i.e. the water allocation purchased can be used during the year it was bought; Permanent trade – purchase or sale of the actual entitlement or the permanent right to water.

*** Salinity trading builds on the notion that discharge of salty water should only take place when there are high quantities of low-salt, fresh water in the river. There is a cap on the overall discharge of salty water into the river and allocated rights to do so can be traded.