NSW Central Murray community profile

Irrigation region

Key issues for the region

1. Region’s population — The region’s population is approximately 35,000. This includes 1,600 farm businesses.

2. Gross value of irrigated agricultural production
   • Drought affected gross value of irrigated agricultural production for NSW Central Murray was $320 million in 2006. This compares to pre-drought $550 million for 2000.

3. Water Entitlements (approximate)
   • Surface Water Long-term Cap — 1880 GL including the NSW Murray downstream of the region and the Lower Darling.
   • High reliability/Security - 48 GL.
   • General Security/low reliability — 1300 GL approx.
   • Conveyance - 300 GL (Murray Irrigation Ltd).
   • Groundwater entitlements are 83 GL.

4. Major enterprises — Major enterprises include mixed farms growing rice, winter crops and pastures for livestock production and dairying in mid Murray region (Finley Deniliquin Wakool), citrus in south west (Barham) and winter crops and pastures for livestock fattening.

5. Government Buyback — Buybacks have resulted in the purchase of 200 GL of NSW General Security entitlements predominantly from within the Murray Irrigation area. A relatively small volume of water entitlements has been purchased from the remaining part of the region.

6. Water Dependence
   • Irrigated agriculture is the major economic driver within the region.
   • The urban communities of Deniliquin, Finley, Jerilderie, Moulamein and Wakool have a high dependency on irrigated agriculture. Around 90% of businesses in these centres are directly reliant on irrigated agriculture.
   • Rice and dairy producers make up around 75% of the farm businesses and have a high dependency on irrigation.
   • Groundwater access is limited to the Murray River corridor. Only a small proportion of farm businesses have access to both surface water and groundwater.
   • There is limited scope for farm transformation for Murray Irrigation farms in the area west of Deniliquin, due to heavier soils and low rainfall. Most farms are too small to become viable dryland farm businesses.
   • The irrigation dependant farms east of Deniliquin have greater enterprise flexibility but are still dependent on irrigation for business viability.
   • Previous agreements have resulted in environmental allocations made to the Moira wetlands (2 GL), the Barmah Millewa Forest (75 GL) and the NSW Murray Wetlands Working Group (30 GL).

7. Current Status
   • The Murray Irrigation Ltd area was established as a government irrigation district in the 1940s and 1950s and now provides irrigation water to 1,200 farm businesses.
• The region has been severely impacted by drought since 2002, with General Security allocations falling from an average of 82% prior to the drought to 26% over the period 2002–09.
• The drought has had a major impact on the region’s farming community. Over 50% of farms are accessing Exceptional Circumstances financial support.
• The temporary closure of the Deniliquin rice mill has had significant economic impacts within the Deniliquin community.
• A major groundwater adjustment process was implemented in 2008 and involved groundwater entitlements being reduced from 257 GL to 83 GL.
• Over the past 15 years, irrigated farm businesses have continued to adjust to changing Government water policy, including the MDBC Cap on Diversions, the NSW Water Sharing Plan, the recent ACCC Water Charge Rules and NSW IPART Water Price Determinations. This adjustment has resulted in significant restructuring with less than 1,200 farm businesses owning the 2,400 irrigation landholdings previously established within the Murray Irrigation area alone.
• There is significant human and financial stress within the region. Many farm businesses have either sold or offered to sell water entitlements to the Government as a means of raising funds to meet critical household and business needs.
• There is scope for improved farm water use efficiency of around 10% in the short to medium term which will offset climate change impacts, however these improvements may incur greater energy costs. Murray Irrigation modernisation is estimated to achieve a 5% saving on conveyance losses (15 GL at full allocation).
• There is scope for water savings by piping stock and domestic water to some of the larger farms in the east, south and far west of the region.

8. Response to Water Availability Scenarios
• All farms will be financially impacted by a reduction in long-term water availability. A uniform adjustment will impact on efficient as well as inefficient users.
• There are few significant (if any) economic development opportunities from increased environmental flows that will offset the impacts of irrigated agriculture.
• There is limited scope for farm businesses to adjust to lower long-term water allocations, given there are limited markets for high value enterprises or conversion to dryland farming.
• Medium size farms are likely to be more adversely affected by reduced water availability as they have limited capacity to adjust either via scale (increase farm size) or via supplementation with off farm income (time constraints).
• The broadacre mixed irrigation farms producing winter crops, pastures for stock and rice are most susceptible to reduced water availability. Subject to annual water prices and commodity prices, the dairy industry has greater capacity to pay higher prices to purchase water on the annual trade market to offset reduced annual water allocations. However, this adjustment will be an increased operating cost to these businesses.
• A uniform long-term water availability reduction of up to 20% will result in some farm businesses becoming unviable and many other businesses being unable to maintain the business growth required to address the long-term cost price squeeze. Some larger businesses will attempt to restructure their businesses and purchase water entitlements or annual
allocated water to maintain productivity. Many smaller businesses would be expected to cease operation.

- A reduction in the long-term water availability of greater than 20% will result in many farm businesses becoming unviable with direct flow on impacts occurring at a community level.

- A reduction in long-term water availability in the order of 60% will be equivalent to the drought conditions experienced since 2002–03. Experience over the past seven years has shown that farm businesses have severely eroded working capital, increased borrowings and realised assets to meet commitments.

- A transformation to dryland agriculture would require the aggregation of 5–10 farms into a single farm business. This would have significant flow on impacts to the service community and the provision of community services such as health, education, police and recreational facilities.

- The purchase by Government of water entitlements, by investing in water use efficiency, works at a district and farm level is seen as the most appropriate means for Government to secure the environmental water requirements. There is scope for these purchases to be supplemented with sub system retirement involving strategic direct market purchase and the retirement of associated irrigation infrastructure.

Regional overview

The Central Murray region is located within southern NSW adjacent to the Murray River. Covering the irrigated area west of Corowa, the Central Murray region then extends west to Kyalite, positioned between the Murray River in the south and the Billabong Creek and Edward River in the north (Figure 1).

The region has a population of around 35,000. The majority of the community is dependent on irrigated agriculture either directly or indirectly. Population levels are relatively stable but have exhibited aging, as many young people have left the region to obtain employment. In recent years a number of people have left the region to obtain work to offset the impacts of the drought.

Deniliquin is the largest centre in the region with 8,000 people. There are a number of smaller towns and villages ranging in population from 500–2,500 people. The region also has strong relationships with other large centres in Victoria including Shepparton, Echuca, Swan Hill and Bendigo.

The region includes the local government areas of Berrigan, Jerilderie, Conargo, Wakool, Murray and Deniliquin.

The Central Murray was developed for irrigated agriculture in the 1940s–1950s following the completion of the Hume Dam and the end of World War II.

Forestry is a long standing industry for the region, based on the River Red Gum forests of the Central Murray. There are an estimated 530,000 hectares of River Red Gum forests in the Murray Valley Region (both NSW and Victoria). The forestry industry supports both direct and indirect jobs and will be impacted by the recent decisions regarding restricting future red gum logging.

Tourism delivers a moderate economic and employment benefit to the region with the Murray River attracting visitors primarily in the summer and Easter holidays. Visitors to the Murray River tend to visit from the western side of Melbourne and the Melbourne–Geelong corridor.
Figure 1 Location of irrigation district
The region has a relatively flat landscape predisposed to surface irrigation. Over 90% of the irrigation water is delivered via gravity fed earthen channels and applied using surface irrigation. Irrigation within the western portion of the region is interspersed with the creeks and flood runners of the Edward Wakool floodplain. The soils in the region generally range from lighter well drained soils in the east to heavier non self mulching sodic clay soils in the far west. A diverse range of irrigated agricultural industries are produced. Rice, dairying and winter crop production and livestock fattening are the dominant industries.

The Murray Region includes the Millewa and Perricoota-Koondrook Red Gum Forests, both identified as icon assets within the Living Murray Initiative. The region also includes the Edward and Wakool Rivers, the Werai State Forest, and is bordered to the north by Billabong Creek.

**Irrigation overview**

The region includes Murray Irrigation Limited, West Corurgan Private Irrigation District (PID), Moira PID and a number of smaller irrigation trusts and single license holders.

Prior to the Government environmental flow and buyback initiatives, the NSW Central Murray region held approximately 1,300 GL of NSW General Security entitlements which have a long-term average yield of 80%. The region also held approximately 48 GL of High Security water entitlements with a long-term average yield of 96%. Murray Irrigation holds the largest water licence of 1,514 GL comprising 3GL High Security (town water), 1,190 GL General Security, 121 GL Supplementary and 300 GL of Conveyance entitlements. West Corurgan Irrigation holds a water licence with 80 GL of General Security and 1 GL of High Security entitlements. Moira Irrigation holds 38 GL General Security entitlements. Remaining entitlements are held by private diverters and small irrigation trusts. A water sharing plan was developed in 2003–04 for the NSW Murray region.

Groundwater region N16 extends from the Corowa Urana Road in the east, to Euston in the west, and south of Billabong Creek. The licensed volume of groundwater entitlement is 83 GL. The development of the N16 Groundwater Sharing Plan 2007 reduced water entitlements from 267 GL to 83 GL and the created 120 GL supplementary entitlements which decline to 0 GL by 2015. The adjustment process commenced in 2007–08.

Irrigation commenced in the area in the 1940s following the completion of the Hume Dam and expanded across the region during the subsequent 30 years. The West Corurgan PID was formed in 1968. All irrigation diversion and delivery infrastructure, excluding the publicly owned dams and weirs within the river system, is privately owned. Murray Irrigation Limited, previously government-owned, was privatised in 1995. West Corurgan and Moira private irrigation districts and the smaller irrigation trusts were established as private entities.

The water used for irrigation, farm stock and domestic and town purposes is stored in Lake Hume and Dartmouth Dam. The West Corurgan Irrigation diversion pumps are located on the Murray River downstream of Corowa. Murray Irrigation diversions are made from Lake Mulwala and the Edward River downstream of Deniliquin. The Moira Irrigation diversion point is on the Murray River downstream of Picnic Point. Most of the smaller trusts divert water from the Murray River downstream of Echuca. A relatively small volume is also diverted from the Edward and Wakool Rivers and associated tributaries.
The major commodities produced have been rice, dairy (milk), winter grain crops (wheat, and canola) and citrus. A range of other commodities are produced in smaller amounts including other winter and summer crops, wine grapes and fodder crops including lucerne. The rice and dairy industries dominate water use in the more intensively irrigated areas because of relatively higher farm level profitability.

Annual General Security water allocations have averaged 26% over the past seven years compared to 82% during the 5 year period to 2001–02. There has been a significant shift in relative water use primarily away from rice production to annual pasture for livestock production and winter crops within the Central Murray irrigation area and reduced crop and pasture water use in the other areas. Prior to the drought West Corurgan diverted around 75 GL annually primarily for winter crop and annual pasture production. Around 35% was used for rice production and 3% for potato production. West Corurgan has been limited to supplying its farmers with stock and domestic water during the last three years.

The CSIRO Sustainable Yields project concluded that the impact of climate change on NSW General Security water availability is likely to be a reduction of around 8% by the year 2030 under a median climate scenario. The anticipated gains in water use efficiency may provide the opportunity for farm businesses to offset this impact.
Rural water supply

Regional system description

Surface water is the major water source within the Central Murray region. In most cases, private irrigation companies and trusts hold the water licences and supply water under contract to their members.

Murray Irrigation holds the water entitlement licence and diverts the water to individual farms within its area of operation. The Murray Irrigation distribution infrastructure includes 2,948 km of channel, 1,425 km of district surface drainage and 3,718 farm irrigation supply points. Under normal operating conditions the level of distribution efficiency is 83%. Proposed improvements to the distribution system are estimated to increase the level of efficiency to 88%. Murray Irrigation has implemented a major refurbishment program over the past 15 years involving a major focus on upgrading supply regulators that can be operated remotely to provide greater water control. Major investigations have been undertaken into the quantification of channel seepage and associated channel lining. Part of the privatisation agreement in 1995 between Murray Irrigation and the NSW Government involved the company transferring 30 GL of its Conveyance licence to the Government for environmental use, in return for funding to undertake seepage control works within the supply channel system. A modernisation plan was prepared and submitted to the Federal Government in November 2009. The focus of the modernisation plan is to rationalise and reconfigure smaller channels and upgrade water management control structures.

West Corurgan Private Irrigation holds a single water entitlement licence and diverts water to 239 individual farms within its area of operation. The distribution infrastructure includes 565 km of channel. Under normal operating conditions, West Corurgan requires approximately 9–10 GL of conveyance water to distribute 75 GL of irrigation and stock and domestic water. A modernisation plan is currently being prepared. This plan has a focus on rationalisation and piping of some small spur channels and installation of in-line storages.

Table 1 System details and performance, Murray Irrigation

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>2005-06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total length of natural waterways used within the distribution system</td>
<td>km</td>
<td></td>
</tr>
<tr>
<td>Total length of irrigation supply channel — unlined</td>
<td>km</td>
<td>2,948</td>
</tr>
<tr>
<td>Total length of irrigation supply channel — lined</td>
<td>km</td>
<td>1</td>
</tr>
<tr>
<td>Area Irrigated in current year</td>
<td>ha</td>
<td>190,000</td>
</tr>
<tr>
<td>Number of irrigation customers</td>
<td>#</td>
<td>2,411</td>
</tr>
<tr>
<td>Gravity water supply system</td>
<td>% of area</td>
<td>100</td>
</tr>
<tr>
<td>Pumped water supply system (low pressure 0–30 m line pressure at the farm gate)</td>
<td>% of area</td>
<td>0</td>
</tr>
<tr>
<td>Pumped water supply system (high &gt;30 m line pressure at farm gate)</td>
<td>% of area</td>
<td>0</td>
</tr>
<tr>
<td>Is a surface drainage service provided by your business? Y/N</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Total area serviced by surface drains</td>
<td>ha</td>
<td>263,000</td>
</tr>
<tr>
<td>Gross diversions to water supply system for irrigation purposes</td>
<td>ML</td>
<td>1,177,898</td>
</tr>
</tbody>
</table>

Water trading

| Total transferable entitlement (not including groundwater)               | ML    | 1,444,152|
| Internal transfers — permanent                                         | ML    | 3,644    |
| Internal transfers — temporary                                         | ML    | 145,233  |
| External net transfers (negative means net loss) — permanent           | ML    | -1,362   |
| External net transfers (negative means net loss) — temporary           | ML    | 94,211   |
The farm

Natural capital

Factors such as climate, supply of good quality irrigation water and soil quality, particularly in the eastern areas, make the region suitable for the production of a range of crops and livestock enterprises. The capacity to produce a successful enterprise however is only one component of the process. Processing facilities and development of secure longer term markets are critical. These latter aspects together with the profitability of the existing farm systems prior to the drought led to a relatively high reliance on the rice based farm system within the more intensively irrigation areas. This rice production system is well suited to the region’s soils and climate and produces a high quality, medium grain rice of a world standard. This production is underpinned by the grower funded rice processing facilities now controlled and operated by SunRice. The lighter well drained soils in the east and in the south west are well suited to dairying and horticultural enterprises.

Farms within the region fall into one of four farm system categories; rice based, dairying, horticulture and mixed farms that primarily produce winter grain crops and annual pasture for livestock production.

Figure 3 Survey respondents by farm type

*Number of respondents = 110. Some respondents reported multiple types.*
**Financial capital**

Irrigation water is considered to be the most limiting factor for most farm businesses. A typical Murray Irrigation farm business in the eastern portion of the region holds around 600 water entitlements on a 250 ha landholding. A typical Murray Irrigation farm business in the western portion of the region holds around 750 water entitlements on a 320 ha landholding. Based on the long-term average yield of 80%, the water availability for these landholdings is around 1.9 ML/ha. Most farms will apply the available water to the portion of the farm with the best irrigation layouts and in a manner that will generate the greatest return per unit of water. Most farm businesses own two or more landholdings. Within West Corurgan, each farm holds 200 water entitlements and is commonly 1,000 ha in size.

The Central Murray region is located close to the river storages and thus the transfer of the allocated water to the point of diversion has a relatively lower impact on stream health than most other regions. The water diverted is good quality, suited to a range of agricultural enterprises. The gravity supply system and predominantly surface application systems on-farm have a low carbon impact.

Government support for farm system transformation has been via incentives to redevelop farm irrigation supply and drainage systems as part of the Murray and West Corurgan Land and Water Management Plans and through low interest rate loans for farm redevelopment.

Most farm incomes have substantially reduced as a result of the current drought. Exceptional Circumstance support was first made available in 2006, initially for the dairy industry, but subsequently for non dairy farms. Around 30% of irrigated farm businesses are actively using the Rural Counselling services. An average of 663 annual applications have been made to the NSW Rural Assistance Authority over the period 2007–09 for the Farm Interest Rate Subsidy available as part of the Exceptional Circumstances support program. 50% of farms (615 properties) receiving income support from Centrelink are irrigated properties in the Riverina Exceptional Circumstances area.

Anecdotal evidence suggests that farmers are liquidating many off-farm assets and more recently water entitlements to raise sufficient capital to meet fixed farm business liabilities. Small service businesses in the service centres of Finley, Berrigan, Jerilderie, Deniliquin and Barham advise they are carrying much higher levels of client debt than previously.

Many farm businesses now require access to off-farm income. Before and in the initial phase of the drought, off-farm income was accessed by one of the farm business partners in some cases. For example, one business partner (usually the spouse) would seek external employment or contracting work. In more recent years, a significant number of farmers are involved in off-farm work. This has generally involved working outside the region in the mines, truck driving and in skilled labour positions. Most farms require additional income to maintain lifestyles and the impacts of the drought continue to be major constraints to the farm operating conditions.

**Human capital**

Activities held throughout the region during the past two years to encourage farm men and women to socialise have been well attended. While the stress levels of farm families are difficult to quantify, organisers of events such as ‘Blokes Day’ Out have concluded that many farmers are in need of support. The capacity of the local communities to provide professional support is very limited. Most centres have one or two social workers and limited operational budgets.

The following pages provide more detail about farms within different sectors in the region.
The farm: livestock farms

The figures and table on this page present results from the telephone survey of irrigation farmers undertaken in the region. They include:

- farmers’ ranking of a range of issues that they considered problematic;
- farm financial measures (note that 38% of livestock farmers in the NSW Central Murray have off-farm income (29 survey respondents)); and
- measures of optimism, and how satisfied farmers are with a range of life issues.

Table 2  Farm financial measures

<table>
<thead>
<tr>
<th>Ratios</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return on assets(^1)</td>
<td>-1.60%</td>
</tr>
<tr>
<td>Debt ratio(^2)</td>
<td>10.39%</td>
</tr>
<tr>
<td>Value of Water/total assets</td>
<td>22.95%</td>
</tr>
</tbody>
</table>

\(^1\) Profit/Assets  
\(^2\) Total debt / Total assets

Figure 4  Farm issues — livestock farms

Note: 1 = No problem to 5 = Significant problem. Number of respondents = 36
Figure 5 Farm financial measures

Figure 6 Optimism — livestock

Note: 1 = Completely dissatisfied to 10 = Completely satisfied. Number of respondents = 36
The farm: broadacre farms including rice based farm systems

Figures 7 and 8 and the table on this page present results from the telephone survey of irrigation farmers undertaken in the region. They include:

• farmers’ ranking of a range of issues that they considered problematic; and
• measures of optimism, and how satisfied farmers are with a range of life issues.

38% of broadacre farmers in the NSW Central Murray have off-farm income (16 survey respondents).

The farm: broadacre and livestock farms

Figures 9–11 and the table on this page present results from the telephone survey of irrigation farmers undertaken in the region. They include:

• farmers’ ranking of a range of issues that they considered problematic;
• farm financial measures (43% of livestock and broadacre farmers in the NSW Central Murray have off-farm income (35 survey respondents)); and
• measures of optimism, and how satisfied farmers are with a range of life issues.

Table 3 Farm financial measures*

<table>
<thead>
<tr>
<th>Ratios</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return on assets(^1)</td>
<td>-0.73%</td>
</tr>
<tr>
<td>Debt ratio(^2)</td>
<td>20.60%</td>
</tr>
<tr>
<td>Value of Water/total assets</td>
<td>43.79%</td>
</tr>
</tbody>
</table>

\(^1\) Profit/Assets  
\(^2\) Total debt / Total assets
Figure 7  Farm issues — broadacre farms

Note: 1 = No problem to 5 = Significant problem. Number of respondents = 19

Figure 8  Optimism — broadacre

Note: 1 = Completely dissatisfied to 10 = Completely satisfied. Number of respondents = 19
Figure 9  Farm issues — broadacre & livestock farms\textsuperscript{xi}

Note: 1 = No problem to 5 = Significant problem. Number of respondents = 32

Figure 10  Farm financial measures\textsuperscript{xi}
On-farm irrigation water use

Irrigation application methods

Over 98% of the irrigation water in the NSW Central Murray is applied as surface or flood irrigation. All rice crops are permanently flooded between December and February, the critical reproductive phase of the crop. Historically rice has been sown by aircraft into flooded bays. Direct seeding followed by intermittent irrigation (flushing) prior to the application of the permanent flooding in December is being used by an increasing number of farmers as a means of reducing water use.

Most winter grain crops and pastures are irrigated using laser land formed layouts and supply and drainage reuse systems.

Drip irrigation has been installed on many of the citrus orchards near Barmah, primarily replacing overhead irrigation which was installed at the time the orchards were established. Subsurface drip is used for tomato growing and most potatoes are irrigated using low pressure overhead irrigation.
Table 4 On-farm irrigation management (2007-08)\textsuperscript{iv}

<table>
<thead>
<tr>
<th>Irrigation parameter</th>
<th>Livestock (%)</th>
<th>Broadacre (%)</th>
<th>Broadacre &amp; livestock (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Method</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flood flow</td>
<td>90</td>
<td>88</td>
<td>78</td>
</tr>
<tr>
<td>Travelling</td>
<td>3</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Microjet fixed sprinklers</td>
<td>3</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Drip/trickle</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td><strong>Timing irrigation on the basis of</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil moisture measuring tools</td>
<td>7</td>
<td>25</td>
<td>16</td>
</tr>
<tr>
<td>Calendar based</td>
<td>21</td>
<td>31</td>
<td>25</td>
</tr>
<tr>
<td>Weather forecast</td>
<td>24</td>
<td>31</td>
<td>25</td>
</tr>
<tr>
<td>Own observations/knowledge</td>
<td>79</td>
<td>81</td>
<td>72</td>
</tr>
<tr>
<td>Percentage of farms trading</td>
<td>29 traders</td>
<td>19 traders</td>
<td>33 traders</td>
</tr>
<tr>
<td>Purchasing</td>
<td>24</td>
<td>11</td>
<td>27</td>
</tr>
<tr>
<td>Selling</td>
<td>38</td>
<td>63</td>
<td>52</td>
</tr>
</tbody>
</table>

**Opportunities/trends**

To reduce water, increasing numbers of rice crops are being dry sown and intermittently irrigated (flushed) leading up to early December. Industry research indicates that water savings of around 10% may be achievable. Surge flow irrigation is currently being evaluated as a way to improve water use efficiency and evenness of application on surface irrigation layouts. A small number of farmers have installed low pressure overhead irrigators (lateral moves, centre pivots) to improve productivity per unit of water applied. This equipment has generally been installed on the lighter textured soils that are not suitable for growing rice.

Water savings from improved efficiency have been used to improve farm production levels. Around 10% of farm businesses have recently submitted expressions of interest to trade water entitlements to the Commonwealth Government in exchange for funding for improved water use efficiency technologies. Over 50 farm projects were implemented under a rice industry led water efficiency project during the past three years. This involved farms selling water entitlements to the MDBA (formerly MDBC) for environmental use, with the funds received being invested in technology to generate water savings equivalent to the long-term yield of the water entitlements sold.

There will continue to be scope to improve on farm water use efficiency. The gains are likely to be in the order of 10% in the short to medium term, and will be achieved via the adoption of improved water application technology and management practices. This is expected to involve further adoption of sub surface irrigation for hill or row cropping, overhead irrigation for broad acre crops and pastures, micro irrigation for horticulture crops and improvements to surface irrigation such as laser levelling and water applications methodology e.g. ‘surge’ irrigation for pastures and crops or ‘flush’ irrigation for rice. Further improvements in WUE are likely to require on-going investment in R&D particularly to develop more cold-tolerant rice varieties.
Soil moisture measurement

Soil moisture measurement is limited to citrus growers near Barham. These farmers use tensiometers to monitor soil moisture levels and guide the timing of irrigation applications.

Irrigation timing

Most cropping and pasture farmers use a combination of field observations and weather data to guide the timing of irrigation events. Due to the low levels of water availability most winter crops and pastures are irrigated using sub optimal levels of water to optimise the return from all assets. This water is applied at the more critical periods of plant growth to achieve the greatest crop yield response, rather than be specifically guided by soil moisture deficits. For example a flood irrigated wheat crop grown under optimal conditions may require around 5 ML/ha. If the water is applied at the optimal time, this crop would be expected to yield in excess of 7.5 t/ha. By applying 2-2.5 ML/ha at critical times, the crop may produce 5 t/ha. Past experience has shown that the lower yielding crop often generates a higher gross margin and a higher return per unit of water applied. There is also less financial risk involved with the lower input crop.

Water application to rice is based on crop growth stage and existing weather conditions. During the reproductive phase of the crop water is ponded to a depth that provides optimal protection against cold induced crop sterility. This volume of water is held on the cropped area and subsequently used by the crop. Any excess water is drained from the crop and used elsewhere on the farm for pasture or winter crop irrigation. Summer grain crops and dairy pastures are irrigated to maximise crop yields.

Water entitlements

Water entitlements are held by either organisations or individuals. Murray Irrigation members and individual licence holders have been able to freely trade water entitlements for many years. The Private Irrigation Districts and a number of Trusts are now being reconstituted to comply with the Australian Competition & Consumer Commission (ACCC) Water Market Rules (2009) to enable their members to trade water entitlements.

Irrigation farmers within the region have been actively involved in water trade. Prior to the drought the main trading activity related to the temporary or seasonal trade of allocated water. Murray Irrigation was a net trader of water into its area of operations in all years prior to 2007-08, with water sourced from the NSW Lower Murray, Lower Darling, Murrumbidgee and SA Riverland regions. In the past three years, Murray Irrigation members have been active sellers of both allocation water (temporary trade) and water entitlements (permanent trade). The reversal of the trade of allocated water has been price driven.

The stimulus for the (permanent) trade of water entitlements has primarily been the need to address debt provisions that have resulted from failed crops and increased grain and fodder purchase prices.

Government organisations have been purchasing water entitlements from the NSW Central Murray Valley (page 23). Over 194 GL (16%) of General Security entitlements has been purchased from the Murray Irrigation area alone for environmental use during the period 2007-08 to December 2009.
Regional agricultural production

Regional agricultural value chain

Irrigated agriculture generated around 80% of the region’s gross value of agricultural production of $320 million (Figure 12) in 2006. Prior to the drought both the level of gross value of agricultural production and the proportion produced from irrigated agriculture would have been higher due to a higher level of winter grain crops, rice production and dairy production.

Value adding of agricultural production within this region is limited to rice processing, bulk transport of grain and milk, tomato processing and cereal straw processing. There is a small stud stock industry for meat and wool sheep and dairy cattle.

All the rice produced is stored and processed within the region and the majority is exported as labelled supermarket produce. There are seven major rice storage centres and a milling facility. The storage and processing infrastructure has been placed in a ‘care and maintain’ mode during the drought.

The rice and grain transport sectors are currently sourcing most of their work outside of the region due to the low production levels. The rice produced locally has been transported to the rice processing facilities located in the Murrumbidgee valley. A long-term reduction in the level of rice production will influence future staffing levels and maintenance of the rice storage and processing facilities and the transport sector.

Milk produced in NSW Central Murray is processed outside the region, mostly at Cobram and Strathmerton in northern Victoria. Cobram provides employment to some people who live within the region. Tomatoes produced in the region are processed locally into supermarket ready products.

The abattoir in Deniliquin has closed and is unlikely to reopen. The livestock selling centres in both Finley and Deniliquin are not self sustaining with current throughput and the livestock transport operators have either reduced the size of their businesses or pursued work outside the region.
Figure 12  Gross value of agricultural production (GVAP) (2006)**

Figure 13  Gross value of agricultural production (GVAP) $/ML of water used (2006)**
The region's community

Figure 14  Level of highest school education (2006)\textsuperscript{xvii}

Figure 15  Higher education (2006)\textsuperscript{xviii}
Figure 16 Employment (2006)

Figure 17 Nominal income (2006)
The region’s community — education, employment and income

Deniliquin, in the geographic centre of the region, is the largest service centre with a population of 8,000 people. There are a number of smaller towns, with Corowa, Finley, Berrigan, Barooga, Jerilderie and Tocumwal in the east and Barham, Moulamein and Wakool in the west. These towns range in population from 500 to 2,500. Cobram, Shepparton, Echuca/Moama and Swan Hill located to the south of the region also provide significant services to the region. Cobram provides employment for people living in the Tocumwal, Barooga and Berrigan areas.

In the mid 1990s, a range of government centres were closed in Deniliquin and Finley. These included CSIRO, the regional electricity provider and the Department of Main Roads. The Department of Water Resources was restructured with the privatisation of Murray Irrigation. This change process resulted in the relocation of most senior government staff. Deniliquin and Finley transformed from administrative centres to service centres and as such became far more dependent on the region’s agricultural economy. Health services have undergone significant change over the past 15 years. Self supporting hospitals and associated medical services have been transformed into limited emergency treatment stabilisation centres, and providers of aged care facilities. Deniliquin Hospital is the only hospital in the region that provides surgical and maternity facilities.

There is a TAFE centre in Deniliquin and Finley and secondary schools in Finley, Deniliquin and Barham. There are 40-50% of school students completing either years 11 or 12 (Figure 14) and around 50% of the region’s population have completed a post secondary school course (Figure 15).

Youth unemployment is reasonably low with most young people leaving to find work elsewhere. Many of these people do not return to the area. Approximately 70% of young people work in the clerical sales and service sector or have professional or associate professional positions (Figure 16). Around 25% of the age group older than 55 years are farmers or farm managers (Figure 16). Retiring farmers tend to move into their local towns or into the urban centres located on the Murray River, including Barooga, Tocumwal, Echuca, Barham and Swan Hill. The population of most of the towns has either remained relatively stable or fallen by up to 10% over the past 10 years.
Figure 18 Regional issues

Note: 1 = No problem to 5 = Significant problem. Number of respondents = 44

Figure 19 Optimism (regional people)

Note: 1 = Completely dissatisfied to 10 = Completely satisfied. Number of respondents = 44
The region’s community — demographics and key statistics

Table 5  Demographics and key statistics (LGAs within study area, 2006)\textsuperscript{xxiii}

<table>
<thead>
<tr>
<th></th>
<th>Balranald</th>
<th>Berrigan</th>
<th>Conargo Shire</th>
<th>Corowa Shire</th>
<th>Deniliquin</th>
<th>Jerilderie</th>
<th>Moira</th>
<th>Urana</th>
<th>Wakool</th>
<th>Total</th>
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<tbody>
<tr>
<td>Population</td>
<td>109</td>
<td>8010</td>
<td>1588</td>
<td>2381</td>
<td>7428</td>
<td>1268</td>
<td>5735</td>
<td>782</td>
<td>2990</td>
<td>36224</td>
</tr>
<tr>
<td>Total Indigenous persons</td>
<td>0</td>
<td>108</td>
<td>28</td>
<td>19</td>
<td>221</td>
<td>32</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>75</td>
</tr>
<tr>
<td>Farm and farm managers</td>
<td>24</td>
<td>539</td>
<td>435</td>
<td>188</td>
<td>83</td>
<td>160</td>
<td>35</td>
<td>86</td>
<td>504</td>
<td>2446</td>
</tr>
<tr>
<td>Farm and farm managers as percentage of total employed</td>
<td>41%</td>
<td>15%</td>
<td>51%</td>
<td>18%</td>
<td>3%</td>
<td>27%</td>
<td>2%</td>
<td>28%</td>
<td>35%</td>
<td>15%</td>
</tr>
<tr>
<td>Households</td>
<td>4</td>
<td>122</td>
<td>58</td>
<td>84</td>
<td>187</td>
<td>25</td>
<td>133</td>
<td>16</td>
<td>73</td>
<td>876</td>
</tr>
</tbody>
</table>

Dwelling

<table>
<thead>
<tr>
<th></th>
<th>Fully owned</th>
<th>Being purchased - directly or rent/buy scheme</th>
<th>Rented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population per education employee</td>
<td>55%</td>
<td>44%</td>
<td>38%</td>
</tr>
<tr>
<td>Population per health employee</td>
<td>47%</td>
<td>36%</td>
<td>31%</td>
</tr>
<tr>
<td>Population per culture and recreation employee</td>
<td>25%</td>
<td>20%</td>
<td>17%</td>
</tr>
</tbody>
</table>

Community services and wellbeing by remoteness

<table>
<thead>
<tr>
<th></th>
<th>36</th>
<th>37</th>
<th>37</th>
<th>52</th>
<th>30</th>
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<td>0</td>
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<td>206</td>
<td>127</td>
<td>191</td>
<td>261</td>
<td>157</td>
<td>188</td>
</tr>
</tbody>
</table>

The regional economy

Regional economic structure

The major regional industry is service provision to the agricultural sector. Deniliquin supports a major rice mill, a Red Gum saw mill, road transport and a range of smaller services. Finley supports a cereal straw processing facility, transport and a range of smaller service facilities. Deniliquin, Berrigan, Moulamein and Jerilderie provide local government services. Barham supports a Red Gum saw mill. The other towns provide a range of general and tailored services to the farming community. A milk processing facility is located in Cobram which receives most of the milk produced within the Central Murray region. A tomato processing facility is located in Jerilderie.

Murray Irrigation is a significant employer in Deniliquin and Finley. A precast concrete factory is located in Finley.

The economies of these service centres are directly linked to the viability of the irrigated agricultural sector. Berrigan, Finley, Deniliquin and Barham are considered to be the areas that are most directly influenced by the irrigated farm economy. A number of small businesses have ceased operation within these towns during the current drought and many remaining businesses are carrying large portfolios of unpaid accounts for works and services provided to irrigation farmers.

Many irrigation farm businesses have additional income being generated by off-farm income. Much of this income is generated within the regional service centres from activities such as shop assistants, teachers, nurses and blue collar workers. However the drought has seen many men leave the region to find professional and labouring work elsewhere. A decline in the number of farm businesses is expected to lead to a decline in the services required, a decline in the town employment opportunities and subsequently a decline in the town population.
Barooga and Tocumwal support a tourism industry centred on the Murray River. Bush camping and river recreational activities draw holiday makers to these areas. A reduction in summer river flow levels during the drought has reduced visitation. Increased environmental flows during the spring are not expected to create significant economic benefits to these service centres as the region’s tourism is primarily during the summer and Easter school holidays. Most visitors are currently from western Melbourne and the Melbourne–Geelong corridor. Local government representatives are concerned that increased regulation for the current river based activities (e.g. provision of sanitary facilities, requirement for bush fire plans) may lead to a reduction in visitor numbers.

Regional response over the last five years

Water shortage

The seven year average allocation for NSW Murray General Security entitlements for the period 2002-03–2008-09 was 26%. Over the past three years the region has transformed from being a net importer of temporarily traded water to a net exporter of temporarily traded water, as well as a net seller of water entitlements.

In the five years to 2001-02 the region produced over 600,000 tonnes of rice annually. In the five years to 2008-09, less than 132,000 tonnes of rice were produced annually with almost no production in 2007-08 and 2008-09. The number of dairy farm businesses in the eastern portion of the region has reduced from 100 to 80 over the last five years.

Figure 20. Industry segmentation (2006)
The impact of the drought has been compounded by low dairy commodity prices in 2008-09 and 2009-10 and low grain prices in 2009. The higher dairy commodity prices in 2006-07 and 2007-08 provided a buffer against the drought impacts for some farmers in those years. The projected low grain prices for 2010 will slow any recovery for the grains sector in the region.

The region was first granted Exceptional Circumstances provisions in 2006, initially for the dairy industry and subsequently for all industries. Over 30% of farm businesses currently use the Rural Counselling service and an average of 663 applications has been made for Interest Rate Subsidies to the NSW Rural Assistance Authority in each year between 2007 and 2009. One major bank has reported an across the board decline in farm equity within the region. The pattern of permanent water entitlement trade within Murray Irrigation indicates that the initial impact of the drought may have been felt more severely in the western and central areas of the region. However, more recent expressions of interest to sell water are more evenly spread across Murray Irrigation’s area of operation.

**Demonstrated adaptation capacity**

During the drought, rice based farms have transformed into mixed farms, not producing rice. Dairy farms have transformed from (permanent) pasture based grazing to feedlot based fodder systems. Most inputs of grain and fodder have been sourced locally by these dairy farms.

More general transformation over the past 5-10 years has involved farm businesses becoming larger, a reduction in livestock numbers on non-dairy farms, an increase in herd size on dairy farms with increased supplementary feeding and the adoption of improved irrigation application systems on all farm types.

Some farmers are attempting to reduce their dependence on the supply of irrigation water by increasing farm size and/or selling assets to reduce farm debt. The ability of farm businesses to access capital will influence the extent to which this strategy will be implemented. The drought has resulted in a significant reduction in farm equity in many cases. In most areas the option of supplementing surface water supplies with groundwater is not feasible due to low yielding aquifers, poor quality groundwater, the high cost of bore establishment and/or high pumping costs. Groundwater users are required to purchase water entitlements or annual allocated water via the groundwater trade market if a new bore is installed and the owner does not hold water entitlements from an existing licence.

Over 16% of the Murray Irrigation General Security water entitlements have been sold or committed to the NSW and Commonwealth Governments over the past three years as part of the Restoring the Balance, Living Murray and Water for Rivers programs. This adaptation strategy is likely to result in greater exposure of the farm business to low water availability in future years and is expected to have a flow on effect on the service community. In response to the sale of water entitlements, the farm business will reduce its productive capacity, have greater reliance on dryland agriculture and hence annual rainfall, or depend on the annual water trade market to secure additional water supplies.
Regional vulnerability

The farming community of the NSW Central Murray region is highly dependent on irrigation. This is particularly true in the smaller more intensive irrigation farms within the area serviced by Murray Irrigation, and the horticultural area near Barham. The Murray Irrigation area was subdivided into small farm areas and established as an irrigation district in the 1940s-1950s. The farm areas commonly were 150–320 ha with relatively low irrigation volumes of water entitlements for each landholding. The long-term average yield of the entitlements is typically 1.9 ML/ha. The small farm size makes dryland farming unviable without significant farm aggregation. The transformation to dryland will also incur significant costs at a farm level to remove existing irrigation infrastructure. The rainfall in the eastern portion is 400mm/annum and less than 350mm in the western portion of the region. Dryland winter cropping is considered to be only marginally viable west of Deniliquin due to a combination of heavier clay textured soils and low rainfall.

Farm ownership within the Murray Irrigation area has been consolidated over the past 30 years. The original 2,400 landholdings are now owned and operated by approximately 1,200 farm businesses.

Farm size in the West Corurgan and Moira Private Irrigation Districts is larger and the number of water entitlements held on a land area basis is lower than for the Murray Irrigation area. These farms are relatively less dependent on irrigation water with the irrigated area of West Corurgan serviced farms being around 10% of the total farm area.

Regional water dependence

The regional economy is highly dependent on irrigated agriculture. The major economic driver for each urban area is the provision of services to the irrigated agricultural sector. The reduced water availability over the past five years has impacted significantly on these industries. The SunRice rice mill located in Deniliquin has been in a ‘care and maintain’ mode, the transport sector has continued to operate but conducts the majority of its business outside the region. Murray Irrigation and West Corurgan have reduced staff numbers and reduced the use of local contracting services. Most small service businesses have reported an increased exposure to bad debts from clients. The Deniliquin abattoir has closed due to low stock numbers.

The service centres of Deniliquin, Finley, Jerilderie and Berrigan have been assessed by local government as the centres most exposed to the agricultural economy. The river towns of Barooga, Tocumwal and Barham are to some extent buffered from the impacts on irrigated agriculture due in part to regular tourism or in the case of Barooga the presence of a major recreational centre and Cobram, a larger adjoining centre. Barham and Deniliquin are vulnerable to the recent decision made to reduce future saw-milling of River Red Gum.

The social and economic advantage and disadvantage score presented in Figure 21 shows that the region is relatively vulnerable compared to the Australian average. The SEIFA score is a suite of four summary measures of different aspect of the socio-economic conditions using information about people and households.
Figure 21. Index of Relative Socio-economic Advantage and Disadvantage (2006)**

Figure 22. Unemployment and labour force participation (2006)**
Community resilience to change in water allocation

Based on the number of farms accessing Exceptional Circumstances support and utilizing the Rural Counselling services, it is likely that the community has a limited capacity to cope with a significant reduction in water availability in the absence of adjustment support.

Scope for regional transformation

Scope for farm transformation

The eastern portion of the region has lighter textured, more free draining soils and a slightly higher rainfall. This area is also closer to the point of diversion of the irrigation water from the Murray River and within Murray Irrigation is at the upper end of the irrigation distribution system. These natural features suggest there is scope for industry diversification. It is however recognised that a successful industry or enterprise requires efficient production, cost effective processing and secure long-term markets. The two major industries within the region, rice and dairy, have developed these attributes over the past 50 years. There are many examples of over production of ‘high value’ industries.

Any transformation to enterprises that generate a higher return per unit of water applied is likely to take time before a significant scale is reached and will continue the dependency on irrigation.

The features of the western portion of the region limit options for farm transformation. There are, however, areas of lighter, free draining soils within this western portion that can be used to produce a range of enterprises. Prior to the introduction of irrigation, this area was pastoral grazing country.

It is likely that regardless of a change in water availability, farm transformation will involve the expansion of some farm businesses, a reduced reliance on irrigation water and a greater capacity to utilise irrigation water on a more opportunistic basis efficiently on the most suitable land and best developed irrigation layouts.

The drought is expected to slow farm transformation due to an erosion of the capital base of most farm businesses, unless there is a major reduction in land values. A significant reduction in water availability in the short-term without the provision of adjustment support also would be likely to result in a relatively slower transformation process, akin to a continuation of the drought. Increased environmental flows and improved river health is not expected to lead to significantly increased tourism or offset in any significant way the impacts of reduced economic production. The health of the river system and river flow levels are not considered to be factors that impact on tourism or recreational use of the region’s rivers.

A number of farmer groups within the Murray Irrigation area have developed proposals that involve retirement from irrigation and the decommissioning of both farm level and district level irrigation infrastructure. This approach reduces any future dependency on annual water trade markets or the impacts of reduced water availability for those farms. Agreement has not been reached between the farmers and the Australian Government for this sub system retirement. A study prepared by Marsden Jacob Associates for Murray Irrigation (2009) concluded that the cost of the transformation (which would include farm aggregation) was equivalent to a general security water entitlement of around $2,000 per entitlement, approximately 2-2.5 times the current market price.
Scope to strengthen irrigation management

On-farm water use efficiency has continually improved over the past 50 years. There has been a major focus at the farm level to improve surface water irrigation layouts during the past 15 years as part of the Murray Land and Water Management Plans. Approximately 80-90% of surface layouts within the more intensively irrigated eastern areas, and around 50% of the western areas of the Murray Irrigation area, have been redeveloped during this time. More recently, a relatively small number of farm businesses have adopted overhead irrigation or subsurface irrigation to improve production levels per unit of water. This adoption has occurred on the lighter textured soils that are not suitable for growing rice. Irrigation application techniques for surface water application continue to be refined with a current focus on using surge flow irrigation for crops and pastures and using flushing techniques for rice establishment.

It is concluded there is scope to improve farm water use efficiency by around 10% in the short-term. This scope may increase as further experience is gained from the adoption of alternative technologies. It is important to note, however, that most techniques that may increase water use efficiency will also have higher energy requirements. All the techniques currently available will substitute the use of gravity for electricity or petroleum based power to drive supply or recycle pumps, engines for overhead irrigators and pump and filter systems for subsurface or micro irrigation.

The Murray Irrigation distribution system has a distribution efficiency of 83% at full allocation. The strategic investment of capital is modelled to raise this efficiency level to 88%. The West Corurgan distribution efficiency is lower due to a smaller volume of water being distributed relative to the length of channel system used. A study is currently underway to determine the extent to which this can be improved.

Water availability scenarios — introduction

Description of scenarios

Face-to-face interviews of key stakeholders, and a telephone survey of dryland and irrigation farmers, businesses and community members, were undertaken in the region.

In addition to providing information for the development of the community profile, respondents were asked about the likely impacts of a range of water availability scenarios. These scenarios are not linked to possible Sustainable Diversion Limits; rather, they are intended to test a range of responses from irrigators, and flow-on effects in communities.

The following pages present the results of those discussions.

Water availability scenarios were expressed relative to the long-term cap equivalent water entitlements for the irrigation region. Baseline data are provided below.

The Central Murray region has undergone significant adjustment over the past 15 years. Prior to the introduction of the Murray–Darling Basin Cap on Diversions, water use within the Murray Irrigation area (formally the Murray Irrigation Area and Districts) averaged in excess of 100% annually. This use was offset by a much lower level of water use by irrigated farm businesses outside the Murray Irrigation area. Following the implementation of the MDBC Cap, Murray Irrigation irrigators were forced to adjust to a lower water use or purchase water on the annual water trade market. As part of the development of the NSW Water Sharing Plan, an additional environmental allocation was made to the Barmah Millewa Forest (100 GL). The long-term diversion limit
for High Security entitlements was set at 97%, and 80% for General Security entitlements.

The drought commenced in 2002-03 in southern NSW. Over the past seven years up to June 2009, average allocations have been 87% for High Security and 26% for General Security. High Security allocations fell below 95% in only one year, in 2007-08 at 10%. General Security allocations have ranged from zero (two years) to 63%. There are estimated to be 1,300 General Security entitlements and 48 GL High Security entitlements within the Central Murray region. In addition, Murray Irrigation holds a Conveyance licence of 300 GL and a supplementary water licence of 121 GL. There are 83 GL of groundwater entitlements, which were reduced from 257 GL as part of the development of the Groundwater Sharing Plan 2007.

There have been a number of Government-funded water entitlement purchase programs undertaken within the region since 2007. Approximately 200 GL of water entitlements have been purchased, the vast majority from the Murray Irrigation area of operations. It has not been possible for members of a number of the smaller private irrigation districts and trusts to sell their water entitlements until recently.

A 60% reduction in water availability based on the long-term average allocation would result in a reduction of High Security water use from 46 GL to less than 20 GL and a reduction from 1,040 GL to 416 GL for General Security water. This level of reduction is similar to the average seven year drought induced water availability reduction.

A reduction in High Security water allocations would initially impact on the horticultural industry. The reduction in General Security water availability would impact on both the dairy sector and the rice based farming systems.

---

**Table 6  Baseline water data by region (LTCE, approximate, rounded)**

<table>
<thead>
<tr>
<th>Region</th>
<th>LTCE allocation volume (GL, approx, rounded)</th>
<th>Drought average use (GL, July 2002 to June 2009)</th>
<th>Buybacks (GL) (already delivered, or committed to)</th>
<th>Efficiency project savings (GL, committed)</th>
<th>Number of irrigators (number, approx)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Murray</td>
<td>1,085</td>
<td>380</td>
<td>170***</td>
<td>-</td>
<td>~1,600</td>
</tr>
<tr>
<td>General Security</td>
<td>1,040</td>
<td>340</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Security (Irrigation)</td>
<td>46</td>
<td>42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater (not included in LTCE surface water)</td>
<td>83</td>
<td>83</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 7  Water availability scenarios — reductions from estimated LTCE entitlement volume**

<table>
<thead>
<tr>
<th>Region</th>
<th>Comment</th>
<th>Sector</th>
<th>20%</th>
<th>40%</th>
<th>60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Murray</td>
<td>TOTAL</td>
<td>Horticulure</td>
<td>870</td>
<td>650</td>
<td>435</td>
</tr>
<tr>
<td></td>
<td>High security</td>
<td>Dairy; rice farm systems</td>
<td>35</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>General security</td>
<td>Dairy; rice farm systems</td>
<td>830</td>
<td>625</td>
<td>415</td>
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<tr>
<td></td>
<td>Groundwater</td>
<td></td>
<td>65</td>
<td>50</td>
<td>35</td>
</tr>
</tbody>
</table>
Water availability scenarios — direct impacts (face-to-face interviews)

**Horticulture**

A reduction in High Security water allocations would initially impact on the horticultural industry. The majority of the horticultural growers are located downstream of Picnic Point and thus are currently not able to trade water for use from licence holders above Picnic Point. These horticulturalists would however be able to purchase water from the Lower Murray, Murrumbidgee and Goulburn river systems.

**Dairy**

As a result of the drought the dairy industry has undergone significant change. Many, if not all, of the smaller businesses have ceased to operate. The larger dairy farms have changed their feeding system from a pasture based system to a system that incorporates mixed rations as the basis of the feed requirements during the late spring, summer and early autumn. This has reduced the reliance on irrigation water during the summer months. Dairy farmers are likely to attempt to offset reduced long-term water availability by using the annual water market to purchase additional water subject to commodity prices and annual water prices. This strategy will increase the business operating expenses but is considered to be the least cost option.

**Rice farm systems**

There has been very little rice grown within the Central Murray region during the drought. Irrigation farmers have either sold the small quantities of water they were allocated or have used it to irrigate winter crops. A longer term reduction in available water is expected to result in a relatively greater reduction in rice production. This is likely to be due, in part, from an in-farm response to irrigate winter crops through to completion, particularly in low rainfall years. It is also likely to be partially due to the dairy industry and other specialist growers being prepared to pay higher prices for allocated water on the annual trade market. This demand for traded water may come from both within the Murray region, from the Victorian Murray or from horticultural growers within the Murrumbidgee region. Historically the NSW Central Murray region has been a net importer of water annually (up to 200 GL) from the Murrumbidgee region, however a significant reduction in water availability may see a reversal of this trading pattern.

The impacts of the water scenarios evaluated will impact differently on the region's mixed rice and non-rice-based farms. All farms will be financially impacted by a long-term reduction in water availability. It is expected that the smaller farms and a number of the mid sized farms will become unviable if the long-term water availability was reduced by 20% compared to the long-term average diversion limit. Any further increase in the level of reduction will increase the proportion of farms becoming unviable. A 60% reduction in the long-term water availability will be similar to the average drought allocation (32% compared to 26% during the drought). The experience during the drought would suggest that almost none of the existing mixed farm irrigation businesses would remain viable in the longer term.
### Table 8  Summary of direct (irrigation) responses to water availability scenarios

<table>
<thead>
<tr>
<th>Region</th>
<th>Key sectors</th>
<th>-20% LTCE</th>
<th>-40% LTCE</th>
<th>-60% LTCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Murray</td>
<td>Horticulture</td>
<td>Strategic purchase of allocated water on a seasonal basis</td>
<td>Strategic purchase of allocated water on a seasonal basis. Likely to be a reduction in production due to less-viable growers ceasing to operate due to increased water expenses.</td>
<td>Strategic purchase of allocated water on a seasonal basis. Likely to be a reduction in production due to less-viable growers ceasing to operate due to increased water expenses.</td>
</tr>
<tr>
<td>Central Murray</td>
<td>Dairy</td>
<td>Strategic purchase of allocated water on a seasonal basis</td>
<td>Strategic purchase of allocated water on a seasonal basis. Likely to be a reduction in production due to less-viable growers ceasing to operate due to increased water expenses.</td>
<td>Strategic purchase of allocated water on a seasonal basis. Likely to be a reduction in production due to less-viable growers ceasing to operate due to increased water expenses.</td>
</tr>
<tr>
<td>Central Murray</td>
<td>Rice based farm systems</td>
<td>Strategic purchase of allocated water by larger farms or farms producing specialist products. Many farms become unprofitable. A number of the smaller and mid size farms become unviable.</td>
<td>Many farms become unviable. Almost all farms become unviable.</td>
<td>Almost all farms become unviable.</td>
</tr>
</tbody>
</table>

### Water availability scenarios — telephone survey responses

For the NSW Central Murray as a whole, in the telephone survey conducted for this assignment, 15% of irrigation farmers indicated they would seek to exit if water availability reduced by 20%, with 28% indicating they would seek to exit if it reduced by 40%.

This is broadly similar to the results found across the rice and horticulture sectors in response to these scenarios, although for the rice sector the extent of predicted exit was much more pronounced (discussed in the Synthesis Report for this assignment).

![Figure 23 NSW Central Murray: telephone survey responses to water availability scenarios](#)
Water availability scenarios — value chain and flow-on impacts (face-to-face interviews)

The major flow-on effect of reduced water availability would be expected to result from the impact on the rice and non-rice-based farm system businesses. While it is anticipated that there would be an effect on the dairy and horticultural industries in the region, this would be likely to be relatively small compared to the impact of reduced water availability on the mixed farm systems.

The initial impacts include a reduction in farm inputs, freight from the farm to the grain storage and processing facilities and reduced labour requirements to operate the milling and storage facilities. In 2000-01 the rice industry employed 400 staff at the rice mill facility in Deniliquin.

The flow on impacts will be felt throughout the business community and subject to the scale of the reduction in water availability could have substantial impacts on the smaller towns and Deniliquin.

This will flow through to the level of services local Government can provide and other services including health, education and policing.

Table 9 Summary of indirect (flow-on) responses to water availability scenarios

<table>
<thead>
<tr>
<th>Region</th>
<th>Key sectors</th>
<th>-20% LTCE</th>
<th>-40% LTCE</th>
<th>-60% LTCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Murray</td>
<td>Horticulture</td>
<td>Post farm processing expected to continue to occur subject to commodity process and water prices.</td>
<td>Post farm processing expected to continue to occur subject to commodity process and water prices, however at a smaller level due to fewer growers.</td>
<td>Post farm processing expected to continue to occur subject to commodity process and water prices, however at a smaller level due to fewer growers.</td>
</tr>
<tr>
<td>Central Murray</td>
<td>Dairy</td>
<td>Milk processing expected to occur in northern Victoria.</td>
<td>Milk processing expected to continue to occur in northern Victoria, however at a smaller level due to fewer growers.</td>
<td>Milk processing expected to continue to occur in northern Victoria, however at a smaller level due to fewer growers.</td>
</tr>
<tr>
<td>Central Murray</td>
<td>Rice</td>
<td>Rice aerated storages to be rationalised. One of two mills at Deniliquin unlikely to operate.</td>
<td>Rice Mill at Deniliquin unlikely to operate.</td>
<td>All rice storage and milling facilities likely to be closed.</td>
</tr>
</tbody>
</table>
Endnotes


2 Data from the National Water Commission

3 MJA Socio-economic Survey for MDBA 2010

4 MJA Socio-economic Survey for MDBA 2010

5 MJA Socio-economic Survey for MDBA 2010

6 MJA Socio-economic Survey for MDBA 2010

7 MJA Socio-economic Survey for MDBA 2010

8 MJA Socio-economic Survey for MDBA 2010

9 MJA Socio-economic Survey for MDBA 2010

10 MJA Socio-economic Survey for MDBA 2010

11 MJA Socio-economic Survey for MDBA 2010

12 MJA Socio-economic Survey for MDBA 2010

13 MJA Socio-economic Survey for MDBA 2010

14 Australian Bureau of Agricultural and Resource Economics. 2008, Australian Farm Survey Results 2005-06 to 2007-08, Canberra


16 Australian Bureau of Statistics. 2006, 2006 Census, Canberra

17 Published figures from the NSW and Commonwealth Governments were used to estimate buybacks.

18 MJA Socio-economic Survey for MDBA, March-April 2010. n=159 (-20% scenario), n=141 (-40% scenario). Samples were independent.