Murrumbidgee community profile

Irrigation region

Key issues for the Region

1. Region’s population — The region’s population is approximately 75,000 people, including around 1,500 farm businesses.

2. Gross Value of Irrigated Agricultural Production
   • Drought affected Gross Value of Irrigated Agricultural Production for Murrumbidgee in 2006 was around $195 million.
   • This compares to a pre-drought figure of around $500 million (2000).

3. Water entitlements (approximate)
   • Surface Water Long-term Diversion Limit — 1,925 GL.
   • High reliability/Security — 350 GL.
   • General Security (low reliability) entitlements — 1,900 GL.
   • Groundwater entitlements equal approximately 280 GL. In addition, there are 39.8 GL in Supplementary licences.

4. Major enterprises — Major enterprises include rice, wine grapes, citrus and vegetables and other tree crops in mid Murrumbidgee region (Griffith, Leeton and Coleambally), winter crops, annual pastures in western and southern areas.

5. Government buyback (publicly reported to date) — Government buybacks have resulted in the purchase of 53.5 GL (LTCE) within Murrumbidgee and Coleambally Irrigation.

6. Water dependence
   • Irrigated agriculture is the major economic driver within the region.
   • The major urban communities of Griffith, Leeton, Darlington Point and Coleambally have a high dependency on irrigated agriculture.
   • Post-farm processing of irrigated agricultural produce is a major economic driver and involves rice processing, wineries, citrus processing, sugar plums, tomatoes and more recently almond packing sheds.
   • Rice and horticulture producers make up around 90% of the farm businesses and have a high (or total) dependency on irrigation. Relatively high historic allocations of 1,300–1,400 ML per broadacre farm (6–7 ML/ha) and 12 ML/ha for horticulture blocks have provided a buffer for lower annual water allocations.
   • Groundwater access is limited to the mid and upper regions along the Murrumbidgee River. Only a small proportion of farm businesses have access to both surface water and groundwater.
   • There is limited scope for farm transformation for Murrumbidgee Irrigation and Coleambally Irrigation farms due to the size of the farms, the level of irrigation development, the generally poorly drained soils and low rainfall. Most farms are too small to become viable dryland farm businesses.

7. Current status
   • The Murrumbidgee Irrigation Area was formed in 1924 as a government irrigation area and the Coleambally Irrigation Area was constructed as a government irrigation area between 1960 and 1970.
   • The drought has severely impacted on broadacre mixed rice and non rice irrigation farms since 2002, with General Security allocations falling from
an average of 83% prior to the drought to 32% over the period 2002 — 2009.

- As a direct result of the drought over 30% of farms are accessing Exceptional Circumstances provisions.
- The horticulture industry has been shielded from the drought due to almost full annual allocations of High Security water entitlements.
- There is scope for improved farm water use efficiency of around 10% in the short-term although this may incur greater energy costs. Approximately 75% of both the citrus and wine grapes are irrigated using micro-irrigation application technology. Murrumbidgee and Coleambally irrigation modernisation is estimated to achieve savings on conveyance losses.
- There is scope for water savings by piping stock and domestic water to some of the larger farms in the 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.
- A material reduction in water availability would result in reduced rice and grain production on broadacre farms.
- A material reduction in water availability will impact on farmers’ ability to manage environmental stewardship of the natural resources on their property.
- Subject to annual water prices and commodity prices, the horticultural industries generally have greater capacity to purchase water on the trade market to offset reduced annual water allocations. These industries have historically generated higher returns per unit of water. This adjustment however will be an increased operating cost to these businesses.
- Innovative wine grape and citrus growers who have expanded to their full water allocation will be impacted by a reduction in long-term water availability.
- There is limited scope for farm businesses to adjust to lower long-term water allocations. In recent years there has been a conversion from rice based farming to horticulture, primarily grapes. However, the downturn in the wine industry limits any further opportunity, at least in the short-term.
- Farmers’ ability to consolidate (buy up those who wish to leave industry) will be hampered by a reduction in long-term water availability. Without a number of profitable years they will be unable to restore the working capital of their business which has been eroded during the drought.
- The medium size farms are likely to be more adversely affected by reduced water availability as they have the least capacity to adjust either via scale (compared to larger farms) or via supplementation with off farm income (compared to smaller farms).
- A major groundwater adjustment process was implemented in 2008 limiting the scope for further adjustment to future water availability.
- There are few significant (if any) economic development opportunities from increased environmental flows that will offset the impacts of irrigated agriculture.
• A uniform long-term water availability reduction of up to 20% will result in some farm businesses becoming unviable and many other businesses not able to maintain 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 is not considered a feasible option for many of the intensively developed irrigation areas in the Murrumbidgee region.

Regional overview

The Murrumbidgee region covers approximately 8% of the Murray–Darling Basin within southern NSW. The catchment includes the major centres Canberra, Wagga Wagga, Griffith, Leeton and Hay and comprises 27% of the Basin’s population. The region is one of the more major irrigated regions within the Murray–Darling Basin, using over 22% of the surface water diverted for irrigation and urban use and over 24% of the Basin’s groundwater resource. Blowering Dam, located on the Tumut River, and Burrinjuck Dam, on the upper Murrumbidgee River, are the major water storages in the region. The region includes the nationally significant mid Murrumbidgee wetlands and the Lowbidgee floodplain on the lower reaches of the Murrumbidgee River.

Major water resources in the Murrumbidgee region include the Murrumbidgee River and its tributaries, the Snowy Mountains Scheme and its associated storages, alluvial aquifers, wetlands and water storages.

There is extensive irrigation in the mid to lower areas of the Murrumbidgee region. A range of crops are grown including rice, winter cereal grains, grapes, citrus, sugar plums, pasture, lucerne, corn, tomatoes soybeans and cotton. Major irrigation development dates from the early 1900s with the development of schemes around Yanco and Mirrool. The construction of Burrinjuck Dam in 1928 and its subsequent expansion in 1957 and construction of Blowering Dam in 1968 lead to further irrigation development. The main irrigation areas are the Murrumbidgee, Coleambally and Lowbidgee Irrigation areas. Irrigation is also undertaken on the larger farms along the Yanco, Columbo and Billabong creeks in the south of the region and along the Murrumbidgee River upstream of Narrandera.

The Murrumbidgee Irrigation, Coleambally Irrigation and the Yanco Creek and tributary irrigators have all developed natural resource management plans. These plans have been implemented for up to 15 years and aim to achieve improved water use and delivery efficiency and improved protection of natural wetlands, riparian zones and native vegetation both along the natural waterways and within the irrigated landscape.
Figure 1 Location of irrigation district
Irrigation overview

Irrigation within the region is sourced from both surface water and groundwater. Surface water is the major water source and used predominantly in the mid catchment region around Griffith, Leeton and Coleambally. Groundwater is mainly used in the upper catchment, east of Wagga and also in the mid catchment near Darlington Point.

The region includes the Murrumbidgee Irrigation Area, Coleambally Irrigation Area and single licence holders, referred to as private diverters. Prior to the Government environmental flow and buyback initiatives, the region held approximately 1,995 GL of NSW General Security water entitlements which have a long-term yield of 71% and approximately 350 GL of NSW High Security water entitlements with a long-term average yield of 96%.


Irrigation infrastructure

Irrigation commenced in the Murrumbidgee area prior to World War I and expanded across the region during the subsequent 60 years. The Coleambally Irrigation Area was formed between 1957 and 1970. All irrigation diversion and delivery infrastructure, excluding the publicly owned dams and weirs within the river system, is privately owned. Murrumbidgee Irrigation Limited and Coleambally Irrigation Cooperative Limited, both previously government-owned, were privatised in 1995.

The water used for irrigation, farm stock and domestic and town purposes is stored in Burrinjuck and Blowering dams. The main diversion points for Murrumbidgee Irrigation are located on the Murrumbidgee River at Narrandera and upstream of Darlington Point. The main diversion point for Coleambally Irrigation is upstream of Darlington Point. Most of the private diverters divert water from the Murrumbidgee River and associated tributaries particularly the Yanco, Columbo and Billabong Creek system.

Commodities

The major commodities produced have been rice, citrus, wine grapes, winter grain crops (wheat and canola) and livestock (lambs). A range of other commodities are produced in smaller amounts including other winter and summer crops, fodder crops and vegetables. The rice and horticultural industries across the region dominate in the more intensively irrigated areas because of relatively higher farm level profitability.

During the past five years, annual water allocations have averaged 32% compared to 83% during the five-year period to 2001–02. There has been a significant shift in relative water use primarily from rice production within the Murrumbidgee and Coleambally Irrigation areas. Prior to the drought private diverters primarily used irrigation water for winter crop and annual pasture production and small areas of rice. Private diverters have primarily limited water use to stock and domestic use during the last three years.
Unique features

The landscape of the southern Riverina is relatively flat and previously developed using gravity fed earthen channels and surface (flood) irrigation. Over 90% of the irrigation water is applied via gravity surface irrigation. The soil types range from red and brown loams and clay loams in the east to heavier self-mulching clays and non–self-mulching sodic grey clays in the west and south.

Rural water supply

Regional system description

The Murrumbidgee irrigation area, located between Leeton and Griffith, covers around 160,000 ha of intensive irrigation and 3,320 landholdings. Water is diverted from the Murrumbidgee River at Berembed Weir upstream of Narrandera and Gogeldrie Weir near Leeton. Runoff water from the irrigated area is drained to the Mirrool Creek and Barren Box storage then diverted to the Wah Wah irrigation district for use as irrigation water. Under normal operating conditions the level of distribution efficiency is 80%. Proposed improvements to the distribution system are estimated to increase the level of efficiency to approximately 86–88%. Improvements in water management have reduced flows to Barren Box storage from around 300–500 ML per day to around 70 ML per day which will impact on future water availability in the western areas.

The Coleambally Irrigation Area was established between 1958 and 1970 as a result of the Snowy Mountains Hydro-Electric Scheme. Water is supplied from the Murrumbidgee River from the Gogeldrie Weir pool through the 41 km main canal and 477 km of supply channels. There is a further 734 km of drainage channels flowing south into the Billabong and Yanco creeks, where the drainage and system losses are used for stock and domestic and irrigation purposes on an opportunistic basis. Under normal operating conditions the level of distribution efficiency is 80 to 82%. Proposed improvements to the distribution system are estimated to increase the level of efficiency to around 93%.

The Coleambally Irrigation Area covers some 79,000 ha of intensive irrigation, 42,000 ha irrigation/dry farms and 297,000 ha of outfall district stations. Coleambally Irrigation supplies water to 492 farms owned by 330 business units. Coleambally Irrigation has a bulk licence of 625 GL of surface water and 4 GL groundwater.

In addition to the Murrumbidgee and Coleambally irrigation areas, there are many individual irrigation farms along the length of the Murrumbidgee River and its tributaries that pump river water directly to their farms. This includes irrigation along the Yanco, Columbo and Billabong creeks which receive augmented water supplies from the Murrumbidgee River and from the Coleambally Irrigation Area.

Both Murrumbidgee and Coleambally Irrigation have implemented major refurbishment programs over the past 15 years involving a major focus on upgrading supply regulators that can be operated remotely to provide greater water control. Coleambally is in the final stages of installing a complete total channel control system that will allow for remote operation of the distribution system. Modernisation plans were prepared and submitted to the Commonwealth Government in November 2009 by both organisations.
The Murrumbidgee region has been subdivided into eight Groundwater Management Units (GMUs) for management purposes. The Lower Murrumbidgee Alluvium (N02) and the Mid Murrumbidgee Alluvium (N13) GMUs are categorised as Very High and High Priority, respectively, and are subject to detailed analysis. Significant groundwater development in the Lower Murrumbidgee Alluvium GMU began in the late 1970s. Groundwater extraction experienced strong growth and a rapid increase in the mid to late 1990s. Extraction was 324 GL/year in 2004–05. Groundwater extraction in the Mid-Murrumbidgee in 2004–05 was estimated at 48 GL/year and used to supply irrigation, stock, domestic and town water supplies.

The Groundwater sharing plan 2007 (WSP) for the lower Murrumbidgee Alluvium will reduce groundwater extraction to 280 GL/year. Supplementary water licences have been introduced as part of the WSP to ease the transition from the pumping regime prior to the WSP to that under the WSP. The volume under the Supplementary Licences was set at 39.80 GL/year at the commencement of the plan and is being reduced annually to a final share of 0 GL/y by 2015.

Table 1  System details and performance

<table>
<thead>
<tr>
<th></th>
<th>2007–08</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Murrumbidgee Irrigation Ltd</strong></td>
<td></td>
</tr>
<tr>
<td>Area served (ha)</td>
<td>480,000</td>
</tr>
<tr>
<td>Cropped area (ha)</td>
<td></td>
</tr>
<tr>
<td>Customer accounts (no)</td>
<td>3,353</td>
</tr>
<tr>
<td>Asset</td>
<td></td>
</tr>
<tr>
<td>Network supply capacity (ML/d)</td>
<td>9,400</td>
</tr>
<tr>
<td>Network supply capacity (ML/pa)</td>
<td>2,820,000</td>
</tr>
<tr>
<td>Supply method</td>
<td>gravity</td>
</tr>
<tr>
<td>Intended supply availability (d/pa)</td>
<td>300</td>
</tr>
<tr>
<td>Carrier system</td>
<td></td>
</tr>
<tr>
<td>Total carrier (km)</td>
<td>5,048</td>
</tr>
<tr>
<td>Unlined channel (km)</td>
<td>2,421</td>
</tr>
<tr>
<td>Lined channel (km)</td>
<td>167</td>
</tr>
<tr>
<td>Pipe</td>
<td>86</td>
</tr>
<tr>
<td>Drainage – unlined channel (km)</td>
<td>2,279</td>
</tr>
<tr>
<td>Drainage – lined channel (km)</td>
<td>20</td>
</tr>
<tr>
<td>Drainage – natural waterway (km)</td>
<td>70</td>
</tr>
<tr>
<td>Drainage – pipe (km)</td>
<td>5</td>
</tr>
<tr>
<td>Intake volume</td>
<td></td>
</tr>
<tr>
<td>Surface-water source (ML)</td>
<td>335,687</td>
</tr>
<tr>
<td>Groundwater source (ML)</td>
<td>0</td>
</tr>
<tr>
<td>Supply</td>
<td></td>
</tr>
<tr>
<td>Long-term annual supply expectation</td>
<td></td>
</tr>
<tr>
<td>Water supplied at customer service points (ML)</td>
<td>210,297</td>
</tr>
<tr>
<td>Supply network delivery efficiency</td>
<td>63%</td>
</tr>
<tr>
<td>System utilisation (intake/capacity)</td>
<td>7%</td>
</tr>
<tr>
<td>Explanatory comment</td>
<td></td>
</tr>
<tr>
<td>125,390 ML of conveyance water included as unaccounted water.</td>
<td></td>
</tr>
</tbody>
</table>
The farm

Natural capital

The climate, supply of good quality irrigation water and the soils, particularly in the eastern areas, make the region suitable for the production of a range of crops. The lighter well drained soils were previously developed for horticultural enterprises and the heavier soils for broadacre farming. With the advent of improved technology and management practices, soils previously developed for broadacre farming have been redeveloped for vines, particularly in the Murrumbidgee area closer to Griffith.

The heavier more poorly drained soils and the regional climate are well suited to producing high yielding rice crops of good quality rice on world standards. The highest rice grain yields are recorded in the Murrumbidgee Irrigation Area, followed by the Coleambally Irrigation Area.

Government support for farm system transformation has been through the provision of incentives to redevelop farm irrigation supply and drainage systems via the Murrumbidgee Ecowise program and the Coleambally land and water management plans. Low interest rate loans have also been provided by the NSW Government for farm upgrades and farm expansion.

Financial capital

Farms within the region fall into one of three farm system categories: rice based farm systems; annual and perennial horticulture; and mixed farms that primarily produce winter and summer grain crops.

Almost all farm incomes have substantially reduced as a result of the current drought. Working capital has been reduced on most rice-based and grain cropping irrigation farms over the past seven years. Exceptional Circumstance provisions were first made in 2006. One rural counsellor reported they alone are dealing with 300 irrigation farmers in the Murrumbidgee Irrigation Area. Of the farms business seeking household relief funding, 25% have been irrigators (349) in the central Murrumbidgee area of the south west slopes and plains Exceptional Circumstances area.

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. 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.
Figure 2  Regional issues — all farms

Note: 1 = No problem to 5 = Significant problem. Number of respondents = 36

Figure 3  Survey respondents by farm type
Figure 4: Farm issues — horticultural farms

Note: 1 = No problem to 5 = Significant problem. Number of respondents = 23

Figure 5. Farm financial measures
The farm: Horticulture 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 30% of horticulture farmers in the Murrumbidgee have off-farm income (23 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 assets¹</td>
<td>0.87%</td>
</tr>
<tr>
<td>Debt ratio²</td>
<td>22.34%</td>
</tr>
<tr>
<td>Value of Water/total assets</td>
<td>57.45%</td>
</tr>
</tbody>
</table>

¹ Profit/Assets  
² Total debt / Total assets

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; and
- measures of optimism, and how satisfied farmers are with a range of life issues.
- 47% of livestock farmers in the Murrumbidgee have off-farm income (15 survey respondents).
Guide to the proposed Basin Plan

Technical background Part III

Figure 6 Optimism — horticulture

Note: 1 = Completely dissatisfied to 10 = Completely satisfied. Number of respondents = 23

Figure 7 Farm issues — livestock farms

Note: 1 = No problem to 5 = Significant problem. Number of respondents = 18
Figure 8 Optimism — livestock
Note: 1 = Completely dissatisfied to 10 = Completely satisfied. Number of respondents = 18

Figure 9 Farm issues — broadacre farms
Note: 1 = No problem to 5 = Significant problem. Number of respondents = 51
The farm: broadacre farms including rice-based farm systems

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 (38% of broadacre farmers in the Murrumbidgee have off-farm income (50 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>1.40%</td>
</tr>
<tr>
<td>Debt ratio(^2)</td>
<td>22.03%</td>
</tr>
<tr>
<td>Value of water/total assets</td>
<td>80.47%</td>
</tr>
</tbody>
</table>

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

The farm: mixed farms (broadacre and livestock)

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 (52% of livestock and broadacre farmers in the Murrumbidgee have off-farm income (25 survey respondents)); and
- measures of optimism, and how satisfied farmers are with a range of life issues.

Table 4 Farm financial measures

<table>
<thead>
<tr>
<th>Ratios</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return on assets(^1)</td>
<td>-0.86%</td>
</tr>
<tr>
<td>Debt ratio(^2)</td>
<td>12.77%</td>
</tr>
<tr>
<td>Value of water/total assets</td>
<td>42.48%</td>
</tr>
</tbody>
</table>

\(^1\) Profit/assets
\(^2\) Total debt/Total assets
Figure 10 Farm financial measures

Figure 11 Optimism — broadacre

Note: 1 = Completely dissatisfied to 10 = Completely satisfied. Number of respondents = 51
Figure 12 Farm issues — broadacre & livestock farms

Note: 1 = No problem to 5 = Significant problem. Number of respondents = 27

Figure 13 Farm financial measures
On-farm irrigation water use

Irrigation application measures

Irrigation water is considered to be the most limiting factor for most farm businesses.

A typical Murrumbidgee Irrigation broadacre farm business in the more intensively irrigated area of the region holds around 1,300 water entitlements on a 200 ha landholding.

A typical Coleambally Irrigation farm business holds around 1300-1,400 water entitlements on a 200 to 210 ha landholding.

Based on the long-term average yield of 64%, the water availability for these landholdings is around 4 to 4.5 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.
Table 5 On-farm irrigation management (2007–08)

<table>
<thead>
<tr>
<th>Irrigation parameter</th>
<th>Horticulture (%)</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>
<td></td>
</tr>
<tr>
<td>Flood flow</td>
<td>30%</td>
<td>80%</td>
<td>94%</td>
<td>100%</td>
</tr>
<tr>
<td>Travelling</td>
<td>9%</td>
<td>13%</td>
<td>4%</td>
<td>8%</td>
</tr>
<tr>
<td>Microject fixed sprinklers</td>
<td>4%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Drip/trickle</td>
<td>61%</td>
<td>7%</td>
<td>2%</td>
<td>8%</td>
</tr>
<tr>
<td>Other</td>
<td>4%</td>
<td>7%</td>
<td>8%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Timing irrigation on the basis of</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil moisture measuring tools</td>
<td>48%</td>
<td>27%</td>
<td>48%</td>
<td>32%</td>
</tr>
<tr>
<td>Calendar based</td>
<td>0%</td>
<td>20%</td>
<td>28%</td>
<td>36%</td>
</tr>
<tr>
<td>Weather forecast</td>
<td>39%</td>
<td>20%</td>
<td>50%</td>
<td>48%</td>
</tr>
<tr>
<td>Own observations/knowledge</td>
<td>78%</td>
<td>100%</td>
<td>88%</td>
<td>80%</td>
</tr>
<tr>
<td><strong>Percentage of farms trading</strong></td>
<td>(22 traders)</td>
<td>(18 traders)</td>
<td>(51 traders)</td>
<td>(27 traders)</td>
</tr>
<tr>
<td>Purchasing</td>
<td>45%</td>
<td>6%</td>
<td>37%</td>
<td>37%</td>
</tr>
<tr>
<td>Selling</td>
<td>73%</td>
<td>56%</td>
<td>75%</td>
<td>85%</td>
</tr>
</tbody>
</table>

**Opportunities/trends**

Over 98% of the irrigation water is applied as surface or flood irrigation on broadacre farms growing winter and summer crops and pastures. All rice crops are permanently flooded between December and February, the critical reproductive phase of the crop. Rice has generally been sown by aircraft into flooded bays, however there has been an increasing number of rice crops dry sown and intermittently irrigated (flushed) until early December, in order to reduce water use. Industry research indicates that water savings of around 10% may be achievable.

Most winter grain crops and pastures are irrigated using laser landformed layouts and supply and drainage reuse systems. Industry statistics show that between 80 to 90% of broadacre irrigation layouts have been redeveloped over the past 20 years using laser level controlled landforming. 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 been installed on the lighter textured soils that are not suitable for growing rice.

Micro-irrigation has replaced the traditional furrow and sprinkler irrigation on a large proportion of the horticultural plantings. All new plantings are established with micro-irrigation. Industry statistics show that 35% of the citrus area is still irrigated with flood or furrow irrigation. Over 75% of wine grapes are irrigated using micro-irrigation. Adoption of micro-irrigation on the remaining citrus orchards and vineyards would lead to increased water use efficiency.

Water savings from improved efficiency have been used historically to improve farm production levels. Around 10% of farm businesses have recently submitted expressions of interest to trade water entitlements to the Commonwealth Government for funding to adopt improved water use efficiency.
There will continue to be scope to improve on-farm water use efficiency. Gains are likely to be around 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 subsurface irrigation for hill or row cropping, overhead irrigation for broadacre crops and pastures, micro-irrigation for horticulture crops and improvements to surface irrigation such as laser levelling and water applications methodology such as surge irrigation for pastures and crops or flush irrigation for rice.

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 2% by the year 2030 under a median climate scenario. The anticipated gains in water use efficiency provide the opportunity to offset this impact.

**Water entitlements**

Water entitlement licences are held by either organisations or individuals. Murrumbidgee and Coleambally Irrigation members and individual licence holders have been able to freely trade water entitlements for many years.

Water entitlement holders have been able to convert General Security entitlements to High Security entitlements at a conversion rate of 1.55. In recent years 60 GL of High Security water entitlements have been created through the conversion process.

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. Murrumbidgee Irrigation was a net trader of water out of its area of operations in most years prior to the drought, with allocated water traded to the NSW Murray valley. Up to 200 GL have been traded from the region annually.

The stimulus for the more recent increase in the trade of water entitlements has been the need to address the debt provisions which have resulted from failed crops and increased grain and fodder purchase prices.

A number of Commonwealth Government programs have been purchasing water entitlements from the Murrumbidgee Valley. Over 110 GL (non-LTCE) has been purchased from the Murrumbidgee and Coleambally Irrigation areas for environmental use during the period 2007–08 to December 2009.

Modernisation plan proposals have been developed by Murrumbidgee and Coleambally Irrigation for government investment in infrastructure to improve water use or water delivery efficiency. If funded, these proposals will result in a further transfer of entitlements to the Commonwealth Government.

**Soil moisture measurement**

A high proportion of the citrus and vineyards developed with micro-irrigation have tensiometers installed 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 suboptimal levels of water. 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. Past experience has shown that lower yielding crops often generate 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. Monitoring crop growth is considered to be at least as important to accurately monitoring soil moisture deficits. The timing of irrigation application to summer crops is designed to provide optimal plant growth conditions and maximise yield.

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.

Regional agricultural production

Regional agricultural value chain

Irrigated agriculture generated around 80% of the region’s gross value of agricultural production of $400m (Figure 15) in 2006. The annual water allocation in 2005–06 was 54%, compared to a five-year average allocation of 83% prior to the drought. This would suggest that the level of gross value of agricultural production and the proportion produced from irrigated agriculture would have been significantly greater than that recorded in 2006 due to a higher level of rice production.

Value adding of agricultural production within this region is extensive and has involved a significant private investment. The winemakers’ association estimates that there is over $2 billion-worth of regional investment in wine processing facilities in the Griffith area. SunRice has established two rice mills, a flour mill and a stock food processing plant and 13 aerated grain storages within the Murrumbidgee valley. National Foods is currently enhancing its citrus juice processing facility in Leeton which will become the major facility for the company in southern Australia. In addition, there is bulk transport of grain and horticulture products, a national distribution transport centre in Leeton, a large number of fruit packing sheds and a beef feedlot and a major poultry enterprise, both of which source most of their grain feedstuff requirements from the irrigated area.
Figure 15 Gross value of agricultural production (GVAP) (2006)\textsuperscript{xviii}

Figure 16 Gross value of agricultural production (GVAP) $/ML of water used (2006) \textsuperscript{xx}
The region’s community

Figure 17 Level of highest school education (2006)**

Figure 18 Higher education (2006)**
Figure 19 Employment (2006)\textsuperscript{xii}

Figure 20 Nominal income (2006)\textsuperscript{xxiii}
The region’s community — education, employment and income

Griffith, in the geographic centre of the region, is the largest service centre with a population of 30,000 people. There are a number of other major centres, small towns and villages including Leeton with 6,500 people and Narrandera, Hay, Yanco, Darlington Point and Coleambally. These towns range in population from 100 to 5,000. Wagga Wagga, located to the east of the region, also provides significant services to the region.

The region’s population and community structures have been shaped by irrigated agriculture. Griffith, Leeton and Coleambally exist as communities only as a direct result of irrigation. The Griffith community is a multicultural community that speaks 55 languages. Around 25% of the population were migrants to Australia and the city provides bilingual services and settlement services to meet the needs of its community.

The region has a major education and research and development focus. Leeton shire has two high schools, the Murrumbidgee Rural Training centre and the NSW Department of Industry and Infrastructure irrigated agriculture research facility located at Yanco. CSIRO and the NSW Department of Industry and Infrastructure have research facilities at Hanwood and Griffith has a major TAFE centre. The Charles Sturt University has a major campus at Wagga.

Narrandera and Leeton provide medical services including maternity and surgical facilities and a major medical centre is located at Griffith. Leeton also has a growing aged care industry with the number of aged care beds currently in the process of increasing from 28 to over 150.

Approximately 40–50% of school students are completing either years 11 or 12 (Figure 17) and around 50% of the region’s population have completed a post secondary school course (Figure 18). 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 19).

Around 25% of the age group older than 55 years are farmers or farm managers (Figure 19). Retiring farmers tend to move into their local towns. The population of most of the towns has either remained relatively stable or fallen by up to 10% over the past 10 years.
Figure 21 Regional issues

Note: 1 = No problem to 5 = Significant problem. Number of respondents = 31

Figure 22 Optimism (regional people)

Note: 1 = No problem to 5 = Significant problem. Number of respondents = 31
The region’s community — demographics and key statistics

Table 6  Demographics and key statistics (LGAs within study area, 2006)

<table>
<thead>
<tr>
<th></th>
<th>Griffith</th>
<th>Jerilderie</th>
<th>Leeton</th>
<th>Murrumbidgee</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>23,802</td>
<td>374</td>
<td>11,127</td>
<td>1,405</td>
<td>36,708</td>
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<tr>
<td>Total Indigenous persons</td>
<td>898</td>
<td>3</td>
<td>499</td>
<td>48</td>
<td>1,448</td>
</tr>
<tr>
<td>Farm and farm managers</td>
<td>1,061</td>
<td>128</td>
<td>404</td>
<td>217</td>
<td>1,810</td>
</tr>
<tr>
<td>Farm and farm managers as percentage of total employed</td>
<td>10%</td>
<td>60%</td>
<td>9%</td>
<td>30%</td>
<td>11%</td>
</tr>
<tr>
<td>Households</td>
<td>652</td>
<td>3</td>
<td>267</td>
<td>23</td>
<td>945</td>
</tr>
</tbody>
</table>

Dwelling

<table>
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<tr>
<th></th>
<th>Griffith</th>
<th>Jerilderie</th>
<th>Leeton</th>
<th>Murrumbidgee</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully owned</td>
<td>35%</td>
<td>43%</td>
<td>36%</td>
<td>37%</td>
<td>35%</td>
</tr>
<tr>
<td>Being purchased - directly or rent/buy scheme</td>
<td>26%</td>
<td>22%</td>
<td>31%</td>
<td>23%</td>
<td>28%</td>
</tr>
<tr>
<td>Rented</td>
<td>35%</td>
<td>43%</td>
<td>36%</td>
<td>37%</td>
<td>35%</td>
</tr>
</tbody>
</table>

Community services and wellbeing by remoteness

<table>
<thead>
<tr>
<th></th>
<th>Griffith</th>
<th>Jerilderie</th>
<th>Leeton</th>
<th>Murrumbidgee</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population per education employee</td>
<td>37</td>
<td>34</td>
<td>24</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>Population per health employee</td>
<td>26</td>
<td>75</td>
<td>33</td>
<td>47</td>
<td>29</td>
</tr>
<tr>
<td>Population per culture and recreation employee</td>
<td>274</td>
<td>0</td>
<td>348</td>
<td>351</td>
<td>298</td>
</tr>
</tbody>
</table>

Figure 23  Industry segmentation (2006)
The regional economy

Regional economic structure

Service provision and post farm gate processing are the major economic drivers of the Mid-Murrumbidgee region. Griffith has approximately 370 businesses, the majority of which provide direct services to irrigated agriculture. Griffith is now the largest wine-producing area in Australia, processing over 400,000 tonnes of wine grapes annually and employing 1,000 people on a full-time equivalent basis. Associated with this processing is a major transport industry, warehousing and services that maintain and upgrade the processing facilities. Griffith also supports significant tourism centred on the wine industry.

There are six major fruit packing facilities within the Griffith—Leeton area and over 40 smaller packing facilities. The majority of the fruit is transported to the Sydney basin. It is estimated that around 2,100 full-time equivalent jobs are associated with the citrus production and post farm processing. A citrus juice processing facility at Leeton currently employs 60 people and is being expanded. Citrus will be transported from the Murray Valley and the Riverland for processing in the upgraded facility. The rice industry head office is located in Leeton and the industry has major milling facilities at Leeton and Coleambally. The industry also operates a flour mill, grain storage centres and a stockfeed manufacturing facility in the region. More recently a specialist biscuit factory has been opened at Murami, employing 50 people. A national distribution transport centre has been established in Leeton, employing approximately 60 people and the NSW Department of Industry and Infrastructure employ in excess of 100 people at its research and extension facilities within the region.

The Leeton Shire has reported unemployment being higher than the state average, reflecting the reduced rice production and feedlot production due to the drought and reduced water availability.

Murrumbidgee Irrigation is a significant employer in Murrumbidgee Irrigation Area and Coleambally Irrigation is a significant employer in the Coleambally community. Both organisations contract local firms to undertake a significant component of their upgrading and modernisation programs.

Regional response over the past five years

Water shortage

The seven-year average allocation for High Security water entitlements for the period 2002–03 to 2008–09 was 95%. This compares with the seven-year average allocation for General Security entitlements for the period 2002–03 to 2008–09 of 32%. Over the past seven years the regional economy has been underpinned by the horticultural industries based on High Security water entitlements.

In the five years to 2001–02 the region produced over 500,000 tonnes rice annually. In the five years to 2008–09, less than 187,000 tonnes of rice were produced annually with less than 13,000 and 52,000 tonnes production in 2007–08 and 2008–09 respectively. In comparison there were 148,000 tonnes wine grapes produced in 2000 compared to 256,000 tonnes in 2008, a 73% increase over the eight-year period.

The projected low grain prices for 2010 will slow any recovery for Murrumbidgee’s grains sector.

The region was first granted Exceptional Circumstances provisions in 2006. Over 350 farm businesses currently use the Rural Counselling Service and 850 applications for interest rate subsidies to the NSW Rural Assistance Authority were approved in 2009. One major bank has reported an across-
the-board decline in farm equity within the region. The increased level and pattern of permanent water entitlement trade within Murrumbidgee Irrigation indicates that the impact of the drought is being felt across the whole of the Murrumbidgee Irrigation Area.

**Demonstrated adaptation capacity**

During the drought, the rice-based farms have only grown small areas of rice or traded allocation water. Around 10,000 ha of wine grapes have been planted on farms that previously grew rice. Approximately 98 GL of the General Security water entitlements have been converted to High Security water entitlements within the Murrumbidgee area, and approximately 13 GL of General Security entitlements have been converted in the Coleambally area.

More general transformation over the past five to 10 years has involved farm businesses becoming larger, a reduction in livestock numbers and the adoption of improved irrigation application systems on all farm types. In many 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. Any new bore triggers a requirement to purchase water entitlements.

Over 7% (77 GL) of the Murrumbidgee Irrigation water entitlements and 35 GL of the Coleambally Irrigation water entitlements have been sold to the NSW and Commonwealth Governments over the past three years as part of the Water Buyback, The Living Murray and the NSW River Bank programs. The sale of water entitlements may result in greater exposure of the farm business to low water availability in future years. In response to the sale of water entitlements, the farm business will either have reduced 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 Murrumbidgee region's farming community is highly dependent on irrigation, particularly the area serviced by Murrumbidgee Irrigation and Coleambally Irrigation. The Murrumbidgee and Coleambally irrigation areas were subdivided into small farm areas and established as irrigation areas between the 1920s and the 1960s. The farm areas were relatively small, commonly 10 to 200 ha with relatively moderate irrigation volumes of water entitlements for each landholding. The long-term average yield of the entitlements is typically 4-4.5 ML/ha for broadacre farms and 12 ML/ha for the gazetted horticulture blocks. The rainfall in the eastern portion is 400 mm/annum and less than 350 mm in the western portion of the region. Dryland winter cropping is considered to be only marginally viable west of Narrandera due to a combination of heavier clay textured soils and low rainfall.

Farm ownership within the Coleambally Irrigation Area has been consolidated over the past 30 years. The original 492 landholdings are now owned and operated by approximately 330 members. The number of farm families in Coleambally has declined by 2.5% annually and by 6% in 2006–07. The national average for the decline in Australia is about 1.5% annually.

The farm size of the private diverter irrigators is generally larger and the number of water entitlements held on a land area basis is lower than within the Murrumbidgee and Coleambally irrigation areas. These farms are relatively less dependent on irrigation water with the irrigated area of private diverter serviced farms being around 10% of the total farm area. The irrigated enterprise is, however, important to these farm businesses as the low rainfall environment makes dryland farming enterprises marginal in years of below average rainfall.
Regional water dependence

The regional economy is highly dependent on irrigated agriculture. Each urban area provides services to the irrigated agricultural sector and almost all service businesses are dependent on the irrigated agriculture sector for income. The reduced water availability over the past five years has impacted significantly on the industries that service the broadacre farms. The SunRice Rice Mill located in Coleambally has been placed in a 'care and maintain' mode, and the feedlot near Narrandera has significantly reduced its throughput.

The horticultural industries have been primarily influenced by market demand and associated commodity prices. These industries have been shielded from the extreme impacts of the drought as these businesses are based on High Security entitlements. The original High Security entitlements were based on 12 ML/ha. Average annual water requirements for citrus are around 11 ML/ha, and for winegrapes and vegetables are around 5-6 ML/ha. As such these businesses have had sufficient water availability in most years, particularly given that annual allocations have averaged 95% during the drought years.

The service centres of Griffith, Leeton, and Coleambally, together with a number of smaller centres located within the intensively irrigated areas of the region, have been assessed by Local Government as the centres most exposed to the agricultural economy.

The social and economic advantage and disadvantage score presented in Figure 24 shows that the region is relatively disadvantaged 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.

Community resilience to change in water allocation

Many horticultural businesses located in the original horticultural gazetted area (8,000 ha) have a higher number of High Security entitlements than is required to meet their annual water requirements in most years. A proportion of these farm businesses sell their surplus to requirement allocated water on the temporary trade market each year. Approximately 30–40 GL is traded by High Security water entitlement holders each year. Other farmers have used the excess water to underpin expanded developments undertaken on nearby land that was originally issued with General Security water entitlements. This income has become an important component of some of these farm businesses, particularly the smaller producing citrus and wine grape producers. 18% of wine grape-growers produce less than 2% of the total wine grape production.

Based on the number of farms accessing Exceptional Circumstances support and utilising the Rural Counselling services, it is likely that the broadacre farming community has a limited capacity to cope with a significant reduction in water availability in the absence of adjustment support.
Figure 24  Index of Relative Socio-economic Advantage and Disadvantage (2006)\textsuperscript{xxvi}

Figure 25  Unemployment and labour force participation (2006)\textsuperscript{xxvi}
Scope for regional transformation

**Scope for farm transformation in response to low water availability**

The Murrumbidgee Valley produces a wide diversity of irrigated enterprises. Rice, citrus and wine grape enterprises are based on extensive research programs and established markets. Most industries involve post-farm processing within the region. Any transformation to enterprises that generate a higher return per unit of water applied is likely to take time before it develops long-term secure markets and reaches a significant scale at the regional level.

The more central areas of the Murrumbidgee Irrigation Area, in the Griffith and Leeton districts, have generally lighter textured, more free draining soils and a slightly higher rainfall, indicating that a wide range of crops can be grown. This area is also closer to the point of diversion of the irrigation water from the Murrumbidgee River, at the upper end of the irrigation distribution system. Similarly the fertile grey self-mulching clays in the northern Coleambally area are well suited to a range of summer and winter crops.

The features of the western portion of the region limit options for farm transformation or farm system flexibility. Rice has been a major crop grown in association with winter cereals and livestock production. The balance between these enterprises will continue to be influenced by annual rainfall, commodity prices and irrigation water availability.

Farm transformation will involve the expansion of some farm businesses 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. 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.

**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 a farm level to improve surface-water irrigation layouts during the past 15 years as part of the Coleambally Land and Water Management Plan and the Murrumbidgee Ecowise program. Approximately 80 to 90% of surface layouts, within the more intensively irrigated areas, have been redeveloped during this time. There has been a continued adoption of micro-irrigation on horticultural farms and almost all new horticultural plantings and vegetable crop plantings are established with micro, or subsurface drip, irrigation.

More recently, a relatively small number of farm businesses have adopted overhead irrigation or sub surface irrigation to improve production levels per unit of water on broadacre farms. 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 that there is scope to improve farm water use efficiency by around 10% in the short-term. This scope may increase as enhanced experience is gained from the adoption of alternative technologies. There is greater scope to increase water use efficiency on those horticultural properties that still use furrow or flood irrigation. The Murrumbidgee Irrigation modernisation plan proposes to provide an integrated pressurised water supply to horticultural farms to aid improved farm water use efficiencies. However, it is important to note that most techniques that may increase water use efficiency will also have higher energy requirements.
The Murrumbidgee Irrigation distribution system has had a distribution efficiency of 80% at full allocation. The strategic investment of capital is modelled to raise this efficiency level to 86–88%. Part of this modernisation will involve reducing the area serviced by around 15%. Total channel control is not considered an option for the Murrumbidgee Irrigation Area due to insufficient capacity within the channel system to buffer short-term changes in delivery demand. During the drought the area was split into zones with some areas only receiving irrigation water on a rostered basis to reduce delivery losses.

The Coleambally Irrigation distribution efficiency has been 80–82%. The major investment in the total channel control system is expected to increase the distribution efficiency to 93%. There is limited scope to increase the distribution efficiencies beyond these improved levels, given the extensive nature of the supply channel networks. Major investigations and works programs have been, and are anticipated to continue to be, undertaken to isolate those areas within the supply channel systems where higher seepage losses occur. The Yanco Creek Management Plan involves implementing a range of works and measures to improve delivery efficiency and associated Creek health.

**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 Murrumbidgee region like other regions within NSW has undergone a number of adjustments over the past 15 years. These adjustments include responding to the Murray–Darling Basin Cap on diversions, the NSW Water Sharing Plan, and more recently the changes to water management outlined by the Australasian Competition and Consumer Commission (ACCC).

The drought commenced in 2002–03 in southern NSW. Over the past seven years up to June 2009, average annual allocations have been 95% for High Security and 32% for General Security. High Security allocations did not drop below 90% over the seven-year period. General Security allocations have ranged from 13% to 54% with four of the years recording above 38% and three years recording below 21%. There is estimated to be approximately 1,900 General Security entitlements and approximately 350 GL High Security entitlements within the Murrumbidgee region. In addition, Murrumbidgee Irrigation and Coleambally Irrigation hold conveyance licences of 373 GL and Supplementary water licences of 220 GL. There are 280 GL of groundwater entitlements within the Lower Murrumbidgee Alluvium aquifer (N02) and Supplementary licences of 39.8 GL reducing to 0 GL by 2015.

There has been a number of Commonwealth Government-funded water entitlement purchase programs operated within the region since 2007. Approximately 112 GL of water entitlement has been purchased, the vast majority from the Murrumbidgee Irrigation Area.

A 60% reduction in water availability based on the long-term average allocation would result in a reduction of High Security water use from 332 GL to approx
132 GL and from 1210 GL to 484 GL for General Security water use. This level of reduction is greater than 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 the rice-based farming systems and any horticulture-based on General Security water entitlements.

### Table 7 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>Murrumbidgee</td>
<td>1,540<strong>xxvi</strong></td>
<td>670</td>
<td>55<strong>xxvii</strong></td>
<td>-</td>
<td>1,500</td>
</tr>
<tr>
<td>General Security</td>
<td>1,210</td>
<td>340</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Security (Irrigation)</td>
<td>332</td>
<td>332</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater (not included in LTCE surface water)</td>
<td>83</td>
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</table>

### Table 8 Water availability scenarios — reductions from estimated LTCE entitlement volume

<table>
<thead>
<tr>
<th>Region</th>
<th>Comment</th>
<th>Sector</th>
<th>20% GL</th>
<th>40% GL</th>
<th>60% GL</th>
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</thead>
<tbody>
<tr>
<td>Murrumbidgee</td>
<td></td>
<td></td>
<td>1,235</td>
<td>925</td>
<td>615</td>
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<tr>
<td>High security</td>
<td>Horticulture</td>
<td></td>
<td>265</td>
<td>200</td>
<td>130</td>
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<tr>
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<td>Rice farm systems</td>
<td></td>
<td>970</td>
<td>725</td>
<td>485</td>
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<tr>
<td>Groundwater</td>
<td></td>
<td></td>
<td>225</td>
<td>170</td>
<td>110</td>
</tr>
</tbody>
</table>
Water availability scenarios — direct impacts
(face-to-face interviews)

Any reduction in long-term water availability will result in financial impacts on irrigated farm businesses and will have flow-on impacts to the regional economy. The extent of the impact will be dependent upon the level of income derived from the use of the water, whether the water would have been used for productive purposes or traded on the annual water market and the extent to which the products produced are processed within the region.

Permanent horticulture

Almost all permanent horticulture (citrus and grapes) is underpinned by High Security water. As such a reduction in High Security water allocations would initially impact on these industries. Subject to commodity prices and water prices horticultural growers may enter the annual water market and purchase water from other industry groups either from within the region (e.g. mixed broadacre farms) or from other regions such as the NSW Central Murray, Sunraysia or from the Riverland. Generally there are three broad groups of growers:

- Highly geared farm businesses where the annual water requirements are similar to the long-term yield of the entitlements held. Any reduction in water availability will impact directly on these businesses either by reduced production or increased costs to purchase replacement water. It is estimated that around 35% of grape-growing businesses would be within this group.

- Moderately geared farm businesses where the annual water requirements are slightly (10 to 20%) lower than the long-term yield of the entitlements held. This lower level of dependency is akin to a buffer or risk margin to minimise the business from the impacts of short-term reductions in water availability. A long-term reduction in water availability will increase the risk exposure of these businesses and increase the business operating costs in low water availability years, nullifying the deliberate risk management strategy put in place by these businesses. It is estimated that around 40% of grape-growing businesses would be within this group.

- Less intensive farm businesses that may not have expanded in previous years, may source off-farm income and trade a proportion of their allocated water each year. In most years around 30 to 40 GL (10 to 20%) of High Security allocation is traded. A reduction in long-term water availability initially will reduce the level of income for these businesses from reduced water sales. Any subsequent increase in water prices due to reduced water supply would to some extent offset this impact if annual water prices increased. It is estimated that around 25% of grape-growing businesses would be within this group.

Within both the citrus and grape industries, a small proportion of the growers produce a major proportion of the total production. For example, 15% of grape-growers produce over 50% of the annual production.
Rice farm systems

Prior to the drought these farm businesses had access to annual allocations of over 80%. With farm water entitlements commonly 1,300 to 1,400 ML per landholding, these farm businesses were able to use over 1,000 ML per landholding. Most farm businesses farm two to three landholdings. A transition to the Murrumbidgee WSP long-term diversion limit, equivalent to a 64% allocation for General Security entitlements, will mean these farm businesses will have access to approximately 850 ML per landholding, a reduction of around 15%. Most farm businesses have not developed longer term strategies to adjust to this lower diversion limit due to the drought occurring at the same time the WSP commenced.

During the drought, General Security water allocations have averaged 32%. There has been very little rice grown during the past seven years. Irrigation farmers have either sold the small quantities of water they were allocated, used it to irrigate winter crops or grown small areas of rice. Rice underpins these farm systems by generating the majority of the farm income and by providing subsoil moisture for cereal crops grown following the rice phase of the rotation.

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 to other industry groups purchasing allocated water at price levels higher than those generated by rice-growing. This demand for traded water may come from both within the Murrumbidgee region or from horticultural growers within the Sunraysia and Riverland regions. Historically, the Murrumbidgee region has been a net exporter of water annually (up to 200 GL) to the Murray region; however, a significant reduction in water availability may see a reversal of this trading pattern. Murrumbidgee rice production yields have been higher than those in the Murray Valley, indicating that a higher level of profitability is likely to occur and hence Murrumbidgee farmers may have greater capacity to purchase water annually than their Murray Valley counterparts.

The impacts of the water scenarios evaluated will impact differently on the region’s mixed rice and non–rice based farms. 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 non-viable. A 60% reduction in the long-term water availability will have a greater impact on water availability than the current average drought allocation (26% compared to 32% 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.

Water availability scenarios — telephone survey responses

For the Murrumbidgee as a whole, in the telephone survey conducted for this assignment, 33% of irrigation farmers indicated they would seek to exit farming if water availability reduced by 20%, with 41% 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).
Table 9 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>Murrumbidgee</td>
<td>Horticulture</td>
<td>Strategic purchase of allocated water on a seasonal basis by up to 75% of growers.</td>
<td>Strategic purchase of allocated water on a seasonal basis by the more efficient and highly developed farm businesses. 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 by a limited number of efficient businesses. Subject to water prices and commodity prices there is likely to be a moderate reduction in production.</td>
</tr>
<tr>
<td>Murrumbidgee</td>
<td>Rice-based farm systems</td>
<td>Strategic purchase of allocated water by larger farms or farms producing specialist products. Many farms become marginal or unprofitable. A number of the smaller and mid-size farms become unviable.</td>
<td>Many farms become unviable.</td>
<td>Almost all farms become unviable.</td>
</tr>
</tbody>
</table>

Figure 26 Murrumbidgee: telephone survey responses to water availability scenarios
Water availability scenarios — Value chain and flow-on impacts (face-to-face interviews)

The impacts of reduced water availability on the rice and non-rice based farm system businesses are expected to precipitate major flow-on effects. While there is anticipated to be an effect on the horticultural industries in the region this is likely to be relatively small unless the reductions in water availability are 40–60%. The initial impacts will include a reduction in farm inputs, less freight from the farm to the grain storage and processing facilities and diminished labour requirements to operate the rice milling and storage facilities. Prior to the drought the rice industry operated rice milling facilities at Griffith, Leeton and Coleambally. The Leeton facility is the only rice mill currently operating and this will continue to be the case unless rice production returns to levels produced prior to the drought. The Griffith mill has been decommissioned.

The impacts of reduced water availability will initially be felt within the Coleambally business community and to a lesser extent the Darlington Point community. The Darlington Point community will be directly impacted by any changes made to groundwater use. The larger centres of Griffith and Leeton have been underpinned by High Security water allocations during the drought. They will, however, be directly impacted by flow-on effects from any reduction in General Security water availability, as a significant number of the region’s businesses provide service to rice and other broadacre irrigated industries. Subject to the scale of the reduction in water availability the flow-on effects could have substantial impacts on the level of services local government can provide and other services including health, education and policing.

The region’s wine industry has a vision to be the major wine producing region. There is currently over $2 billion of post farm gate wine industry infrastructure within the region and approximately 25% of the grapes processed are imported from outside the region. A significant reduction in water availability will reduce the efficiency of this investment and the diverse service businesses it supports.

Table 10 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>Murrumbidgee</td>
<td>Horticulture</td>
<td>Post-farm processing expected to continue to occur at similar levels subject to commodity prices and water prices.</td>
<td>Post-farm processing expected to occur at lower levels and may involve the rationalisation of citrus packing facilities. Any rationalisation of wine industry infrastructure and citrus juicing infrastructure will depend on a broader restructure of these industries across the Riverland, Sunraysia and Murrumbidgee regions.</td>
<td>Post-farm processing expected to occur at lower levels due to reduced production. There is likely to be reduced farm production and rationalisation of post-farm processing infrastructure.</td>
</tr>
<tr>
<td>Murrumbidgee</td>
<td>Rice</td>
<td>Rice aerated storages to be rationalised. Only one mill in the region likely to operate.</td>
<td>Rice mill at Coleambally unlikely to operate.</td>
<td>Most rice storage facilities likely to be closed and milling would only occur at Leeton.</td>
</tr>
</tbody>
</table>
Figure 27 Map of irrigation district
Endnotes

1 Data from Murrumbidgee Irrigation 2007
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 MJA Socio-economic Survey for MDBA 2010
15 MJA Socio-economic Survey for MDBA 2010
16 MJA Socio-economic Survey for MDBA 2010
17 Australian Bureau of Agricultural and Resource Economics. 2008, Australian Farm Survey Results 2005-06 to 2007-08, Canberra
20 Australian Bureau of Statistics. 2006, 2006 Census, Canberra
22 Australian Bureau of Statistics. 2006, 2006 Census, Canberra
23 Australian Bureau of Statistics. 2006, 2006 Census, Canberra
26 Australian Bureau of Statistics. 2006, 2006 Census, Canberra
27 Australian Bureau of Statistics. 2006, 2006 Census, Canberra
29 Australian Bureau of Statistics. 2006, 2006 Census, Canberra
30 NSW WSP
31 Published figures from the NSW and Commonwealth Governments were used to estimate buybacks.
32 MJA Socio-economic Survey for MDBA, March-April 2010. n=162 (-20% scenario), n=192 (-40% scenario). Samples were independent.