Macquarie community profile

Irrigation region

Key issues for the region

1. **Region’s population:** The Macquarie irrigation region comprises an area of some 13,000 km² in central west New South Wales covering three council areas, Dubbo City and the shires of Narromine and Warren. The area has a total population of 47,000 people, of whom 37,000 live in the City of Dubbo. Outside Dubbo, the region is highly reliant on agriculture for employment and wealth creation, with most employment in the irrigation districts especially in cotton. The region is also a centre for cereal cropping and is famous for its Merino studs. Agriculture supports a wide range of services in the public and private sectors.

2. **Water entitlements**
   - Surface Water Long-term Cap — *The Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source* took effect on 1 July 2004. This limits average annual extractions to 391,900 ML.
   - Water entitlements for the Macquarie region are as follows: High Security (15,038 ML); General Security (611,271 ML); Environmental Water Allowance (160,000 ML); Supplementary Water (48,505 ML); Domestic and Stock water (4,826 ML); Local Water Utility (16,205 ML); Groundwater entitlements (65,524 ML). These figures refer solely to the entitlements available from the Macquarie River serviced out of Burrendong Dam. They ignore entitlements available from the Cudgegong supplied out of Lake Windamere.

3. **Major enterprises** — Cotton has been a major employer across the region since the 1980s, both in primary production and in processing, with five gins located at strategic points across the region. The leading company in the cotton sector is Auscott Limited, since Twynam Cotton pulled out of the sector recently.

4. **Government buyback** — Buyback of entitlement by the Federal and State Government has totalled 103 GL, with a further 48 GL anticipated from implementation of the *Private Irrigation Infrastructure Operators Program* across the Valley. This adds to the 160 GL already in the Environmental Water Allowance. This will reduce the potential productive capacity of the region but helps move the valley closer to a sustainable balance.

5. **Water dependence** — Agriculture is the dominant enterprise outside Dubbo and the levels of activity, employment and wealth creation are all highly dependent on irrigation.

6. **Current Status:**
   - Reduced rainfall since 2001-02 has had a significant impact on all sectors of the rural economy, affecting both dryland and irrigated sectors. The level of activity in the cotton sector has been seriously affected, falling from 57,000 ha planted in 2000-01, at an allocation of 100%, to less than 10,000 ha over the last seven years, when allocations have averaged 10%. The ability to maintain even that area has relied on access to groundwater as well as carryover between seasons and water trading.
• This reduction in the level of activity in cotton has directly impacted on the wider regional economy and the social fabric of the community, with the local centres losing population and key services in both the public and private sectors. Recent closure of major irrigated corporate properties has shaken the confidence of the community. The town of Warren is on a knife-edge in terms of continued viability. Any further reduction in the level of services will have particular effects for the local Indigenous community.

• Much of the entitlement in the valley is held by seven off-river irrigation schemes. The majority do not meet best practice in water delivery efficiency. They have not been able to operate over recent years, when allocations fell below 20%. They will require major rationalisation and modernisation to be sustainable. This is likely to involve a contraction in scale and a greater density of operation closer to the river. DEWHA has recently announced funding of $162 million for upgrading of three schemes which will also generate further water savings of around 48 GL.1

• Cotton remains an optimal choice for irrigation in the valley as a high value crop with the ability to vary the area planted each year to match a highly variable water resource. The cotton sector has demonstrated continuing productivity gains over the last five years, with higher yields per ML applied and per hectare grown. This has helped offset some of the impact of the reduced allocations.

• No alternative sectors can match the returns available from cotton in terms of levels of employment, profitability or certainty of market access. However, all growers are now planning for a future with a more diverse, if less profitable, mix of crops including winter wheat, sorghum and chickpeas. Other irrigators are exploring options such as citrus and vegetables, but the scale of opportunity here is limited.

• Almost all cotton in the valley is grown using furrow irrigation. This can be close to best practice in terms of water use efficiency on the heavier soils of the region when combined with soil moisture monitoring. Drip irrigation may benefit sandy porous soils, but is expensive to install and has higher running costs. It is unrealistic to expect the major capital expenditure required for increased water use efficiency when future water allocations are uncertain.

• The community understands the importance of the Macquarie Marshes as a key environmental asset as the majority of the marshes are in private hands. The debate centres around how this asset is to be best managed, and the relative importance of more water or better grazing practice for its future health. Increased flows will also generate economic benefits for the graziers who own and manage the large majority of the floodplain and marshes.

7. **Responses to water availability scenarios**

• The level of production of cotton is directly proportional to the level of allocation. A reduction in water availability of more than 40% would challenge the viability of cotton production as it would not be possible to operate the multiple off-river schemes that provide the majority of the irrigation.

• Reductions of 40% and above would also threaten the presence of the significant cotton processing capability.

• Reductions of 40% and above also would pose significant risks to the viability of smaller regional towns which are already on a knife-edge in terms of population and services and would be likely to slip into a culture of welfare dependency.
Regional overview

The Macquarie irrigation region has a diverse range of people and industries. Irrigated cotton has been the predominant activity over the last twenty years. The major urban centre is the City of Dubbo, with smaller towns at Narromine, Warren, Trangie, and Nyngan. The urban area of Dubbo represents approximately 37,000 of the total population of the region of 47,000. This profile relates to the area serviced by the *Macquarie Regulated Rivers Water Source* and covers the three local government areas of Warren, Narromine, and Dubbo.

The landscape of the catchment varies markedly from hills and tablelands in the east, to wetlands and rich alluvial river flats in the west. The Macquarie River is impounded by the Burrendong Dam upstream of Wellington. From here, the river flows northwest through Wellington and Dubbo. From Narromine the river flows north through a complex system of effluent creeks to the Macquarie Marshes and ultimately to the Darling River.

The profile does not cover regulated supplies out of Lake Windamere above Burrendong that service viticulture around Mudgee.

The Macquarie Marshes are one of the largest remaining semi-permanent wetlands in south-eastern Australia, and are still in a semi-natural state. 90% of the Marshes are in private hands. The Marshes are a Ramsar listed Wetland of International Importance. The Marshes were declared a fauna sanctuary as early as 1900. The idea of draining the Macquarie Marshes for grazing was briefly considered in the 1940s, but in 1948, an interdepartmental committee strongly recommended their preservation. The committee also recommended an annual "wildlife" allocation of 50,000 ML. There are also other important environmental values along the length of the river.

Dubbo is the major urban centre in the region. It was founded as a village in 1849, developing into a thriving regional city by 1966. Geographically located in the heart of New South Wales, Dubbo is the shopping capital of the west servicing a third of the geographic area of New South Wales. This generates the significant employment in retail trade recorded for the region. Historically, farming was based around cattle and sheep grazing and wool production. Warren was celebrated as the centre of the Merino stud industry. Cereal cropping continues to be important. The irrigation community is centred on the smaller towns of Narromine, Trangie, and Warren to the north west of Dubbo. The first cotton crops were grown near Warren in 1967 and the sector saw significant expansion during the 1980s and 1990s, so that by the year 2000 many landholders in the Narromine and Warren shires had developed at least part of their property for irrigation and cotton comprised the large bulk of the irrigated sector. Citrus and nursery plants are also irrigated around Narromine. Regulation of the river has reduced the incidence and extent of flooding. This has affected both environmental values and grazing opportunities.
Figure 1  Location of irrigation district
Appendix C  Irrigation district community profiles

Irrigation overview

History of irrigation

The main storage on the Macquarie, Burrendong Dam, was originally proposed and designed in the 1940s. The dam was intended to “drought-proof” the Macquarie Valley and also to reduce risks from flooding. Work on Burrendong was started in 1946 with water first released in 1969. Windamere Dam, a smaller supplementary storage on the Cudgegong river upstream of Burrendong, was completed in 1984.

Publicly-owned water storages account for the large majority of the total storage capacity on the Macquarie system, with 630 GL of General Security entitlement. There is some 110 GL of on-farm storage, which represents a smaller relative volume than is common in the other northern valleys. Groundwater is also an important resource, especially around Narromine.

Approximately 600 users have entitlements from the river. 500 of these are small users, each with less than 2,000 ML of entitlement, totalling some 125 GL, or 20% of the total. By contrast the top nine users account for 332 GL between them or 52% of the total entitlement. Seven of those nine large users are off-river irrigation schemes that were constructed in the 1970s to take advantage of the new water resource. Those schemes comprise multiple smaller properties. General Security entitlements have experienced an average 55% allocation over the last 20 years, reflecting a significant reduction in inflows since the 1970s when much of the entitlement was awarded. That allocation has been around 10% over the last eight years.

Cotton is the major irrigated sector in the region and is grown mostly on the riverine plains west and north-west of Narromine, which also sees irrigation of oilseeds, cereals and citrus. The first cotton crop was grown in 1967 and two gins were built in the next three years. Favourable climatic conditions and good cotton prices promoted the rapid expansion of the cotton industry in the 1980s and early 1990s. Irrigation is generally by furrow for cotton.

As with other northern valleys, cotton growing has been difficult in this region since the run of dry years starting in 2001-2002. Low rainfall has meant reduced water allocation. This has translated into dramatic reductions in the area planted to cotton, with a fall from 57,000 ha in 2001-02 to 3,100 ha in 2007-08. This has impacted on primary production, processing and dependent service sectors across the region, in particular on the throughput and viability of the five gins in the valley. As a result, the population of Warren fell by nearly 50% between 2001 and 2010. Many cotton growers and dryland properties have run down their equity. A number of major cotton properties have recently been put on the market and/or been converted to dryland undermining the confidence of the irrigation sector in the region.

There has been an increasing entitlement for the Macquarie Marshes from the initial proposed figure of 50,000 ML to the current figure of 160,000 ML within the Water Sharing Plan. But there is a continuing debate within the community as to how best to manage the long-term health of the Marshes and as to the respective flows to be allocated for irrigation and the volume to be retained in the river for the health of the Macquarie Marshes and the graziers that benefit from the increased flows.
Rural water supply

Regional system description

Most of the seven off-river supply schemes are inefficient by contemporary standards. Few have been able to irrigate over the last seven years as they require a minimum allocation of 20% to operate.

Three of the larger schemes have recently received funding from DEWHA for modernisation plans including rationalising the scheme channels, provision of stock and domestic pipelines and improved channel management technologies. The outcome will see further reduction in diversions, with the savings shared between irrigators and government under the Private Irrigation Infrastructure Operators Program.

- Nevertire supplies water almost solely to Auscott Limited at Snake Plain. Crops include cotton, lucerne, wheat, pasture and corn. The total entitlement is 48,198 ML. This is a relatively efficient scheme.
- Tenandra supplies water upstream of the Gin Gin Weir east of the river south of Warren. Crops include cotton, lucerne, wheat, pasture and sorghum. Total entitlement is 35,362 ML. This scheme recently received DEWHA funding of $37.5 million.
- Buddah Lake supplies water east of the Mitchell Highway between Narromine and Trangie. The total entitlement is 32,516 ML. Crops include cotton, pasture, wheat, corn, barley and oats.
- Greenhide supplies water downstream of Gin Gin Weir to properties from Gin Gin bridge 20 km north towards Collie. Crops include pasture, lucerne, cotton, and sorghum. The total entitlement is 7,776 ML.
- Narromine supplies water to properties west of Narromine. Main crops are cotton, lucerne, soybean, wheat, pasture and nursery plants. Total entitlement 60,110 ML.
- Trangie–Nevertire supplies water to properties west of Trangie. Crops include cotton, lucerne, wheat, pasture and oats. The total entitlement is 63,408 ML. The scheme has recently received DEWHA funding of $115 million.
- Marthaguy supplies water to properties in the Marthaguy district. Crops include cotton, wheat, soybeans, barley and oats are grown. The total entitlement is 25,689 ML. The scheme has recently received DEWHA funding of $9.5 million.

The farm

Please note: due to low respondent numbers, this profile does not include some of the farm type analysis that was able to be included in other regional profiles.

Natural capital

The climate and soils on the river plains are suited to irrigated cotton production, with cereal rotations part of the farming system. Cotton provides a high value annual crop whose level of production can match highly varying water availability between years. Large-scale changes to the crop mix are thought unlikely.

In the following figure 2 the term “broadacre” is taken from ABS and represents the cotton sector in the valley.
Farm business environment

Most properties are not profitable under current operating conditions, with cotton more heavily capitalised than other sectors. By far the largest constraint related to uncertainty about access to water. This demonstrates the reliance of the community on irrigation.

Horticulture is generally stable as it can rely on High Security entitlement. Wine grape is seeing contraction around Mudgee due to oversupply at a national scale.

Financial capital

The current run of dry years coincided with the cotton industry transition from development to the mature phase. Many growers hit peak debt as production dropped below long-term averages. Opportunities for increasing off-farm income are low. Many families are trapped by the downturn in cotton production as property values are now below debt levels. Many businesses are holding on hoping for a turn-up in cotton production to allow them to exit the industry. The increase in the value of water entitlements over ten years (from $500/ML to $1,250/ML) has allowed greater debt to be leveraged off the equity in the water entitlement. There is a risk that the exit of the Commonwealth Government from the market will see a collapse in this value.
Human capital

The level of stress amongst farming families has increased over the last five years. The population of Warren fell by 50% between 2001 and 2010 due to the reduction in the level of cotton production. A continuation of current conditions will see considerable adjustment and fewer farmers. Reduced water availability will compound these strains. Outside the large centres, there is limited capacity to support farming families through further change.

Local Councils are an important voice for the community. Macquarie River Food and Fibre (MRFF) provides a focus and voice for irrigation across the valley, and the Cooperative Research Centre (CRC) for Cotton Communities provides a research capability to review and publish data to support community adjustment.

Financial ratios

Most farms have relatively high levels of equity with a solvency ratio <0.2, and so the capacity to take on more debt. This conflicts with the regional perception that most farms have high levels of debt and minimal financial capacity to transform the farm business. The negative profit margin ratio and minimal return on assets employed confirm the severity of the impact of the drought on current business viability.

On-farm irrigation water use

Irrigation application methods

The large majority of cotton is furrow irrigated, with trickle irrigation used for fruit and vegetable crops. Flood irrigation is used rarely and only for pasture or fodder crops. Changes over the last five years have mostly focussed on decisions around the right time to irrigate and the right volume to apply, which has improved efficiency.

Technically, more efficient systems are possible for cotton, but at this stage they are judged to be uneconomic. They also require an equivalent improvement to the off-farm water delivery systems.

Opportunities/trends

One of the larger cotton growers has experimented with drip-tape irrigation on trial plots. However, the saving in water costs was more than out-weighed by the increased power costs to drive pumps and filters. It is likely that this approach will remain limited to a small number of experimental plots.

Travelling irrigators are being trialled in other valleys where soils are lighter.

There are few incentives to commit to the significant capital investment required to introduce and implement drip irrigation at the scale involved for cotton as a broadacre sector while there is continuing uncertainty about water availability. The crop rotation for cotton also increases the area of the investment required and reduces the annual return.
Water entitlements

There are two major sources of entitlement in Macquarie:

- surface water allocated under the Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source (see Table 1 for figures for the Macquarie valley alone); and

- groundwater allocated under the Water Sharing Plan for the Lower Macquarie Groundwater Sources with a total annual aquifer access allocation of 65,524 ML. The plan took effect on 1 October 2006 and involved a significant reduction from previous practice.

The long-term annual flow in the regulated surface water system is estimated at 1,448,000 ML. The Water Sharing Plan limits average annual extractions to 391,900 ML (27%) to ensure that the majority (73%) of the long-term average annual flow is maintained for the health of the river’s ecosystem. Though this average percentage includes contributions from large flood flows and so may overstate flows available in other years. There has been an average of 10% allocation for General Security entitlements for the last eight years, with three years when there was a zero allocation.

Table 1. Surface Entitlement for the Macquarie Valley

<table>
<thead>
<tr>
<th>Licence Type</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Security</td>
<td>611,271 unit shares</td>
</tr>
<tr>
<td>High Security</td>
<td>15,038 unit shares</td>
</tr>
<tr>
<td>Environmental Water Allowance</td>
<td>160,000 unit shares</td>
</tr>
<tr>
<td>Supplementary Water</td>
<td>48,505 unit shares</td>
</tr>
<tr>
<td>Domestic and Stock</td>
<td>4,826 ML per year</td>
</tr>
<tr>
<td>Local Water Utility</td>
<td>16,205 ML per year</td>
</tr>
</tbody>
</table>

Soil moisture measurement

The cotton sector in the valley claims high levels of adoption of soil moisture monitoring mainly through capacitance probes linked through 3G directly to controls for the irrigation systems themselves. The degree of adoption is correlated to farm size.

Water trading

Water trading was an active part of the economy when allocations were higher (e.g. 44,000 ML traded in 2005-06). Many cotton growers often planted 20% more than allocation allows, and relied on water trade to cover their total water needs.

Carryover is flexible and is an important tool to manage cross-seasonal decisions.

Trade has been constrained by the very low allocations. Most irrigators with High Security entitlement have used whatever allocation they hold. Cotton has relied on access to carryover, groundwater and occasional Supplementary Allocations.

Temporary sales have occurred where General Security has been transferred from off-river schemes to direct river diverters as allocations were not large enough to allow the off-river schemes to be operated. Auscott uses trade to access sufficient water each year to maintain a minimum area under cotton to cover its on-going overheads.

Permanent sales have been almost entirely to the Commonwealth Government as part of the buyback program.

There is no inter-valley or inter-state trade.
Regional agricultural production

Regional agricultural value chain

Agriculture is the central driver of the regional economy. Climatic variability is a major factor in business decisions, all farmers depend on the returns from good years to help them ride out the bad years.

Cotton production drives many other economic activities and supports many jobs in the region. There were five cotton gins in the valley, one near Carinda, two near Warren and two between Trangie and Collie. These are operated by large operators with multiple sites and enterprises across northern NSW and southern Queensland.

The gin at Carinda has closed due to the drought and only one of the remaining gins has been operating regularly through the recent drought sequence.

The level of economic activity from the sector also drives a further major percentage of the service sector. This includes equipment supply and maintenance as well as public sector services.

Low water availability over the last five years has seen a drop in the number of people directly employed in cotton production and in cotton processing in the region. The move to genetically modified cotton has also reduced demand for unskilled workers to chip weeds.

Water access is the major constraint for irrigated cotton. Movement by farmers into other crops (such as vegetables and pulses) does not generate the same level of investment and employment in secondary processing in the region.

(note: Gross Value of Agricultural Production data were not available for Macquarie)

The region’s community

Figure 3. Level of highest school education (2006)
Figure 4. Higher education (2006)\textsuperscript{iv}

Figure 5. Employment (2006)\textsuperscript{v}

\textsuperscript{iv} Figure 4. Higher education (2006)

\textsuperscript{v} Figure 5. Employment (2006)
The region’s community — education, employment and income

Community overview

Narromine and Warren are the major service centres for the cotton irrigation sector. Agriculture represent a significant percentage of the total employed population for these towns, that is far higher than the overall average for the region. In practice much of the other employment relies on agriculture as well.

For many irrigators in Narromine the proximity to Dubbo (40 km) provides important linkages with the non-agricultural economy, but for those around Warren (150 km from Dubbo) that benefit is reduced.

As part of this assignment, a telephone survey was conducted across all priority irrigation regions. Forty-two respondents were included in the valley out of a total of 1,650 basin-wide. Figure 2 shows that the respondents were mainly livestock farmers with the remainder largely broadacre croppers.

The survey sought responses to two main questions: “what are the key regional issues” and “how optimistic are you about life”? Figure 7 reports that the community feels highly exposed to major stresses including access to essential services and financial worries. However, Figure 8 shows that overall people remain highly optimistic about the future and feel strongly part of a community.
Figure 7: Regional issues

Note: 1 = no problems to 5 = significant problem. Number of responses = 42.

Figure 8: Optimism (regional people)

Note: 1 = completely dissatisfied to 5 = completely satisfied. Number of responses = 42.
The region’s community — demographics and key statistics

Table 2. Demographics and key statistics (LGAs within study area. 2006)*

<table>
<thead>
<tr>
<th></th>
<th>Dubbo</th>
<th>Narromine</th>
<th>Warren</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>37,868</td>
<td>6,394</td>
<td>2,664</td>
<td>46,926</td>
</tr>
<tr>
<td>Total Indigenous</td>
<td>3,907</td>
<td>1,015</td>
<td>331</td>
<td>5,253</td>
</tr>
<tr>
<td>Indigenous as %</td>
<td>10.3%</td>
<td>15.9%</td>
<td>12.4%</td>
<td>11.2%</td>
</tr>
<tr>
<td>Occupied Dwellings</td>
<td>13,989</td>
<td>2,472</td>
<td>1,123</td>
<td>17,584</td>
</tr>
<tr>
<td>Fully owned</td>
<td>4,270</td>
<td>981</td>
<td>441</td>
<td>5,692</td>
</tr>
<tr>
<td>Being purchased - directly or rent/buy scheme</td>
<td>4,563</td>
<td>663</td>
<td>269</td>
<td>5,495</td>
</tr>
<tr>
<td>Rented</td>
<td>3,916</td>
<td>682</td>
<td>353</td>
<td>4,951</td>
</tr>
</tbody>
</table>

Employment

<table>
<thead>
<tr>
<th></th>
<th>Dubbo</th>
<th>Narromine</th>
<th>Warren</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total employed population</td>
<td>16,982</td>
<td>2,742</td>
<td>1,244</td>
<td>20,968</td>
</tr>
<tr>
<td>Employed in agriculture</td>
<td>677</td>
<td>811</td>
<td>543</td>
<td>2,031</td>
</tr>
<tr>
<td>Employed in agriculture (%)</td>
<td>4%</td>
<td>29.6%</td>
<td>43.6%</td>
<td>9.69%</td>
</tr>
</tbody>
</table>

Employed in services (per 1000 population)

<table>
<thead>
<tr>
<th></th>
<th>Dubbo</th>
<th>Narromine</th>
<th>Warren</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education and training</td>
<td>39.4</td>
<td>33.0</td>
<td>27.8</td>
<td>37.9</td>
</tr>
<tr>
<td>Health care and social services</td>
<td>60.3</td>
<td>44.7</td>
<td>36.4</td>
<td>55.9</td>
</tr>
<tr>
<td>Arts and recreation</td>
<td>6.0</td>
<td>2.5</td>
<td>2.3</td>
<td>4.7</td>
</tr>
</tbody>
</table>

The regional economy

Regional economic structure

The region is a story of two communities:

- Dubbo, which is now a thriving service centre for a wide area of central west NSW; and
- irrigation dependent shires at Narromine and Warren that have suffered from the drought over the last eight years.

There is a high level of employment in Retail Trade and Health Care Services for the region as a whole (see Figure 9), but this is located almost entirely within Dubbo, with 80% of this employment occurring within the city.

This picture is also true of other professional sectors such as Cultural and Recreational Services, Finance and Insurance, and Property and Business Services.

Manufacturing is also preferentially located in Dubbo which provides services for the mining sector across central NSW.

By contrast 67% of all employment in agriculture is located in Narromine and Warren, which represents 44% of employment in Warren. This is in contrast to Dubbo where farming is only 4% of employment.

Regional response over the last five years

Impact of drought

The continued drought over eight years has seen a dramatic reduction in the level of economic activity in the cotton sector (Figures 10 and 11).
Figure 9. Industry segmentation (2006)

Figure 10. Allocation of General Security since 2000-01
This reduction in cotton production has had major impacts on the wider regional economy. The table below shows that employment in Warren shrunk between 2001 and 2006. This fall has continued since then with the total population now only half its earlier size, with consequential impacts for employment particularly for unskilled labouring jobs.

**Table 3. Population and Employment — Warren: Changes between 2001 and 2006**

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2006</th>
<th>Reduction</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>3,149</td>
<td>2,664</td>
<td>485</td>
<td>15</td>
</tr>
<tr>
<td>Indigenous</td>
<td>371</td>
<td>331</td>
<td>40</td>
<td>11</td>
</tr>
<tr>
<td>Total Employed</td>
<td>1,511</td>
<td>1,245</td>
<td>266</td>
<td>18</td>
</tr>
<tr>
<td>Professionals (all)</td>
<td>642</td>
<td>593</td>
<td>49</td>
<td>8</td>
</tr>
<tr>
<td>Trades</td>
<td>153</td>
<td>137</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Labourers</td>
<td>236</td>
<td>144</td>
<td>92</td>
<td>39</td>
</tr>
</tbody>
</table>

**Adapting to drought**

Irrigators have responded to the recent run of dry years in a range of ways:

- all have reduced the area planted to cotton, with smaller growers exiting the sector entirely;
- some have diversified from reliance on cotton into other niche crops such as lupins, sorghum and chickpeas; and
- some have concentrated more on winter cereal crops.

But none of these alternative enterprises has the same return as from cotton and none provide employment or processing at the same level across the district. None provides the same established market access. Unlike the Namoi and Gwydir valleys summer rainfall is not sufficient to support dryland summer cropping.
Cotton processors have reduced the operation of the gins in the valley. Of the 5 originally operating, one has closed permanently, three have operated only intermittently, with only one gin still consistently in use. One processor has resorted to shipping cotton lint to the Gwydir to maintain the throughput of its gin there. This is important to retain customer loyalty as the processors rely on external growers for 75% of their normal throughput.

Secondary service providers in the public and private sectors have also been hard hit by the reduction in the purchasing power of the cotton sector.

**Buyback**

Irrigators in the Macquarie have also responded to drought by selling entitlement through the buyback scheme and similar state-based initiatives.

**Table 4. Buyback in the Macquarie (note: rounding error may occur)**

<table>
<thead>
<tr>
<th>Program</th>
<th>General Security (ML)</th>
<th>Supplementary (ML)</th>
<th>LTCE (ML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restoring the Balance (Commonwealth)</td>
<td>61,215</td>
<td>1,888</td>
<td>26,107</td>
</tr>
<tr>
<td>RiverBank (State)</td>
<td>36,016</td>
<td>140</td>
<td>15,156</td>
</tr>
<tr>
<td>Wetland Recovery Program (Joint)</td>
<td>5,891</td>
<td>1,302</td>
<td>2,748</td>
</tr>
<tr>
<td>Total held for environment</td>
<td>103,122</td>
<td>3,330</td>
<td>44,011</td>
</tr>
</tbody>
</table>

Local contacts suggest that most of the revenue has gone to pay off debt rather than being invested directly in the region. This sale will reduce the productive capacity of the region and its ability to "bounce-back" if allocations return. Equally, the volume of buyback across northern NSW (such as Twynam’s recent sale of 240 GL including 40 GL from the Macquarie) will lead to closure of gins across the region as total production volumes fall. Recent sales of major irrigation properties in the valley will exacerbate this trend.

A further 48 GL is also anticipated from implementation of the Private Irrigation Infrastructure Operators Program across the Valley.

There has therefore been a significant movement towards any new SDLs and meeting environmental flow requirements for the river and Macquarie Marshes on top of the existing 160 GL Environmental Water Allowance.

**Regional vulnerability**

**Regional vulnerability**

The levels of unemployment recorded at Figure 13 underestimate the severity of the situation as they do not record the loss of young people from the district who move to the larger regional centres for education and seeking work. Warren is losing its younger members in comparison with the norm for NSW, with a significant reduction in the population between the ages of 12 and 35, but a relative increase in the age bands between 60 and 85. This creates an unsustainable community structure with few working families with breadwinners in the 20-35 year age bracket and many older people.

**Regional water dependence**

The region’s economy is highly dependent on access to water for irrigation. This is particularly true of the communities to the west of the region, such as Warren. The review of constraints on business operation identified that access to water is by far the largest factor in limiting current and future business activity. The tables above confirm the direct correlation between the level of allocation for General Security and the area of cotton production.

Most properties are barely breaking even under current drought conditions, with cotton more heavily capitalised than other sectors.
Community resilience to change in water allocation

A change in water allocation would impact both on primary producers and on the significant processing sector in the Macquarie.

There is a direct correlation between water availability and the level of cotton production. This is largely a function of the allocation of General Security entitlement. This has been zero in three of the last eight years. Many of the off-river schemes cannot operate at these low allocations, so the total impact on production has been even more severe than the allocation data might suggest.

Any reduction in water allocated for diversions would translate into a reduction in the total area under irrigation. However, projected reductions would still involve higher levels of water availability than have been experienced over the last five years.

The sale of entitlement to the State and Federal governments has seen a shift in the relative balance with the transfer of 100 GL to the environment.

There is a strong sense across the community that the smaller towns are on a knife-edge. Cotton production and processing have traditionally generated sufficient return to support a vibrant secondary service sector at the local scale. That has sustained the economy and population of the local small towns, which has justified retention of government services. Reduction of employment and revenues at this scale risks the viability of these smaller centres such as Warren.

Even if there were a return to historic levels of water allocation it is questionable whether these communities would bounce back as:

• there has been a loss of service sectors to support smaller farms;
• technological change has reduced the demand for labour; and
• the buyback scheme has reduced the total volume of water available to allocate to cotton.

On the other hand the cotton sector has seen a remarkable and continuing growth in productivity over the last five years so that the same production can now be generated from 35,000 ha which previously required 55,000 ha, with an equivalent reduction in the total water required.

Any change would also impact on the cotton processing sector. The gins have been an important source of employment and training for tradespeople across the community. It is unlikely that the four gins would all continue in operation under long-term reduced water availability. A reduction in long-term average water use by 20% would be likely to see the closure of at least one gin. A 40% reduction would see two close and a 60% reduction might result in only one remaining in operation. Any such closures would have a big impact on the small regional centres.

These are working towns and people move away if there is no work. Gin closures would put a big dent in the demand for the existing retail and service sectors there. This would make it harder again for farmers in the more remote parts of the catchment to attract and retain skilled workers, especially those with young families desiring ready access to schools and other services. The cotton sector has traditionally been sufficiently profitable to employ a core of tertiary educated managers across the region. A reduction in the level of activity is making it increasingly difficult to attract and retain these skilled staff.
Figure 12. Index of Relative Socio-economic Advantage and Disadvantage (2006)

Figure 13. Unemployment and labour force participation (2006)
Scope for regional transformation

Scope for farm transformation

There is low capacity for cotton farms to transform profitably into the production of different commodities. All growers already manage a diversified portfolio including a variety of grains and pulses to ensure a sustainable rotation of crops. However, those other crops hardly cover their costs of production. Cotton is a large area annual irrigated crop whose area of production can easily be adjusted by season to match the available water allocation. The product is all exported with established markets. Other high value irrigated crops tend either to be permanent plantings (which require High Security water) or niche products (that can only support a small number of producers with volatile markets).

Irrigated cotton generates a far higher return for the area under cultivation and far higher levels of employment than dryland activities. Evidence from growers in Queensland suggests a factor of around eight. This disparity is now strongly evident to the Macquarie community as Agriland, a major cotton and citrus grower at Trangie, has recently decided to exit the irrigated sector, making 20 people redundant. It will continue as a dryland enterprise employing 1.5 people and relying on contractors on a seasonal basis. That is not a positive alternative enterprise model for the wider region.

Any transformation would also impact on the secondary processing sectors as cotton generates a higher level of regional employment through its ginning and processing than other sectors.

There may be scope for some irrigation enterprises to change their crop mix, with a few able to make the shift to large-scale vegetable production or niche sectors such as citrus juicing. However, these markets would soon be saturated if everyone tried to make the same change. Several growers have diversified in the past into crops such as processing tomatoes but have found it very difficult to build secure contracts for highly perishable commodities.

It is likely that water trade would see any surplus water move away from these alternative enterprises to support the remaining cotton industry.

Scope to strengthen irrigation management

There is limited scope to further strengthen irrigation management in the cotton industry. Further changes are likely to be evolutionary rather than revolutionary. Drip tape has been tried on pilot plots in the Macquarie. However, the costs are prohibitive. The Namoi and Gwydir are looking at travelling irrigators due to soil conditions. However, there is little incentive to implement these capital intensive approaches at the scale required in the face of uncertainty in water availability. Cotton is an opportunistic annual crop that expands and contracts to meet varying annual allocations. In order to be viable, that model has to minimise fixed capital costs that can be stranded in years of low water allocation.

Reduced water availability may result in some consolidation of farms and the cessation of irrigation on certain marginal lands.

There is scope to further strengthen irrigation management, but this will require significant changes to the off-stream supply schemes following the modernisation reviews. It is understood that the larger schemes are looking to concentrate irrigation on bigger properties closer to the river.
Water availability scenarios — introduction

Description of scenarios

Face-to-face interviews of key stakeholders, and a telephone survey of 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 allocations for the irrigation region. Baseline data are provided below. Current entitlements and allocations are determined by reference to The Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2004. This now limits average annual extractions to 392 GL (assumed to be equivalent to Long-term Cap Equivalent entitlements for the region) or 53% of aggregate diversion entitlement. Data on historic allocation and usage comes from the MDBC’s Water Audit Monitoring Reports. They cover the wider Macquarie/Castlereagh and Bogan systems. In practice the majority of irrigation diversions occur in the Macquarie from Burrendong Dam. The region also has access to 68 GL of groundwater resources allocated under the Water Sharing Plan for the Lower Macquarie Groundwater Sources.

Table 5. 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>Macquarie</td>
<td>390xvii</td>
<td>100xvii</td>
<td>45xx</td>
<td>30xv</td>
<td>800xxi</td>
</tr>
</tbody>
</table>

Table 6. Historical water statistics

<table>
<thead>
<tr>
<th>Region</th>
<th>Entitlement (GL)</th>
<th>Long-term average use (GL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macquarie</td>
<td>739xiv</td>
<td>453xviii</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></td>
<td></td>
<td></td>
<td>GL</td>
<td>GL</td>
<td>GL</td>
</tr>
<tr>
<td>Macquarie</td>
<td>TOTAL</td>
<td>Cotton</td>
<td>315</td>
<td>235</td>
<td>155</td>
</tr>
</tbody>
</table>
Water availability scenarios — direct impacts (face-to-face interviews)

There is a direct correlation between water availability and the level of cotton production. This is largely a function of the level of allocation of General Security entitlement. Any reduction in water allocated for diversions would translate into a reduction in the total area under irrigation. On the other hand the cotton sector has seen a remarkable and continuing growth in productivity over the last five years so that the same production can now be generated from 35,000 ha which previously required 55,000 ha, with a reduction in the total water required.

The cotton sector is used to responding to highly variable levels of water availability, with the ability to adjust the area under cultivation to match available water supplies. The water markets and carry-over have also been important tools in helping maximise the area planted.

The cotton sector comprises two scales of operation: a small number of major corporate players with fully integrated vertical businesses, and then a large number of small, family farms that supply cotton product to the gins operated by those major players. There is a mutual dependence between the sectors. The small players rely on the major corporates as their route of market access, while the majors rely on the family farms to maximise the throughput of their processing plants.

Any reduction in allowable diversions would be likely to impact differentially on these two categories:

- the major players would be able to buy up additional entitlement to maintain their own production. This would follow recent experience where Auscott, has been able to maintain a minimum level of production over the recent seasons, at least to cover its fixed costs of production, as it has access to water out of the upgraded Nevertire scheme and has purchased additional water as required;
- most of the small properties are supplied from the older off-river schemes. These have not been able to operate during the last eight years of low allocations. Several of the schemes are likely to close and those that remain will see major rationalisation to reduce scale and water losses. These pressures will be stronger as the level of reduction increases. There is likely to be a consequential consolidation in the family-farm sector with a growth in medium sized properties at a more competitive scale; but too strong a contraction in the level of activity amongst family farms would undermine the viability of the major corporates who rely on the additional product to achieve economies of scale in processing.

<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>Macquarie</td>
<td>Cotton</td>
<td>Contraction from peak planting in 2001 directly proportional to the reduced allocation. Some consolidation of properties but continued viability.</td>
<td>An equivalent reduction in production lost (i.e. -40%). Many smaller properties would cease to irrigate.</td>
<td>At this level of allocation most of the off-river irrigation schemes could not afford to operate. This would effectively sterilise cotton growing in the valley.</td>
</tr>
<tr>
<td>Macquarie</td>
<td>Horticulture: viticulture and citrus</td>
<td>There is a small horticulture sector with access to High Security entitlement and/or groundwater. This sector would be able to buy water to maintain production.</td>
<td>High Security is only 2.6% of total entitlement so it is assumed that horticulture would be able to survive under all 3 three scenarios.</td>
<td>High Security is only 2.6% of total entitlement so it is assumed that horticulture would be able to survive under all 3 three scenarios.</td>
</tr>
</tbody>
</table>
Water availability scenarios — value chain and flow-on impacts (face-to-face interviews)

Cotton processing is an important component of the regional economy. It has traditionally provided skilled employment in the more remote communities based around the five gins in the region. These have been major sources of investment and employment. One of the five gins has already closed as a response to the drought, with only one of the other four operating consistently through the recent seasons.

Three of the gins are moth-balled but with an expectation that they will re-open when allocations return ‘to normal’. A formal reduction in the long-term access to diversions would provide a signal for reduction in the level of processing across the region. A greater than 40% reduction in diversions would be likely to see all gins close and processing consolidated in neighbouring valleys.

There is a strong sense across the community that the smaller towns are on a knife-edge. Cotton production and processing have traditionally generated sufficient return to support a vibrant secondary service sector at the local scale. That has sustained the economy and population of the local small towns, which has justified retention of government services. Reduction of employment and revenues at this scale risks the viability of these smaller centres such as Warren.

Even if there were a return to historic levels of water allocation it is questionable whether communities would bounce back as:

- there has been a loss of service sectors to support smaller farms;
- technological change has reduced the demand for labour; and
- the buyback scheme has reduced the total volume of water available to allocate to cotton.

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>Macquarie</td>
<td>Cotton processing</td>
<td>A permanent reduction in production would see consolidation of processing capacity with closure of one gin.</td>
<td>Probable halving of the processing capability with closure of two gins. Significant reduction in employment and value adding.</td>
<td>Questionable viability of processing within the valley. High likelihood of consolidation of ginning capacity across valleys with transfer of cotton to the neighbouring Namoi.</td>
</tr>
<tr>
<td>Macquarie</td>
<td>Service sectors</td>
<td>Some loss of capacity and employment across sectors including retail, pubs and clubs.</td>
<td>Major impact on service sectors - undermining the quantum needed to support these services.</td>
<td>Not viable with the loss of most of the specialist contracting skills and services required.</td>
</tr>
</tbody>
</table>
Figure 14 Map of irrigation district
Endnotes

1 Senator the Hon Penny Wong, Media Release 83/10, *Infrastructure Rolls Outs in Macquarie River Catchment*, 13 April 2010
2 State Water data from Regional Manager 2010
3 Ashley Wielinga, General Manager, Warren Shire Council
4 Senator the Hon Penny Wong, Media Release 83/10, *Infrastructure Rolls Outs in Macquarie River Catchment*, 13 April 2010
11 State Water (2010), pers comm., Sri Srithraran, Regional Manager
12 Macquarie River Food and Fibre, pers comm., Susan Madden, Executive Officer, March 2010
17 NSW WSP
18 Published figures from the NSW and Commonwealth Governments were used to estimate buybacks.
19 Many of the off-river schemes are proposing co-investment with DEWHA under the *Private Irrigation Infrastructure Operators Program*
20 State Water records 600 licensed diverters. However, 7 of these are the off-river schemes, each of which has 25 members.
22 MDB's *Water Audit Monitoring Reports*
23 Note that due to insufficient respondent numbers for responses to water availability scenarios, that output from the telephone survey is not included here. Please refer to MJA's Synthesis Report for information about survey outcomes.