

# INFORMATION AUDIT OF SOCIO-ECONOMIC ACTIVITIES IN THE MACQUARIE RIVER CATCHMENT

Prepared for

**Department of Environment  
and Climate Change (NSW)**

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Prepared by



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Photo: Cudgegong River 2007.

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## Acronyms and abbreviations

ABS	Australian Bureau of Statistics
CMA	Catchment Management Authority
DECC	Department of Environment Climate Change
DSRD	Department of State and Regional Development
Ha	Hectares
IQQM	Integrated Quantity and Quality Model
km	Kilometres
LGA	Local Government Area
MMMC	Macquarie Marshes Management Committee
ML	Mega Litre
NWI	National Water Initiative
SEIFA	Socio-Economic Index for Areas
WMA	Water Management Act 2000
WSP	Water Sharing Plan

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## EXECUTIVE SUMMARY

The Department of Environment & Climate Change (DECC) wishes to have relevant information regarding socio-economic activities in the Macquarie River catchment of Central NSW collated and analysed.

### **The Macquarie Catchment**

The population of the Macquarie Catchment was estimated at 266,978 for 2006, an increase of 5.2% of the population estimated for the 2001 Census. The largest populations in the Macquarie Catchment are found in the Orange, Dubbo and Bathurst LGAs, which together were estimated to account for 43% of the population of the Catchment in 2006.

The total value of agricultural production in the Macquarie Catchment exceeded \$2.2 billion in 2001.

### **Macquarie Irrigation Subgroup**

For the purposes of the socio-economic profile a Macquarie Irrigation Subgroup of LGAs has also been specified to allow a focus on the key regions for irrigated agricultural production. These LGAs are found along a 'spine' in the Macquarie Catchment which runs through the centre of the Catchment following the Macquarie River. The population of the Macquarie Irrigation Subgroup is estimated to have grown by 4.8% over the five years to 2006, to 82,890. The Brewarrina and Warren LGAs had the highest population growth rates, showing a rise in the population of more than 6.0% over the five years to 2006. Bathurst and Lithgow made the highest absolute contribution to population growth, by around 2,500 persons in each LGA.

Dubbo is the largest population centre in the Macquarie Irrigation Subgroup (48% of population in 2006) and the Macquarie Catchment (15% of population in 2006).

The LGAs within the Macquarie Irrigation Subgroup show higher proportions of indigenous persons in the population (9.4%) when compared to NSW (1.9%) in 2001. Across the Subgroup, indigenous unemployment averages 3 times the level seen for the non-indigenous population, at 23% compared to 7%. The proportion of indigenous persons in each LGA of the Subgroup varied significantly in 2001, ranging from as low as 2.3% in the Mid Western Regional LGA to 50.2% in the Brewarrina LGA.

The highest disparity in the unemployment rate is seen in the Brewarrina LGA, where the indigenous unemployment rate is 5.5 times higher than that of the non-indigenous population. Dubbo and Warren also showed high disparity, with rates of unemployment 4.5 and 4.8 times higher for the indigenous population respectively. The highest level of indigenous unemployment is shown in Warren (27%), with the lowest in Mid Western Regional (18%).

The agriculture, forestry and fisheries sector is one of the largest employers in the Subgroup. Agricultural industries employ 99.2% of persons in the sector, of which 7.6% are engaged in providing services to agricultural industries. The remaining fraction of employment is generated by forestry.

Aggregate household incomes within the Subgroup are similar to those of NSW. However, incomes varied across the individual LGAs, with Wellington notably having lower income levels. Only 17% of households earned \$1,000 or more income per week in 2001, while 44% of households earned less than \$500 per week. The lower incomes seen here may be reflective of the growth in the older age groups as a proportion of the population.

With respect to average individual annual taxable income, only the Dubbo LGA shows a similar level of income to the rest of the state. The other LGAs show a lower level of average taxable income, with the disparity ranging up to \$11,100 in the case of Brewarrina.

### **Major industries**

The major agricultural industries of the Macquarie Catchment include crops, livestock and fruit production. Cropping is the most significant contributor to the value of agricultural production at both the Catchment and Subgroup level.

The total value of agricultural production in the Macquarie Catchment exceeded \$2.2 billion in 2001, which was 23.5% of the value of agricultural production estimated for NSW. Crops accounted for 45% of the value of agricultural production, with the combined livestock slaughterings and livestock products accounting for a further 52%. Fruit production accounted for only 2% of agricultural production in the Catchment. The value of agricultural production in the Subgroup was estimated at \$525 million in 2001.

Dubbo, Brewarrina, Wellington and Mid Western Regional LGAs all differ from Warren and Narromine in having much lower values of crop production, and higher proportions of agricultural production derived from livestock production. In most cases, fruit accounts for a small proportion of agricultural production (an average 3% for the Subgroup), with the exception of Mid Western Regional LGA, where fruit accounted for 14% of agricultural production, and 72% of total fruit production in the Subgroup.

Importantly, Warren and Narromine together accounted for 76% of the value of cropping activities in the Macquarie Irrigation Subgroup in 2001.

Tourism also plays an important role in the Macquarie Catchment, particularly in the east, around centres such as Mudgee and Orange. In the year ending December 2006, Central NSW received 1.8 million overnight visitors from within Australia, which was down 2.4% on the previous year, and down 22.9% since 2002.

In the year ending December 2006 there were an estimated 4.7 million visitor nights in Central NSW, during which domestic visitors spent an average \$121 per night. The industry supports an estimated 5,000 jobs in the region accounting for 5% of the workforce (Tourism NSW 2006).

A NSW Tourism report completed on the Hunter and Mudgee wine regions in 2004 identified that average daily expenditure on wine per group member surveyed as part of the study was \$109. The average level of cellar door expenditure was \$45, average daily accommodation expenditure was \$60, while average daily food expenditure was \$35.

### **Climate Change**

A report by CSIRO (2006) suggests that NSW is likely to become warmer in the future, with more hot days and fewer cold nights. Droughts are likely to become more frequent and more severe, with greater fire risk. Water resources are likely to be further stressed



due to projected growth in demand for cities, industry and environmental flows and climate-driven changes in supply for irrigation.

Little change in annual rainfall with higher evaporative demand would lead to a tendency for less run-off into rivers, The most likely changes to mean annual Burrendong Dam storage, Macquarie Marsh inflows and irrigation allocations are 0% to –15% in 2030 and –0% to –35% in 2070. Flow increases have only a 5% probability of occurring in 2030 and 2070 under most assumptions.

Climate change may result in marginal agricultural land becoming unsuited to production, thus increasing the value of the remaining ‘better’, more viable agricultural land (DEH 2006).

### **Reliance on Irrigated Agriculture and Options**

Irrigated agriculture is of most significance in the Warren and Narromine LGAs. In these LGAs, cotton accounted for 88% and 69% of the irrigated area respectively in 2001. There was no irrigated cotton production reported for the other LGAs of the Subgroup in 2001. The gross value of cotton production in the Macquarie Valley Catchment was estimated at \$3,215 per hectare in 2005 (CRDC 2006).

Other important industries in the Subgroup include viticulture and horticulture, which dominate in the slopes region around Mudgee, Orange and Wellington, and citrus is grown in Narromine, and cotton and other summer crops are grown on the lower valley floodplains west of Dubbo. Irrigation occurs adjacent to the Macquarie River or in the seven off-river schemes. Irrigation is far less prominent in the Castlereagh and Bogan catchments.

Within the cropping industry in the Subgroup, 35% of the value of production is derived from cereal production which would include dryland crops. This is dominated by wheat which accounted for 93% of the value.

There has been some move to diversify into other summer crops in the lower Macquarie, partly in response to lower water supplies and higher feed prices due to the drought. However, the more likely changes would involve consolidation of properties into larger entities as is the case across most agricultural industries. Options involving permanent plantations are concentrated in the Mudgee region and many summer crops use similar volumes of water as cotton.

An area for efficiency improvements may be the rationalisation of some schemes which have large lengths of channels and also improvements in storage and on farm conveyance. The best potential for efficiency gains is through an incremental improvement in management on-farm using current methods.

# 1 INTRODUCTION

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## 1.1 Study Purpose

The Department of Environment & Climate Change Conservation (DECC) wishes to have relevant information regarding socio-economic activities in the Macquarie River catchment of Central NSW collated and analysed.

This information is being considered in order to understand the implications of reallocating water from consumptive users to the environment. A comprehensive understanding of the socio-economic landscape within the Macquarie River catchment is a key element of this understanding.

## 1.2 Approach Used

The study was desktop in nature and aimed to:

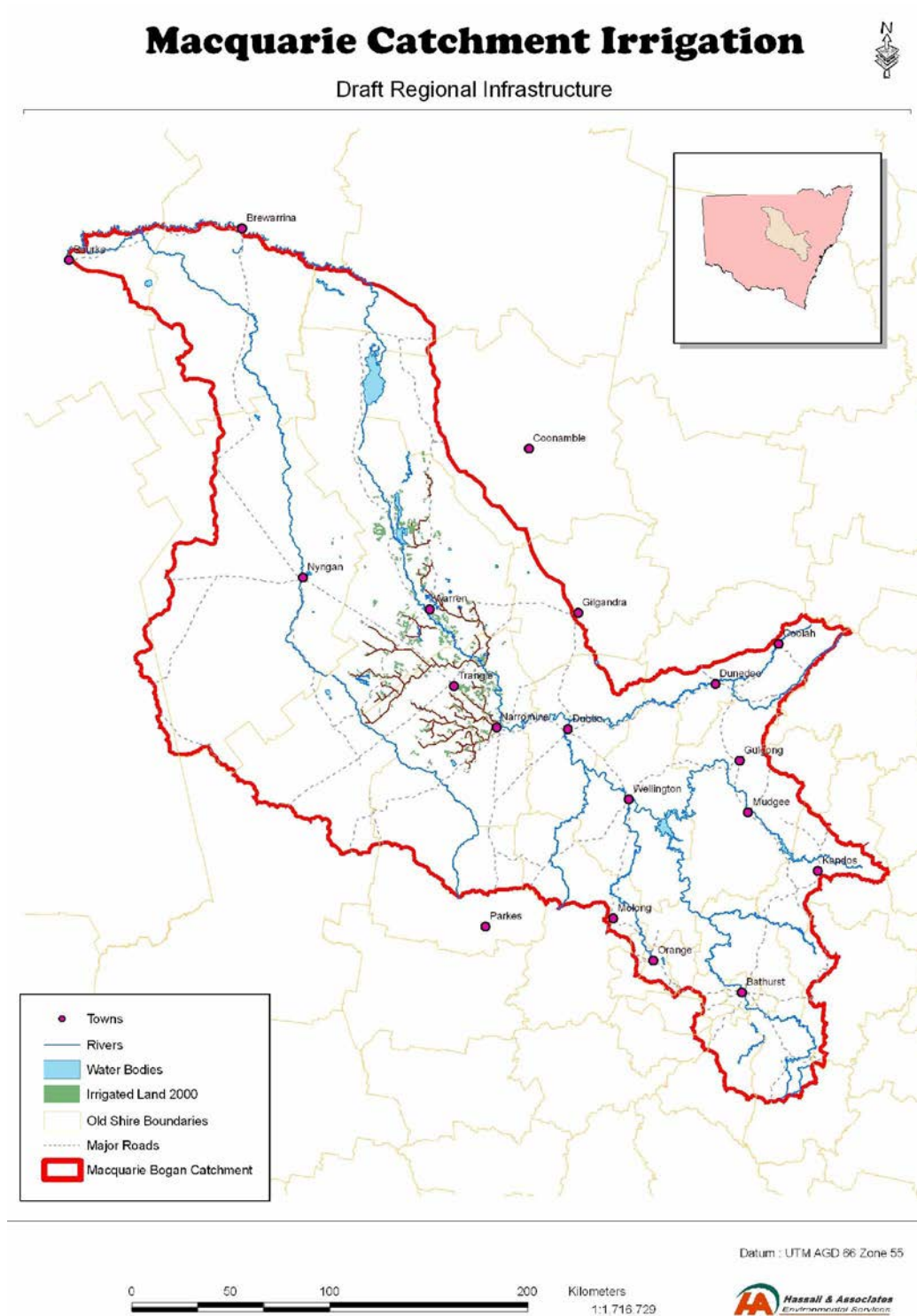
- § carry out a review of available data;
- § identify relevant indicators; and
- § suggest any trends in data on irrigated agriculture within the region which are particularly relevant to water policy and the irrigation sector.

The profile is in two parts. First, there is a review of available Australian Bureau of Statistics (ABS) data and second, a review of available information on the irrigated agricultural sector within the catchment.

### 1.3 Study Area

Defining a Study Area for profiling purposes was required for baseline collation. The catchment is shown in Figure 1.

Figure 1: Macquarie Catchment



Source: Swan (2007).

## 2 SOCIO-ECONOMIC PROFILE

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### 2.1 General background

**Catchment** The Local Government Areas (LGAs) in the Macquarie Catchment include Bathurst Regional, Blayney, Bogan, Bourke, Brewarrina, Cabonne, Cobar, Coonamble, Dubbo, Gilgandra, Lachlan, Lithgow, Mid Western Regional, Narromine, Oberon, Orange, Parkes, Walgett, Warren, Warrumbungle, and Wellington. Many of these LGAs also include extensive areas which are outside the Macquarie Catchment boundary.

**Changes to LGAs** There have been number of changes to LGA boundaries over the past 5 years which impact on reporting within this profile. The key changes that have occurred are:

- § Mid Western Regional Council LGA has been formed, largely from the aggregation of the former Mudgee and Rylstone LGAs;
- § Bathurst Regional LGA was formed from the former Bathurst and Evans LGAs; and
- § the Warrumbungle LGA, formed from the former Coonabarabran and Coolah LGAs.

The information reported in the socio-economic profile refers to the new LGAs. In all cases, this information is based on the aggregation of the previous LGA-based information.

**Macquarie Irrigation Subgroup** For the purposes of focusing on the key irrigation areas of the Macquarie Catchment a Macquarie Irrigation Subgroup has been defined. The Subgroup consists of the Brewarrina, Dubbo, Mid Western Regional, Narromine, Warren and Wellington LGAs which essentially run down the centre of the catchment along the Macquarie River and include a majority of the area of irrigated agriculture.

**Census Release Dates** A large proportion of the data used in this socio-economic profile has been sourced from the Australian Bureau of Statistics (ABS) Census of Population and Housing and Agricultural Census. While the most recent Census was carried out in 2006, the first data from that Census will not be released until late June 2007. This first release will consist of base data sets such as population and dwelling counts.

The second data release scheduled for October/November 2007 will provide a more detailed set of data including industry level statistics and cross tabulations. Similar release schedules have been set for the Agricultural Census data.

As a consequence, most of the statistics reported in the profile as based on data collected during the 2001 Census of Population and

Housing, with some data also provided on the 1996 Census for comparative purposes. Where available, more recent estimates have been included, such as for population and state level unemployment.

## 2.2 Macquarie Catchment

**The Catchment** The Macquarie Catchment is located in central NSW, west of the Great Dividing Range. It has an area of 87,201 km<sup>2</sup>, approximately 8% of the Murray-Darling Basin (Hope 2003).

### 2.2.1 Social geography and demography

**Population and Change** The population of the Macquarie Catchment by LGA is provided in Table 1. Note that due to some of the LGA boundaries extending beyond the Catchment boundary, this is likely to be an over estimate of the population within the Catchment.

The largest populations in the Macquarie Catchment are found in the Orange, Dubbo and Bathurst LGAs, which together accounted for 43% of the population of the Catchment in 2006.

The population of the catchment grew by 5.2% between 2001 and 2006, with the Oberon and Blayney showing the highest levels of growth with 13.5% and 12.3% respectively. A number of these LGAs also experienced population decline over the five years to 2006, including Walgett, Cobar, Warrumbungle and Bourke and Gilgandra.

The population of NSW was estimated to have grown by 3.8% between 2001 and 2006, indicating that growth in the Macquarie Catchment was higher than the average level of growth in the state. However, as noted above, a number of LGAs in the Catchment showed low or negative population growth.

**Table 1: Population and Change – 1996 to 2006**

<b>LGA</b>	<b>1996</b>	<b>2001</b>	<b>2006</b>	<b>Change 1996 to 2001</b>	<b>Change 2001 to 2006</b>
Brewarrina	2,193	2,060	2,201	-6.1%	6.8%
Dubbo	36,701	37,659	39,500	2.6%	4.9%
Mid Western Regional	20,808	21,356	22,260	2.6%	4.2%
Narromine	6,523	6,621	7,059	1.5%	6.6%
Warren	3,290	3,155	3,252	-4.1%	3.1%
Wellington	8,648	8,239	8,618	-4.7%	4.6%
Bathurst Regional	33,764	35,005	37,508	3.7%	7.2%
Blayney	6,025	6,141	6,894	1.9%	12.3%
Bogan	3,287	3,089	3,113	-6.0%	0.8%
Bourke	4,049	3,908	3,876	-3.5%	-0.8%
Cabonne	11,944	11,888	12,843	-0.5%	8.0%
Cobar	5,676	5,160	5,023	-9.1%	-2.7%
Coonamble	4,804	4,606	4,699	-4.1%	2.0%
Gilgandra	4,844	4,712	4,699	-2.7%	-0.3%
Lachlan	7,433	7,188	7,355	-3.3%	2.3%
Lithgow	19,248	19,197	20,981	-0.3%	9.3%
Oberon	4,608	4,847	5,503	5.2%	13.5%
Orange	33,964	35,521	37,982	4.6%	6.9%
Parkes	15,098	14,455	15,099	-4.3%	4.5%
Walgett	8,550	8,310	8,047	-2.8%	-3.2%
Warrumbungle	10,764	10,664	10,466	-0.9%	-1.9%
<b>Macquarie Catchment</b>	<b>252,221</b>	<b>253,781</b>	<b>266,978</b>	<b>0.6%</b>	<b>5.2%</b>

Source: ABS (1996, 2001) Census of Population and Housing, and ABS (2007) Regional Population Growth.

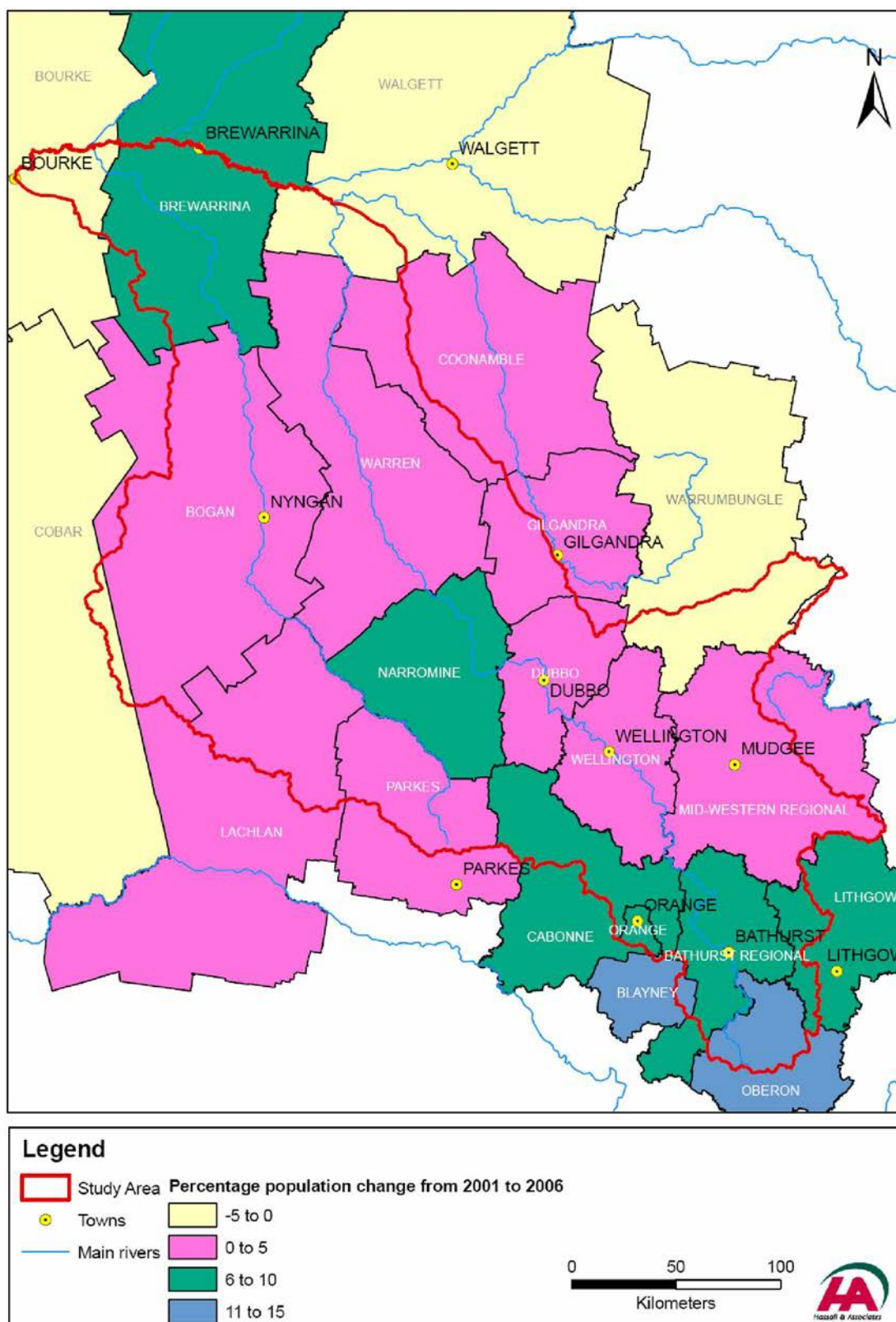
### **Population Change**

A spatial analysis of population change across the LGAs of the Macquarie Catchment is provided in Figure 2.

The map shows that the LGAs which experienced a population decline were predominantly located on the boundary of the Catchment, while those experiencing positive growth were closer to the middle of the Catchment. Blayney and Oberon, at the south eastern end of the Catchment showed the strongest growth.

The map also identifies the population centres which are within and outside of the Macquarie Catchment boundary. The main townships located within the Catchment are Dubbo, Wellington, Orange, Bathurst, Mudgee and Nyngan, while Parkes, Lithgow, Walgett and Gilgandra are outside the boundary. This has a strong influence on the distribution of the population within the Catchment.

**Figure 2: Population Change in the Macquarie – 1996 to 2001**



Source: ABS (2001) Census of Population and Housing.

### 2.2.2 Socio-economic profiles and economy

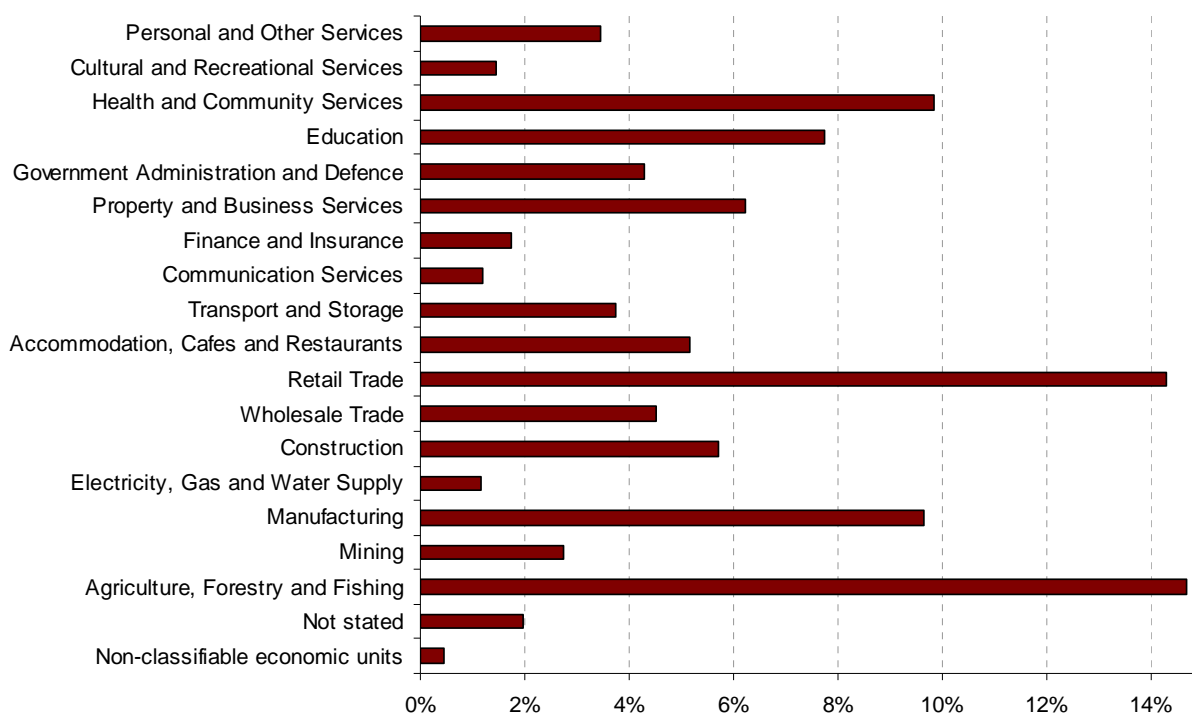
#### Employment by Industry

The employment of persons in the workforce by industry is provided in Figure 3 for the Macquarie Catchment in 2001.

The largest employer of the workforce is the agriculture, forestry and fishing sector, which employed close to 15,500 persons in 2001. Other important sectors included the retail trade, health and community services, and manufacturing.

The Cabonne, Mid Western Regional, Lachlan and Warrumbungle LGAs employ the largest number of persons in the agriculture, fisheries and forestry sector at over 1,100 persons in each of the LGAs.

**Figure 3: Industry of Employment, Macquarie Catchment – 2001**



Source: ABS (2001) Census of Population and Housing.

Comparatively, the highest sectors of employment in NSW are the retail trade, manufacturing, and property and business services. At the state level, the agriculture, forestry and fishing sector employs only 3.4% of the workforce, indicating a much higher reliance on agriculture for employment in the Macquarie Catchment.

#### Agricultural Production

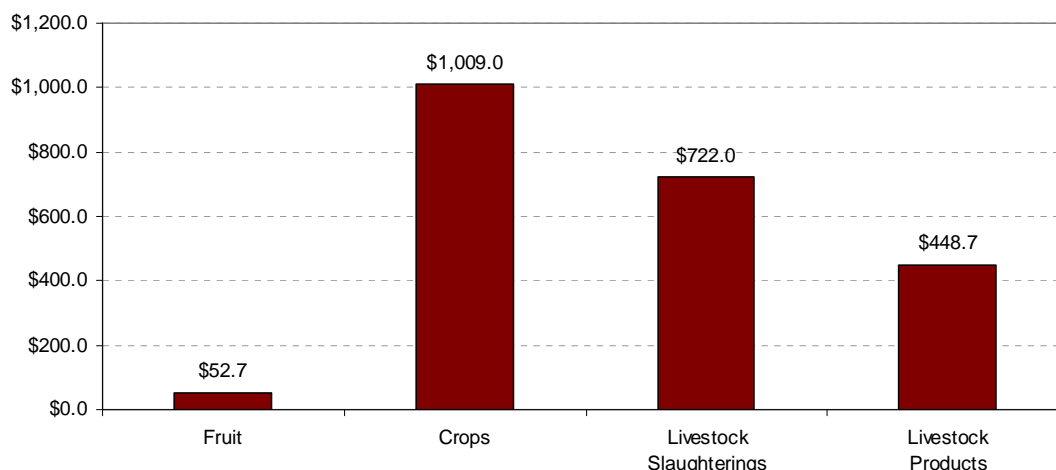
The total value of agricultural production in the Macquarie Catchment exceeded \$2.2 billion in 2001, which was 23.5% of the value of agricultural production estimated for NSW. Crops accounted for 45% of the value of agricultural production, with the combined livestock slaughterings and products accounting for a



further 52%. Fruit production accounted for only 2% of agricultural production in the Catchment.

The value of agricultural production by industry is provided in Figure 4.

**Figure 4: Value of Agricultural Production, Macquarie Catchment – 2001**



Source: ABS (2001) Agricultural Census.

### **Tourism**

Tourism also plays an important role in the Macquarie Catchment, particularly in the east, around centres such as Mudgee and Orange. In the year ending December 2006, Central NSW received 1.8 million overnight visitors from within Australia, which was down 2.4% on the previous year, and down 22.9% since 2002.

In the year ending December 2006 there were an estimated 4.7 million visitor nights in Central NSW, during which domestic visitors spent an average \$121 per night. The industry supports an estimated 5,000 jobs in the region accounting for 5% of the workforce (Tourism NSW 2006).

A NSW Tourism (2004) report completed on the Hunter and Mudgee wine regions in 2004 identified that average daily expenditure on wine per group member surveyed as part of the study was \$109. The average level of cellar door expenditure was \$45, average daily accommodation expenditure was \$60, while average daily food expenditure was \$35.

Estimated visitation in the former Mudgee Shire local government area stood at around 333,000 domestic overnight visitors at the end of the 2003 year, showing a rising trend on the average of 275,000 visitor nights noted in the 1998-2003 period.

This compares to visitation to the Bathurst area (294,000), Orange (223,000) and Dubbo, which had the highest domestic overnight visitors at 581,000 in 2003 (Tourism NSW, 2006).

### Tourism Employment and Value

Limited data is available to provide an indication of the employment and business incomes generated by tourist accommodation establishments for LGAs in the Macquarie Valley Catchment. Statistics are reported in Table 2. The LGAs for which no data is available have been excluded. Data is not published for privacy reasons in some LGAs due to the limited number of responses.

These figures indicate a significant level of employment in the tourist accommodation sector, with over 925 employment positions reported. The majority of these (86%) are provided by hotels, motels and serviced apartments that have more than 15 rooms.

These accommodation facilities also generated business income of \$13.9 million for the June quarter of 2006. Around 85% of this income was generated by hotels, motels and serviced apartments with more than 15 rooms. This would suggest that, on an annual basis, the tourist accommodation sector makes a significant contribution to the regional economy.

**Table 2: Employment and Takings by  
Accommodation Establishments –  
June Quarter 2006**

LGA	<u>Persons employed</u>			<u>Takings from accommodation (\$'000)</u>		
	<i>Hotels* (5 - 14 rooms)</i>	<i>Hotels* (15+ rooms)</i>	<i>Caravan parks</i>	<i>Hotels* (5 - 14 rooms)</i>	<i>Hotels* (15+ rooms)</i>	<i>Caravan parks</i>
Dubbo	17	262	42	239	5,024	795
Narromine		9			143	
Mid-Western Regional	9	128	22	134	1,812	362
Bathurst Regional		178			2,278	
Blayney		12				
Bourke	17			141		
Cobar		68			904	
Coonamble		8			125	
Gilgandra	11	23		136	194	
Parkes			7			112
Warrumbungle Shire	9	55		205	813	
Walgett		48			475	
<b>Total</b>	<b>63</b>	<b>791</b>	<b>71</b>	<b>854</b>	<b>11,767</b>	<b>1,269</b>

\* Note: Includes hotels, motels and serviced apartments.  
Source: ABS (2006) NSW Regional Statistics.

### Manufacturing

For the 1996-97 financial year, the ABS reported the turnover of manufacturing industries in the Macquarie Valley Catchment as \$355.5 million, based on figures reported for Dubbo, Wellington and Mudgee. Data is not reported for any other LGAs in the Catchment.

This sector also injected \$74.4 million into the regional economy in the form of incomes paid as wages and salaries.

## 2.3 Macquarie Irrigation Sub-group

### 2.3.1 Social geography and demography

#### *Irrigation Subgroup*

The population of the Macquarie Irrigation Subgroup is estimated to have grown by 4.8% over the five years to 2006, higher than the NSW state average level of growth of 3.8%. Brewarrina and Warren were the most significant contributors to population growth, with these LGAs showing an increase in the population of more than 6.0% over the five years to 2006. Only the Narromine LGA did not exceed the NSW rate of population growth. Population in the Subgroup by LGA is provided in Table 3.

Dubbo is the largest population centre in the Macquarie Irrigation Subgroup (48% of population) and the Macquarie Catchment (15% of population). The newly formed Mid Western Regional Council LGA also holds over a quarter of the Subgroup population, with Mudgee being the largest centre in that LGA.

**Table 3: Population and Change – 1996 to 2006**

<b>LGA</b>	<b>1996</b>	<b>2001</b>	<b>2006</b>	<b>Change 1996 to 2001</b>	<b>Change 2001 to 2006</b>
Brewarrina	2,193	2,060	2,201	-6.1%	6.8%
Dubbo	36,701	37,659	39,500	2.6%	4.9%
Wellington	8,648	8,239	8,618	-4.7%	4.6%
Warren	3,290	3,155	3,252	-4.1%	3.1%
Narromine	6,523	6,621	7,059	1.5%	6.6%
Mid Western Regional	20,808	21,356	22,260	2.6%	4.2%
<b>Irrigation Subgroup</b>	<b>78,163</b>	<b>79,090</b>	<b>82,890</b>	<b>1.2%</b>	<b>4.8%</b>

Source: ABS (1996, 2001) Census of Population and Housing, and ABS (2007) Regional Population Growth.

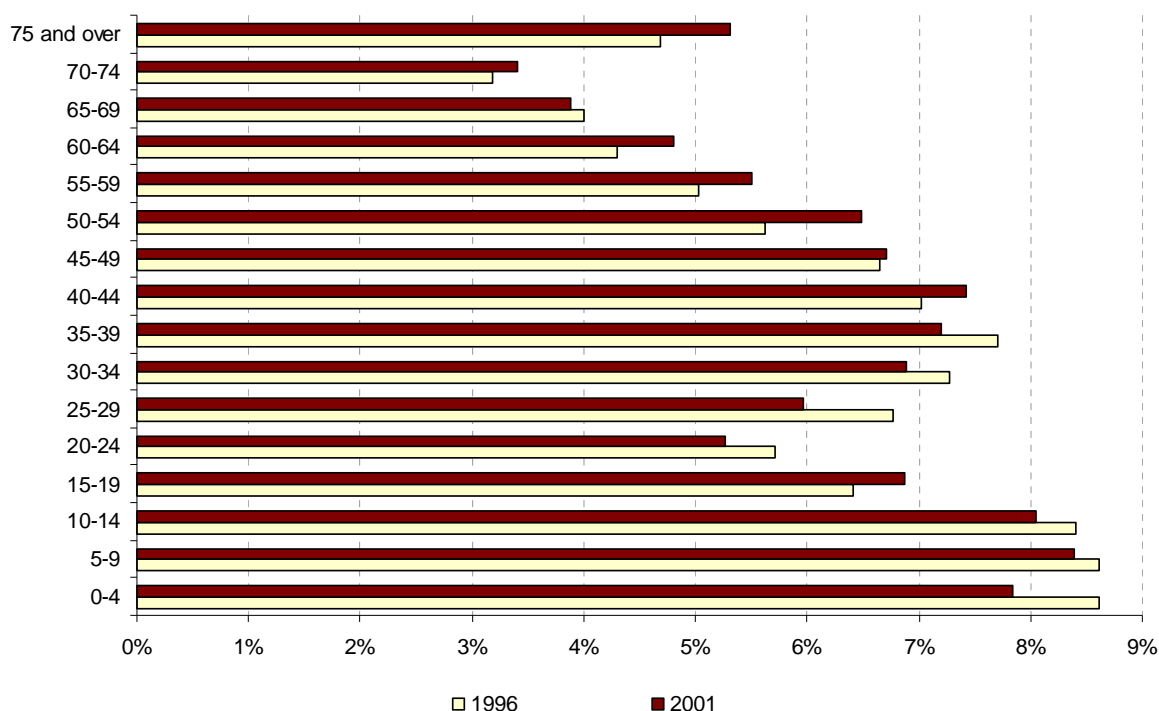
#### *Age Distribution*

The population of the Macquarie Irrigation Subgroup by age group is provided in Figure 5 for 1996 and 2001.

There has been growth in proportion of the population in all of the age brackets for people aged 40 years and over. Conversely, a majority of the younger age groups have shown a decline in their proportion of the population. This outcome is in line with the trend of an aging population across NSW.

For both periods, the 0-4, 5-9 and 10-14 years old age groups held the largest proportion of the population (over 7%), though this may change if the population continues to age.

**Figure 5: Population by Age Group for the Macquarie Irrigation Subgroup – 1996 and 2001**



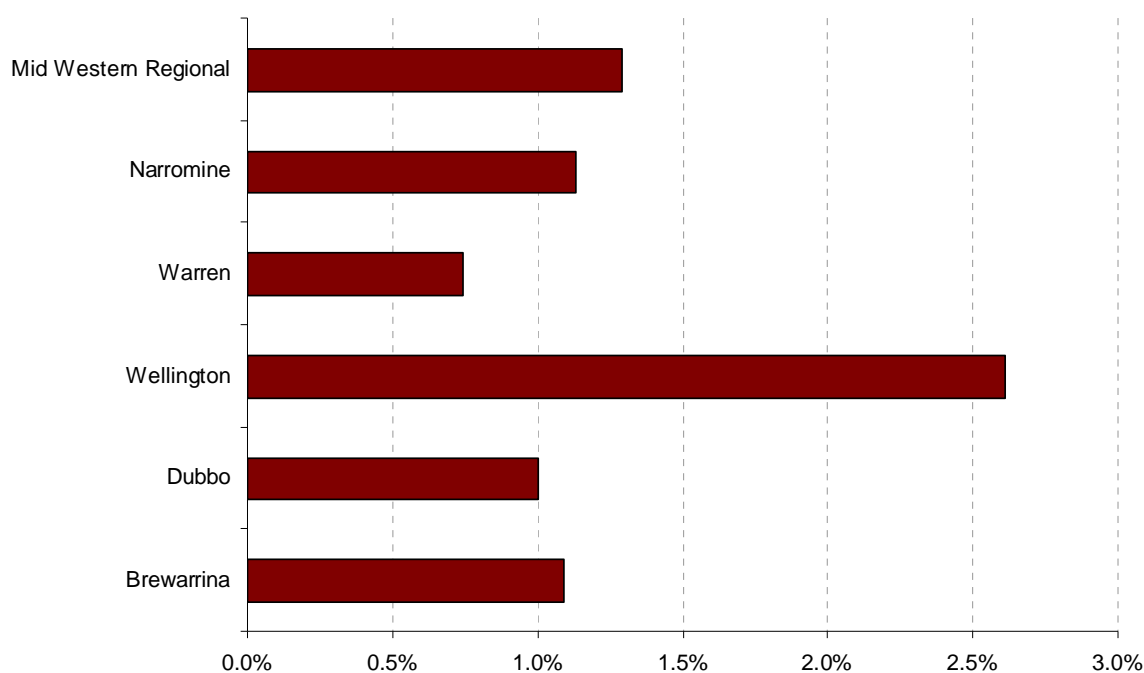
Source: ABS (2001) Census of Population and Housing.

The proportion of people aged 60 years and over increased in all LGAs in the Macquarie Irrigation Subgroup between 1996 and 2001, as indicated in Figure 6.

The largest increase in this age group was shown in Wellington, which saw an increase in the proportion of people aged 60 years and over from 20.5% in 1996 to 23.1% in 2001. This was double the change seen in the next highest LGA, Mid Western Regional, which saw an increase in the proportion of people aged 60 years and over by 1.3%. It is likely that Wellington’s status as a small but well serviced township makes it a more attractive location to older persons.

The proportion of people aged 60 years and over grew by 0.7% to 17.4% of the population in NSW between 1996 and 2001, which indicates that the population in the Subgroup is aging at a faster rate relative to the population of NSW.

**Figure 6: Change in the Proportion of People Aged 60+ of the Total Population – 1996 to 2001**



Source: ABS Census 1996 and 2001.

### **Indigenous Persons**

The number and proportion of indigenous persons living in the Macquarie Irrigation Subgroup by LGA is shown in Table 4. There were close to 7,400 indigenous persons living in the Subgroup in 2001, accounting for 9.4% of the total population.

The proportion of indigenous persons in each LGA of the Subgroup varied significantly in 2001, ranging from as low as 2.3% in the Mid Western Regional LGA to 50.2% in the Brewarrina LGA.

All LGAs within the Subgroup have higher proportions of indigenous persons in the population when compared to NSW. Indigenous persons accounted for only 1.9% of the NSW population in 2001.

**Table 4: Number & Proportion of Indigenous Persons – 2001**

<i>LGA</i>	<i>Indigenous</i>	<i>Total</i>	<i>Proportion Indigenous</i>
Brewarrina	1,100	2,193	50.2%
Dubbo	3,399	36,701	9.3%
Wellington	1,075	8,648	12.4%
Warren	371	3,290	11.3%
Narromine	963	6,523	14.8%
Mid Western Regional	483	21,356	2.3%
<b>Subgroup</b>	<b>7,391</b>	<b>78,711</b>	<b>9.4%</b>

Source: ABS (2001) Census of Population and Housing.

### *Language*

The language spoken at home by persons in each LGA is provided in Table 5. While the high level of non-response distorts the figures to some degree, it is clear the vast majority of the population speaks English at home.

In each LGA the proportion of the population which speaks English at home is higher than the level seen across NSW, which is 76%.

**Table 5: Language Spoken at Home – 2001**

<i>LGA</i>	<i>English Only</i>	<i>Other Language</i>	<i>Not Stated</i>
Brewarrina	92%	2%	7%
Dubbo	93%	2%	5%
Wellington	94%	1%	5%
Warren	96%	0%	3%
Narromine	95%	1%	4%
Mid Western Regional*	92%	3%	5%

Source: ABS (2001) Census of Population and Housing.

### **2.3.2 Socio-economic profiles and economy**

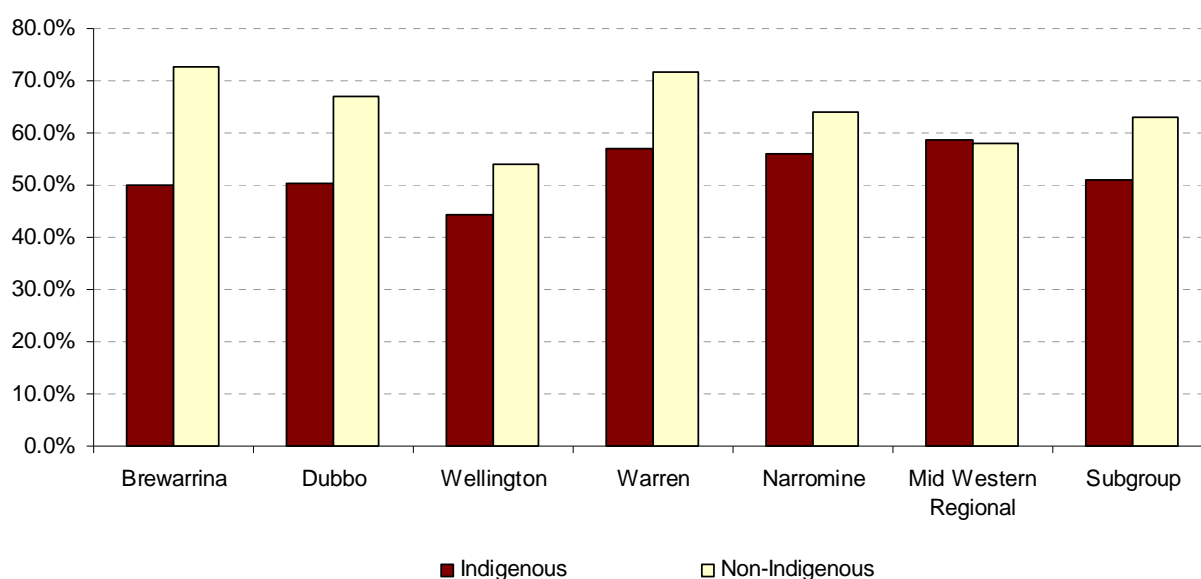
#### *Participation Rates*

The workforce participation rates for the indigenous and non-indigenous population of the Macquarie Irrigation Subgroup is provided in Figure 7.

In all LGAs, except Mid Western Regional, the participation rates for indigenous persons is lower than that for non-indigenous persons. For the Subgroup overall, indigenous and non-indigenous participation rates are 51% and 63% respectively.

Comparative figures for NSW show an indigenous population participation rate of 53%, which is only slightly higher than for the Subgroup region, while the non-indigenous participation rates is the same as that of NSW.

**Figure 7: Workforce Participation Rates for Indigenous and Non-indigenous Persons – 2001**



Source: ABS (2001) Census of Population and Housing.

### **Employment Status**

The employment status of persons in the workforce in the Macquarie Irrigation Subgroup is provided in Table 6.

With the highest population, Dubbo provided the largest number of persons in the workforce in 2001. Across the Subgroup, 92% of persons were employed, with 66% of those employed being employed on a full time basis.

The Macquarie Irrigation Subgroup accounts for 1.2% of the NSW workforce and has the same level of persons in full time employment, with 66% of the NSW workforce also employed on a full time basis.

**Table 6: Workforce Status – 2001**

Status	Brewarrina	Dubbo	Wellington	Warren	Narromine	Mid Western Regional	Subgroup
Employed:							
Full Time	520	11,004	1,814	1,078	1,854	5,393	21,663
Part Time	219	5,179	938	397	826	2,628	10,187
Not stated	41	444	94	50	79	273	981
Total employed	780	16,627	2,846	1,525	2,759	8,294	32,831
Unemployed	94	1,195	310	116	261	749	2,725
<b>Total</b>	<b>874</b>	<b>17,822</b>	<b>3,156</b>	<b>1,641</b>	<b>3,020</b>	<b>9,043</b>	<b>35,556</b>

Source: ABS (2001) Census of Population and Housing.

### **Unemployment Rates**

Unemployment rates for the LGAs in the Macquarie Irrigation Subgroup are provided in Table 7.

The level of unemployment for the Subgroup stood at 7.7% in 2001, which was comparable to the NSW state level of 7.2%. Unemployment showed variability across the LGAs; Brewarrina in particular showed a higher unemployment rate of 10.8%, while Dubbo showed a comparatively low level of unemployment.

Estimates provided by the ABS for 2004 show that unemployment fell in all LGAs except Brewarrina. While a Subgroup level estimate of unemployment cannot be provided, it is likely that the unemployment rate will have declined over the 5 years since the 2001 Census was undertaken. As an indication, the NSW state wide unemployment rate has fallen by 2.1% to 5.1% in April 2007 (ABS 2007).

**Table 7: Unemployment Rates – 1991 to 2004**

<b>LGA</b>	<b>1991</b>	<b>1996</b>	<b>2001</b>	<b>2004*</b>
Brewarrina	16.0%	11.9%	10.8%	12.6%
Dubbo	10.3%	8.0%	6.7%	4.6%
Wellington	16.8%	11.7%	9.8%	8.4%
Warren	10.3%	10.1%	7.1%	5.5%
Narromine	11.2%	12.0%	8.6%	4.3%
Mid Western Regional	14.8%	11.4%	8.3%	7.5%
<b>Irrigation Subgroup</b>	<b>12.4%</b>	<b>9.8%</b>	<b>7.7%</b>	

Source: ABS (2001) Census of Population and Housing 2001.

\* Note: ABS National Regional Profile, 2000 to 2004.

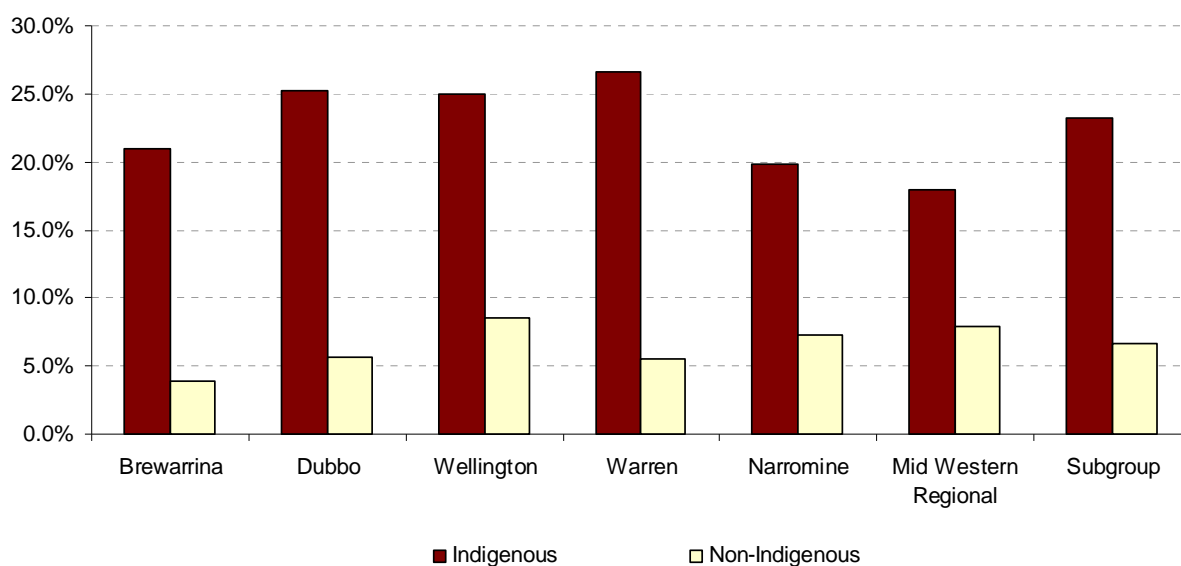
### **Indigenous Unemployment**

The unemployment rate for indigenous and non-indigenous persons in the Macquarie Irrigation Subgroup is provided in Figure 8. In all LGAs within the Subgroup, unemployment rates are higher for the indigenous population.

The high proportion of the population made up by indigenous persons in the Brewarrina LGA and the high level of unemployment amongst indigenous persons is the primary reason for the LGA's higher level of overall unemployment identified above.



**Figure 8: Comparative Indigenous and Non-indigenous Unemployment Rates – 2001**



Source: ABS (2001) Census of Population and Housing.

The highest level of indigenous unemployment is shown in Warren (27%), with the lowest in Mid Western Regional (18%). Across the Subgroup, indigenous unemployment averages 3 times the level seen for the non-indigenous population, at 23% compared to 7%.

The largest disparity in unemployment is in Brewarrina, where the indigenous unemployment rate is 5.5 times higher than that of the non-indigenous population. Dubbo and Warren also showed a large disparity, with rates of unemployment 4.5 and 4.8 times higher for the indigenous population respectively.

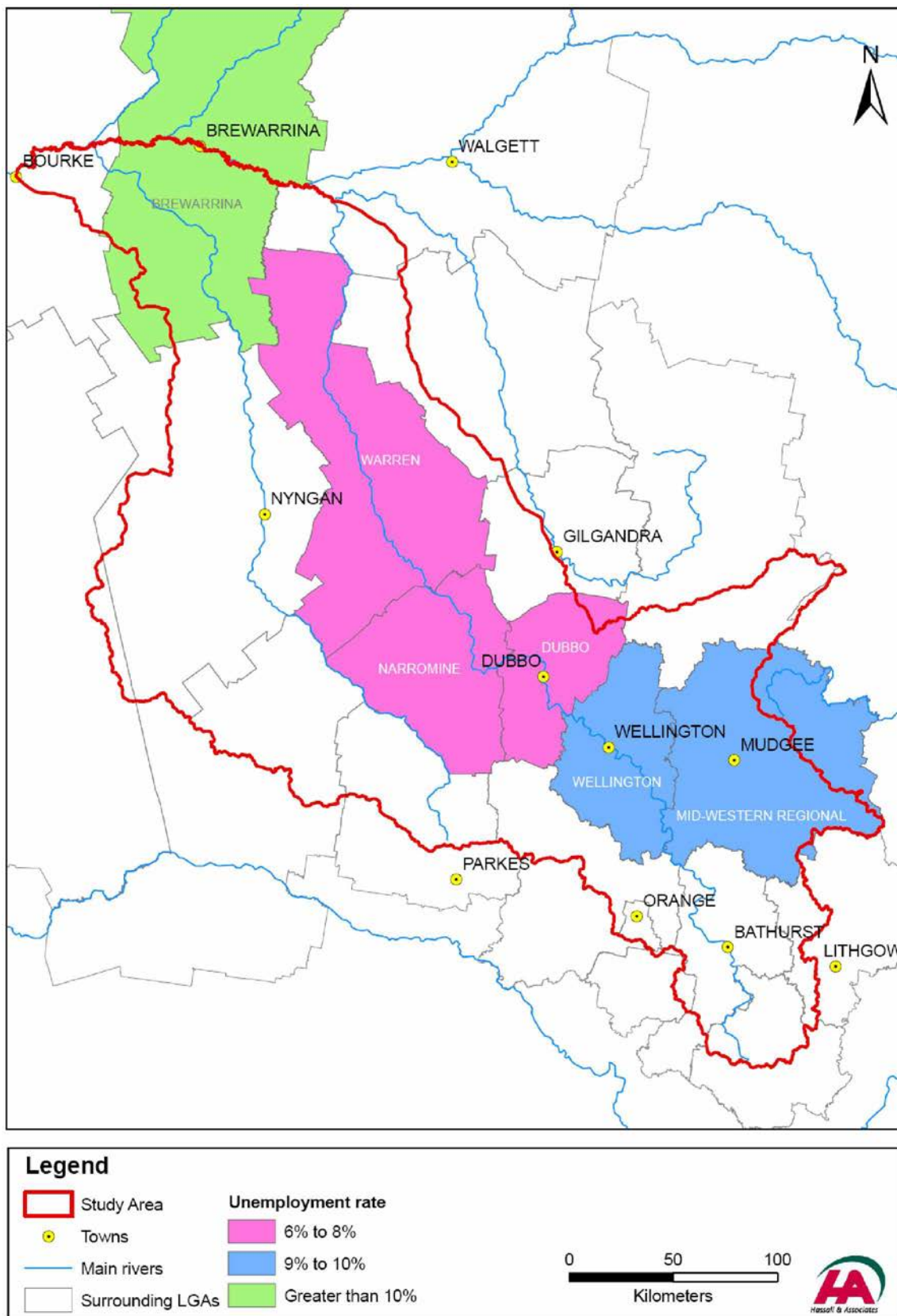
At the NSW state level, indigenous population unemployment rates were the same as those shown for the Subgroup in 2001.

### **Spatial Unemployment**

A map indicating the differing unemployment rates across the Macquarie Irrigation Subgroup LGAs is provided in Figure 9.

In 2001, the unemployment rate was highest in the Brewarrina LGA in the north western part of the Catchment. The Wellington, Narromine and Mid Western Regional LGAs also had unemployment rates above the NSW average of 7.2%. Dubbo and Warren had unemployment rates below the NSW state average in 2001.

**Figure 9: Unemployment Rate for the Macquarie Catchment LGAs – 2001**



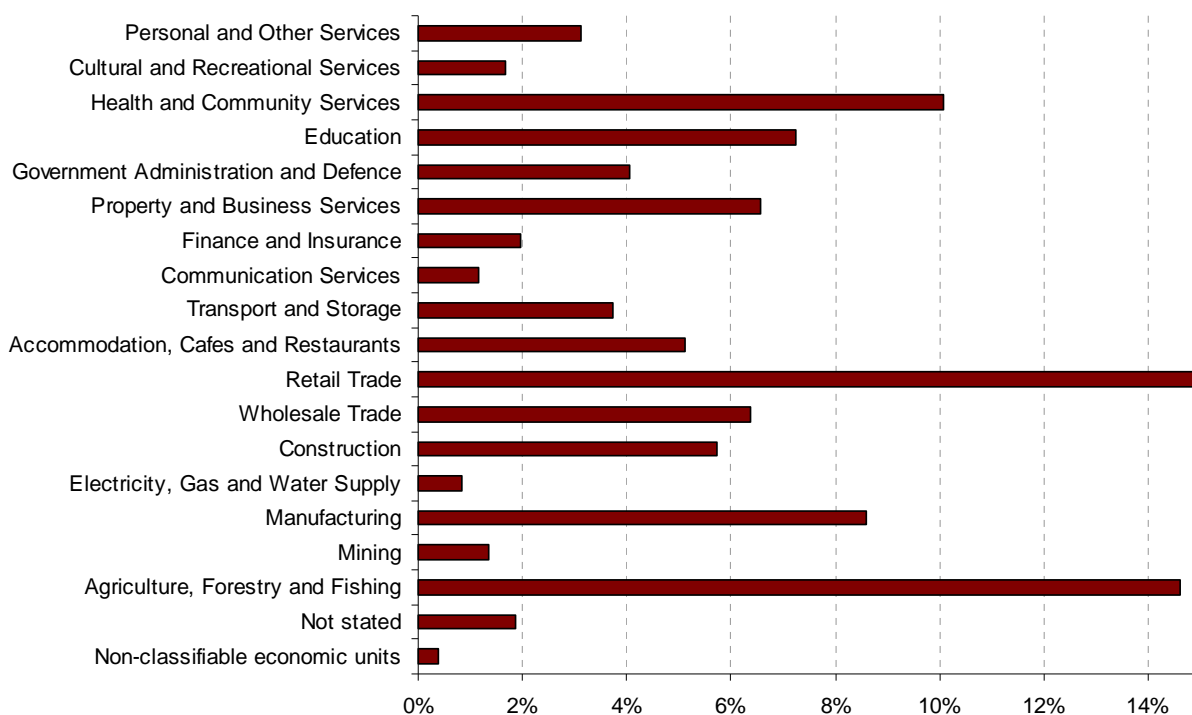
Source: ABS (2001) Census of Population and Housing.

**Industry of Employment**

The employment of workforce participants by sector is provided in Figure 10 for the Macquarie Irrigation Subgroup.

The agriculture, forestry and fishing sector is one of the largest employers in the Macquarie Irrigation Subgroup, with an equal proportion of the workforce employed in the retail sector. Employment in the agriculture, forestry and fishing sector grew by 5% over the 5 years from 1996 to 2001.

**Figure 10: Industry of Employment – 2001**



Source: ABS (2001) Census of Population and Housing 2001.

As noted in Section 2.2.2, only a small proportion of employment at the NSW state level is provided by the agriculture, forestry and fishing sector (3.4%), while the proportion of employment in the retail trade is similar to that of NSW.

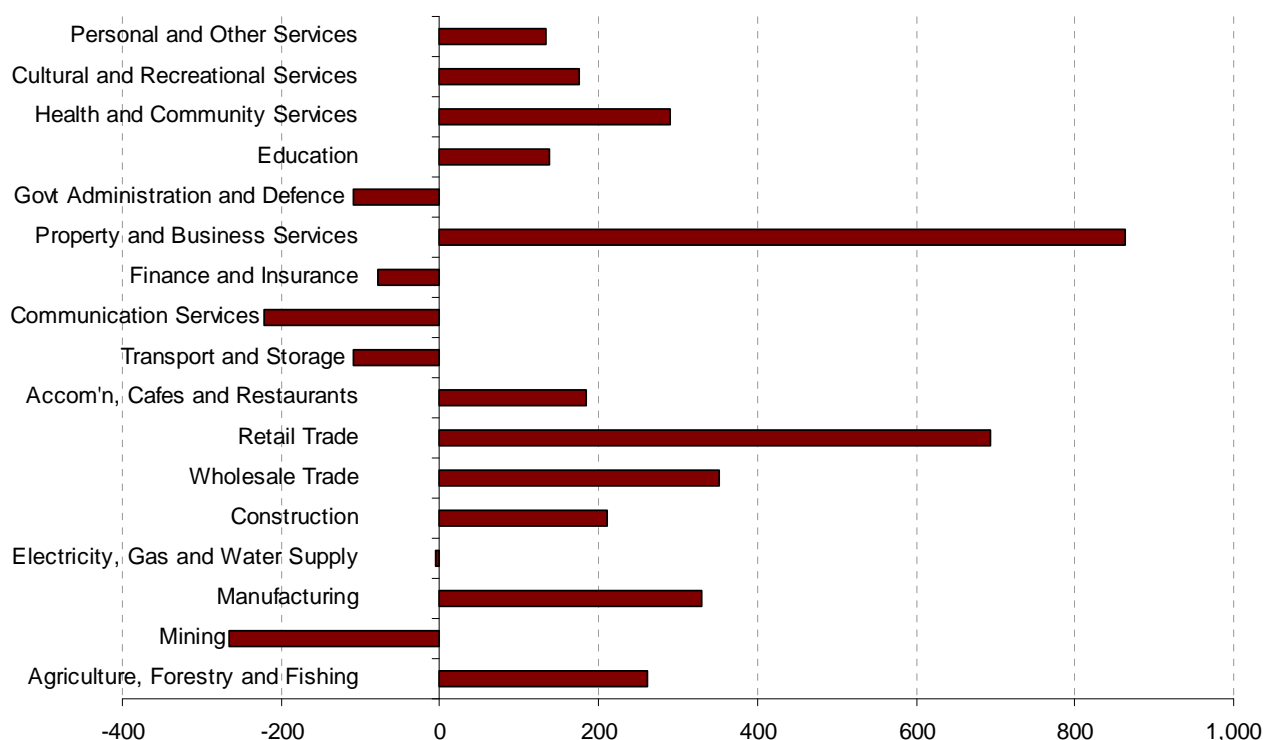
**Agricultural Employment**

Agricultural industries employ 99.2% of persons in the agriculture, forestry and fisheries sector, of which 7.6% are engaged in providing services to agricultural industries. The remaining fraction of employment is generated by forestry.

**Change in Employment**

The change in the actual number of people employed by the sector in the Macquarie Irrigation Subgroup between 1996 and 2001 is provided in Figure 11.

**Figure 11: Change in the Number of Persons Employed by Industry between 1996 and 2001 for the Macquarie Irrigation Subgroup**



Source: ABS (1996, 2001) Census of Population and Housing.

A significant increase in the number of persons employed in the property and business services sector and retail sector occurred between 1996 and 2001. A similar trend is observed at the state level for NSW. An additional 262 persons were also employed in the agriculture, fisheries and forestry sector between 1996 and 2001.

Employment in the mining sector declined over the 5 years to 2001 by more than 200 persons. The communication services, transport and storage, finance and insurance, and government administration and defence sectors also showed a net decline in employment.

### Occupation

The employment of the workforce by occupation is provided in Table 8.

Clerical sales and service workers at all levels account for over a quarter of occupations (27%). Other important occupations in the Subgroup region include professionals, managers and administrators, and tradespersons.

**Table 8: Employment by Occupation for the Macquarie Irrigation Subgroup – 2001**

<i>Occupation</i>	<i>Macquarie</i>
Intermediate Clerical, Sales and Service Workers	14%
Professionals	14%
Managers and Administrators	13%
Tradespersons and Related Workers	13%
Labourers and Related Workers	12%
Associate Professionals	10%
Elementary Clerical, Sales and Service Workers	9%
Intermediate Production and Transport Workers	9%
Advanced Clerical and Service Workers	4%
Not stated	1%
Inadequately described	1%

Source: ABS (2001) Census of Population and Housing.

### **Taxation**

The average individual annual taxable income for the Subgroup and NSW is provided in Table 9. While the Dubbo LGA shows a similar level of income to the rest of the state, the other LGAs show a lower level of average taxable income, with the disparity ranging up to \$11,100 in the case of Brewarrina.

**Table 9: Taxable Income – 2004**

<i>LGA</i>	<i>Average Individual Annual Taxable Income<sup>1</sup></i>
Brewarrina	\$32,548
Dubbo	\$43,649
Mid Western Regional	\$35,854
Narromine	\$34,742
Warren	\$35,502
Wellington	\$33,012
NSW	\$43,649

Source: ABS (2004) National Regional Profile.

<sup>1</sup> Year end 30 June 2004.

### **Education**

The level of education in the Irrigation Subgroup is generally lower than that seen across NSW. The proportion of persons with non-school qualifications in the LGAs of the Subgroup are provided in Table 10.

Over a third of the population of the Subgroup reported some form of education beyond schooling, with the most common being a Certificate qualification. The proportion of persons with no qualifications beyond school was higher than for NSW, with 59% of persons in the Subgroup having no non-school qualification compared to 51% for NSW. Warren, Brewarrina and Narromine had notably lower levels of non-school qualifications.

**Table 10: Education Level by Non-school Qualification – 2001**

<i>Education</i>	<i>Brewarrina</i>	<i>Dubbo</i>	<i>Wellington</i>	<i>Warren</i>	<i>Narromine</i>	<i>Mid Western Regional</i>	<i>Macquarie</i>
Postgraduate Degree	1%	1%	0%	0%	0%	1%	1%
Graduate Diploma and Graduate Certificate	0%	1%	1%	1%	1%	1%	1%
Bachelor Degree	5%	7%	5%	5%	5%	5%	6%
Advanced Diploma and Diploma	2%	4%	4%	5%	4%	4%	4%
Certificate	12%	18%	15%	14%	15%	18%	17%
Not stated	14%	12%	13%	10%	10%	13%	12%
Not applicable	65%	57%	61%	66%	64%	58%	59%

Source: ABS (2001) Census of Population and Housing.

### 2.3.3 Infrastructure

Major highway and rail corridors cross the region. Commercial airlines provide regular services to Sydney from Dubbo and to a lesser extent Coonamble. Dubbo is on the banks of the Macquarie River, and is at the junction of the Newell and Mitchell Highways, and has always been an important transport centre. Orange and Wellington are located on the Great Western Highway.

#### *Transport*

Major road and rail networks traverse the region east-west and north-south, providing competitive advantages for businesses with interstate links.

Rail and freight networks link the region to Sydney and the ports. Two intermodal transport depots at Parkes and Blayney give access by road or rail to 82% of Australia's population, including direct access to Botany Bay.

The Golden Highway from Dubbo connects the region's largest manufacturing and service centre with the Hunter Port facilities. Passenger coach services operate throughout the region. There is a passenger rail service that links Dubbo to Sydney, with one service per day, as well as a major airport located at Dubbo with a flight time to Sydney of approximately one hour (DSRD 2007).

#### *Education Facilities*

The Macquarie Catchment provides a number of major educational facilities, including:

- § Charles Sturt University Campuses in Dubbo, Bathurst and Orange;
- § Dubbo Senior College; and
- § Western Institute of Technical and Further Education.

### 2.3.4 Household income

#### **Median Household Incomes**

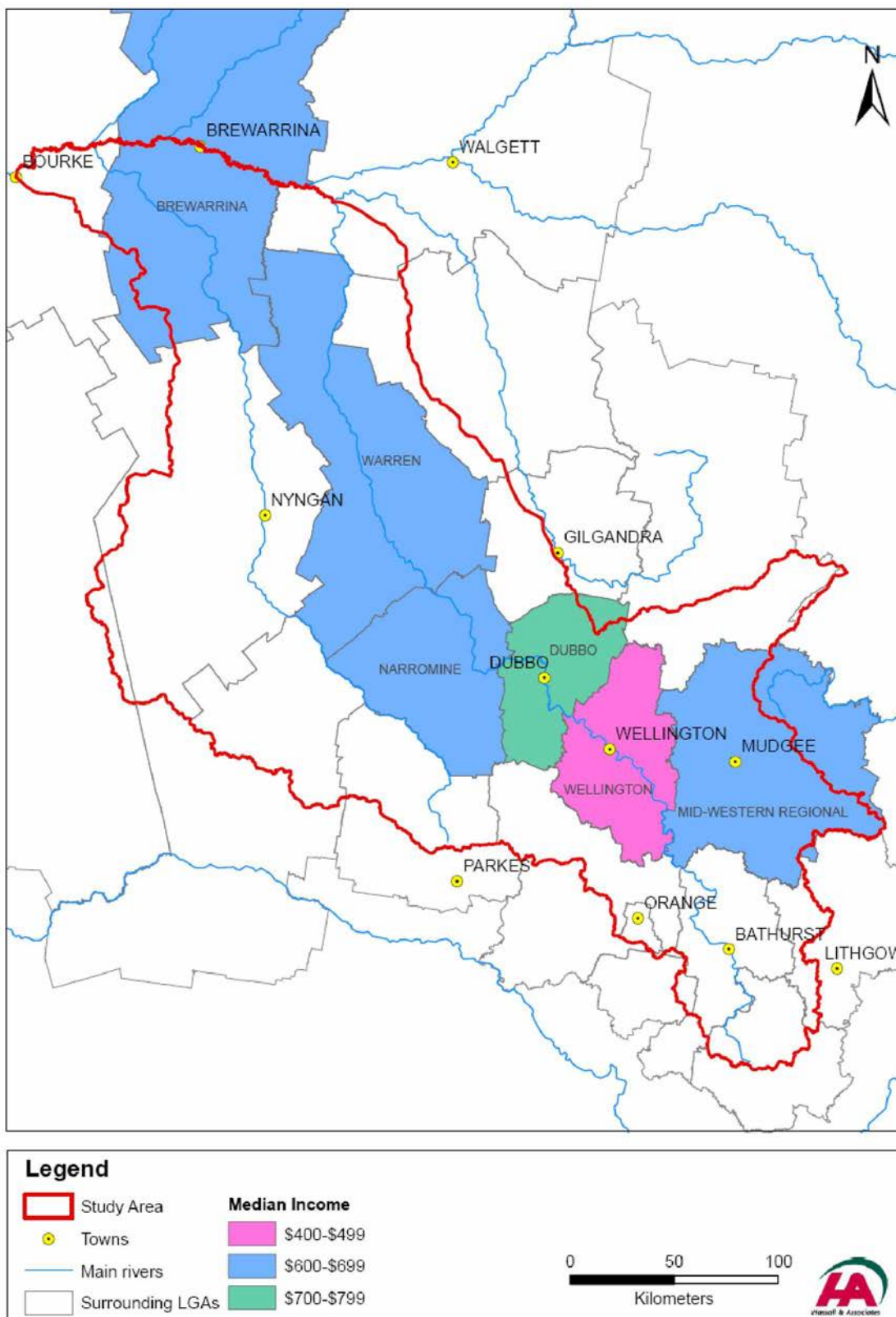
The median household income brackets for the LGAs of the Macquarie Irrigation Subgroup are provided in Figure 12.

Brewarrina, Narromine, Warren and Mid Western Regional LGAs all show median incomes of between \$600 and \$699 per week. Dubbo shows a higher level of weekly household median income of \$700-\$799, while Wellington shows a lower level of \$400-\$499.

It is likely that Dubbo's role as a regional centre influences the level of income shown for that LGA.

The median weekly household income bracket for NSW is \$800-\$999, which is higher than the level shown for the LGAs in the Subgroup.

**Figure 12: Median Household Income for LGAs in the Macquarie Irrigation Subgroup – 2001**



Source: ABS (2001) Census of Population and Housing.



**Household  
Income**

A breakdown of household income by income bracket is provided in Table 11. The table indicates the proportion of households earning the specified level of income across each of the Irrigation Subgroup LGAs.

**Table 11: Household Income for the Macquarie Irrigation Subgroup – 2001**

<i>Income Bracket</i>	<i>Brewarrina</i>	<i>Dubbo</i>	<i>Wellington</i>	<i>Warren</i>	<i>Narromine</i>	<i>Mid Western Regional</i>
Partial income stated	9.4%	8.6%	7.6%	8.7%	9.7%	7.3%
All incomes not stated	5.4%	3.9%	4.6%	4.7%	4.1%	4.1%
Negative/Nil income	0.9%	0.5%	1.0%	1.0%	1.4%	1.0%
\$1-\$199	6.2%	4.1%	6.6%	4.2%	5.3%	5.7%
\$200-\$299	6.6%	7.6%	11.7%	6.2%	9.0%	10.2%
\$300-\$399	10.0%	9.0%	13.8%	9.2%	10.9%	12.2%
\$400-\$499	6.8%	7.6%	11.0%	9.1%	8.4%	8.8%
\$500-\$599	7.1%	5.6%	6.1%	7.7%	6.6%	6.2%
\$600-\$699	7.1%	6.5%	7.7%	7.1%	8.4%	7.0%
\$700-\$799	6.6%	5.4%	4.8%	5.7%	5.0%	4.9%
\$800-\$999	9.6%	9.9%	7.7%	11.1%	9.4%	8.4%
\$1,000-\$1,199	7.6%	8.7%	6.1%	8.0%	7.6%	6.5%
\$1,200-\$1,499	5.9%	9.0%	4.5%	7.2%	5.9%	6.8%
\$1,500-\$1,999	6.6%	8.7%	4.3%	6.2%	5.4%	6.2%
\$2,000 or more	4.0%	5.0%	2.5%	3.9%	2.9%	4.7%

Source: ABS (2001) Census of Population and Housing.

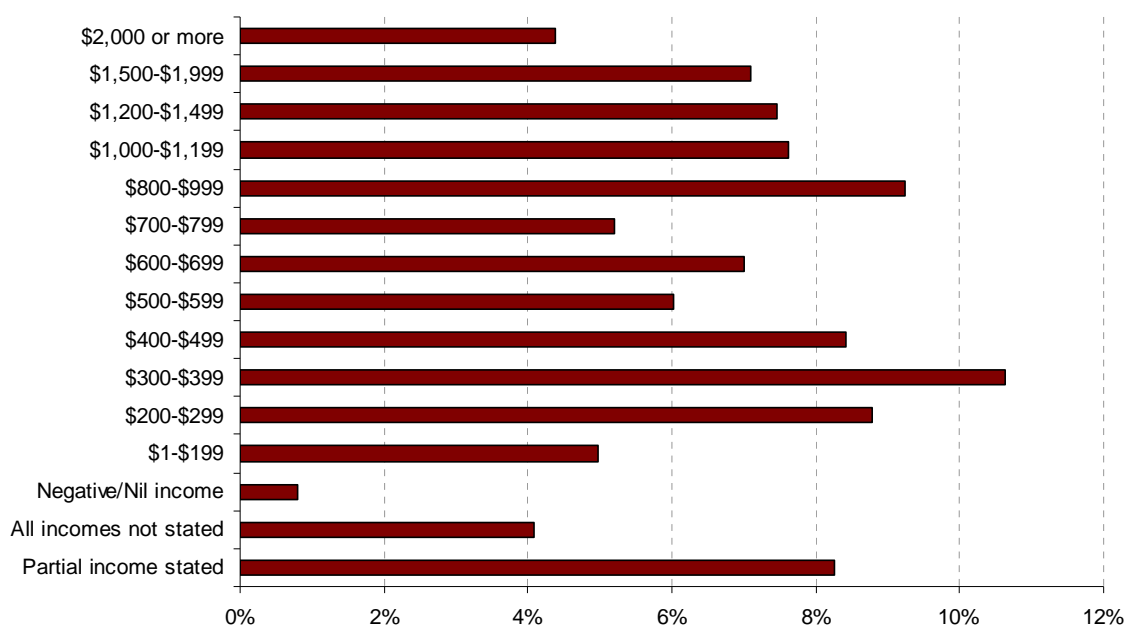
Household income by income bracket for the whole Macquarie Irrigation Subgroup is provided in Figure 13.

In the Macquarie Irrigation Subgroup, 34% of households have a weekly income of less than \$500, while 27% have a weekly income of \$1,000 or more. Comparatively, the same proportion of NSW households earn less than \$500 per week, while a higher proportion (33%) earn \$1,000 per week or more.

This indicates that the income distribution within the Subgroup is similar to that of NSW at the aggregate level. However, incomes varied across the individual LGAs, with Wellington notably having lower income levels. Only 17% of households in this LGA earned \$1,000 or more income per week, while 44% of households earned less than \$500 per week in 2001. The lower incomes seen here may be reflective of the growth in the older age groups as a proportion of the population.

It should be recognised that the income data also includes a relatively high level of partial and non-response (Figure 13).

**Figure 13: Household Income for the Macquarie Irrigation Subgroup – 2001**



Source: ABS (2001) Census of Population and Housing.

## 2.4 Socio-economic Advantage and Disadvantage

### SEIFA Index

The values for the Australian Bureau of Statistics' Index of Socio-economic Advantage and Disadvantage are provided in Figure 14 for the LGAs of the Macquarie Irrigation Subgroup, with comparative values for Australia and NSW also provided.

At the time of the 2001 Census, the ABS replaced the Urban and Rural Indexes of Advantage with the Socio-Economic Index for Areas (SEIFA) Index of Advantage/Disadvantage. This index is used to rank a defined geographic area in terms of both advantage and disadvantage simultaneously (i.e. the net effect is measured). For each region, information on advantaged persons offsets information on disadvantaged persons.

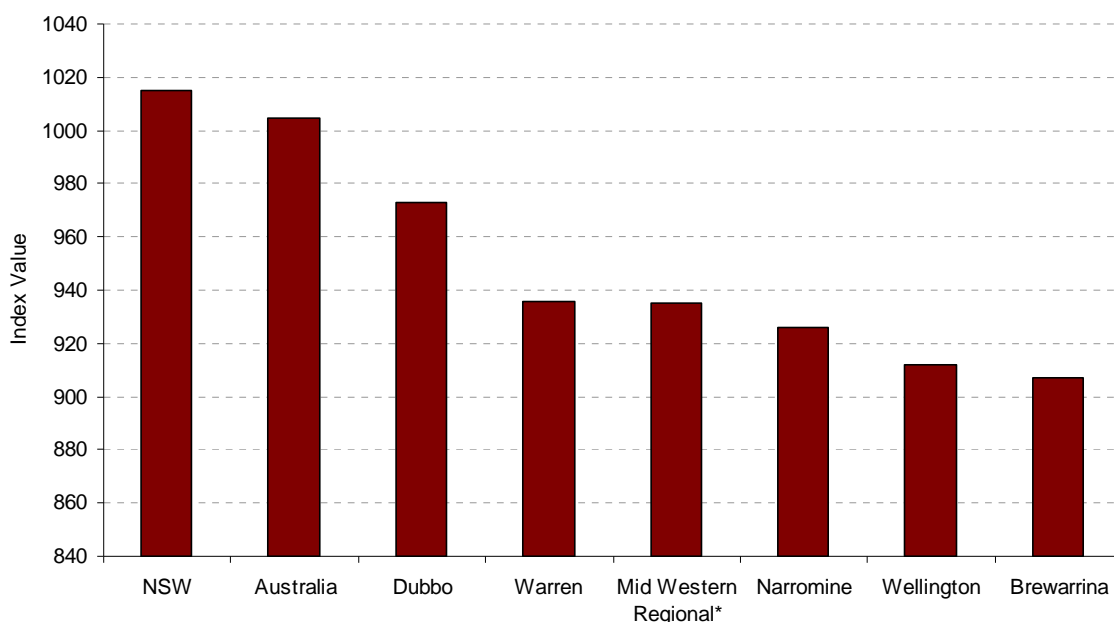
The SEIFA Index of Socio-economic Advantage/Disadvantage is a continuum of advantage to disadvantage. Low values indicate areas of disadvantage, and high values indicate areas of advantage. It takes into account variables such as the proportion of families with high incomes, people with a tertiary education, and employees in skilled occupations.

The key factors which determine the index include income, education (or qualification), and occupation. Other variables used in the calculation of the index include:

- § Number of motor vehicles, number of rooms in house (wealth or assets);
- § Unemployment (employment status);
- § Type of residence; number of bedrooms (residential

conditions); and  
 § Low fluency in English (language disadvantage).

**Figure 14: SEIFA Values by LGA – 2001**



Source: ABS (2001) Census of Population and Housing.

All the LGAs in the Macquarie Irrigation Subgroup are relatively disadvantaged when compared to the Australian and NSW average. Dubbo, most likely as a result of its role as a regional centre has the highest index value, while the more isolated Brewarrina LGA shows the lowest value.

Based on the factors which are considered in the estimation of the SEIFA values, it is suggested that the values for the Subgroup may be lower than those of NSW and Australia due to generally lower education levels, lower incomes and higher level of unemployment.

## 2.5 Cultural heritage

The Australian Heritage Places Inventory has been used to identify the number of registered heritage sites present in each of the LGAs of the Macquarie Irrigation Subgroup. In total, there are 139 registered heritage sites across the region, with the majority of those located in the Wellington, Mid Western Regional and Dubbo LGAs.

**Table 12: Heritage Sites and Places in the Macquarie Catchment – 2007**

<i>LGA</i>	<i>Number of Sites</i>
Brewarrina	10
Dubbo	32
Mid Western Regional	39
Narromine	6
Warren	8
Wellington	44
<b>Total</b>	<b>139</b>

Source: Register of the National Estate (2007).

It is suggested that, where necessary, further information on specific cultural and heritage sites and locations be sought from the Heritage Officer at the relevant Catchment Management Authorities (Central West and Western).

## 2.6 Summary

There has been population growth in excess of the NSW state average across all LGAs in the Subgroup.

Older age groups of the population increasing at a slightly faster rate than NSW.

In common with the rest of NSW, unemployment rates are generally declining. There is low indigenous participation in the workforce and high indigenous unemployment.

Within the irrigation Subgroups, and the broader Catchment, there is a high level of employment in agriculture and related services. Income levels are broadly similar to those observed at the NSW state level, but they show variation across the Subgroup.

### 3 POLICY, ENVIRONMENT AND KEY STAKEHOLDERS

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#### 3.1 Introduction

There are a range of policies which may affect the irrigators of the Macquarie catchment. These occur at the Commonwealth and State level of government.

#### 3.2 Commonwealth

##### *The National Water Initiative*

The NSW Government is a partner in the National Water Initiative (NWI), endorsed by the Council of Australian Governments in June 2004. The aim of the NWI is to make a coordinated effort to manage Australia's water better.

##### *Reforms in NSW which address COAG and the NWI*

Reforms carried out in NSW include:

- § legally separating water access licences from land title, thereby expanding the trade of water within NSW and interstate;
- § independently setting water charges through the Independent Pricing and Regulatory Tribunal;
- § implementing water sharing plans, which by early-2006 were already covering 80 % of all the water used in NSW, and which return on average over 200 billion litres of water to the environment every year;
- § extending opportunities for water trading, including opening up permanent trade out of the irrigation corporations in the southern Murray-Darling Basin; and
- § making provision to compensate licensees if water access has to be reduced in the future.

The legal recognition of water rights has been a critical reform for water users, through the introduction of perpetual access share entitlements. These are robust, mortgagable, and tradeable assets, giving licence holders the confidence to plan for the long-term and invest in best-practice water use and conservation technologies.

One of the significant impacts in the short term of the NWI is the uncertainty associated with removal of barriers to trade in and out of joint infrastructure schemes. Currently trade out of the private schemes is not possible (Department of Natural Resources 2006).

### **Modernising Irrigation**

The *Modernising Irrigation in Australia Programme* is one of a number of elements in the National Plan for Water Security. The plan aims to improve water efficiency and to address the over use and over allocation of water in rural Australia, particularly in the Murray-Darling Basin.

The Plan provides a commitment of \$5.9 billion over 10 years to modernise on and off farm delivery systems, to save water and increase water use efficiency, and to improve the measurement of water.

## **3.3 State**

### **Water Act reforms and Water Sharing Plans**

The legislative framework for water management in NSW is currently in a state of transition from the *Water Act 1912* to the *Water Management Act 2000* (WMA). The WMA introduces a range of changes to water management, including the need to develop Water Sharing Plans, requirements to provide water for the environment, establishing priority between different types of access licences, enshrining basic rights and establishing new trading arrangements.

The WMA is being phased in geographically, and it applies to those water sources (river, creek, groundwater source) where a Water Sharing Plan (WSP) has been developed.

### **NSW RiverBank**

NSW RiverBank is a program that is purchasing water from willing sellers to use for environmental outcomes. The NSW RiverBank operates within existing WSP frameworks to build on the environmental improvements achieved by these plans. Funds from NSW RiverBank will buy water from the holders of existing water licences who are willing to sell all or part of their entitlement. \$105 million program administered the DECC. The indicative investment target for 2006/07 for the Macquarie was \$6.5 million (DECC 2006).

### **Central West Catchment Action Plan**

There are several targets in the Central West CMA Catchment Action Plan. The most relevant is that by 2016 the CMA would like to see a total of 30,000ML in water savings recovered to improve environmental outcomes (achieved through agreements such as the National Water Initiative and funding initiatives such as RiverBank and environmental water trust funds).

### **The Macquarie Marshes Management Plan**

The Macquarie Marshes is a large non terminal wetland in the lower Macquarie. The marsh area is approximately 200,000ha, 12% of which is public land, managed by the NSW National Parks and Wildlife Service. The remaining area of the wetland is private land.

There has been a long history in joint government / community collaboration for the management of the marshes. In 1996, the NSW Government approved the first Macquarie Marshes Water Management Plan, after extensive planning and negotiation between government and irrigation and marsh landholder representatives. This plan established a wildlife water allocation of 50,000ML high security water and 75,000ML general security with carry over. This water is now managed under the Macquarie Regulated River Water Sharing Plan, by and Environmental Flows Reference Group, which comprises representatives of government, indigenous extractive users, and marsh landholders.

The Macquarie Marshes Environmental Landholders Association is a group that represents landholders adjacent to the marsh. A number of members of the landholders Association were involved in the now dissolved Macquarie Marshes Management Committee (MMMC), which developed a comprehensive land and water management plan in 1997. This plan was the result of more than 4 years of cooperation between the landholders, NSW Government agencies, three local Shire Councils, environmental groups, Aboriginal groups and the public.

The Coonamble, Walgett and Warren Shire local government areas and the MMMC (1997) estimated approximately 50 families live in the region.

Agricultural land in the marsh region is considered valuable for a range of industries, particularly livestock grazing on areas where pastures are more frequently flooded.

Within the planning area, grazing returned approximately \$6 million, based on November 1996 figures (Cunningham 1997) and dryland wheat returned nearly \$1 million in the same year.

Other organisations operating in the Macquarie Catchment and their contact details are provided in Table 13.

**Table 13: Macquarie Irrigator Organisations' Contact Details**

<b>Organisation</b>	<b>Contact Details</b>
Macquarie River Food and Fibre	<b>Dannielle Anderson</b> Phone: (02) 6884 9577 Fax: (02) 6882 8838 Email: <a href="mailto:mrff1@mrff.com.au">mrff1@mrff.com.au</a>
Macquarie Cotton Growers' Association	<b>Michelle Wise</b> Phone: (02) 6847 3387
Macquarie Marshes Environmental Landholders Association	<b>Sue Jones</b> Phone: (02) 6824 2097 Fax: (02) 6824 2433 Mobile: 0419242097

## 4 IRRIGATED AGRICULTURE IN THE MACQUARIE

### 4.1 Natural features

The catchment comprises three sub-catchments: from north to south, the Castlereagh, the Macquarie and Bogan catchments.

The Central West Catchment is located in central western New South Wales, flanked by the Barwon and Darling catchments to the north and west, Lachlan to the south and the Sydney/Shoalhaven Basin to the east.

### 4.2 Agricultural Production

The value of agricultural production in the Macquarie Irrigation Subgroup is provided in Table 14 and Figure 15.

Warren produces the highest value of agricultural production, followed closely by Narromine. In both cases the majority of value is generated by crops, which account for 77% and 79% for Warren and Narromine respectively.

**Table 14: Value of Agricultural Production (in millions) by LGA – 2001\***

<i>LGA</i>	<i>Fruit</i>	<i>Crops</i>	<i>Livestock Slaughterings</i>	<i>Livestock Products</i>	<i>Total Agriculture</i>
Brewarrina	\$0.1	\$20.7	\$7.8	\$11.0	\$39.6
Dubbo	\$0.3	\$15.6	\$23.0	\$9.5	\$48.5
Wellington	\$0.1	\$20.3	\$18.9	\$21.0	\$60.3
Warren	\$0.1	\$118.6	\$24.1	\$11.0	\$153.8
Narromine	\$3.3	\$112.3	\$14.1	\$12.1	\$141.8
Mid Western Regional	\$9.9	\$15.2	\$28.8	\$27.9	\$81.9

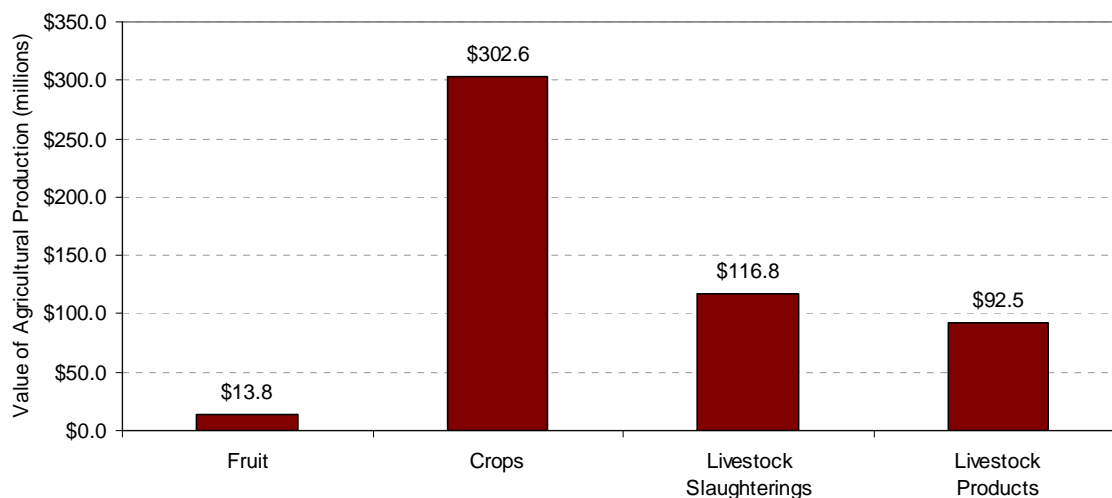
Source: ABS (2001) Agricultural Census.

\* Note: All Agricultural Census data is reported for financial years.

Dubbo, Brewarrina, Wellington and Mid Western Regional LGAs all differ from Warren and Narromine in having much lower values of crop production, and higher proportions of agricultural production derived from livestock production. In most cases, fruit accounts for a small proportion of agricultural production (average 3% for Subgroup), with the exception of Mid Western Regional LGA, where fruit accounted for 12% of agricultural production, and 72% of total fruit production in the Subgroup.



**Figure 15: Value of Agricultural Production (in millions) Total for the Macquarie Irrigation Subgroup – 2001**



Source: ABS (2001) Agricultural Census.

In line with the whole Macquarie Catchment, crops make the most significant contribution to the value of agricultural production in the Macquarie Irrigation Subgroup, accounting for 59% of agricultural production in 2001.

#### 4.2.1 Water resources

The upper reaches of the Bogan and the Castlereagh River are largely unregulated rivers. In the Macquarie Catchment there are two main dams regulating flows. Windamere Dam, on the Cudgegong River upstream of Mudgee, has a capacity of 368,000 megalitres and Burrendong Dam located at the junction of the Macquarie and Cudgegong River has a capacity of 1,189,000 megalitres and is located just upstream of Wellington.

There are a number of weirs along the length of the Macquarie River including, Dubbo, Narromine, Gin Gin and Warren.

The regulated section of the Macquarie extends from Burrendong Dam to Pillicawarrina in the Marshes and includes Bulgeraga Creek, Duck Creek and Gunningbar Creek. Other rivers and creeks in the catchment that have their flow augmented by river regulation include the Ewenmar system, the lower Bogan River, Marra and Crooked Creeks, the Marthaguy Creek and the lower Macquarie River.

All other streams within the catchment are regarded as “unregulated”. Impacts on the natural flow regime of these streams are largely a result of extractive demand and the construction of town water supply schemes.

### 4.3 Water Resource Management

This section of the report provides an outline of Water Sharing Plans for regulated water resources in the Catchment. Requirements for water under access licences are provided as identified in the Macquarie Cudgegong Regulated River Water Sharing Plan.

#### 4.3.1 Surface Water – Macquarie and Cudgegong Regulated Rivers Water Source

The water requirements of holders of domestic and stock rights are estimated to be 14,265 ML/yr.

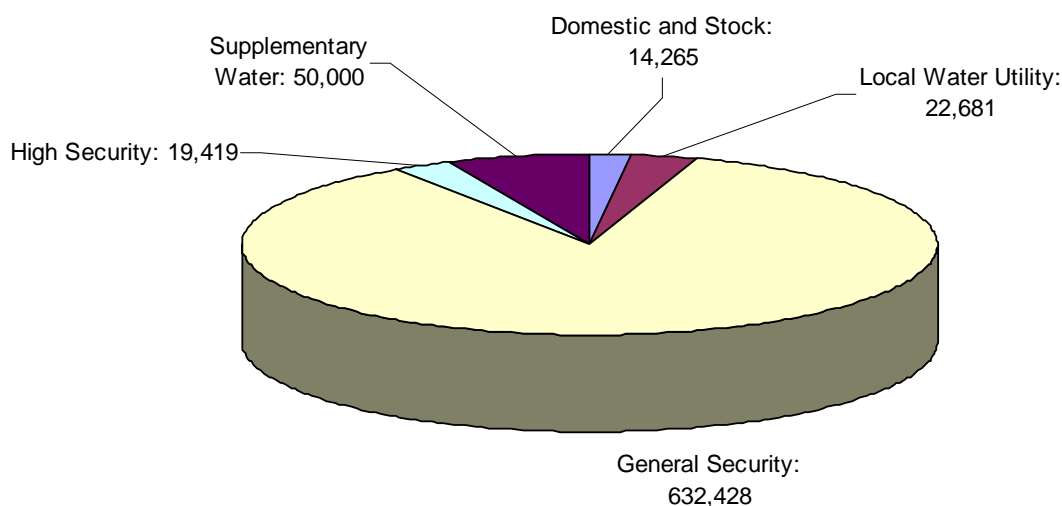
**High Security** It is estimated that the share components of regulated river (high security) access licences authorised to extract water from this water source will total 19,419 unit shares.

**General Security** It is estimated that the share components of regulated river (general security) access licences authorised to extract water from this water source will total 632,428 unit shares.

**Supplementary** It is estimated that the share components of supplementary water access licences authorised to access water from this water source will total 50,000 unit shares.

The relevant Macquarie IQQM computer model run indicates a long-term average annual extraction volume of 391,900 megalitres.

**Figure 16: Extractive Unit Shares of Macquarie Regulated River**

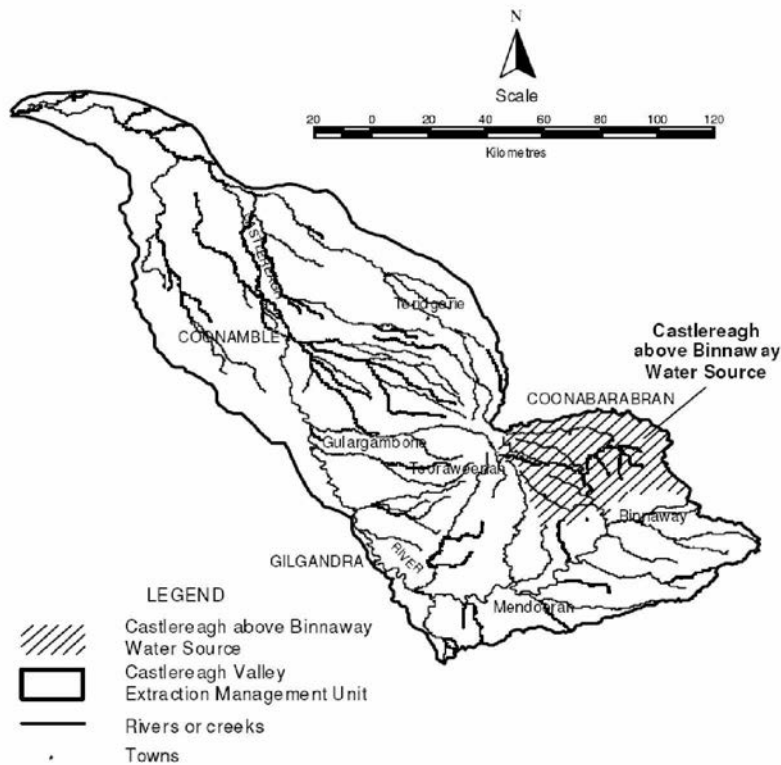


Source: DIPNR (2004).

### 4.3.2 Surface Water - Unregulated River Water Source

Water Sharing Plan for the Castlereagh River above Binnaway Water Source estimates that extraction under access licences within this water source will total approximately 5,000 megalitres per year.

**Figure 17: Castlereagh Valley Extraction Management Unit**



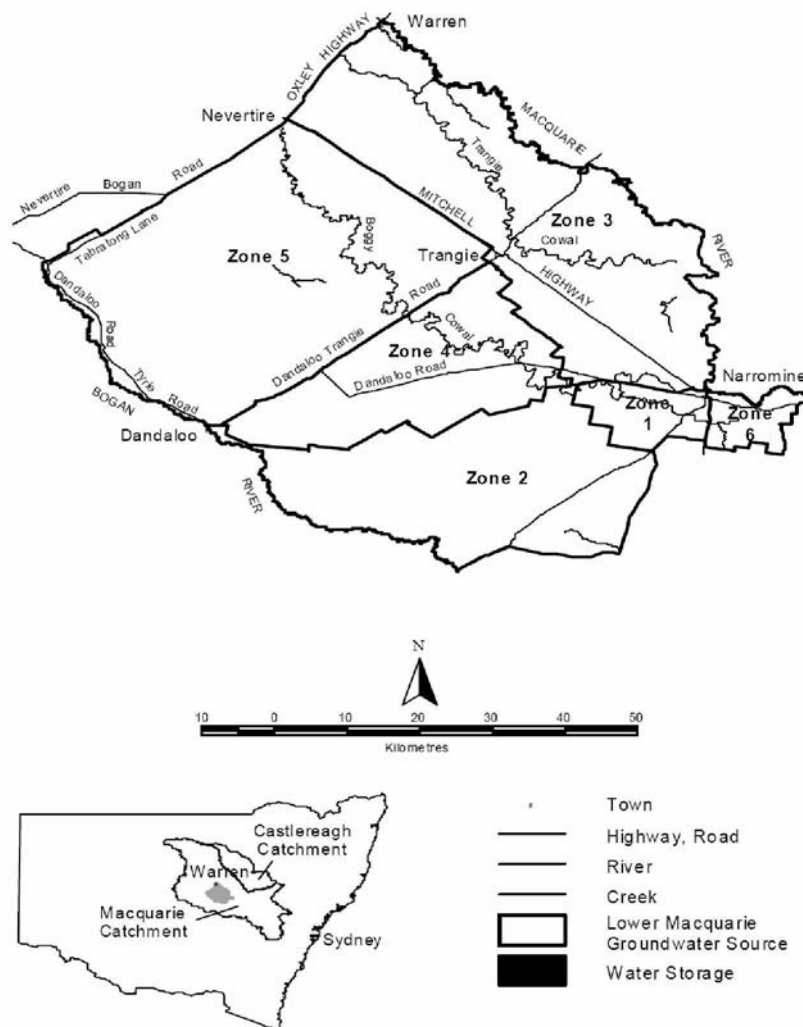
Source: Castlereagh River above Binnaway WSP (DNR website)

### 4.3.3 Groundwater

The Lower Macquarie Groundwater Sources are located in the Macquarie Catchment in central New South Wales, covering an area of 4,042 square kilometres from around Narromine to the west.

There are 6 groundwater sources (or zones) covered by the Plan. There are 146 water licences shared amongst 91 high-yield users in the water source for irrigation. Total use for 2000/01 for irrigation and industrial use was estimated to be 17,488 ML.

**Figure 18: Map of Lower Macquarie Groundwater Source**



Source: Lower Macquarie WSP (DNR website).

#### **4.4 Soils**

The soils of the catchment vary according to geology and landscape. Soil health issues can be categorised into three components – fertility (salinity, acidity, nutrients), biology (the number, condition and type of soil biota) and physical characteristics (structure, sodicity and erosion).

##### **Tablelands**

In the tablelands, high total rainfall has led to lower nutrients and poorer soil types. Generally, the geology of this area is dominated by coarse grained, acidic rocks resulting in sandy textured soils that are susceptible to erosion.

##### **Slopes**

The slopes are characterised by variable geology with soils developed by colluvial and alluvial activity. Generally, the soil types are less fragile and have higher nutrient levels. Many of these soils have naturally high salt stores in their profile, therefore increasing the risk of land degradation due to salinity. The tablelands and slopes have ratings of poor soil health, but there is a trend toward improved cropping and grazing management practices.

##### **Plains**

The plains are dominated by alluvial and aeolian soil development. These soil types have higher fertility, cation exchange capacities and clay contents. The soils have a high shrink/swell potential and are susceptible to compaction problems. Acidity has not been an issue in the past due to lower total rainfall, but intensive agriculture is causing the acidity hazard to increase.

#### **4.5 Sustainability Issues**

##### **Rising Watertables**

Rising groundwater, and the potential for development of shallow watertables, were issues recognised in the Lower Macquarie in the late 1980s.

The development of shallow watertables is related to recharge resulting from irrigated agriculture. However, the low irrigation intensities, increased efficiencies and the recent drought should see water tables diminish as an issue in the medium term.

##### **Salinity**

Increasing water salinity in the upper catchment is more likely to be an issue for the irrigators of the Macquarie that salinity caused by rising watertables. The largest impact of increased salinity is likely to be on agricultural. This may occur as water quality of supply diminishes, however the largest impact is the impact on production of soil salinisation as water tables rise in some irrigation areas.

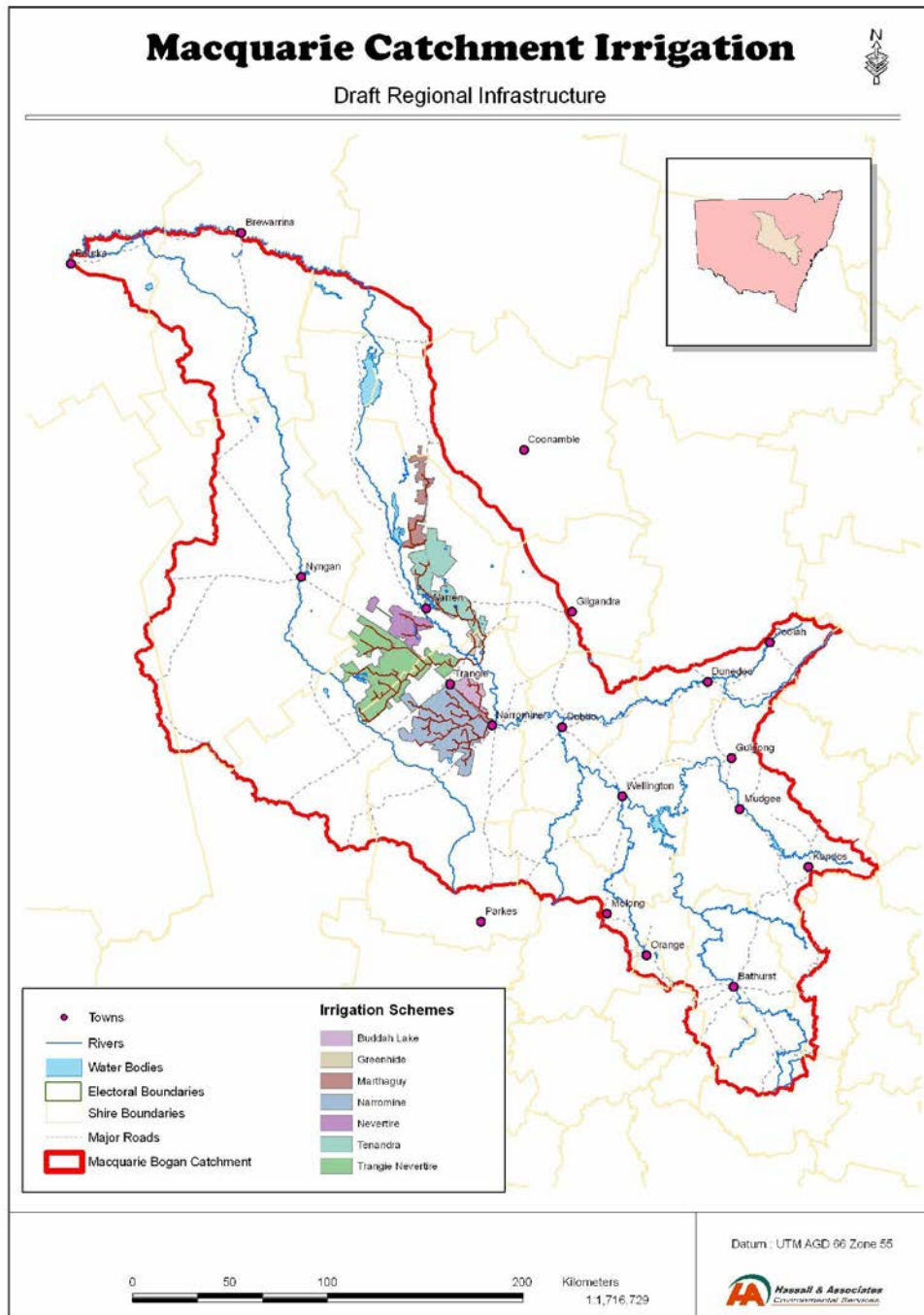
##### **Native Vegetation**

The Central West CMA has a focus on native vegetation issues in the Central West which is a particular issue in the western parts of the catchment which support dryland cereal cropping. The Native Vegetation Management Act and associated regulations may have some impact on irrigators if they are redesigning irrigation layouts but this is likely to be minor.

#### 4.6 Major Irrigated Industries

Viticulture and Horticulture dominate in the slopes region around Mudgee, Orange and Wellington, citrus is grown in Narromine, and cotton and other summer crops are grown on the lower valley floodplains west of Dubbo. Irrigation occurs adjacent to the Macquarie River or in the seven off-river schemes (Table 15). Irrigation is far less prominent in the Castlereagh and Bogan catchments.

Figure 19: Map of irrigation areas



Source: Swan (2007).

**Table 15: Irrigation Schemes in the Macquarie Valley**

	<b>Total Land Irrigated 1993-94 (ha)</b>	<b>Number of Licence Holders</b>
River Pumpers	36,620	600
Narromine Irrigation Scheme	8,970	90
Buddah Lake Scheme	4,200	19
Tenandra Irrigation Scheme	5,535	32
Trangie-Nevertire Scheme	9,855	66
Greenhide Irrigation Scheme	835	10
Marthaguy Irrigation Scheme	2,495	16
Nevertire Irrigation Scheme	4,150	15

Source: Hope (2003).

#### 4.7 Irrigation methods (all water sources)

Hope (2003) provides a summary of irrigation methods used in the Macquarie. Overhead sprays and micro-sprinklers are generally used to irrigate orchards around the Orange area. Around the Mudgee area, vines are irrigated with surface drip and sprinkler.

Centre pivots are found just downstream of Burrendong Dam. Between Coonabarabran and Gilgandra there are small pockets of spay irrigation. Pressurised systems are used to water crops upstream of Dubbo. Pressurised and surface systems are used to water some crops between Dubbo and Narromine.

Downstream of Narromine, systems are predominantly surface. Most cotton is typically watered using furrow irrigation.



Lateral irrigator, Cudgegong 2007.

## 4.8 Dependence on water

This section explores the dependence of the communities on irrigated agriculture.

This section provides an overview of the:

- § Quantity of water irrigated agriculture consumed;
- § Value contribution of irrigated agriculture; and
- § Area of land devoted to irrigated agriculture.

### 4.8.1.1 Economic contribution of irrigated agriculture

Irrigated agriculture plays a significant role in the economy of the Macquarie Catchment.

Table 16 summarises the total area of irrigated cotton and irrigated agriculture in the Macquarie Irrigation Subgroup. In 2001, irrigated cotton accounted for 69% of the total area irrigated in the Subgroup. The key irrigated cotton areas are Warren and Narromine. Irrigated cotton accounted for 88% and 69% of the area of irrigated agriculture in the Warren and Narromine LGAs respectively.

**Table 16: Area (ha) of Irrigated Cotton and Irrigated Agriculture for the Irrigated Subgroup – 2001**

LGA	Area of Irrigated Cotton	Area Irrigated
Brewarrina	-	232
Dubbo	-	2,770
Wellington	-	1,166
Warren	30,491	34,722
Narromine	20,269	29,215
Mid Western Regional	-	5,801
<b>Subgroup</b>	<b>50,760</b>	<b>73,906</b>

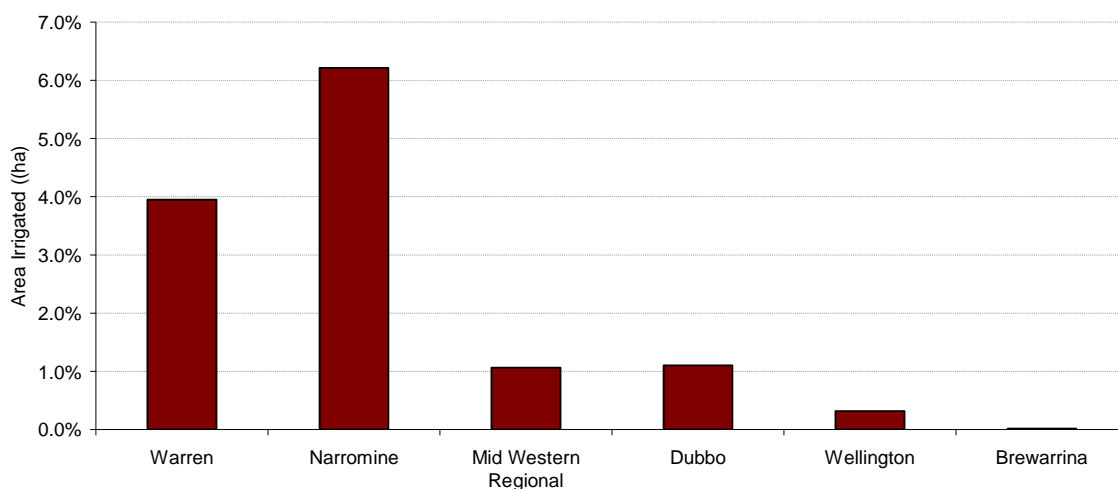
Source: Agricultural Census, ABS (2001).

The area of irrigated cotton in the Macquarie Valley Catchment accounted for 26% of the total irrigated area in 2006, demonstrating the significance of cotton in the Warren and Narromine LGAs.

The area of irrigated agriculture as a proportion of total agricultural holdings is provided in Figure 20. Again, Warren and Narromine show the highest levels of irrigated agriculture.



**Figure 20: The area of Irrigated Agriculture as a Proportion of the Total Area of Agricultural Holdings – 2001**



Source: ABS (2001), Agricultural Census.

Comparatively, the level of irrigated agriculture in NSW accounts for 1.8% of the area of agricultural holdings, which is much less than that shown for Warren and Narromine, but higher than the level in the other LGAs of the Subgroup.

Table 17 summarises the estimated total value of irrigated agriculture as a proportion of the gross value of production for agriculture in the Macquarie Irrigation Subgroup.

**Table 17: Gross Value of Production (in millions) of Agriculture and Irrigated Agriculture for the Irrigation Subgroup (2001)**

LGA	Proportion of Production Irrigated	Value of Irrigated Production	Total Agricultural Production
Fruit	83.6%	\$11.6	\$13.8
Crops	75.4%	\$228.1	\$302.6
Livestock Slaughtering	5.4%	\$6.3	\$116.8
Livestock Products	9.6%	\$8.9	\$92.5
<b>Total Value</b>		<b>\$254.9</b>	<b>\$525.7</b>

Source: Agricultural Census, ABS (2001), the proportion of irrigated agriculture for the catchment was based on estimates outlined in NSW Irrigators Council Factsheets.

The gross value of cotton production in the Macquarie Valley Catchment was estimated at \$3,215 per hectare in 2005 (CRDC 2006). Average water consumption for cotton production in 2005 was 17.9 ML/ha in the Macquarie Valley, compared to a 9.0 ML/ha average across the Gwydir, Macintyre/Barwon, Namoi and Macquarie Valleys.

The value of wheat, cereal, crop and total agricultural incomes are provided in Table 18. For all LGAs in the Macquarie Irrigation Subgroup, the majority of the value of cereal production is accounted for by wheat production.

**Table 18: Value (in millions) and Proportion of Value from Cereals and Cropping – 2001**

<b>LGA</b>	<b>Wheat</b>	<b>Proportion Cereal Value from Wheat</b>	<b>Cereals</b>	<b>Proportion Crop Value from Cereal</b>	<b>Crops</b>	<b>Proportion Agric. Value from Crops</b>	<b>Total Agriculture</b>
Brewarrina	\$5.6	96%	\$5.8	28%	\$20.7	52%	\$39.6
Dubbo	\$9.5	88%	\$10.8	70%	\$15.6	32%	\$48.5
Wellington	\$12.9	90%	\$14.4	71%	\$20.3	34%	\$60.3
Warren	\$27.2	96%	\$28.3	24%	\$118.6	77%	\$153.8
Narromine	\$40.5	94%	\$43.3	39%	\$112.3	79%	\$141.8
Mid Western Regional	\$1.4	79%	\$1.8	12%	\$15.2	19%	\$81.9
<b>Subgroup</b>	<b>\$97.1</b>	<b>93%</b>	<b>\$104.4</b>	<b>35%</b>	<b>\$302.6</b>	<b>58%</b>	<b>\$525.7</b>

Source: ABS (2001) Agricultural Census.

Cereals account for a varying level of the value of crop production across the LGAs of the Macquarie Irrigation Subgroup. The Mid Western Regional LGA shows the lowest proportion at 12%, while the Wellington LGA shows the highest proportion at 71% cereals.

#### 4.9 Processing: Cotton Ginning Overview

Once the cotton is picked it is compacted into modules and is then transported to a cotton gin. Cotton gins are factories that complete the separate the lint from the seed.

##### *The Ginning Process*

The cotton arrives at the gin in modules where the first step is to remove any green bolls, rocks and sticks. Cotton must be ginned with a moisture level of 5%. The cotton is dried out if it is too wet or water is added if it is too dry to ensure the correct moisture level. After cleaning, the cotton is then ready for separation in the gin stand. The gin stand removes the seed from the lint. Any remaining trash in the lint is then removed and the clean lint is pressed into bales, which weigh 227kg each.

**Products From Ginning**

When the seed cotton is processed in the gin, three products are produced, cotton seed, lint and waste.

- § Seeds make up about 55% of the seed cotton weight that comes from the farms. They are very valuable and are used for a variety of products such as oil, plastics, stock feed, cosmetics and margarine. They might also be used as seeds for the next cotton crop.
- § Lint makes up 35% of the seed cotton weight. Once the lint has been separated it is compacted into bales for easy transporting. The cotton bales are then either taken to spinning mills for further processing or they are transported directly to Australian ports for export to other countries that will process the cotton.
- § Waste product account for around 10% of the seed cotton that is classed as waste product or trash.

**Significant Ginners in the Macquarie**

**Namoi Cotton**

Namoi Cotton owns 12 cotton gins, including the Hillston Gin (which is operated as a 50-50 joint venture with the Twynam Agricultural Group), the Wathagar Gin (which is operated as a 50-50 joint venture with Sundown Pastoral Co Pty Ltd) and the Ashley Gin (which is operated as a 51-49 joint venture with Australia Food & Fibre Ltd). As part of its business operations Namoi Cotton owns and operates warehouse facilities in Wee Waa, Warren and Goondiwindi.

Namoi Cotton has one cotton gin (Gin Gin) and a cotton office (Trangie) in the Macquarie Valley. Namoi Cotton's production in the Macquarie Valley was 163,000 bales in the 2006 season, 64,000 bales in the 2005 season and 143,500 bales in the 2004 season.

**Auscott**

Auscott have expanded to ten ginning plants processing around just under 25% of the Australian three million bale crop. Only about 20% of the volume processed is the companies own production. Auscott's own production is around 100,000 bales.

Auscott operates three cotton gins in the Macquarie Valley two cotton gins in Warren and one gin at Trangie. These four cotton gins combined would employ about 120 people during the ginning season. Each gin on average employs 30 people for the season (up to 3 months).

**Deltapine**

Deltapine has established the only Australian cotton delinting and conditioning plant in Narromine.

#### **4.10 Summary**

The subgroups of the Macquarie Catchment differ in their economic structure, range of social services, demographic profiles and dependence on water.

The economy of the Catchment above Dubbo is diverse, and is based on farming, tourism (around Mudgee), government services, and specialist services eg health, secondary and tertiary education.

Around Dubbo there is limited irrigated agriculture. However there is a large agricultural supply industry and also secondary processing of agriculture products including abattoirs. Tourism and trade from the Newell Highway are contributors to the Dubbo.

Tourism is not a major economic activity west of Dubbo. For the areas west of Dubbo within the catchment agriculture is the most important sector.

Irrigated agriculture is an extremely important economic activity in the Catchment. The value of irrigated agriculture accounts for approximately 48% of the gross value of agricultural production or \$525.7 million.

Population growth of 5.2% was experienced between 2001 and 2006 for the Macquarie Catchment, growing to a total of 266,978 people. However, population change was varied across the valley with changes ranging from a decline of 2.7% in Cobar, to an increase of 13.5% in Oberon.

The population of the Irrigation Subgroup also increased between 2001 and 2006, to 82,890 persons in 2006, an increase of 4.8%, which was a higher rate of population growth than for NSW.

Good quality health, education and recreational services are available, including ambulance services, community health centres and ready access to hospitals.

The eastern part of the Catchment, which receives higher rainfall, is able to support a broader mix of agricultural enterprises than western areas, and therefore provides greater flexibility in adjustment to change. Cotton growing often is the key income source for irrigators and these operations are highly dependent on water. Many have cut back on irrigated cotton area, or have irrigated alternative crops during the drought. Water trading to date has been thin.

The strengths of the Macquarie Catchment include:

- § a strong regional centre in Dubbo;
- § population growth in some areas;
- § lifestyle strengths along the river;
- § employment growth in most areas, age groups and industries;

- § located on a major transport route;
- § diversity in the economy in the eastern half of the catchment with tourism and mining prevalent; and
- § diverse agricultural base in the upper reaches.

The areas of vulnerability for the Macquarie Catchment include:

- § declining population in some areas;
- § high degree of work opportunities and processing associated with cotton in the west of the catchment;
- § dependence of the economy and community organisations on the irrigation of cotton; and
- § the cumulative impact of drought as producers' income levels are reduced over a number of consecutive years.

## 5 POSSIBLE DRIVERS OF CHANGE AND TRENDS

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### 5.1 The Water Market

#### 5.1.1 Entitlement Trading

Water trading has had an impact on how people operate. However, the market for entitlement is thin. LAS records for the period July 2000 to February 2006 identify only 118 'permanent' trades of licences, for a total of 28.4 GL of general security shares and 667 ML of high security shares. These volumes represent turnover of less than 1% of issued entitlement in a year.

### 5.2 The Drought

The drought continues to be a significant issue across the catchment

**Table 19: Rural Lands Drought Declared (May 2007)**

RLPB	Status
Central Tablelands	Drought - Whole Board
Brewarrina	Drought - Whole Board
Coonamble	Drought - Whole Board
Dubbo	Drought - Whole Board
Molong	Drought - Whole Board
Mudgee-Merriwa	Drought - Whole Board
Nyngan	Drought - Whole Board

Source: NSW PDI website (2007).

Allocations for 2006/07 for the Macquarie and the Cudgewong are 0% with dam storages below 5% for Burrendong and Windamere at approximately 20%.

Even if the normal rainfall patterns return the financial impacts of the drought are likely to continue for some time. This may particularly be the case for irrigators as there will be lag affects while dam storage levels recover.

### 5.3 Climate Change

A report by CSIRO (2006) suggests that NSW is likely to become warmer in the future, with more hot days and fewer cold nights. Droughts are likely to become more frequent and more severe, with greater fire risk.

Little change in annual rainfall with higher evaporative demand would lead to a tendency for less run-off into rivers, The most likely changes to mean annual Burrendong Dam storage, Macquarie Marsh inflows and irrigation allocations are 0% to –15% in 2030 and –0% to –35% in 2070. Flow increases have only a 5% probability of occurring in 2030 and 2070 under most assumptions.

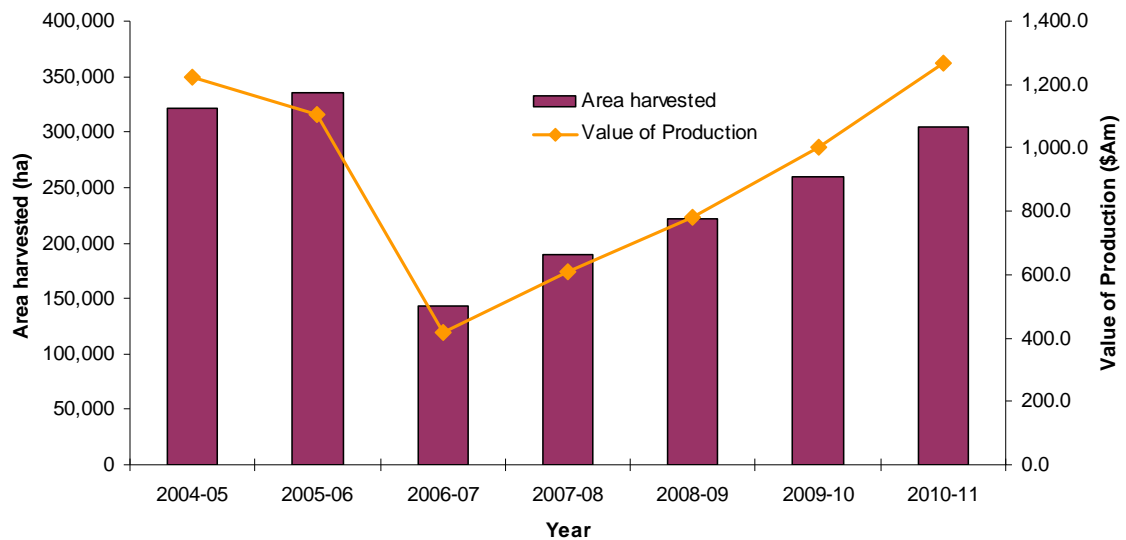
Low to moderate warming may also help plant growth, but more hot days and a decline in rainfall or irrigation could reduce yields. Low to moderate warming may actually help some plant growth especially frost sensitive crops such as wheat. Warmer winters may reduce the yield of stone fruits that require winter chilling. Livestock may be adversely affected by increased heat stress during summer. Climate change may result in marginal agricultural land becoming unsuited to production, thus increasing the value of the remaining 'better', more viable agricultural land (DEH 2006).

### 5.4 Cotton Futures

ABARE expects growth in world cotton consumption in 2006-07 to exceed production, leading to a decline in stocks. Reflecting this, the Cotlook 'A' price index is forecast to increase by 5 per cent in 2006-07 (2007).

Australia's crop over the past twelve months has fallen to historically low levels. The area planted to cotton in 2006-07 is estimated to have fallen by 57% to 143 000 hectares — the smallest area planted since 1983-84. It is estimated to increase to previous levels over the next 4 years (Figure 21).

Figure 21: Cotton Forecasts



Source: ABARE 2007.

There may be some move to diversify into other summer crops. However, the more likely changes would involve consolidation of properties into larger entities as is the case across most agricultural industries and the resumption of cotton production with an increased management ability to adapt to variability in water supplies between seasons.



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