RMCG

Environment | Water | Agriculture
Policy | Economics | Communities

JANUARY 2016

CENTRAL WEST & ORANA
AGRICULTURAL INDUSTRIES

FINAL REPORT

Department of Planning and Environment

This report has been prepared by:

RMCG
135 Mollison Street, BENDIGO VIC 3550
PO Box 2410, BENDIGO DC VIC 3554

P: (03) 5441 4821
E: rm@rmcg.com.au
W: www.rmcg.com.au

ABN: 35 154 629 943

Offices in Bendigo, Melbourne, Torquay, Warragul and Penguin (Tasmania)

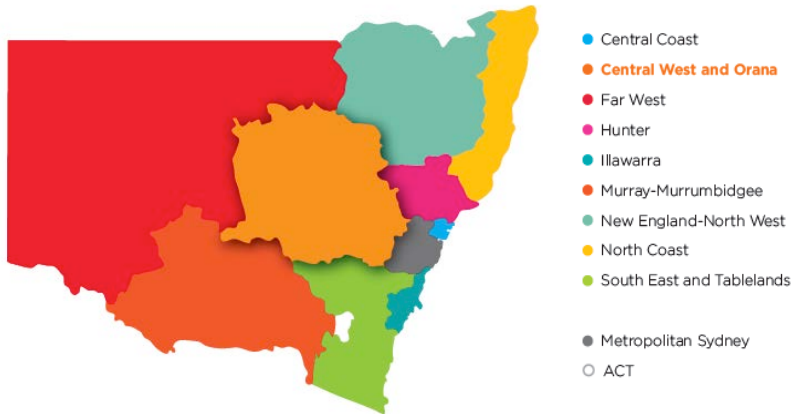
Key Project Contact

Shelley McGuinness
M: 0408 194 993
E: shelleym@rmcg.com.au

EXECUTIVE SUMMARY

This report examines the current status and trends relevant to the main agricultural industries within the Central West & Orana region in NSW and identifies strategic implications for policy to inform development of the Central West & Orana Regional Growth Plan.

The Central West & Orana region is located in central NSW and includes the major town centres of Dubbo, Bathurst, Mudgee, Orange, Parkes and Forbes. The region covers a total area of 125,666 square kilometres or 16% of NSW (Figure 1) and comprises twenty Local Government Areas (LGA) including: Bathurst, Blayney, Bogan, Cabonne, Coonamble, Cowra, Dubbo, Forbes, Gilgandra, Lachlan, Lithgow, Mid-Western, Narromine, Oberon, Orange, Parkes, Warren, Warrumbungle, Wellington and Weddin. The region has a population of 276,750[1] that is projected to increase to around 300,000 by 2031.



The economy of the region is relatively diversified. Agriculture continues to be a significant regional economic driver while mining, food processing and service provision have grown in importance. In 2010-11, the Central West & Orana Gross Value of Agriculture Production (GVAP) was around $2.2 billion, the third highest in NSW, after Murray Murrumbidgee and New England North West and accounted for 20% of the State's GVAP The sector provided employment for over 10% of the regional workforce.

Agricultural production is diverse and includes irrigated cotton, lucerne, winter cereals, horticulture as well as extensive areas of dryland cropping and livestock grazing including beef, sheep and wool. Timber production is also important in the eastern part of the region. The industry supports an extensive value chain including major livestock centres in Dubbo and Blayney, transport, logistics and inter-modal transport hubs, cotton gins, canneries, packing and processing. The region includes the Macquarie and Lachlan Valley irrigation areas that support significant cotton, export lucerne and horticulture industries. The main regional agricultural commodities have shown sustained growth in terms of value of production. The continued success of agriculture will be vital to the prosperity and growth prospects of the region. Regional growth planning should facilitate ongoing agricultural productivity and encourage investment in the value chain.

BROADACRE CROPPING

Broadacre cropping, including cereals, legumes, oilseeds, hay and cotton, generates the most GVAP in Central West & Orana and occupies a significant land area. Other than cotton, most of which is irrigated, most crops are produced from dryland farm systems. While the number of broadacre farms reduced between 2001 and 2011 there has been an increase in the number of large farms and a reduction in small farms providing strong evidence of consolidation and intensification of output.

Most grain is grown in the western and northern part of the region and both the area under crop and production levels have been steadily increasing. The main crops by GVAP are cereals, generating around $897million in gross value in 2011 with 80% of this from wheat. Canola has recently emerged as a significant regional crop. Cotton is mostly grown in the Narromine and Warren LGA, in the central and western parts of the region. The area of cotton grown fluctuates dramatically in response to irrigation water availability, ranging from as high as 60,000 hectares in 2002 and as little as 2,000 hectares in 2008, before the end of the millennium drought.

Economies of scale are the key to success in cropping and technology improvements have enabled farmers to sow larger areas. There is a clear trend towards larger cropping farms and the number of businesses with turnover greater than $1million and an increase in the number of crop-only enterprises has been observed. This has resulted in increased concentration of output with the top 15% of businesses producing over 50% of grain EVAO. Improved machinery technology, irrigation water use efficiency, increasing scale, monitoring and benchmarking have been important factors in the success of broadacre cropping and are also important for managing climate and economic risk.

[1] ABS 2011 Census

LIVESTOCK – MEAT AND WOOL

Livestock production for meat is the second largest agricultural sector measured by GVAP in Central West & Orana and accounted for 16% of NSW meat GVAP and occupied 70% of land used for agriculture in the region. This is followed by wool which accounted for 32% of NSW wool GVAP. Beef production is focused in the eastern parts of the region and sheep in the south western parts of the region. In 2011 there were around 4,500 farms identified as livestock farm in Central West & Orana and a further 1,600 mixed livestock and grains farms.

The livestock sector is dominated by a large number of small farms (<500 hectare and <$100,000 EVAO) and there has been little evidence of consolidation. While cattle numbers have remained steady there has been a 50% drop in the sheep numbers associated with drop in wool prices. Increased demand and high lamb prices has resulted in a shift in managing sheep for wool production to meat production. Livestock production has a significant value chain in Central West & Orana including meat processors, packaging, transport and logistics.

Unlike the grains sector, livestock industries in terms of farm business and production management systems have remained relatively static. Livestock grazing producers need to manage a feed base that is highly seasonal which constrains production levels. The large numbers of sub-commercial producers, that are not necessarily subject to the same economic drivers as commercial businesses, may be masking productivity improvements in the commercial beef sector. Access to affordable land, conflict with an increasing number of non-agricultural neighbours, particularly in the eastern parts of the region, are becoming a significant issues for part of the industry.

HORTICULTURE

The Central West & Orana region produces around 10% of NSW vegetables and 10% of NSW fruit and generated around $93million GVAP in 2011. While the area of horticulture is small, the industry generated over $220,000 GVAP/ha from annual horticulture and $8,000 GVAP/ha from perennial horticulture in 2011. The industry is focused in the south east parts of the region where there is access to High Security irrigation water supplies and suitable climate conditions. Economies of scale are a significant factor in the success of horticulture. Increasing scale provides opportunities for introduction of mechanisation and improved water use efficiency.

While the wine industry has undergone significant restructure, production of other fruit and vegetables has increased. Access to affordable land and labour, conflict with an increasing number of non-agricultural neighbours, particularly in the eastern parts of the region, are becoming significant issues for the industry. Crop protection, improved water use efficiency and new varieties are enabling producers to manage climate risks.

REGIONAL TRANSPORT INFRASTRUCTURE

The agricultural industry generates significant freight flow, exporting products and importing production inputs such as fertiliser and fuel. Rail freight services move bulk commodities such as grain and cotton to major ports. Road freight services move products within the region and to various destinations outside the region. Freight needs for agriculture are projected to grow at between 1 and 3% per annum until 2031. Maintaining road and rail infrastructure and upgrading strategic road assets to accommodate larger and heavier loads will be important for efficient agricultural freight movement.

IRRIGATION

Irrigated agriculture is an important component of the agricultural industry in Central West & Orana providing opportunities for production of high value commodities such as cotton, fruits and vegetables and continuity of production in low rainfall seasons. Water for irrigation is accessed via direct diversion from rivers, privately owned irrigation companies and groundwater pumping. There are two main irrigation districts in the region, being the Macquarie Valley in the centre of the region and the Lachlan Valley which extends across the south of the region.

There has been substantial restructure in irrigated agriculture driven by changes to government water policy including the introduction of water trading, the Murray Darling Basin Plan, NSW Water Sharing Plans, ACCC Water Charge & Trading Rules and ACCC Water Price Determinations. Water trading has driven water into higher value irrigated businesses and environmental water recovery has reduced water availability in every traditional irrigation area throughout the Murray Darling Basin. This restructure has been accompanied by significant investment in water efficiency improvements on farm and in water delivery infrastructure.

The water recovery targets set for the Lachlan and Macquarie-Castlereagh catchments under the Basin Plan have been achieved. Therefore, it is expected that there will be no further reduction in irrigation entitlement in these catchments.

CLIMATE CHANGE

Climate change has and will impact the agricultural industry within Central West & Orana. In the short to medium term producers will modify practices, production mixes and varieties to spread risk and reduce the impacts of climate change. Some strategies are already being adopted such as buying or leasing land in areas with more reliable rainfall or irrigation water security. In the longer term, some areas may see significant change in the mix of agricultural industries.

COMPETITIVE ADVANTAGE AND FUTURE OUTLOOK

The anticipated growth in demand for food and agricultural products in Asia should provide opportunities for further export of food manufactured from Central West & Orana. Numerous free trade agreements both agreed and currently being negotiated will facilitate flow of locally grown agricultural produce and value-added food products from Australia. Global growth in the "middle class" in Asia is leading to increased demand for quality food, including high end agricultural products such as fruit, dairy, high grade meats. This means potential opportunities for the Australian agricultural sector to grow in export significance.

The strengths of the Central West & Orana region[2] include its:

- Proximity to Sydney and other major population centres
- Agricultural productivity levels and diversity
- Population growth in major centres
- Land availability and affordability.

The competiveness of agriculture in the Central West & Orana region will be reliant on farmers being able to:

- Maintain previous productivity growth levels, especially in broadacre farming, in light of a flattening out of growth over recent years
- Innovate, adopt emerging technologies and improve their efficiency
- Manage high production costs, in particular labour costs
- Access an efficient supply chain – from farm to warehouse / manufacturer or bulk terminal to port
- Access secure water supplies for irrigated agriculture
- Manage natural resource pressures, especially associated with climate change
- Be highly attuned to international market developments.

Expansion in agriculture will require upgrades to freight, produce handling and transport infrastructure in some areas. Further diversification of some agricultural industries and value adding will need to attract increased capital investment. The location of the region has strategic competitive advantages for transport and logistics, however, the area is currently not well served by telecommunications and internet infrastructure. Future agricultural and processing business growth in the region will be reliant on a high speed, affordable and reliable communication network. This will be especially important for attracting manufacturing and technology based industries from Sydney.

STAKEHOLDER FEEDBACK

The feedback from stakeholders included the following key trends, risks and opportunities:

- There is a general trend towards increasing scale of agricultural enterprises driven by a mix of improved economies of scale, productivity improvements, declining terms of trade, technology and management improvements resulting in increased water use efficiency and labour inputs, demand from processors for larger quantities of consistent quality product.
- Industry risks include adapting to a changing climate, rural land use conflict around major centres and towns and in high amenity locations, biosecurity and protecting industry 'clean and green' image, accessing labour, irrigation water security
- Opportunities for the industry come from new free trade agreements, Australia's international image as a producer of 'clean and green' food backed by quality assurance programs, adoption of new technology and improved genetics.

The industry is continuously adapting to changing environmental and economic conditions. Producers are more nimble and flexible in responding to change. They are widely networked and actively seek information from a range of sources. They monitor and record their performance to enable them to continually refine and improve their business performance.

RECOMMENDATIONS FOR REGIONAL GROWTH PLANNING

Regional growth planning can support agriculture in Central West & Orana and maintain its competitive advantage by:

- Ensuring land suited agriculture is held in lot sizes suited to commercial agriculture
- Preventing uses and development not associated with primary production within areas identified for agriculture
- Maintaining separation between agriculture and urban development and other sensitive uses
- Facilitating restructure to enable economies of scale, adoption of new technology and more efficient management and land irrigation practices
- Ensuring urban development and sub-commercial agriculture are directed to areas outside irrigated areas or areas with the potential to be developed for irrigated agriculture
- Encouraging flexible and adaptable freight connectivity to the transport network
- Supporting freight and logistics precincts and intermodal hubs with the capacity to grow and adapt to changing needs
- Encouraging improved regional communications network.

[2] RDA Central West (2013). Regional Plan 2013 – 2016. Regional Development Australia Central West

1 INTRODUCTION

REPORT PURPOSE

This report examines the current status and trends relevant to the main agricultural industries within the Central West & Orana region in NSW and identifies strategic implications for policy to inform development of the Central West & Orana Regional Growth Plan. The approach taken has involved analysis of available statistical data (sourced from the Australian Bureau of Statistics) and desktop review of regional and industry reports to identify the most important issues facing producers and their industries, and the main drivers of change in these industries.

This study focuses on the five main agricultural industries in Central West & Orana:

- Broadacre cropping – cereals/oil seeds/legumes and a sub set cotton
- Livestock – cattle, sheep and goats
- Wool
- Perennial horticulture – orchard fruits and wine grapes
- Vegetables – annual horticulture.

DATA SOURCES

The statistical data in this report has been sourced from the Australian Bureau of Statistics (ABS). ABS undertake an Agricultural Census of farm businesses every five years and an Agricultural Survey in the interim years reporting estimates for Statistical Local Areas (SLA's), the smallest spatial unit of the Australian Standard Geographic Classification (ASGC 2006). The 2011 Census data and 2012 and 2013 surveys were collated by Statistical Area Level 2 (SA2). SLA and SA2 boundaries do not line up exactly but for most parts of the region they are close enough to generate meaningful time series data sets. A map showing SA2 boundaries in Central West & Orana is provided in Appendix 1.

Industry sector time series data sets using the Australian and New Zealand Standard Industry Classification (ANZIC) output and number of farms by "Estimated Value of Agricultural Operation (EVAO) ranges (from 2001, 2006 and 2011) and "Area of Holding" ranges were also analysed[3]. A farm business is considered to be 'in-scope' and part of the survey where the EVAO is greater than $5,000 per year.

Unless otherwise referenced, data in graphs and tables throughout this report have been sourced from the Australian Bureau of Statistics.

REGIONAL CONTEXT

The Central West & Orana region is located in central NSW and includes the major town centres of Dubbo, Bathurst, Mudgee, Orange, Parkes and Forbes. The region covers a total area of 125,666 square kilometres or 16% of NSW (Figure 1) and comprises twenty Local Government Areas (LGA) including: Bathurst, Blayney, Bogan, Cabonne, Coonamble, Cowra, Dubbo, Forbes, Gilgandra, Lachlan, Lithgow, Mid-Western, Narromine, Oberon, Orange, Parkes, Warren, Warrumbungle, Wellington and Weddin. The region has a population of 276,750[4] that is projected to increase to around 300,000 by 2031 (a 0.5% annual compound growth rate).

The economy of the region is relatively diversified. Agriculture continues to be a significant regional economic driver while mining, food processing and service provision have grown in importance (Table 1). Mining was particularly important for the local economy through the millennium drought providing off-farm employment and demand for local services.

[3] Compiled by Neil Clark & Assoc. Bendigo, Victoria.
[4] ABS 2011 Census

FIGURE 1: REGIONAL NSW[5]

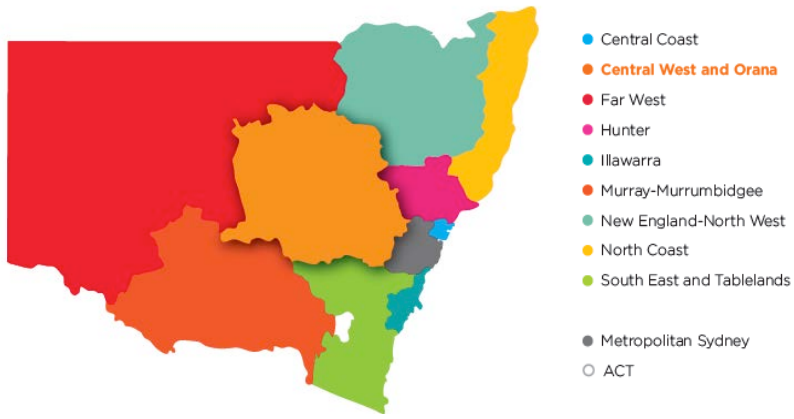


TABLE 1: INDUSTRY GROSS REGIONAL PRODUCT AND EMPLOYMENT IN CENTRAL WEST & ORANA 2011[5]

TOP 5 INDUSTRIES BY CONTRIBUTION TO GROSS REGIONAL PRODUCT	TOP 5 EMPLOYERS BY INDUSTRY
1. Mining (15%)	1. Health Care and Social Assistance (13%)
2. Agriculture, Forestry and Fishing (8%)	2. Retail Trade (13%)
3. Health Care and Social Assistance (7%)	3. Agriculture, Forestry and Fishing (11%)
4. Manufacturing (6%)	4. Education and Training (10%)
5. Education and Training (6%)	5. Manufacturing (8%)

[5] NSW Trade & Investment (2015) Economic Profile: Central West & Orana

2 REGIONAL AGRICULTURE

This section of the report provides an overview of agriculture in the Central West & Orana region including the economic contribution of key industries, land use and employment.

AGRICULTURAL PRODUCTION

In 2010-11, the Central West & Orana Gross Value of Agriculture Production (GVAP) was around $2.2 billion, the third highest in NSW, after Murray Murrumbidgee and New England North West and accounted for 20% of the State's GVAP (Figure 2). The sector provided employment for over 10% of the regional workforce.

Agricultural production is diverse and includes irrigated cotton, lucerne, winter cereals, horticulture as well as extensive areas of dryland cropping and livestock grazing including beef, sheep and wool. Timber production is also important in the eastern part of the region. The industry supports an extensive value chain including major livestock centres in Dubbo and Blayney, transport, logistics and inter-modal transport hubs, cotton gins, canneries, packing and processing. The region includes the Macquarie and Lachlan Valley irrigation areas that support significant cotton, export lucerne and horticulture industries.

The most important agricultural industry in the Central West & Orana region measured by GVAP was broadacre cropping contributing over 50% of GVAP followed by meat (beef, sheep, poultry, pig and goats) wool and cotton (Table 2). These four industries together comprise over 90% of regional agricultural GVAP. Broadacre cropping, meat and wool were significant at the State level generating 27%, 16% and 32% of NSW GVAP of these sectors respectively.

Irrigated horticulture contributes around $90 million or 4% of total GVAP and comprises fruit (mostly apples) and wine grapes, as well as a wide range of vegetables. A comparison of GVAP per hectare of the major commodity group highlights the importance of irrigation to regional agriculture (It should be noted that GVAP/ha is subject to seasonal conditions and commodity prices. The magnitude difference between commodity groups will however be relatively steady). While horticulture and cotton occupy a relatively small land area they generate significant GVAP (Figure 3).

The dairy egg and nursery industries are also represented in the region. Eight commodities make up 85% of the region's GVAP (Table 3). In descending order these are: wheat, beef, wool, sheep meat, barley, canola, hay and cotton.

The LGA contributing the most to regional GVAP are Lachlan (mostly wheat), Narromine (mostly wheat and some cotton), followed by Parkes, Forbes, and Coonamble (mostly mixed farming) and Cabonnne (mixed farming and horticulture). Lithgow, Oberon and Blayney have relatively small agriculture sectors measured by GVAP and area compared to other LGA (Figure 4).

In the decade between 2000-01 and 2010-11, total Central West & Orana GVAP increased by 38% from $1.6billion. The LGAs that experienced the most growth in GVAP over this period were Bogan, Coonamble, Forbes, Lachlan, Narromine, Parkes and Weddin. This growth is exceptional as the region was recovering from the millennium drought and a period of zero allocations in many irrigation areas (Figure 5).

FIGURE 2: REGIONAL GVAP AS A PROPORTION OF NSW GVAP, 2010-11

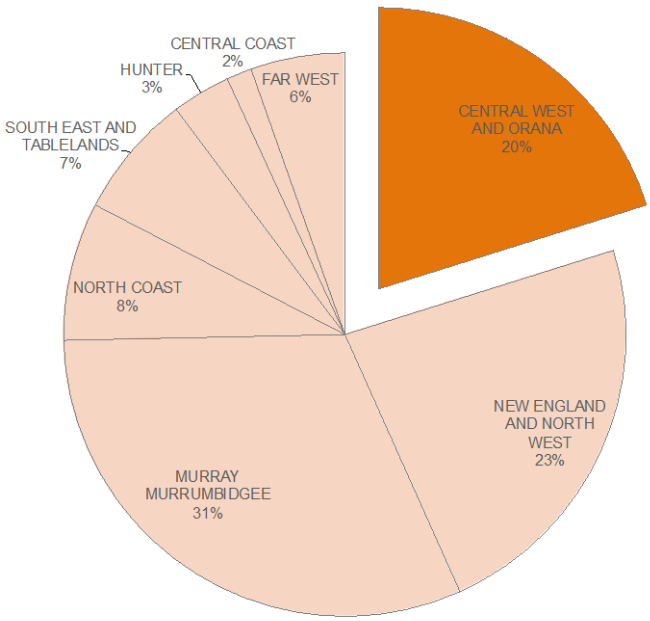


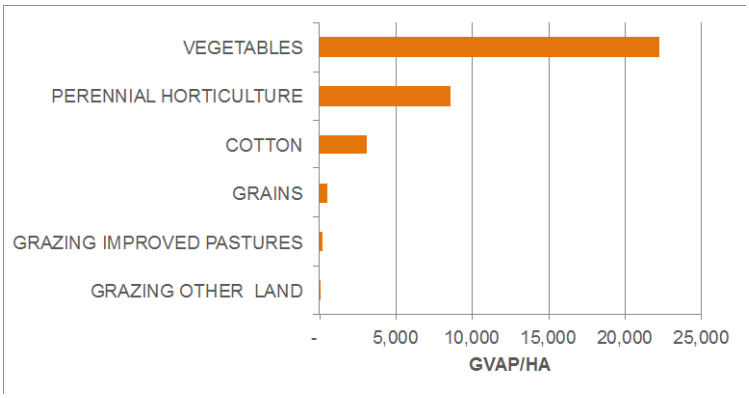
TABLE 2: GVAP BY INDUSTRY SECTOR[6] CENTRAL WEST & ORANA 2010-11

INDUSTRY SECTOR		GVAP $MILLION	PROPORTION OF TOTAL CWO GVAP	PROPORTION OF NSW INDUSTRY SECTOR GVAP
1	Broadacre cropping	$1,159	53%	27%
2	Livestock (meat)	$494	23%	16%
3	Wool	$271	12%	32%
4	Cotton	$78	4%	7%
5	Perennial horticulture (fruit & wine grapes)	$53	2%	11%
6	Vegetables	$40	2%	10%
7	Dairy	$34	2%	7%
8	Eggs	$24	1%	12%
9	Nurseries, cut flowers & turf	$17	0.8%	5%
10	Non classified	$10	0.5%	2%
TOTAL		**$2,179**	**100%**	

TABLE 3: TOP AGRICULTURAL COMMODITIES BY GVAP, CENTRAL WEST & ORANA 2010-11

MAIN AGRICULTURAL COMMODITIES		GVAP $MILLION	PROPORTION OF TOTAL CWO GVAP
1	Wheat	$717	33%
2	Beef	$295	14%
3	Wool	$271	12%
4	Sheep meat	$179	8%
5	Barley	$115	5%
6	Canola	$114	5%
7	Hay	$89	4%
8	Cotton	$78	4%
TOTAL		**$1,858**	**85%**

FIGURE 3: GVAP PER HECTARE MAJOR COMMODITY GROUPS, CENTRAL WEST & ORANA 2010-11



[6] ABS 2010-11 (NSW ag database – % value of NSW sheet)

FIGURE 4: REGIONAL DISTRIBUTION OF GVAP, CENTRAL WEST & ORANA 2010-11

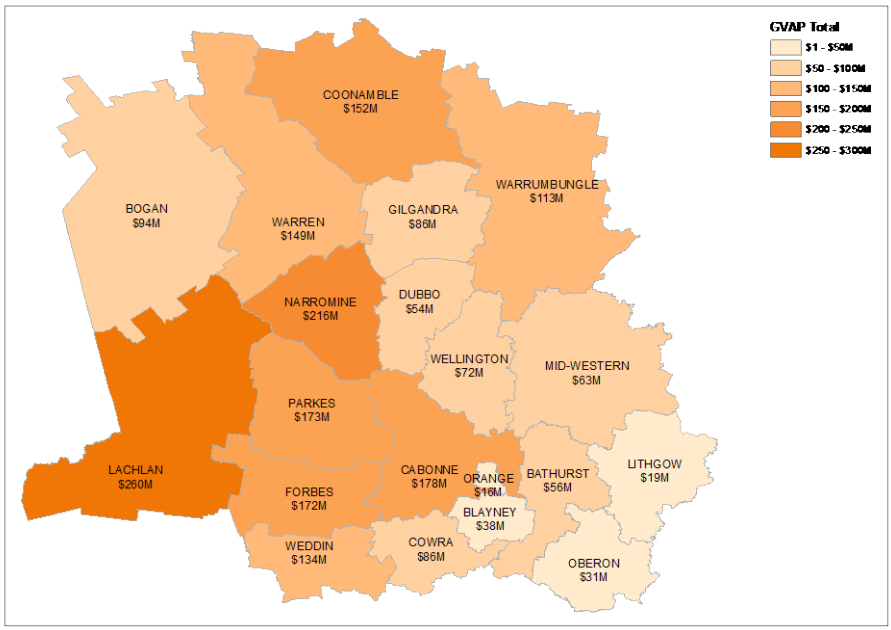
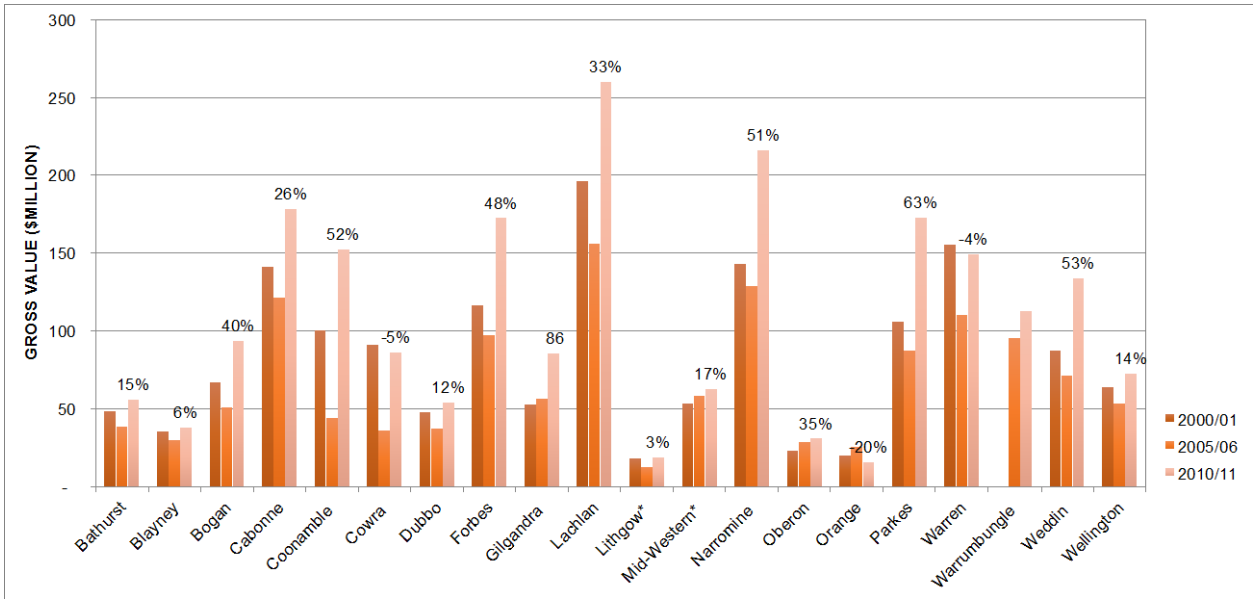


FIGURE 5: TREND IN GVAP BY LGA, CENTRAL WEST & ORANA



AGRICULTURAL LAND USE

Around 95,000 square kilometres is held in private ownership in Central West & Orana, of which over 89,000 square kilometres is used for productive agriculture[7] (Table 4). Areas set aside for conservation and non-agricultural production occupy just 6% of private land.

The most common land use by area is grazing, which occupies almost 70% of productive agricultural land with around 45% improved pastures and 55% unimproved or native pastures (Figure 6). Broadacre cropping and a small area of horticulture occupy the remaining 30% of productive agricultural land. Of the 2,700 square kilometres of cropped land in 2011, wheat was the main crop grown, representing nearly 60% of the cropped area.

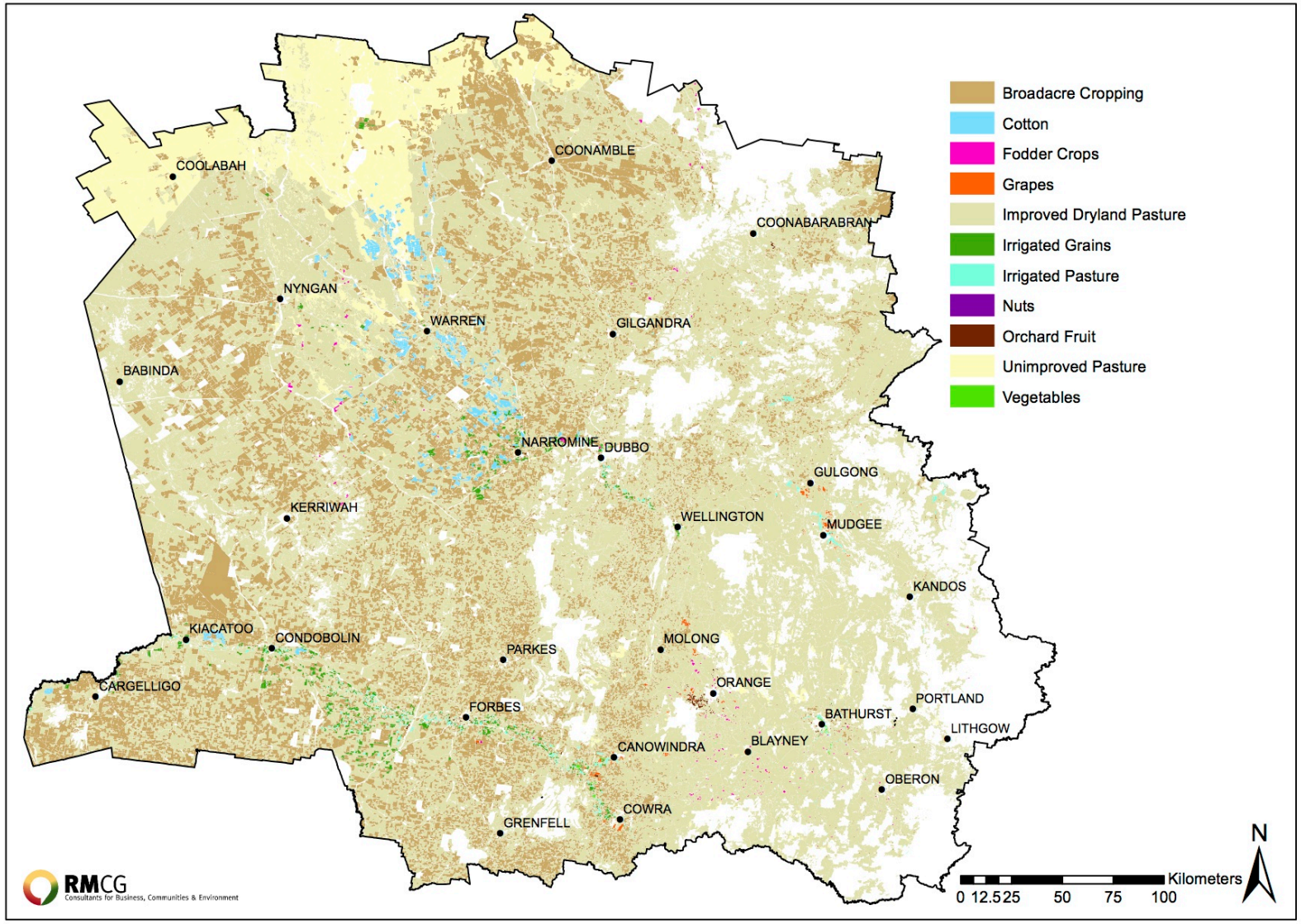
Horticulture occupies a relatively small land area and is estimated to have been in the order of 11,000 hectares in 2011[8]. This area is comprised of approximately 1,900 hectares of fruit trees, (17% of the irrigated area), 6,500 hectares of wine grapes (60% of the irrigated area), and the remaining 2,600 hectares are vegetables (23%).

[7] ABS 2010-11 (NSW ag database – Area Comp spreadsheet)
[8] ABS catalogues …

TABLE 4: USE OF PRIVATE LAND IN CENTRAL WEST & ORANA, 2010-11

LAND HOLDING DESCRIPTION	SQUARE KM
Area of private land	95,000
Area used for productive agriculture	89,000
(Area of crops)	(27,000)
(Area of grazing)	(63,000)
Land set aside for conservation	3,000
Other areas not used for agricultural production	2,000
Area of forestry plantations & other	200

FIGURE 6: AGRICULTURAL LAND USE (2006) [1]



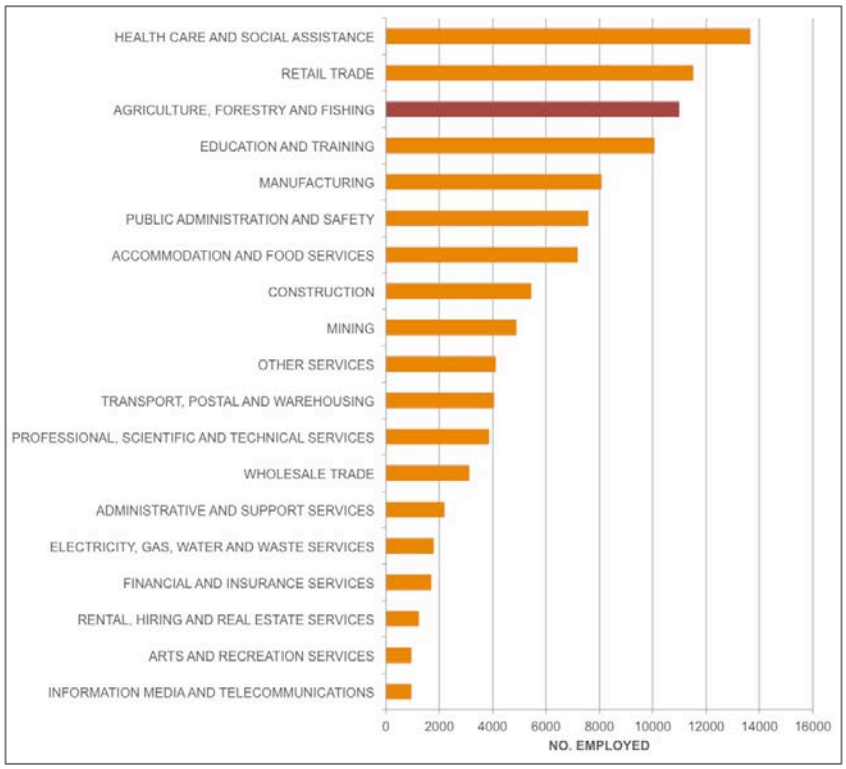
[1] Land use data from Australian Bureau of Statistics provided by Department of Primary Industry

EMPLOYMENT IN AGRICULTURE

In 2010-11, around 103,000 people were employed in the Central West & Orana region[1] or 3% of total employment in New South Wales. The region's agriculture, forestry and fisheries sector was the third largest employer, employing almost 11,000 people, or 11% of the region's workforce (Figure 7) and 15% of all people employed in the New South Wales agriculture, forestry and fisheries sector.

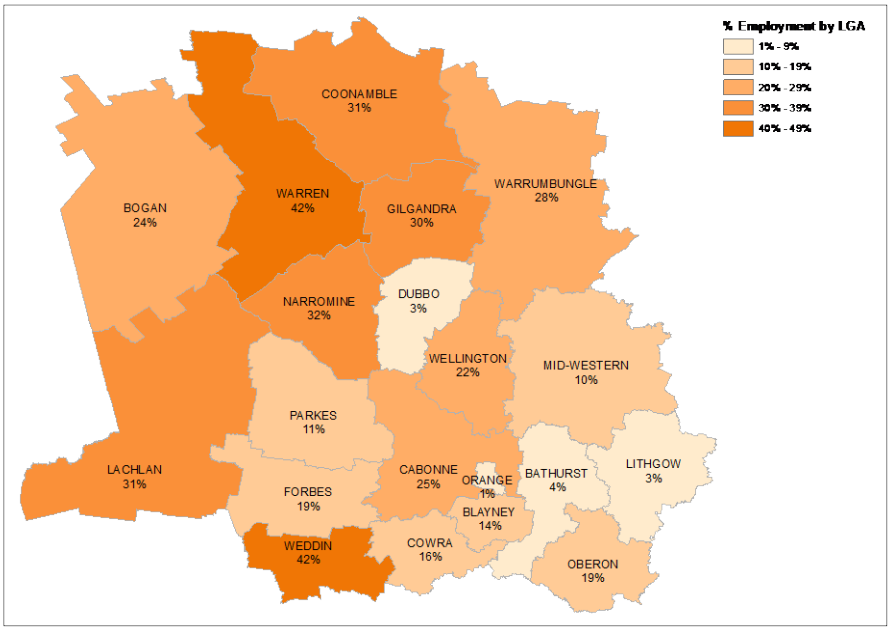
Figure 8 illustrates the distribution of employment in the agricultural sector across the region. LGA with highest proportion of employment in agriculture are Warren and Weddin (42% in each). More than 30% of the workforce was employed in agriculture in the Narromine, Lachlan, Coonamble and Gilandra LGA.

FIGURE 7: EMPLOYMENT BY SECTOR IN CENTRAL WEST & ORANA, 2011



[1] ABS 2010-11 (NSW ag database – RGP employment summary sheet)

FIGURE 8: EMPLOYMENT IN AGRICULTURE AS A PERCENTAGE OF TOTAL LGA EMPLOYMENT CENTRAL WEST & ORANA 2010-11



VALUE CHAIN

Primary production in Central West & Orana also supports a significant value chain including transport and logistics, servicing and farm supplies and manufacturing and processing of primary produce. Turnover of manufacturing and wholesale businesses alone was estimated at over $2.8 billion in 2011 and employed over 4,000 people (Figure 9). The value chain is concentrated in the regional centres of Bathurst, Dubbo and Orange but is locally significant in other smaller population centres (Figure 10)

FIGURE 9: BUSINESS TURNOVER AGRICULTURAL MANUFACTURING AND WHOLESALING, CENTRAL WEST & ORANA 2010-11

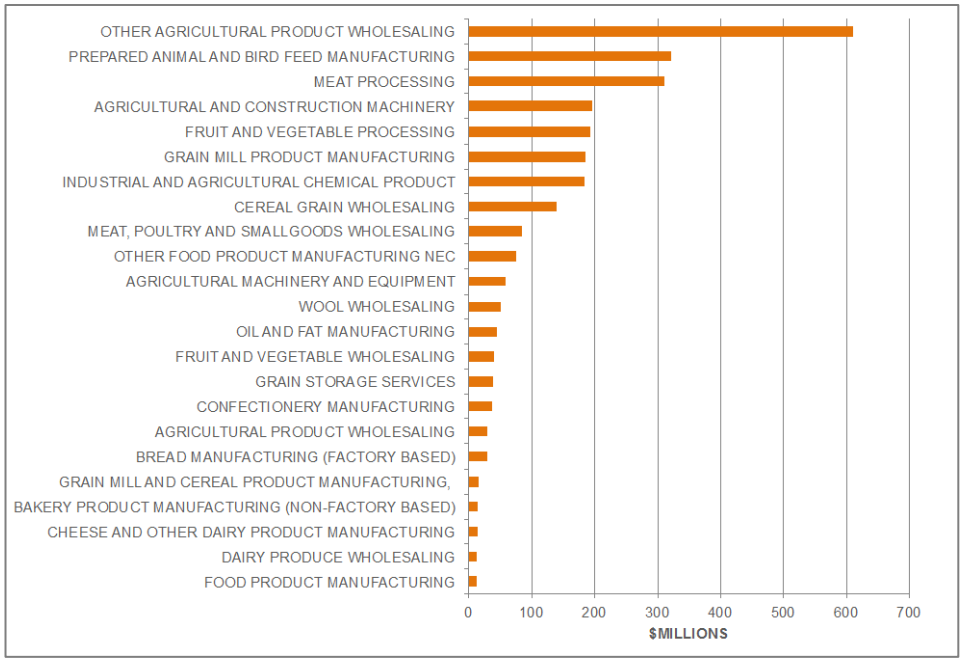
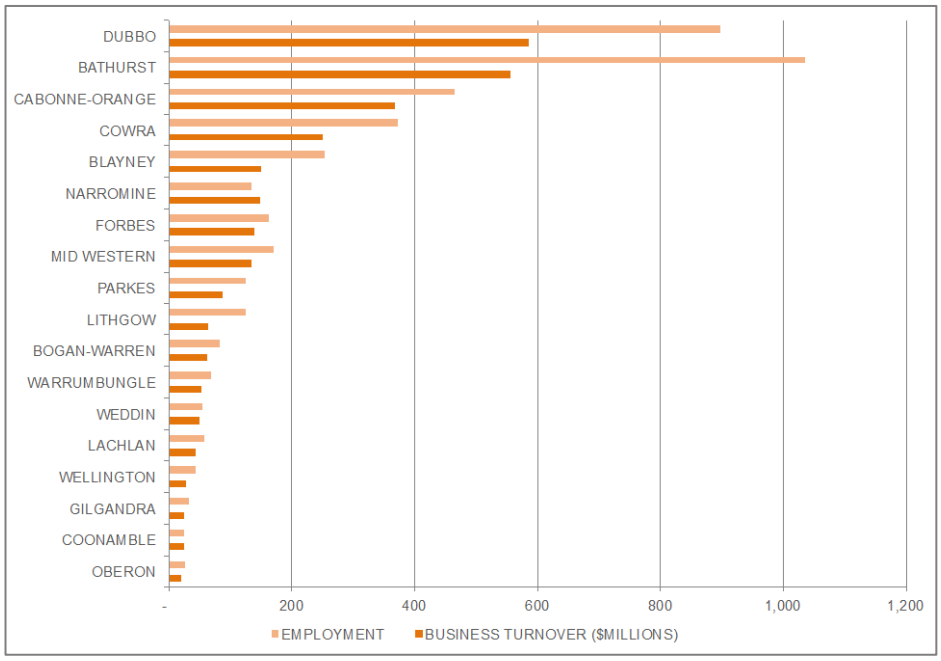


FIGURE 10: EMPLOYMENT AND BUSINESS TURNOVER AGRICULTURAL MANUFACTURING AND WHOLESALING BY LGA, CENTRAL WEST & ORANA 2010-11



MAJOR TRENDS

The GVAP of wheat, the main cereal crop, increased five-fold from $127 million in 1992 up to $717 million in 2011. Canola has recently emerged as a significant commodity generating an all time high value of $220 million in 2013 almost doubling the value generated in 2011(Figure 11). The gross value of sheep meat also increased five-fold over the past 20 years increasing from $27 million in 1992 up to $145 million in 2013. Despite experiencing significant fluctuations, the gross value of beef has shown a small increasing trend over the past two decades, increasing in value in the order of around $100 million up to $313 million in 2013. Wool has tended to fluctuate around $250 million in gross value showing neither an increasing or decreasing trend, representing a loss in value in real terms (Figure 12).

FIGURE 11: TRENDS IN GVAP OF BROADACRE CROPS, CENTRAL WEST & ORANA

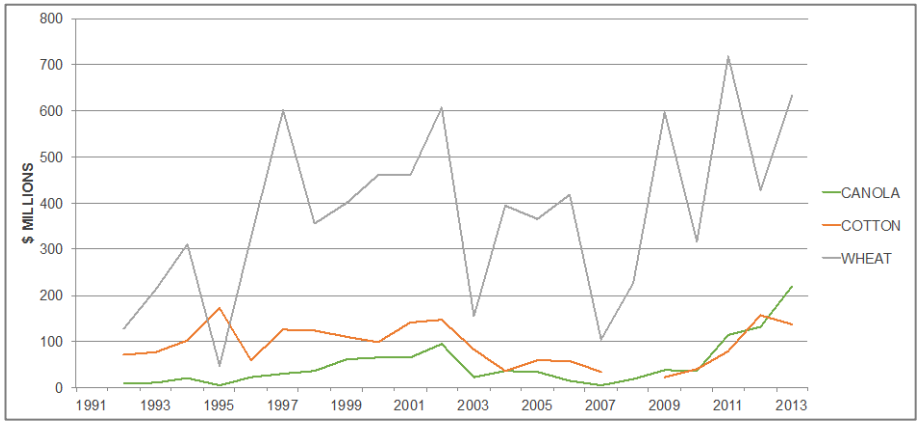
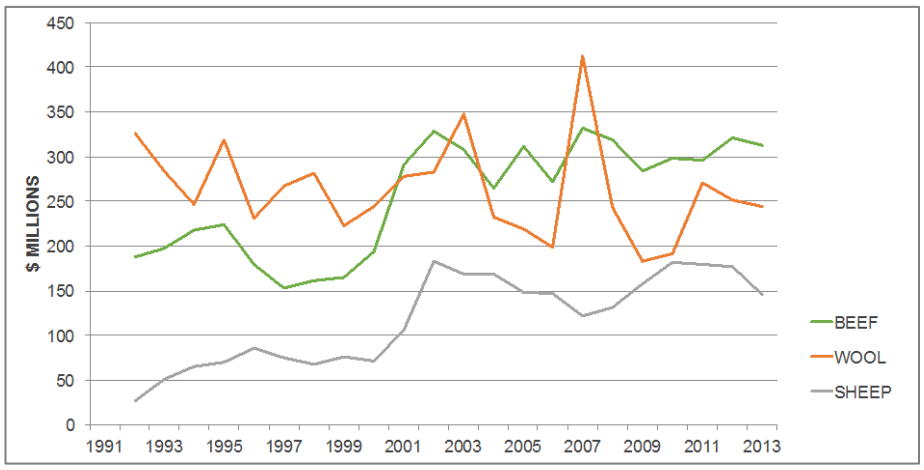


FIGURE 12: TRENDS IN GVAP OF LIVESTOCK PRODUCTS, CENTRAL WEST & ORANA



STRATEGIC IMPLICATIONS

Agriculture and the value chain are significant sectors of the economy of Central West & Orana. Agriculture is the region's most widespread land use and is diverse; ranging from irrigated horticulture and cropping in the Macquarie and Lachlan Valleys to large scale dryland cropping and grazing. Agriculture and the value chain provides significant employment and exports from the region. The main regional agricultural commodities have shown sustained growth in terms of value of production. The continued success of agriculture will be vital to the prosperity and growth prospects of the region.

3 MAJOR AGRICULTURAL INDUSTRY SECTORS

This study focuses on five main agricultural industries:

- Broadacre cropping – cereals/oil seeds/legumes and a sub set cotton
- Livestock – cattle, sheep and goats
- Wool
- Perennial horticulture – orchard fruits and wine grapes
- Vegetables – annual horticulture.

The following sections provide a detailed analysis of these industries.

4 BROADACRE CROPPING

MAIN FINDINGS

- Broadacre cropping, including cereals, legumes, oilseeds, hay and cotton is the largest industry sector in Central West & Orana.
- Other than cotton, most of which is irrigated, most crops are produced from dryland farm systems.
- There were approximately 2,500 broadacre farms in 2011 including (grains-only, and mixed farms) a reduction of 25% since 2001. At the same time there was an increase in the number of large farms (>2,500 hectare and >$1million EVAO) and a reduction in smaller farms providing strong evidence of consolidation and intensification of output.

GRAINS

- Most grain is grown in the western and northern part of the region and both the area under crop and production levels have been steadily increasing.
- The main crops by GVAP are cereals, generating around $897million in gross value in 2011 with 80% of this from wheat.
- The GVAP from wheat has increased five-fold over the past two decades associated with a 100% increase in the area sown and improved productivity.
- The GVAP of canola increased from $8million to $220million and the area sown from 24,000 ha up to 336,000 ha between 1992 and 2013.

COTTON

- Cotton is mostly grown in the Narromine and Warren LGA, in the central and western parts of the region.
- The area of cotton grown fluctuates dramatically in response to irrigation water availability, ranging from as high as 60,000 hectares in 2002 and as little as 2,000 hectares in 2008, before the end of the millennium drought.
- Cotton yields remained steady at around 1.5 tonnes/hectare lint up until 2004 and have since been steadily climbing and now range between 2.5 and 3 t/ha.

CURRENT SITUATION

Broadacre cropping in the Central West & Orana region includes cereals, legumes, cotton, oilseeds and hay. Most of these crops are produced in dryland situations with cotton the main irrigated broadacre crop. Wheat, chickpeas, lupins, canola and oats are grown in rotation and dryland cotton is included when conditions are favourable.

Cereals contribute over 70% ($897 million) of the gross value associated with broadacre cropping (Figure 13) followed by oilseeds ($116 million), hay ($89 million), cotton ($78 million) and legumes 5% ($57 million).

Wheat, generates the most gross value ($717 million) accounting for 80% of all cereals and over 70% of all cropping output in 2011 (Figure 14). The main wheat producing local government areas were Lachlan, Narromine, Coonamble and Warren (Figure 18). The next most important cereals were barley ($115 million) and oats ($41 million). The main local government areas producing barely were Lachlan and Parkes. There is some production of irrigated summer cereals (sorghum and maize) ($10 million).

Canola accounts for $114 million GVAP and 98% of the gross value of all oilseed crops in the region. Canola was grown mostly in the Narromine, Weddin, Forbes and Parkes LGA (Figure 15). Hay production (mostly comprising cereal and pasture hay types) generated $89 million in 2010-11. Legume crops generated $57 million, comprising mostly lupins and chickpeas (Figure 16). Some field peas, mung beans and faba beans are also grown (Figure 17).

In 2010-11, the total area occupied by cotton crops was 19 square kilometres and generated $78 million, which equates to 6% of the total cropping output in the Central West & Orana region. Cotton products include both lint and seed. In 2010-11, 34,550 tonnes of cotton lint and 86,245 tonnes of cotton seed was produced. Most cotton was produced in Narromine and Warren with smaller quantities produced in Lachlan, Parkes and Bogan

The extent of cropping in the region has expanded west of Narromine with land formerly used for sheep grazing is transitioning to crop with introduction of improved equipment, technology and management practices.

FIGURE 13: GVAP OF GRAIN AS A PERCENTAGE TOTAL BROADACRE CROPPING GVAP, CENTRAL WEST & ORANA 2010-11

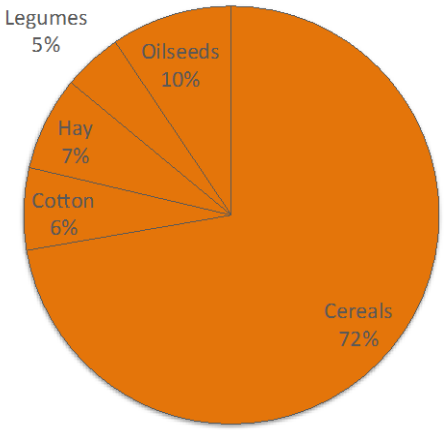


FIGURE 14: GVAP OF CEREALS CENTRAL WEST & ORANA 2010-11

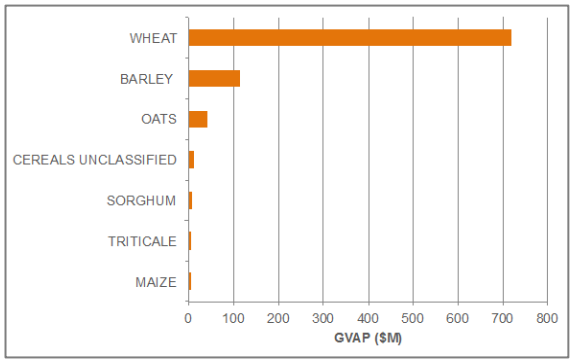


FIGURE 15: GVAP OF OILSEEDS CENTRAL WEST & ORANA 2010-11

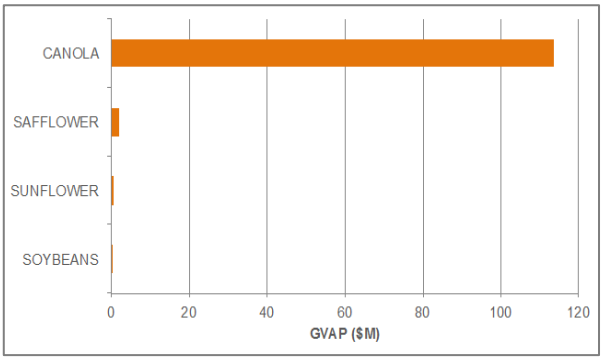


FIGURE 16: GVAP OF HAY, CENTRAL WEST & ORANA 2010-11

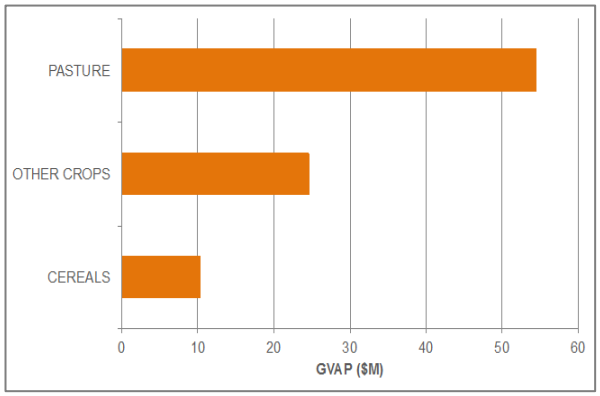


FIGURE 17: GVAP OF LEGUMES CENTRAL WEST & ORANA 2010-11

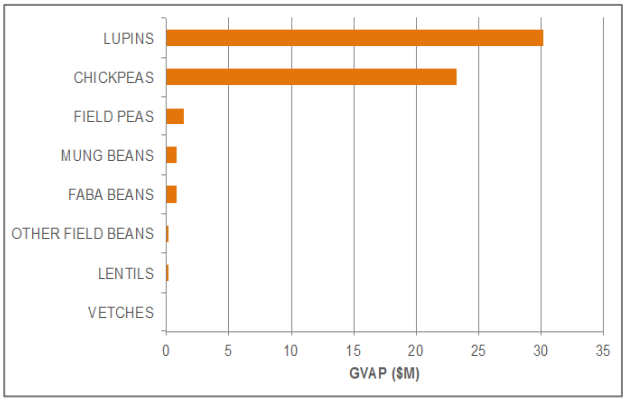
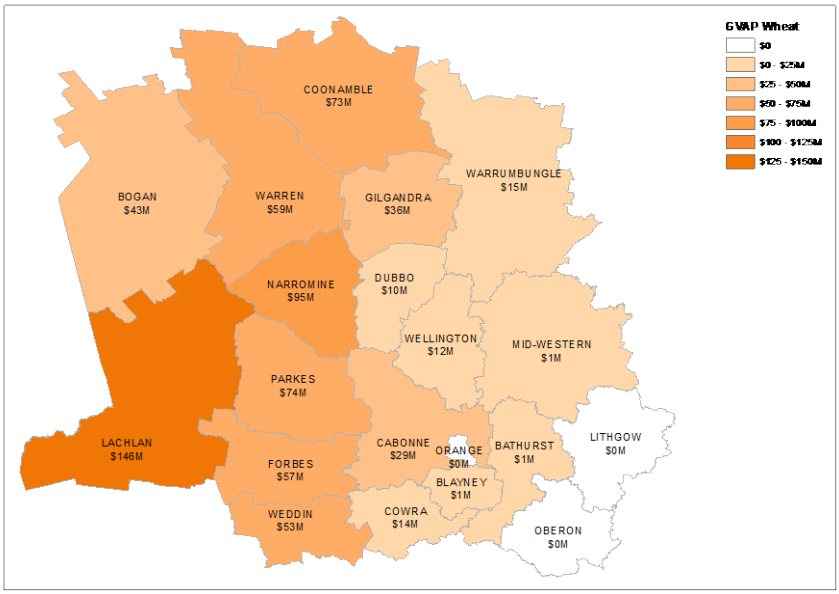


FIGURE 18: DISTRIBUTION OF WHEAT GVAP CENTRAL WEST & ORANA 2010-11

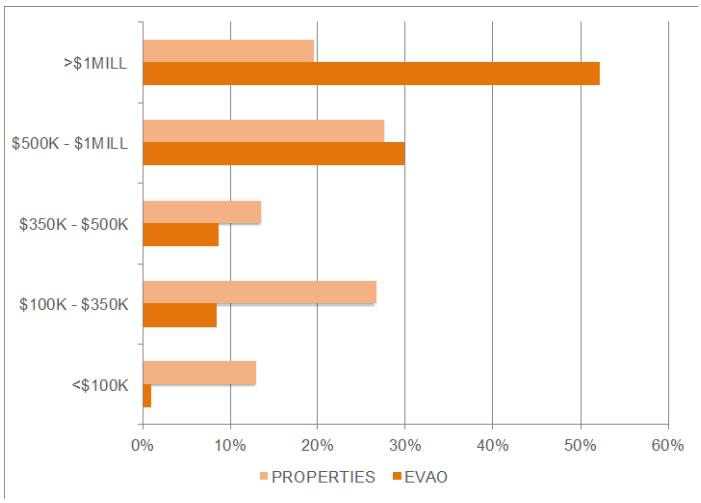


INDUSTRY TRENDS

Around 2,500 farms are identified as grain growing farms in the region and two thirds of these include a livestock enterprise. Since 2001, the number of broadacre mixed and cropping farms has decreased by around 25% from 3,300 farms while at the same time there was a five-fold increase in wheat production and significant expansion in canola production. There is a strong trend in concentration of output with the top 20% of businesses generating more than 50% of grains EVAO (Figure 19).

Wheat, barley, canola and oats continue to be the main dryland crops grown in the region. Wheat remains a stronghold and its dominance is likely due to relatively good returns including years with early season finishes or below average growing season rainfall. Growing non-cereals, such as legumes and oilseeds, on low soil moisture poses larger financial and production risks.

FIGURE 19: PERCENTAGE EVAO AND PROPERTIES BY GRAINS BUSINESS SIZE CATEGORY, MAIN GRAIN PRODUCING LGA CENTRAL WEST & ORANA 2010-11



WHEAT

The area sown to wheat doubled over the past 20 years from around half a million to over one million hectares sown in 2013. Over the same period, the GVAP of the regional wheat crop increased from $127 million in 1992 to $632 million in 2013. While wheat production has increased in accordance with the increased area sown, annual wheat production is extremely variable and fluctuates dramatically in response to growing season rainfall. Wheat production plummeted in the extreme drought years of 1995, 2003, 2007 and 2008 for example (Figure 20).

The trend in area sown to wheat is repeated across the main wheat growing areas of Condobolin, Nyngan, Narromine, Coonamble and Parkes. The area sown to wheat peaked in the Condobolin area in 2005 in several of the other main wheat producing areas (Figure 21).

Wheat yields fluctuate with rainfall and tend to be within a range of 1 to 2.5 tonnes per hectare, averaging just over 1.5 tonnes/hectare over the past 20 years. Yields were as low as 0.3 to 0.5 tonnes/hectare during the extreme drought years. Advances in wheat yields have slowed and the reasons for this are uncertain but are likely to include reduced growing season rainfall. Patterns in wheat yields are also similar between the main wheat growing districts (Figure 22).

FIGURE 20: TREND IN AREA SOWN AND YIELD OF WHEAT, CENTRAL WEST & ORANA

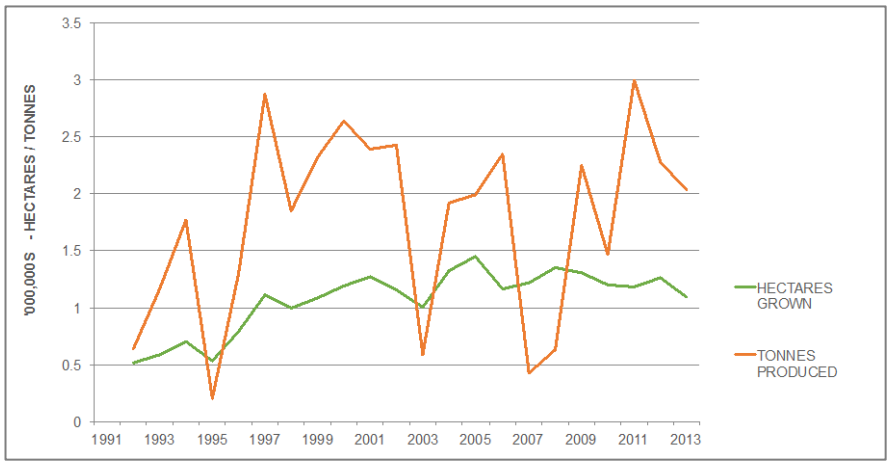


FIGURE 21: TREND IN AREA SOWN TO WHEAT IN MAIN WHEAT GROWING LGA OF CENTRAL WEST & ORANA

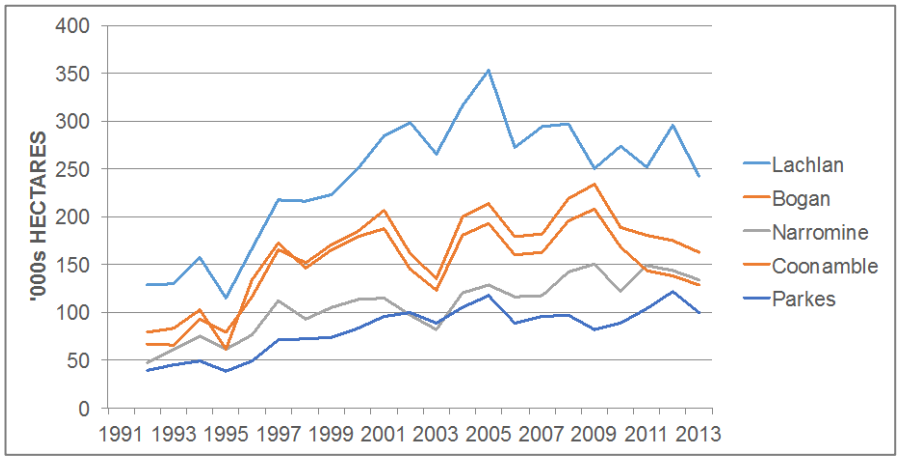
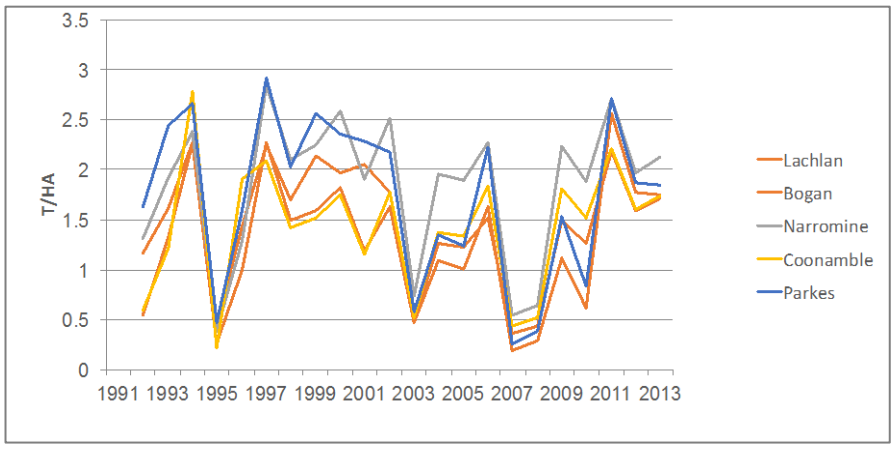


FIGURE 22: WHEAT YIELD TRENDS IN MAIN WHEAT GROWING LGA, CENTRAL WEST & ORANA



CANOLA

Canola has emerged as a significant crop in the region generating $220million GVAP in 2013 up from only $8million in 1992. Over the same period farm numbers producing canola increased from 300 to over 1,000 farms, the area sown increased from 26,000 ha up to 336,000 ha and production increased from around 30,000 tonnes up to over 400,000 tonnes (Figure 23). These trends are replicated in the main canola growing areas in the region (Figure 24). Canola yields trended downwards during the millennium drought and have been recovering since 2009. On average, canola has yielded 1.2 tonnes/ha over the past two decades, fluctuating between 0.5 and 2 tonnes/ha (Figure 25). Equipment and management improvements and good prices have underpinned the expansion of canola.

FIGURE 23: TREND IN AREA SOWN AND YIELD OF CANOLA, CENTRAL WEST & ORANA

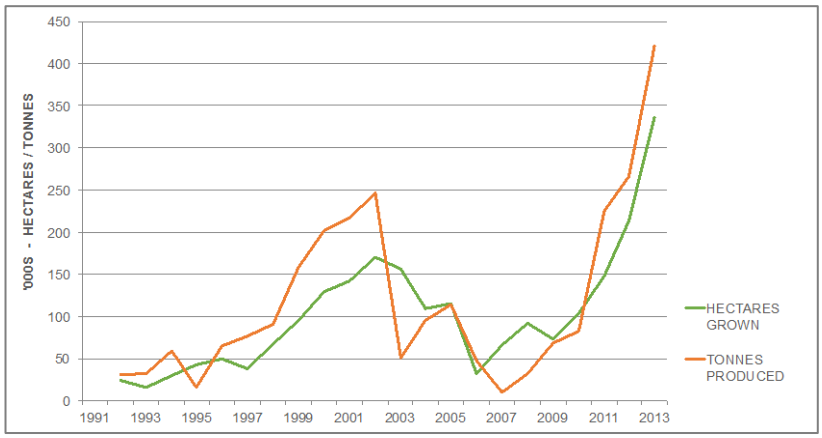


FIGURE 24: TREND IN AREA SOWN TO CANOLA IN MAIN CANOLA GROWING LGA, CENTRAL WEST & ORANA

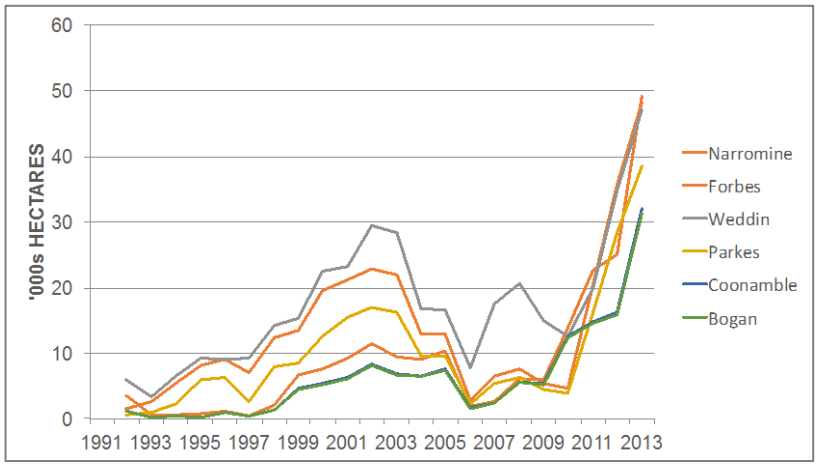
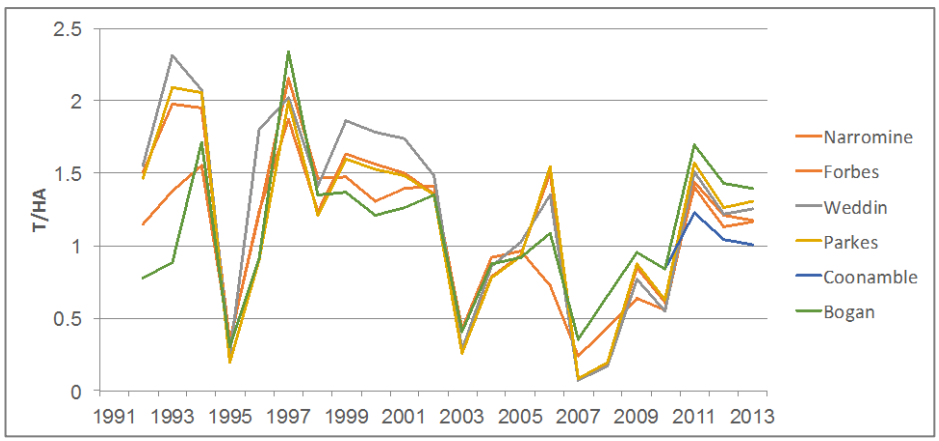


FIGURE 25: CANOLA YIELD TRENDS IN MAIN CANOLA GROWING LGA, CENTRAL WEST & ORANA



COTTON

Cotton is mostly grown in the Narromine and Warren LGA, in the central and western parts of the region. Previously there was considerable cotton grown around Coonamble however cotton production reduced during the drought and is no longer grown in this district. Some cotton is also produced in Lachlan around Hillston and Condobolin. The area of cotton grown fluctuates dramatically in response to water availability, ranging from as high as 60,000 hectares in 2002 to as little as 2,000 hectares in 2008, before the end of the millennium drought (Figure 26). While some dryland cotton is grown, it is highly dependent on seasonal conditions e.g. associated with a La Nina weather event. Yields of dryland cotton range from 2 to 3 bales per hectare compared to 10 bales/hectare from irrigated cotton. Cotton is usually grown as part of a mixed cropping enterprise where cotton is the most profitable crop in a rotation that also includes winter cereals such as wheat.

The yield performance of cotton crops has improved dramatically over the past five years. Cotton yields remained steady at around 1.5 tonnes/hectare lint up until 2004 and have since been steadily climbing and now range between 2.5 and 3 tonnes/hectare (Figure 27). This yield trend has been due to improved varieties and developments in pest control.

FIGURE 26: TREND IN AREA SOWN TO COTTON IN MAIN COTTON GROWING LGA, CENTRAL WEST & ORANA

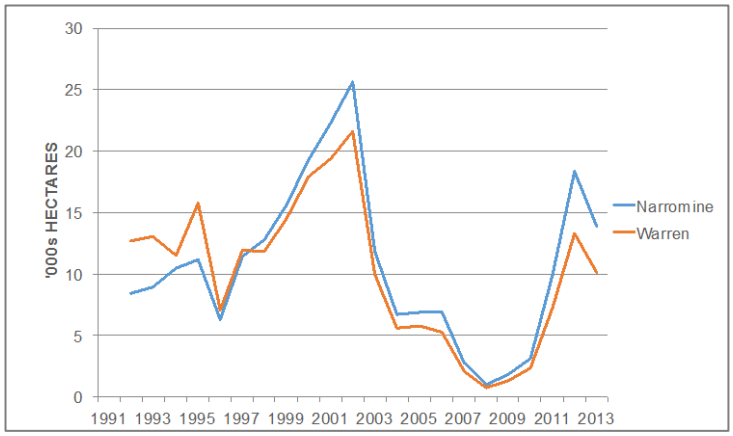
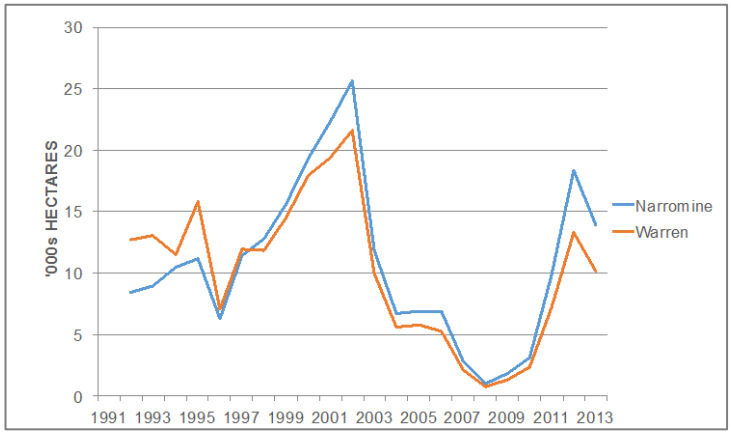


FIGURE 27: COTTON YIELD TRENDS IN MAIN COTTON GROWING LGA, CENTRAL WEST & ORANA



ECONOMIC CONDITIONS AND PRODUCTIVITY

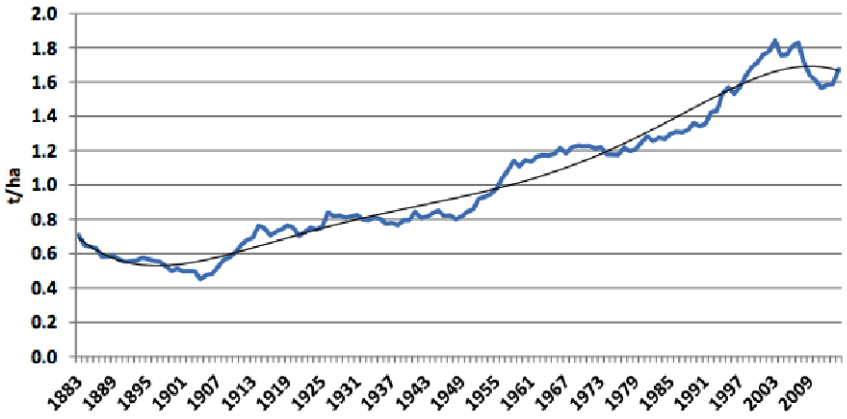
The broadacre cropping sector has gone through a period of relatively rapid adoption of new machinery technologies notably no-till seeding and GPS assisted navigation. Economies of scale are the key to success in cropping and equipment improvements such as large precision seeding and spray equipment (covering up to 100/ha/hr) have enabled farmers to sow larger areas. This technology has enabled farmers to plant larger areas of crops and management of larger farms achieved through farm consolidation. There has been a trend away from sheep in mixed farming systems towards more intensive cropping. On-farm storage of grain has substantially increased and farmers are using a range of tools to price and direct sell their products.

Chemical resistance is a growing issue of concern and poses some risk to no-till system. Some farmers are now using a winter fallow period and / or summer crops to manage disease and weed issues. Projected increases in average temperatures and reduced annual and seasonal rainfall, will impact on crop yields over the medium to long term and this may result in some contraction of the cropping zone eastwards.

Increasing productivity by increasing enterprise scale is the main avenue for cropping enterprises to address declining terms of trade (output prices relative to input prices) and inevitable periods of low commodity prices. This requires access to suitable land in large parcels. Increasingly, cropping enterprises will be attracted to areas of more reliable rainfall.

While there is a continuing growth trend in wheat production in Central West & Orana and Australia wide, there is a plateau in wheat yield. Commencing in the 1990's, advances in yield growth have slowed and appear to be stagnant, as indicated in (Figure 28). As noted previously, wheat yields in Central West & Orana while fluctuating with rainfall, have maintained an average of just over 1.5 tonnes/hectare over the past 20 years. It will be difficult for farmers to find productivity increases under these conditions. This will further drive business to increase scale unless the industry develops improved varieties to overcome inertia in yield improvements as well as look for alternative crops.

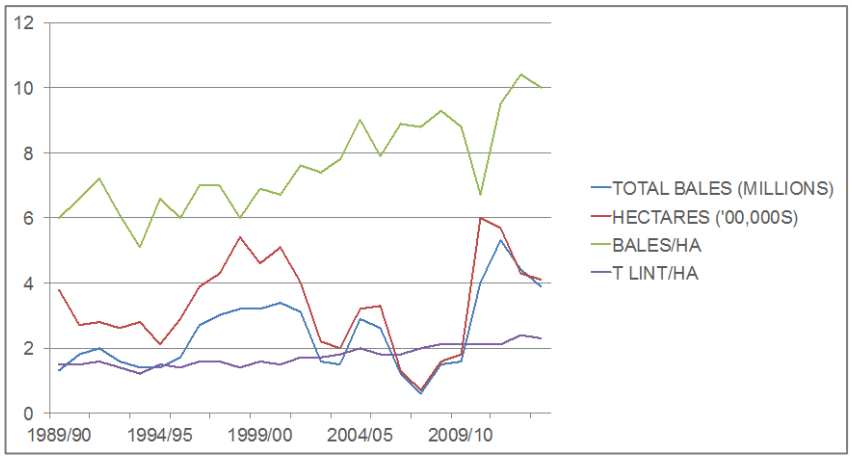
FIGURE 28: AUSTRALIA WIDE TRENDS IN WHEAT YIELDS – 1883 TO 2013: 10 YEAR MOVING AVERAGE[2]



Broadacre farms have been able to maintain profitability in the face of declining terms of trade through productivity growth. Productivity growth amongst broadacre cropping farmers averaged 1.5% per year between 1997 and 2011. This was driven mostly by innovation and farmers adopting more efficient technologies and management practices. Changes in industry structure where less efficient farmers are exiting and larger more efficient businesses are entering is leading to more efficient resource use across farms. This has been an important source of productivity growth. There is however some evidence that this growth is beginning to slow[3].

The area sown and yield of Australian cotton has increased over the past 20 years (Figure 29) with improved genetics, management and water use efficiency. Cotton is a very cohesive industry, with high industry levies, where research and development (R&D) and industry collaboration drives productivity and performance. If productivity improvements can be maintained then production levels should be able to be maintained in 'good' cotton growing years.

FIGURE 29: AUSTRALIAN TRENDS IN COTTON PROUCTION[4]



BUSINESS SCALE TRENDS

The trend towards larger grains farms is reflected in Central West & Orana where there has been an increase in farm size, both in terms of physical size (hectares) and business size, as measured by Estimated Value of Agricultural Operations (EVAO).

[2] JCS Solutions (2014) ABS Agricultural Commodities and ABARES crop reports
[3] ABARES (2014) Australian agricultural productivity growth. Australian Bureau of Agricultural and Resource Economics and Sciences. Commonwealth of Australia
[4] http://cottonaustralia.com.au/cotton-library/statistics accessed 30.7.2015

An analysis of grains-only farms in the main grain producing LGAs (Lachlan, Warren, Narromine, Coonamble and Parkes) found that business size has increased over the past decade (Figure 30) with the number of farms generating over $1million from grains more than doubled between 2001 and 2011, while the number of smaller enterprises decreased. Around 40% of grains-only farms are generating less than $350,000 gross turnover and 40% are generating between $350,000 and $1million per annum from grains.

The data also indicates that across the region, the proportion of grains farms in the largest size category (>$1million) has increased by 10 percentage points to 15% and the share of EVAO produced by these farms increased from around 30% to almost 50% of gross value between 2001 and 2011. This is indicative of the trend towards increased concentration of output observed in other Australian agricultural industries[6] where the largest 30% of businesses are producing more that 60% of the total gross value.

The number of high turnover (greater than $1million/year) mixed farms running grain and livestock operations (sheep and / or beef) also increased (by around 50%) over this decade. At the same time the total number of mixed farms in the region reduced by 33%, from around 2,450 to 1,650. This also suggests that there has been considerable consolidation of mixed farms as well as grain-only farms.

In terms of physical scale, over half of grains-only farms in Central West & Orana are more than 1,000 hectares (Figure 31) and around one quarter of all grain farms are more than 2,500 hectares. Analysis of the change in the size of grain farms shows that there was a reduction in the number of farms between 500 and 2,500 hectares between 2001 and 2011 and a small increase in farms with greater than 2,500 hectares. This has coincided with an increase in the number of high turnover grains businesses and suggests that there has been some restructuring and amalgamation of properties over the past decade. The number of farms smaller than 500 hectares has remained stable. The Lachlan, Warren and Coonamble LGA had the most large (>2,500ha) mixed and grain-only farms, respectively, in 2011 (Table 5).

FIGURE 30: CHANGE IN GRAIN BUSINESS SIZE (MAIN GRAIN PRODUCING LGA), CENTRAL WEST & ORANA

FIGURE 31: CHANGE IN SIZE OF GRAIN FARMS, (MAIN GRAIN PRODUCING LGA), CENTRAL WEST & ORANA

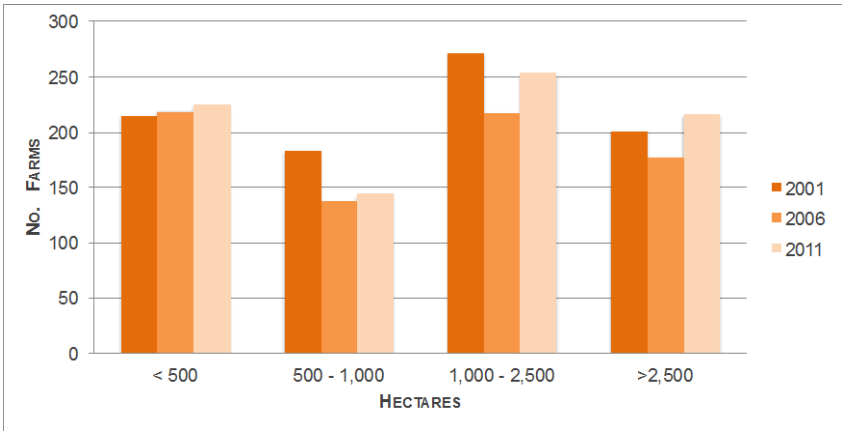


TABLE 5: LGA WITH THE MOST LARGE MIXED AND CROPPING ONLY FARMS, CENTRAL WEST & ORANA 2010-11

RANK	LOCAL GOVERNMENT AREA	FARMS > 2,500 HA		
		MIXED FARMS	GRAIN ONLY FARMS	TOTAL
1	Lachlan	98	59	157
2	Warren	61	48	109
3	Coonamble	54	38	92
4	Narromine	22	25	47
5	Parkes	23	12	35

STRATEGIC IMPLICATIONS

Broadacre cropping generates the most GVAP in Central West & Orana and occupies a significant land area. Crops are grown in rotations that include cereals, oilseeds, legumes and cotton, mostly in dryland systems but also under irrigation. Irrigation increases production significantly.

Economies of scale are the key to success in cropping and technology improvements have enabled farmers to sow larger areas. There is a clear trend towards larger cropping farms and the number of businesses with turnover greater than $1million and an increase in the number of crop-only enterprises has been observed. This has resulted in increased concentration of output with the top 15% of businesses producing over 50% of grain EVAO.

5 LIVESTOCK

MAIN FINDINGS

MEAT

- Livestock production for meat is the second largest agricultural sector in Central West & Orana generating nearly $494 million in 2011 and occupies around two thirds of the farmed area.
- The main meat commodities by GVAP are beef ($295million) and sheep ($179million).
- In 2011 there were around 4,500 farms identified as sheep, beef cattle or sheep and beef farms in Central West & Orana and a further 1,600 mixed livestock and grains farms.
- The livestock sector is dominated by a large number of small farms (<500 hectare and <$100,000 EVAO) and there has been little evidence of consolidation.
- Commercial scale grazing is undertaken across large parts of the region, with sub-commercial (mostly beef cattle grazing farms) concentrated in the local government areas of Bathurst, Blayney, Lithgow, Mudgee and Oberon
- Cattle numbers have remained relatively stable at just over 1 million head and the GVAP of beef increased in value from around $100 million in 1992 up to $313 million in 2013.
- Most beef production comes from the Warrumbungle, Cabonne, Mid-Western and Coonamble LGA.
- While sheep numbers decreased by almost 50%, the GVAP of sheep meat increased five-fold from $27 million in 1992 up to $145 million in 2013.
- Sheep meat was mostly produced in the lower central part of the region, in the Cabonne, Lachlan, Parkes, and Wellington LGA.

WOOL

- Wool is the third largest agricultural sector in Central West & Orana with a GVAP of $271million in 2010-11.
- Wool production has decreased in line with the reduction in sheep numbers. There was 50% less wool produced in the region in 2010 (34,000 tonnes) than in 1992 (73,000 tonnes).
- Despite the decline in production over the past 20 years, the GVAP of wool has tended to fluctuate around $250 million showing neither an increasing or decreasing trend indicating significant productivity gains.
- The local government areas that contributed the most to wool production were Cabonne, Lachlan, Parkes, Wellington and Forbes.

CURRENT STATISTICS - MEAT

Livestock production for meat from cattle, sheep, pigs, poultry and goats contributed $494 million to the region's GVAP in 2010-11. The most important meat commodity was beef, generating $295 million and contributing 60% to the livestock GVAP. The next most important is sheep (36%) to the total livestock GVAP followed by poultry pigs and goats (Figure 32).

Beef and sheep production occurs across the Central West-Orana region, although it is more concentrated in certain LGA (Figure 33) and (Figure 34). The north eastern parts of the region contributed the most to beef production in 2010-11 primarily from Warrumbungle, Cabonne, Mid-Western, and Coonamble. Sheep meat was mostly produced in the lower central part of the region, in the Cabonne, Lachlan, Parkes and Wellington LGA.

The production of goats for meat is a relatively new industry and in 2010-11 was concentrated in Warrumbungle, Bathurst Blayney, Bogan and Cowra.

There were 2,134 beef producers with beef herds in 2011 the majority of which (around 1,700 or 80%) derive less than $100,000 gross turnover (Figure 35). The majority of beef only enterprises, around 70%, are smaller than 500 hectares (Figure 36). The local government areas with the largest numbers of producers with small beef holdings (less than 100 hectares) are Bathurst, Blayney, Lithgow, Mudgee and Oberon.

Sheep only properties tend to be larger. In 2011, 50% of sheep producers had a property size of greater than 500 hectares and two thirds of all properties had a gross turnover from sheep less than $100k (compared with 80% for beef only enterprises) (Figure 37, Figure 38). (Note sheep data includes enterprises that produce sheep for meat and/or wool).

Many of the smaller livestock businesses will be sub-commercial or lifestyle farms.

FIGURE 32: GVAP OF LIVESTOCK COMMODITIES, CENTRAL WEST & ORANA 2010-11

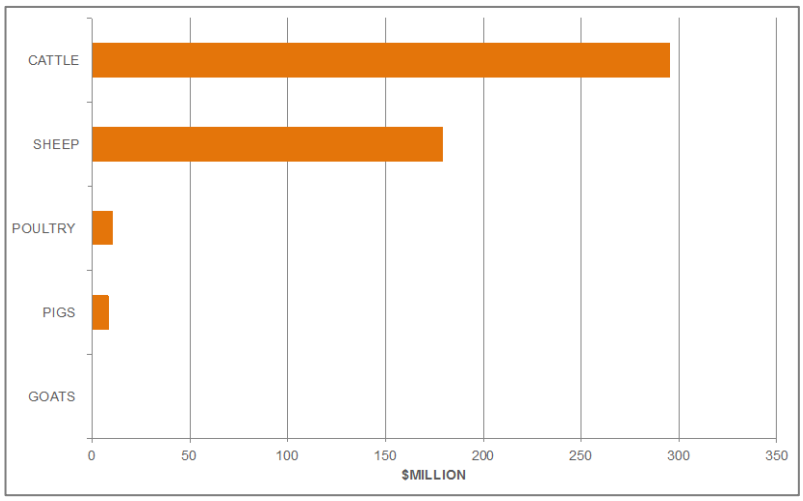


FIGURE 33: REGIONAL DISTRIBUTION OF BEEF GVAP, CENTRAL WEST & ORANA 2010-11

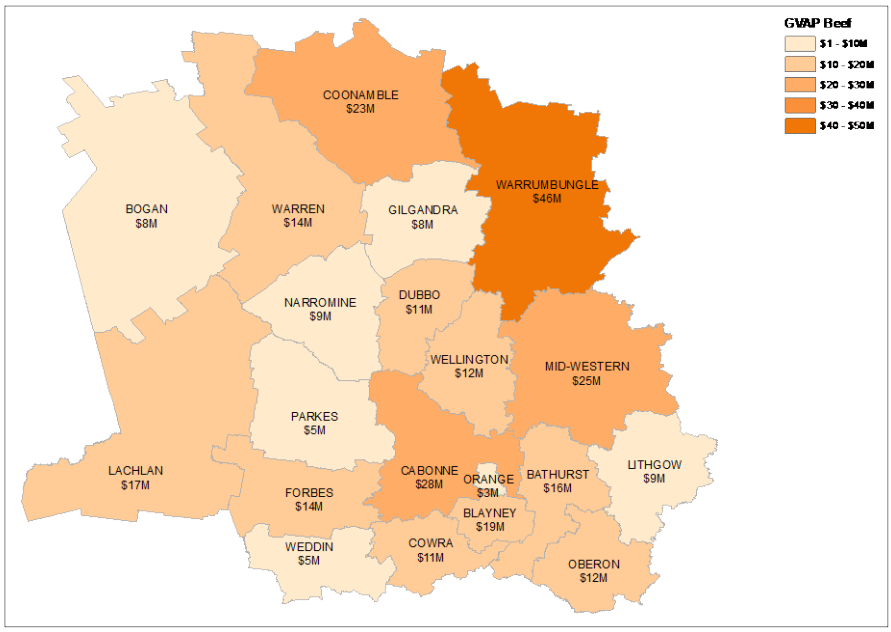


FIGURE 34: REGIONAL DISTRIBUTION OF SHEEP MEAT GVAP, CENTRAL WEST & ORANA 2010-11

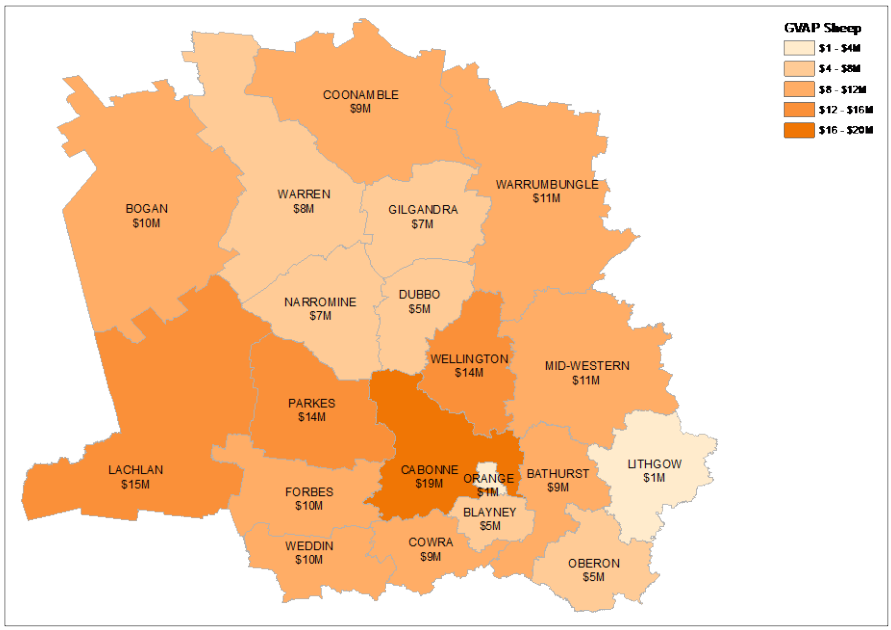


FIGURE 35: PERCENTAGE EVAO AND PROPERTIES BY BEEF BUSINESS SIZE CATEGORY, MAIN BEEF PRODUCING LGA, CENTRAL WEST & ORANA 2010-11

FIGURE 36: BEEF ENTERPRISE HOLDING SIZE, CENTRAL WEST & ORANA 2010-11

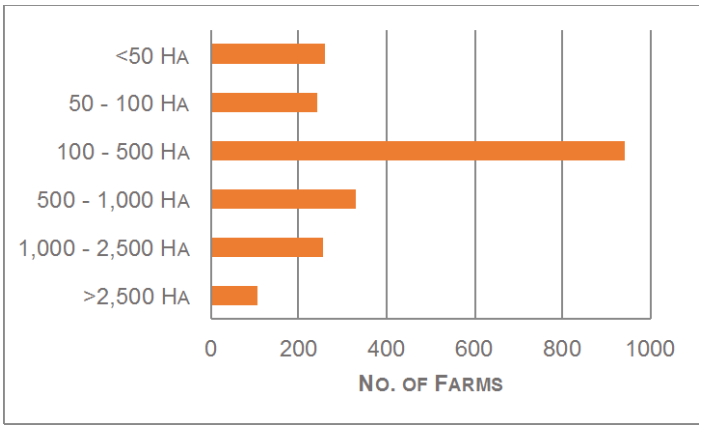


FIGURE 37: PERCENTAGE EVAO AND PROPERTIES BY SHEEP BUSINESS SIZE CATEGORY, MAIN BEEF PRODUCING LGA, CENTRAL WEST & ORANA 2010-11

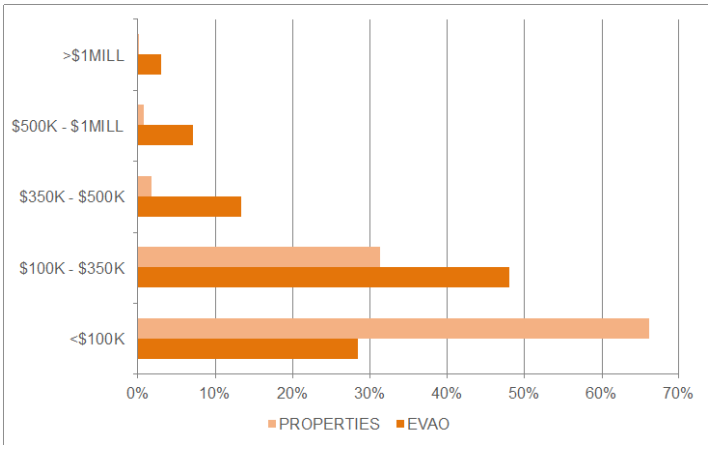
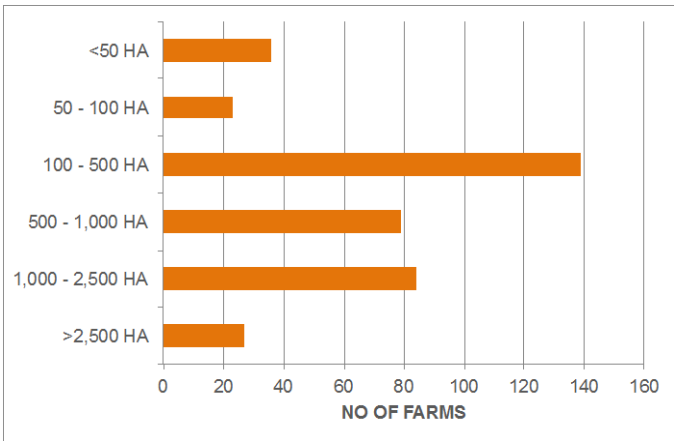


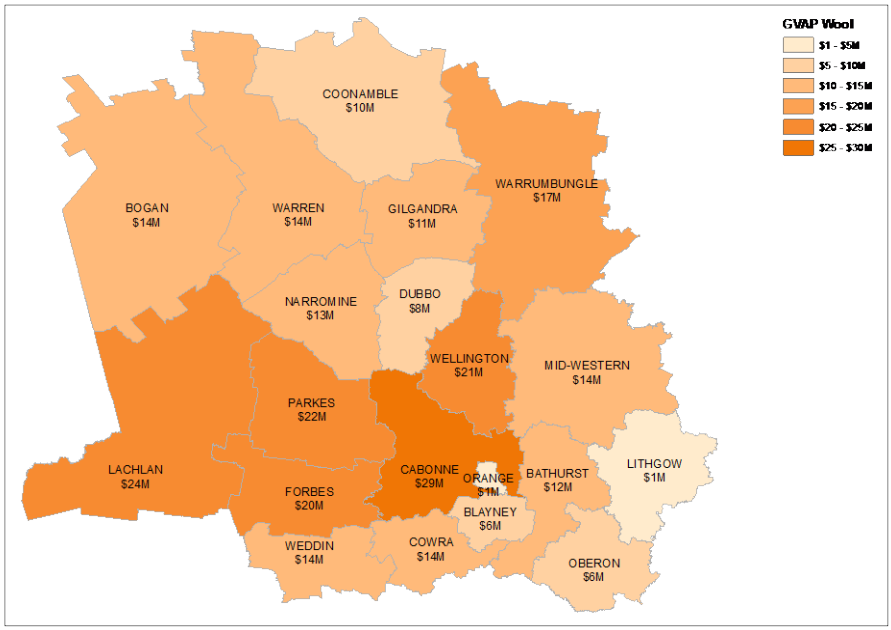
FIGURE 38: SHEEP ENTERPRISE HOLDING SIZE, CENTRAL WEST & ORANA 2010-11



CURRENT STATISTICS - WOOL

In 2010-11 around 34,000 tonnes of wool produced in the Central West & Orana region, with a GVAP of $271 million. Wool occurs across the region (Figure 39) while the LGA that contributed the most to wool production were Cabonne, Lachlan, Parkes, Wellington and Forbes.

FIGURE 39: REGIONAL DISTRIBUTION OF WOOL GVAP, CENTRAL WEST & ORANA



INDUSTRY TRENDS

There were around 4,500 livestock farms in 2011. The GVAP of sheep meat has increased substantially over the past 20 years increasing from $27 million in 1992 up to $145 million in 2013, a five-fold increase in value. Despite experiencing significant fluctuations, the gross value of beef has shown a small increasing trend over the past two decades, increasing in value in the order of around $100 million up to $313 million in 2013.

BEEF

Cattle numbers fluctuate to some extent with seasonal conditions, however, there is no discernible trend in cattle numbers over the past 20 years. Numbers have remained relatively static at around 1.1 million head in the region apart from sharp drops in 2005, 2007 and 2011 associated with low rainfall. These trends in numbers are mirrored across the main beef producing LGA (Figure 40).

Grass fed beef producers are managing a feed base that is highly seasonal and need to be relatively conservative with their production systems and stocking rates. Cattle numbers in the Warrumbungle LGA has increased and may be due to an increase in feed lots which are not as reliant on local seasonal conditions to maintain their feed base.

SHEEP

Sheep numbers have been trending downwards for the past two decades from 16 million to 8 million head between 1992 and 2009. Numbers have now stabilised and are beginning to build. These falling trends are paralleled in each of the main sheep producing areas of Lachlan, Cabonne, Parkes and Wellington (Figure 41). The GVAP of wool has reduced commensurately with the increase in GVAP of sheep meat. The proportion has changed from 90% wool / 10% sheep meat in 1992 to 60% wool / 40% sheep meat in 2013 (Figure 42).

WOOL

Following a significant downward trend over the past two decades, sheep numbers have stabilised and are beginning to build. Sheep numbers fell from 16 million to 8 million head between 1992 and 2013. This trend was reflected in each of the main sheep producing areas of Condobolin, Nyngan, Orange and Mudgee (Figure 41).

Wool production has declined in accordance with reducing sheep numbers. There was 50% less wool produced in the region in 2010 (34,000 tonnes) than in 1992 (73,000 tonnes). The production trends are paralleled in each of the main wool producing areas of Condobolin, Mudgee, Orange, Nyngan, Parkes and Wellington (Figure 43).

Notwithstanding the decline in production, wool has tended to fluctuate around $250 million in gross value showing neither an increasing or decreasing trend. While this represents a loss in value of total wool production for the region in real terms, the value per kg of wool has substantially increased.

FIGURE 40: TREND IN CATTLE NUMBERS IN THE MAIN BEEF PRODUCING LGA, CENTRAL WEST & ORANA

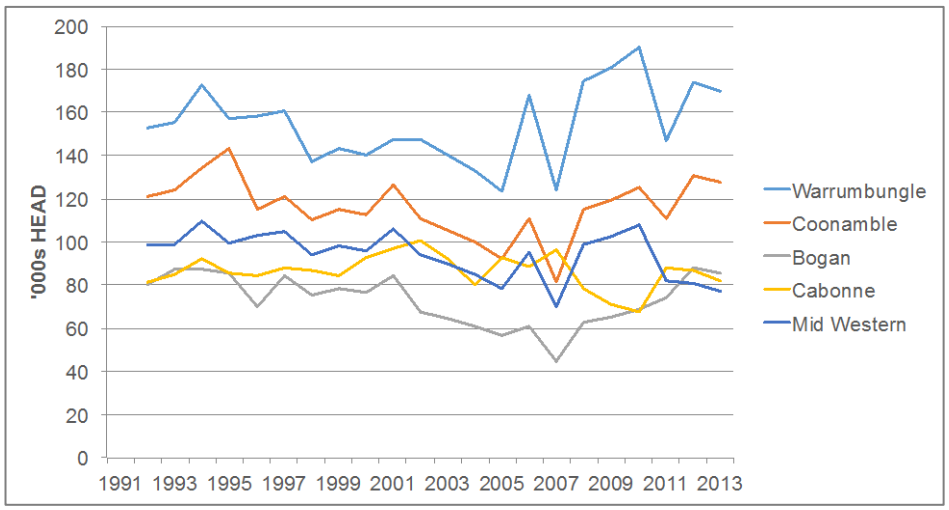


FIGURE 41: TREND IN SHEEP NUMBERS IN THE MAIN SHEEP PRODUCING LGA, CENTRAL WEST & ORANA

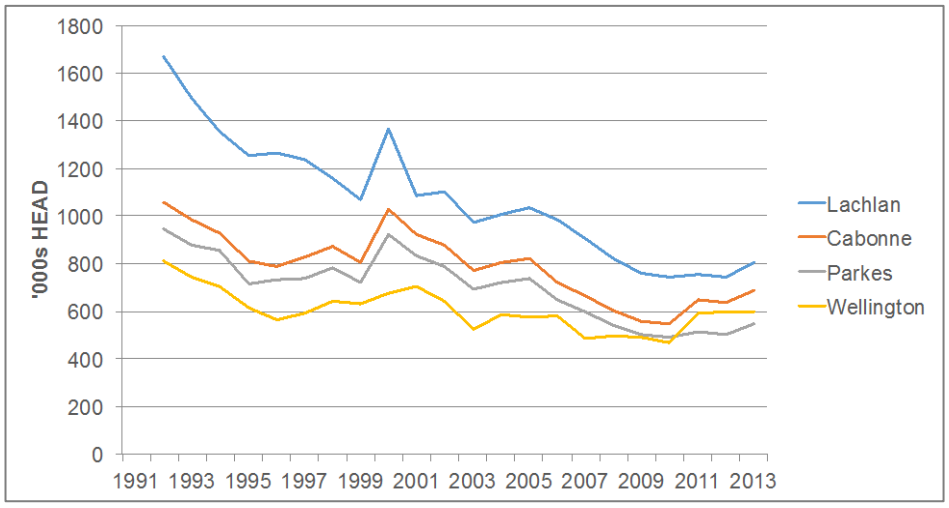


FIGURE 42: TREND IN GVAP OF WOOL AND SHEEP MEAT, CENTRAL WEST & ORANA

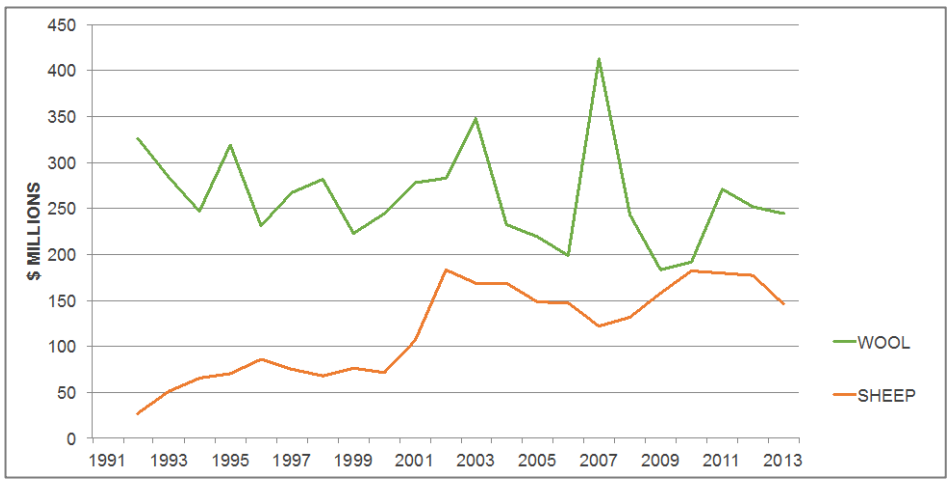
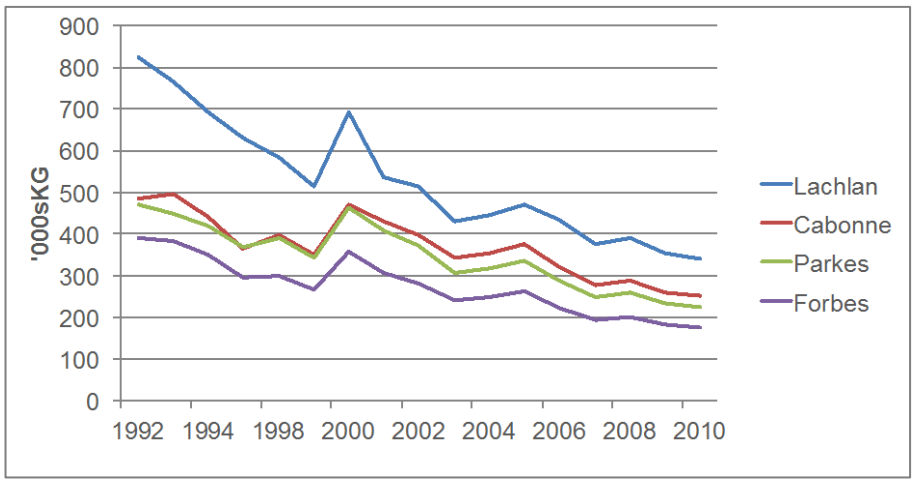


FIGURE 43: TREND IN WOOL PRODUCTION IN THE MAIN WOOL PRODUCING LGA, CENTRAL WEST & ORANA



ECONOMIC CONDITIONS AND PRODUCTIVITY

Unlike the grains sector, livestock industries in terms of farm business and production management systems have remained relatively static. Livestock grazing producers need to manage a feed base that is highly seasonal which constrains production levels. Beef production, more often than not, is a component of farm income, rather than the principal source of farm income. The large numbers of sub-commercial producers, that are not necessarily subject to the same economic drivers as commercial businesses, may be masking productivity improvements in the commercial beef sector.

Sheep enterprises in rainfall zones greater than 500 mm have achieved greater average profitability compared to beef and dryland cropping over the past few years (2008 to 2012). Those farm businesses that have increased their production levels per dry sheep equivalent (DSE) whilst controlling costs are doing the best with sheep enterprises[5]. Sheep meat production in the region has been doing well and increasing its share of gross income, compared to wool, on the back of demand and increase in lamb prices.

The scale of most beef enterprises and long term beef prices have meant the vast majority of beef operations in Australia are non-commercial, however, profits from beef in the last 12 months have been high in relative terms. The biophysical constraints on beef production in grazing systems make it difficult for these enterprises to restructure, scale up their operations and stay competitive.

While wool production has halved over the past two decades, the gross value has been at least maintained. The 1980s was a period of negative productivity in the sheep industry when there was strong global demand for wool and rising wool prices. However, since the dismantling of the wool reserve price scheme, productivity growth has increased at an average rate of 1.4% per year. Beef industry productivity growth has been at a lower 0.9% per year over this period[3].

BUSINESS SCALE TRENDS

There has been little consolidation of livestock farms (in terms of physical size or EVAO) in the Central West & Orana region (Figure 44 and Figure 45). The range of grazing only farms (sheep or beef grazing or both) by business size and area of holding changed little between 2001 and 2012 in the main livestock production LGA of Warrumbungle, Cabonne, Mid-Western and Coonamble (beef) or Mudgee, Bathurst, Orange and Cowra (sheep).

Small farms (in terms of gross value) continue to dominate farm numbers in the region in all sectors but most intensely in the livestock sector, mainly beef. Australia wide, the smallest farms are estimated to account for only 10% of gross farm output, whereas 10% of farm businesses now produce over 50% of output[6].

In the Central West & Orana region the number of higher turnover (greater than $500,000/year) beef farms and sheep has remained static over the past decade (Figure 44, Figure 46). There is also no evident trend towards larger beef farms or sheep farms in terms of physical area over this period (Figure 45, Figure 47). The data indicates that beef farm numbers have increased in all area of holding size ranges over the past decade while sheep farms numbers have decreased.

[5] MLA (2014) Prime lamb situation analysis. Report prepared for Meat and Livestock Australia by Holmes and Sackett.
[6] Productivity Commission (2005) Trends in Australian Agriculture. Productivity Commission Research Paper. Commonwealth of Australia, ACT.

FIGURE 44: CHANGE IN BEEF BUSINESS SIZE (EVAO) IN MAIN BEEF PRODUCING LGA, CENTRAL WEST & ORANA

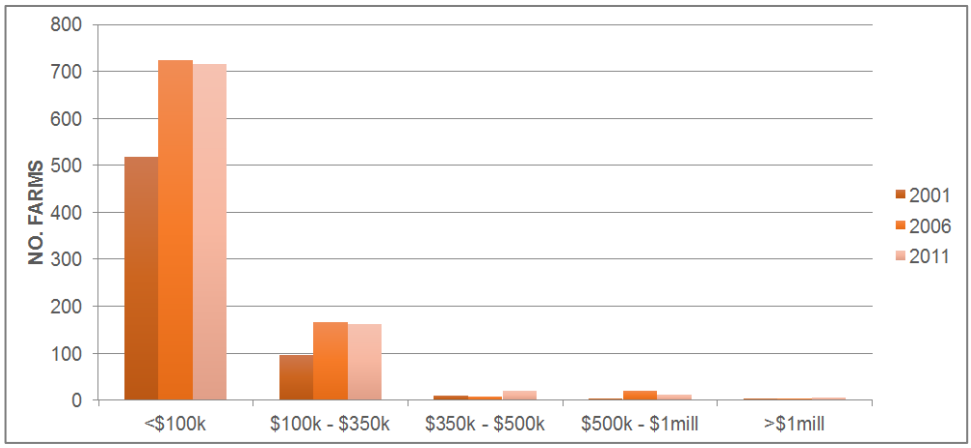


FIGURE 45: CHANGE IN BEEF FARM SIZE IN MAIN BEEF PRODUCING LGA, CENTRAL WEST & ORANA

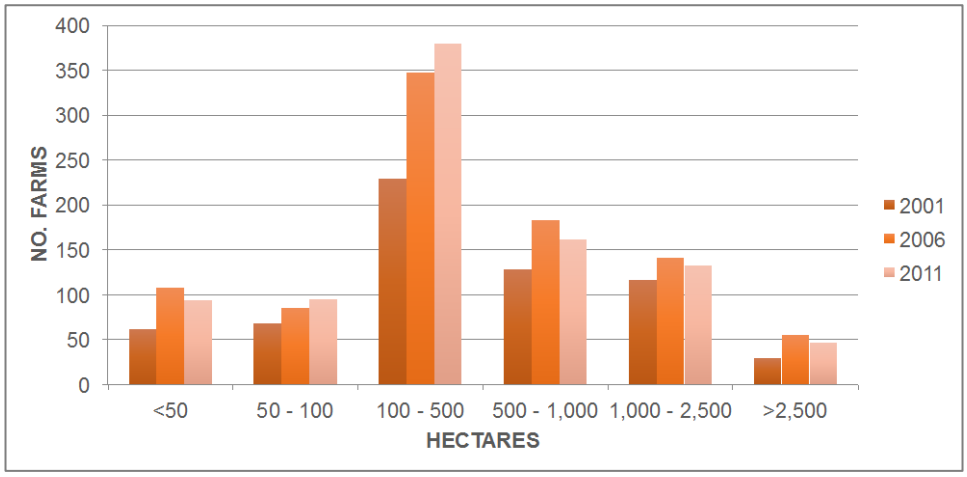


FIGURE 46: CHANGE IN SHEEP BUSINESS SIZE (EVAO) IN MAIN SHEEP PRODUCING LGA, CENTRAL WEST & ORANA

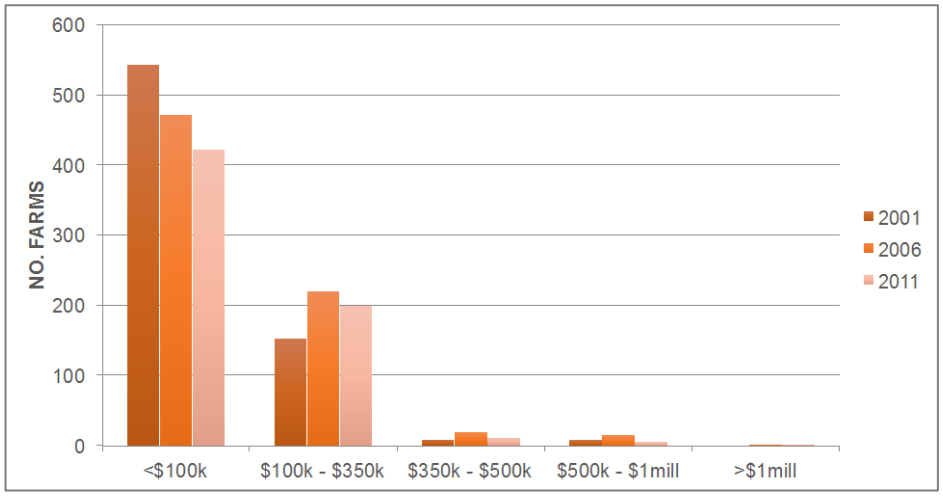
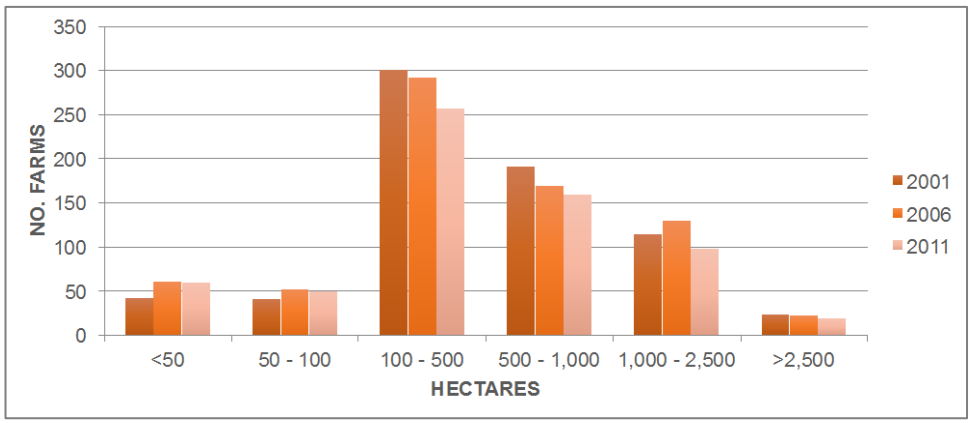


FIGURE 47: CHANGE INSHEEP FARM SIZE IN MAIN BEEF PRODUCING LGA, CENTRAL WEST & ORANA



STRATEGIC IMPLICATIONS

Livestock production for meat is the second largest agricultural sector measured by GVAP in Central West & Orana and accounted for 16% of NSW meat GVAP and occupies 70% of land used for agriculture in the region. This is followed by wool which accounted for 32% of NSW wool GVAP. Beef production is focused in the eastern parts of the region and sheep in the south western parts of the region. Livestock production is undertaken as part of a mixed cropping – livestock enterprise or livestock only.

Most beef enterprises in Central West & Orana are small businesses, less than 500 ha and have a turnover less than $350k. A large proportion of beef enterprises are likely to be sub-commercial enterprises. Most sheep enterprises are large in size, greater than 500 ha and have a turnover less than $350k. Other than beef enterprises between 100 and 500 hectares and turnover $100k and $500k, there has been a reduction in beef and sheep enterprises. There is evidence of a shift of managing sheep for wool production to meat production to capitalise on demand and high lamb prices.

Livestock production has a significant value chain in Central West & Orana including meat processors, packaging, transport and logistics.

6 PERENNIAL HORTICULTURE

MAIN FINDINGS

- Perennial horticulture in the Central West & Orana region comprises wine grapes and orchard fruits, mostly apples, cherries, stone fruits and citrus.
- The perennial horticultural industry had a GVAP in 2011 of around $53million, which is 2% of the total GVAP in the region.
- Wine grapes value has reduced markedly from $39million in 2001 to $10million in 2011, however orchard fruits have retained their gross value.
- Apples contributed $30 million or 57% of the perennial horticulture output in 2011, followed by cherries, stone fruits, citrus, olives and other fruits such as pears, berries and avocados.
- Perennial horticulture (excluding wine grapes) is concentrated in the Cabonne local government area and to a lesser extent, Orange and Forbes.
- Wine grapes are concentrated in the Mid Western, Cabonne and Cowra local government areas.
- Perennial horticulture is highly dependent on access to a secure water supply and is concentrated in areas with access to High Security water entitlements and groundwater.

INDUSTRY STATISTICS

In 2010-11 perennial horticulture contributed $53 million to GVAP in Central West & Orana with orchard fruits (excluding wine grapes) accounting for 81% ($43 million) and wine grapes 19% ($10 million) of the total output.

The total area of perennial horticulture is small relative to the broadacre industries, however, it generated significantly higher GVAP/ha (around $8,000/ha) compared to the broadacre industries (less than $500/ha) in 2011. In 2011 there were around 1,900 hectares classified as fruit trees, nut trees, plantation or berry fruit (established plantings) over 183 farms. Around 1,300 hectares was irrigated using around 2,900 ML of water[7]. There was around 6,500 hectares of wine grapes. Perennial horticulture is highly dependent on access to a secure water supply and is concentrated with access to High Security water entitlements and groundwater.

ORCHARD FRUITS

The most important fruit crop in 2011 was apples, which contributed 57% of the perennial horticulture output (Figure 48). The main stone fruit crop was peaches, generating 57% of the total stone fruit output in 2010-11. Other stone fruits included nectarines and plums. The largest citrus crop was oranges, generating 85% of the total citrus output. Of the 'other fruits', pears and berry fruits contributed $0.4 million each, followed by avocados ($0.1 million).

The Cabonne LGA accounted for 62% of the region's total perennial horticulture output, followed by Orange, Forbes and Narromine (Figure 49). Cabonne was also the region's largest contributor to the gross value of apples, cherries and pears contributing 70% of the region's gross value of apples, 80% of cherries and 100% of the region's pears in 2010-11.

Forbes LGA was the region's largest contributor to the gross value of stone fruit in 2010-11, contributing 87% of the region's peach output and all of the region's nectarine and plum output. Forbes also contributed the most to the region's gross value of oranges. Mid-Western was the region's largest contributor to the gross value of olives, accounting for 64% of the regional output.

WINE GRAPES

Cabonne was the region's largest contributor to the gross value of wine grapes in 2010-11, accounting for 40% of the total output (Figure 50). The next most important LGA were Mid-Western and Cowra. Blayney, Forbes and Orange also contributed to the region's wine grape output. Of the 6,500 hectares of wine grapes, 42% are grown in Mid Western LGA, 27% in Cabonne and 15% in Cowra (Figure 51). Small areas of wine grapes are grown in Blayney, Orange, Forbes, Narromine and Bathurst.

[7] ABS 2010-11 Noting that these irrigated areas include the Central West region only comprising 11 LGAs (Bathurst, Blayney, Cabonne, Cowra, Forbes, Lachlan, Lithgow, Oberon, Orange, Parkes and Weddin) and therefore small areas of cherries (Mid Western) and peaches (Warrumbungle and Wellington) that are not included in the total irrigated area.

FIGURE 48: GVAP PERENNIAL HORTICULTURE, CENTRAL WEST & ORANA 2010-11

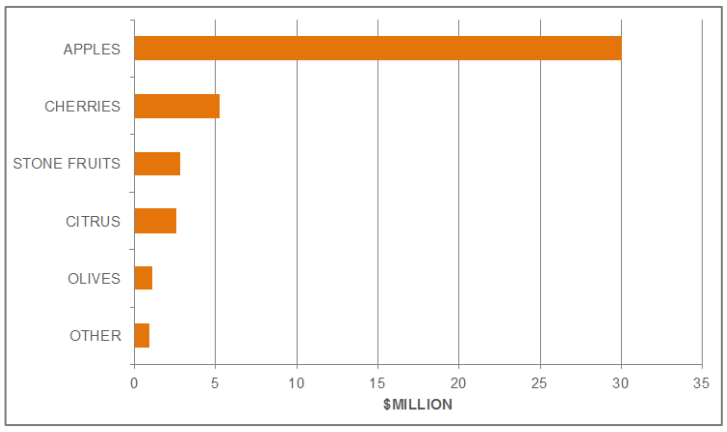


FIGURE 49: REGIONAL DISTRIBIUTION OF PERENNIAL HORTICULTURE GVAP, CENTRAL WEST & ORANA 2010-11

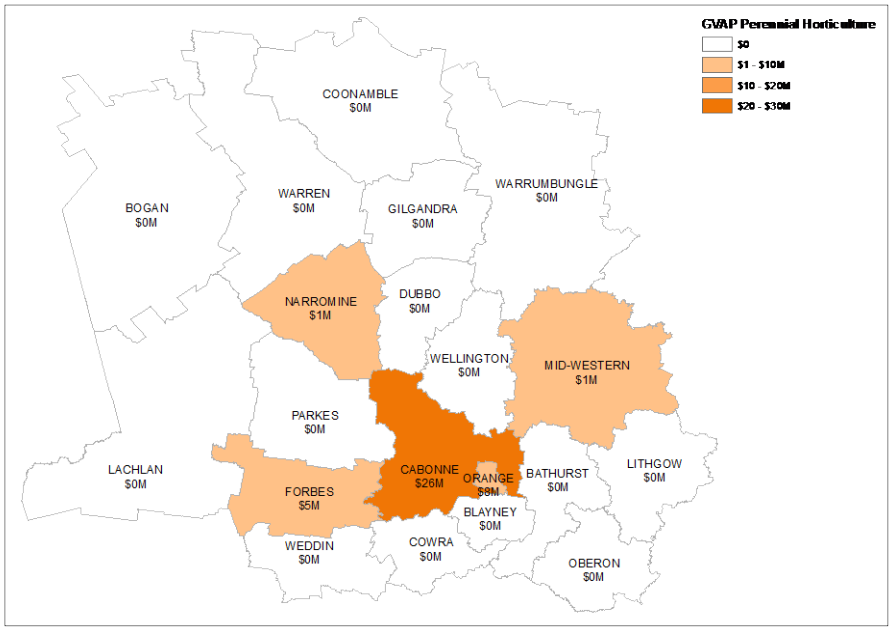


FIGURE 50: REGIONAL DISTRIBUTION OF WINE GRAPES GVAP, CENTRAL WEST & ORANA 2010-11

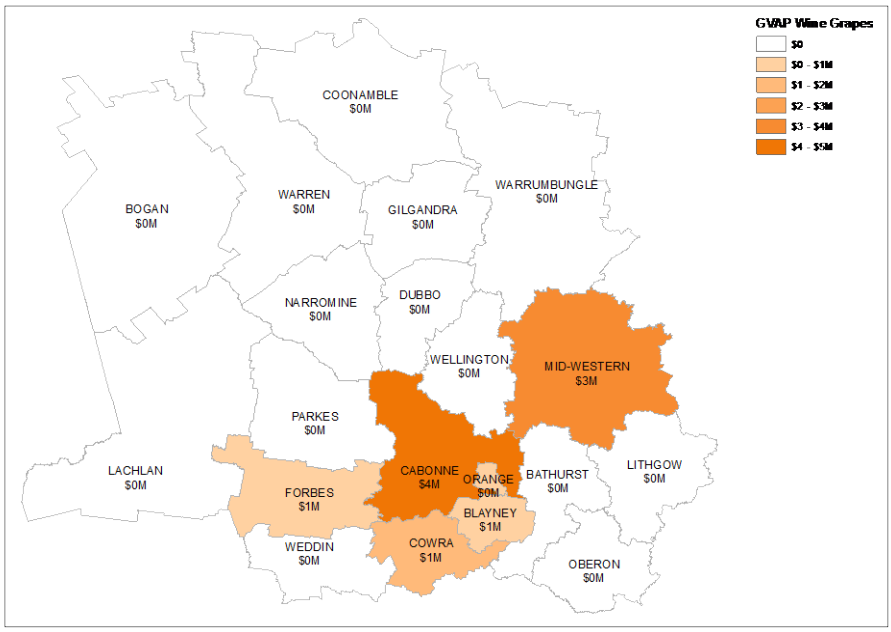
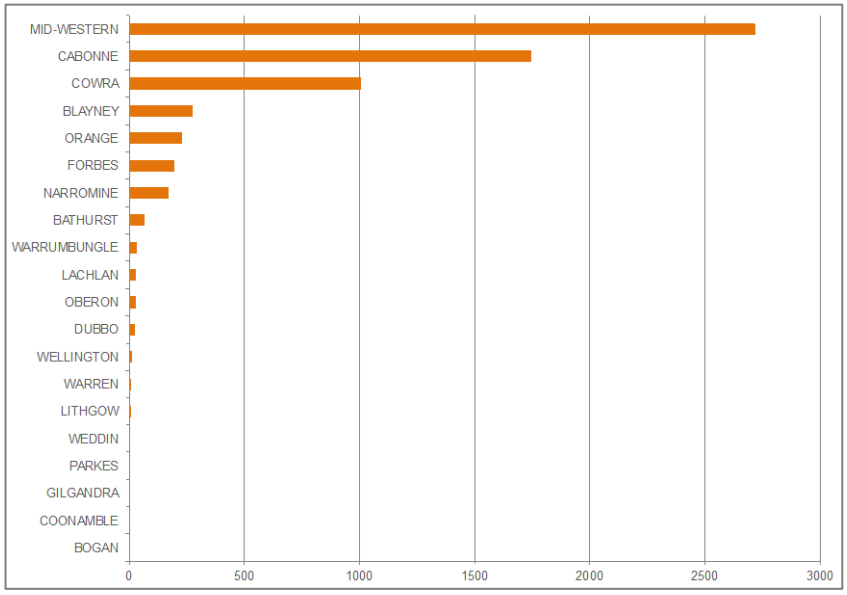


FIGURE 51: AREA (HA) OCCUPIED BY WINE GRAPES, CENTRAL WEST & ORANA 2010-11



INDUSTRY TRENDS

The GVAP of orchard fruits remained steady at around $33 million between 2001 and 2011. In contrast to orchard fruits, the GVAP of wine grapes reduced by 70 % between 2001 and 2011 (Figure 52).

The Australian wine industry experienced a period of considerable growth from 1992 to 2007, led by export expansion. This trend is consistent with the area and production of wine grapes in Murray-Murrumbidgee with production increased steadily from 80,000 tonnes in 1992 up to 300,000 tonnes in 2008. The gross value of wine grapes in the region also rose steadily from $27 million in 1992 to $165 million in 2004, dipped and then peaked again at $173 million in 2008. Since 2007 the Australian wine industry has seen a significant downturn in industry profitability and variable industry output due to the global financial crisis reducing export demand for Australian wine grapes, an oversupply in the domestic market and decreased prices. In the Murray and Murrumbidgee wine grape production fell from 300,000 tonnes in 2008 to 273,000 tonnes in 2013 and gross value has dropped from $173 million down to $105 million.

The wine industry is highly fragmented with the largest 38 wineries accounting for 88% of production and the largest producer with less than 15% of output[8]. The fragmentation of the supply chain combined with recent grape oversupply has

[8] Wine Federation Australia (2014)

meant that an increasing proportion of grape production is un-contracted, and pricing signals tend to be short term and highly variable.

Grape price changes are not uniform and there is significant volatility from year to year and between grape varieties and regions. Prices paid for wine grapes have steadily declined over the decade, however average price for the 2012/13 vintage is the highest for four years, up 9% from 2011/12. Red wine grapes increased by an average of 13% to $619/t while white wine grape prices increased by 2% to $388/t.

FIGURE 52: TREND IN GVAP PERENNIAL HORTICULTURE, CENTRAL WEST & ORANA

ECONOMIC CONDITIONS AND PRODUCTIVITY

The demand for fresh fruit from Asia could result in higher demand. Gaining new market access is an ongoing issue and accelerating productivity to stay competitive is also challenging given the high price of labour in Australia. Food processing in Australia has become increasingly non-competitive however reinvestment in inefficiency measures and growing demand for Australian made products may see re-invigoration of the sector. New fresh fruit markets will continue to be important for the industry.

Like all forms of agriculture, economies of scale are increasing and mechanisation is important to offset internationally high labour costs. Those businesses that are increasing their profitability are the largest and have undertaken high capital investment.

A study on the vegetable industry for Horticulture Australia[9] reinforces the critical relation ship between scale, productivity and farm financial performance. The best performing vegetable growers farm more area, produce more product per area sown and achieve a higher price per tonne produced, whilst having the lowest cost of production per tonne. This strongly indicates that increases in scale are offsetting the increases in farm costs.

Industry stakeholders from Central West & Orana also noted that there has been a trend in increasing farm size in perennial horticulture which provides economies of scale, opportunities for mechanisation of management practices such as harvesting and installation of more efficient irrigation systems. Combined these have lead to more production and returns per hectare. Producers are also making more use of crop protection measures to minimise damage from frost and hail.

The current area and production statistics for the horticultural industry in the Central West & Orana region are summarised in Table 6. Reliable time series data on areas of horticulture in the region has not been found to be available.

TABLE 6: SUMMARY STATISTICS FOR THE HORTICULTURAL INDUSTRY[10] CENTRAL WEST & ORANA

	GROSS VALUE $MILLION	NO. FARMS	TOTAL AREA OF FARMS (HA)	PROPORTION OF FARM AREA PLANTED	AREA IRRIGATED (HA)
Fruit trees, nut trees, plantation or berry fruit	$43	183	1,910	17%	1,274
Grapevines	$10	152	6,494	60%	NA
Vegetables	$40	60	2,637	23%	2,372
Total	**$93**	**395**	**11,000**		

[9] RMCG (2014) Investigating the costs associated with the production, sale and distribution of vegetables. Report prepared for Horticulture Australian Ltd.
[10] Catalogue 46180DO002_ 201213 Water Use on Australian Farms, by SA4 Central West region (ABS)

APPLES

Australia is a minor exporter of apples with only 1% of total production traded internationally. Australia produces about 0.8 per cent of the world's apples and apples account for about one-third of Australia's pome fruit exports. Australian apples are exported to the United Kingdom, Asia, New Zealand and Canada[11].

Over the long term, China could offer opportunities for Australian apple growers, though these need to be kept in perspective of the size of the local production and the current trade restrictions. More detailed research is needed to identify the real opportunities for marketable varieties in niche segments and in targeted cities rather than to view China as one large market.

WINE

The volume of wine consumed within Australia has remained roughly the same from 1997 to 2012 at approximately 25L/head/year. However reduced market share due to increasing consumer demand for wine imports (from 7% in 2007 to 16% in 2012/13) has placed greater pressure on Australian wine grape production for domestic markets.

Wine exports peaked in 2006/07 however the onset of the global financial crisis had a significant impact, given that the industry's two largest markets – the United Kingdom and the United States went into recession and remain heavily impacted by the financial and economic downturn. At the same time, the strong Australia dollar reduced the industry's international competitiveness, and impacted returns on export sales.

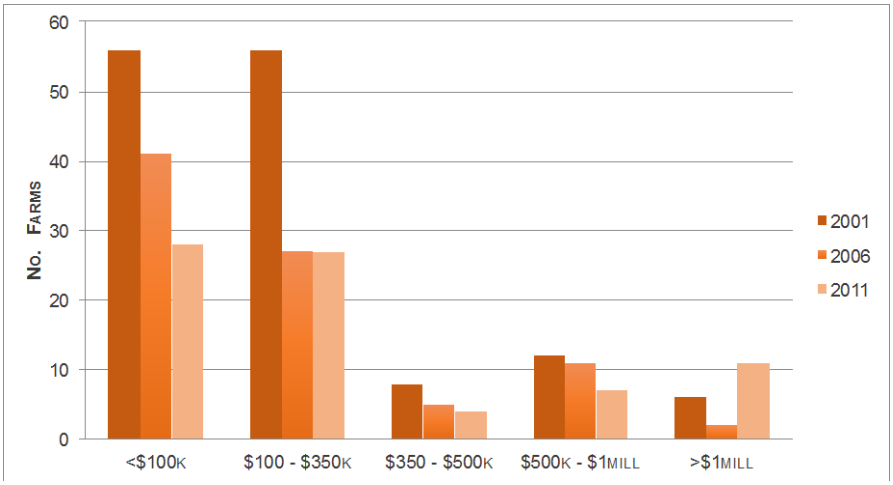
International price-based wine competition has also intensified, with large producers Spain and Italy significantly increasing overseas sales during the past decade, as their domestic consumption has declined – particularly post global financial crisis. Consumption remains under pressure in these regions, which are still affected by recession[8].

BUSINESS SCALE TRENDS

In terms of business turnover, there has been some consolidation in orchard fruit growing farms over the past decade in Central West & Orana. For example, there are now 11 farms with a gross value over $1 million compared with only 6 farms in 2001. The number of pome (apple and pear) and stone fruits (peaches, nectarine, apricots and cherries) farms reduced by around 50% in each of the smaller business size ranges (Figure 53). The overall gross value of the industry, however, has been maintained.

By contrast wine grapes lost around $30 million or two thirds of their gross value following the collapse in wine grape prices beginning in 2007 and reduction in wine exports. This resulted in a reduction in the number of large wine grape businesses (EVAO > $1 million) from 7 in 2006 to 1 in 2011.

FIGURE 53: CHANGE IN BUSINESS SIZE (EVAO) APPLE AND PEAR & STONE FRUIT BUSINESSES, CENTRAL WEST & ORANA



STRATEGIC IMPLICATIONS

Central West & Orana produce over 10% of the NSW orchard fruit and wine grapes. The industry is concentrated in the south-west of the region where there is access to High Security irrigation water supplies and suitable climatic conditions. The wine industry is emerging from significant restructure following global over-supply. Economies of scale are a significant factor in the success of perennial horticulture. Increasing scale has provide opportunities for introduction of mechanisation and improved water use efficiency.

[11] Apple and Pear Australia Ltd

7 ANNUAL HORTICULTURE - VEGETABLES

MAIN FINDINGS

- Vegetable farms cover a very small proportion of the regional land area occupying around 2,600 hectares in 2011.
- The GVAP of vegetables increased from $23million in 2001 to $40 million in 2011.
- The main annual horticultural crops, grown region include melons, cauliflower, broccoli, sweet corn, pumpkins and others including lettuce, potatoes, mushrooms and tomatoes.
- There were around 60 vegetable growing farms in the region in 2011, with the number of farms remaining stable since 2001.
- Vegetables are mostly grown in the local government areas of Cowra, Bathurst, Forbes and Cabonne.
- Annual horticulture is dependent on access to a secure water supply and is grown in areas with access to High Security water entitlements and groundwater.

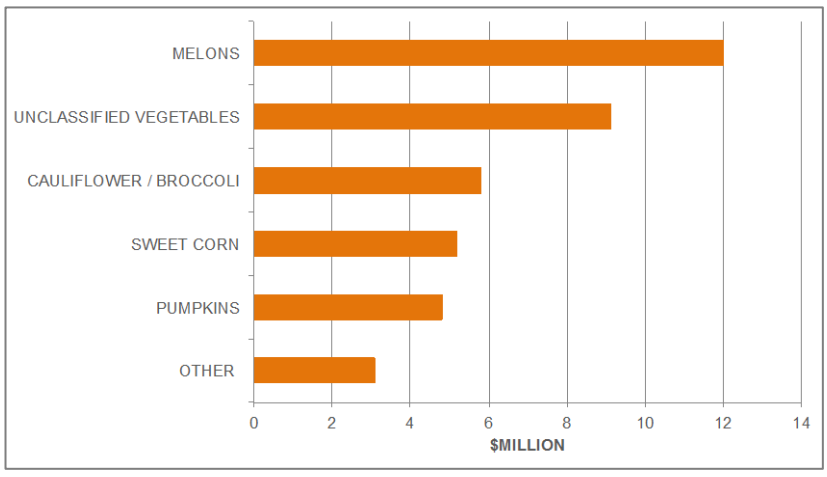
INDUSTRY STATISTICS

Annual horticulture contributed $40 million to the gross value of agriculture in the Central West-Orana region during 2010-11. The most important crop was melons, which accounted for 30% of the total vegetable output (Figure 54). The next most important crops were cauliflower and broccoli, which contributed 15% to the total gross value followed by sweet corn, pumpkins and 'other' vegetables, which includes lettuce, potatoes, mushrooms and tomatoes. Annual horticulture is dependent on access to a secure water supply and is grown in areas with access to High Security water entitlements and groundwater.

In 2010-11, the Cowra LGA accounted for 33% of regional vegetables GVAP followed by Bathurst, Forbes and Cabonne (Figure 55). Forbes LGA was the largest producer of melons in 2010-11, accounting for 42% of the melon output, followed by Cabonne and Cowra

The majority of cauliflowers and broccoli were grown in the Bathurst and Cowra LGA. Combined these LGA accounted for 91% of the total cauliflower and broccoli output. Bathurst LGA was also the largest contributor to the gross value of sweet corn output, accounting for 71% of output.

FIGURE 54: GROSS VALUE OF VEGETABLES, CENTRAL WEST & ORANA REGION 2010-11



INDUSTRY TRENDS

The gross return from vegetable growing has substantially increased (by about one third) up to $31 million in 2011, from $23 million in 2001. The number of farms growing vegetables has remained relatively stable over this time (Table 7).

FIGURE 55: REGIONAL DISTRIBUTION OF VEGETABLES GVAP, CENTRAL WEST & ORANA 2010-11

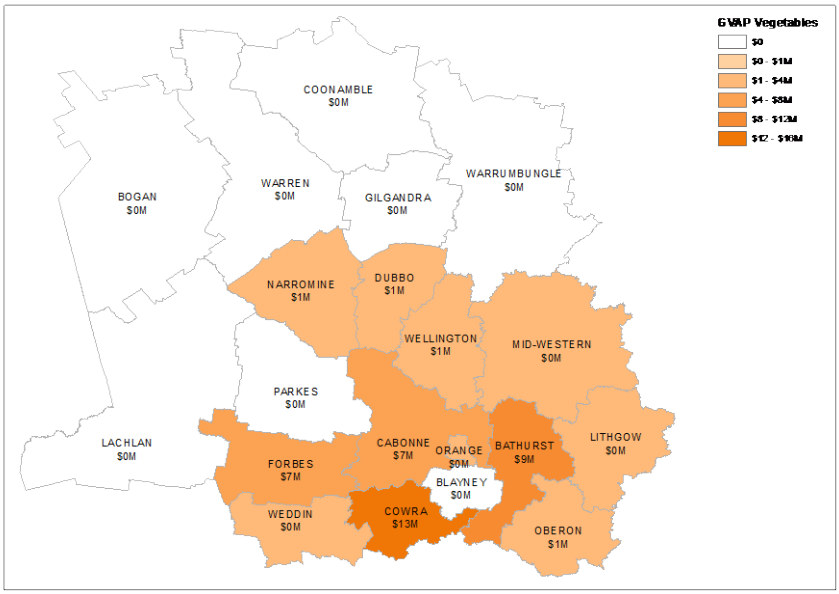


TABLE 7: CHANGE IN VEGETABLE BUSINESS SIZE, CENTRAL WEST & ORANA

SIZE RANGE ($)	2001	2006	2011
<$100k	22	24	16
$100k - $350k	22	15	22
$350k - $500k	2	5	5
$500k - $1mill	14	7	8
>$1mill	4	10	9
TOTAL FARMS	**64**	**61**	**60**
EVAO ($ MILLION)	**$22.8**	**$27.7**	**$31.1**

ECONOMIC CONDITIONS AND PRODUCTIVITY

The Australian vegetable industry has made little headway in expanding exports in recent years. The main reason for this is usually cited to be lack of price competitiveness due to high cost structures. Export markets are not easy and require hard work, dedication, consistency of supply and good working arrangements with supply line participants in the country of destination. Despite this there are a number of Australian vegetable growers who have successfully built markets in Singapore and Japan and are among the leading sources of imports for several vegetables. This success has been achieved despite the price of vegetable imports from Australia often significantly exceeding the price of imports from lower cost and geographically closer countries in East Asia. Australia's success, albeit in a relatively small number of vegetables, is clear evidence that factors other than price (such as quality, reliability, availability and good supply line connections) are important in achieving success in Asian vegetable markets[12].

Australian vegetable producers have faced rising input costs for a number of years, in particular from 2005-06 to 2010-11[13]. This has forced them to push through larger volumes of product to stay abreast of rising cost pressure. However this action by individual growers also leads to supply depressing prices and undermining grower profitability.

The impact of rising input costs can be off-set to a degree by economies of scale. Recent ABARES data suggests that the impact of cash costs on vegetable growers varies depending on the size and scale of the business in question. Growers that produced vegetables on less than five hectares had significantly higher average cash costs than those that grew vegetables on five or more hectares, and average cash costs continue to decline as the size of area sown increases. This is largely due to the cost advantages that are achievable with increased vegetable production. For example, the cost to produce a vegetable unit tends to decrease as total vegetable production increases as the costs are shared over a larger sum of vegetables. Increased scale may also reduce costs per vegetable unit due to efficiency gains.

According to ABARES data, hired labour continues to be the highest cash cost for vegetable growing farms, accounting for approximately 17% of total average cash costs in 2011-12. This was followed by contracts paid (10%), fertiliser (9%) and

[12] Sourcing of vegetables by Asian economies – a look at the data. AUSVEG 2012
[13] ABARES Australian vegetable growing farms: An economic survey, 2011-12 and 2012-13, (2013-14).

seed (7%). Other cash costs used during the production of vegetables, such as fuel and electricity accounted for 6% and 2% respectively.

Typically, vegetable growing in Australia is more labour-intensive than other agricultural industries. The delicate nature of the produce commonly requires the use of labour to hand pick the vegetables. This puts the vegetable industry at a disadvantage to other agricultural industries as it limits vegetable growers' ability to introduce mechanised technologies as a substitute for labour.

STRATEGIC IMPLICATIONS

The Central West & Orana region produces around 10% of NSW vegetables and generated around $40million GVAP in 2011. While the area of vegetable production is small, the industry generated over $220,000 GVAP/ha in 2011. The industry is focused in the south east part of the region where there is access to High Security irrigation water supplies and suitable climate conditions. Economies of scale are a significant factor in the success of annual horticulture. Increasing scale provides opportunities for introduction of mechanisation and improved water use efficiency.

8 REGIONAL TRANSPORT INFRASTRUCTURE

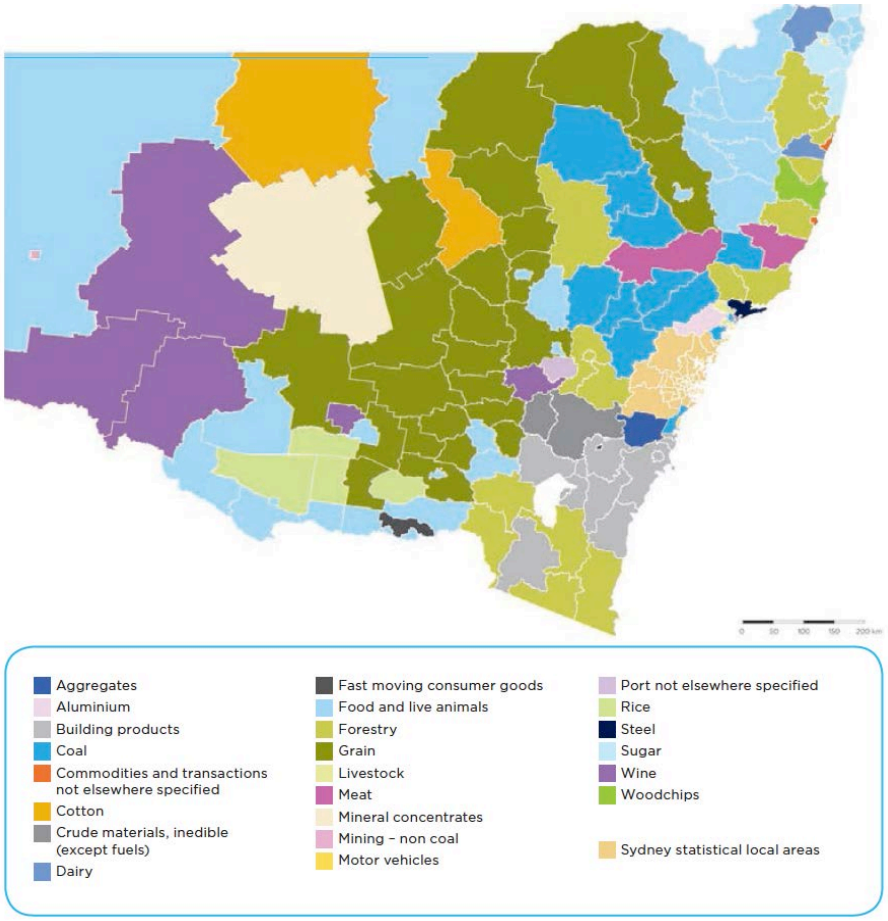
REGIONAL FREIGHT TASK

FREIGHT VOLUMES

The Central West & Orana region is identified as a major commodity transport region in NSW[14]. A study on the economic value of imports and exports from the Central West region[15] concluded that despite the large number of local food companies in the region the vast majority of wheat, livestock, grapevine, fruits, vegetable and other agricultural products leave the region without value adding.

Grain for export is the main commodity transported from the Bogan, Coonamble, Dubbo, Forbes, Gilgandra, Lachlan, Narromine, Parkes and Weddin LGA. Cotton is the main commodity for export transported from Warren. Food products and to some extent livestock are the main commodities transported from Orange, Cabonne and Wellington (Figure 56).

FIGURE 56: LARGEST EXPORT COMMODITY FLOWS BY LGA[14] IN NSW



Producers require products to be transported to domestic and export markets in a timely and efficient manner to remain competitive. An estimated 260 million tonnes of goods originate in regional NSW and transported to other NSW regions, interstate, metropolitan Sydney or international destinations. Regionally generated freight represents approximately 65 % of the total NSW freight task by volume.

A broad analysis of internally generated freight demand (for unprocessed agricultural commodities) within Central West & Orana is shown in Table 8. Bulk grain dominates the annual freight task, generating over 90% of the demand.

[14] NSW Government (2013) NSW Freight and Ports Strategy November 2013. Director General of Transport for NSW, Chippendale, New South Wales.
[15] AEC Group Limited (2014). NSW Central West Export / Import Contribution Study. Report prepared for State of NSW.

TABLE 8: FREIGHT TASK BY COMMODITY AND LGA

COMMODITY	TONNES	PERCENTAGE FREIGHT TASK*	LGA (MAIN OUTPUT)
Crops (wheat)	4,210,569	92%	Lachlan, Narromine, Parkes, Coonamble, Forbes, Warren, Weddin (> 300,000 tonnes)
Beef#	147,650	3%	Warrumbungle, Coonamble, Cabonne, Mid-Western, Lachlan, Blayney (> 8,000 tonnes)
Sheep meat#	89,550	2%	Cabonne, Lachlan, Wellington, Parkes, Mid-Western, Warrumbungle, Forbes, Weddin, (> 5,000 tonnes)
Wool	27,090	1%	Cabonne, Lachlan, Parkes, Wellington, Forbes, Warrumbungle (> 1,500 tonnes)
Cotton			Narromine, Warren (> 30,000 tonnes)
- lint	34,550	1%	
- seed	86,245	1%	
Total tonnes	4,595,654		

Tonnages for the regional meat freight task assumes $2.00/kg gross value for slaughtered beef and $5.00/kg for sheep

* B-DOUBLE FREIGHT TASK CALCULTOR	
	Approx:
Payload e.g. grain	47 tonnes
Loads/year	100,000
Days/year	250
Loads/day	400

Large import components (from outside the region) include fertiliser, chemicals, fuel and equipment. The largest export commodities are grains (wheat), sheep meat and wool, beef, dairy and processed or manufactured products i.e. fruit and vegetable manufacturing (Bathurst, Cowra), grain mill and cereal product manufacturing (Cabonne), meat and meat product manufacturing (Cowra). Other food product manufacturing includes confectionary and pet food products (Blayney, Bathurst). The gross value of food manufacture by category in the Central West** region (rather than Central West & Orana) is summarised in Table 9.

Major food processing occurs in Bathurst, Dubbo and Blayney while Dubbo, Parkes and Forbes are significant hubs for transport of grains and livestock. Examples of regional industries and businesses that employ significant numbers and / or of agricultural importance are outlined in Table 10.

TABLE 9: GROSS REGIONAL PRODUCT OF FOOD MANUFACTURE[15] CENTRAL WEST**

CATEGORY	GROSS REGIONAL PRODUCT $MILLION, 2009-10
Other food product manufacturing (confectionary and pet food products)	$224
Fruit and vegetable manufacturing	$184
Grain mill and cereal product manufacturing	$75
Meat and meat product manufacturing	$42
TOTAL	**$525**

**Note: data sourced for former Central West region i.e. 11 LGAs only (Lithgow, Oberon, Bathurst, Blayney, Orange, Cabonne, Cowra, Parkes, Forbes, Weddin and Lachlan).

TABLE 10: AGRICULTURAL AND PROCESSING EMPLOYERS, CENTRAL WEST & ORANA

LOCATION	SECONDARY AND RELATED RURAL INDUSTRIES
Bathurst	Simplot vegetable and seafood processing; Devro collagen casings, Mars petfood
Blayney	Central Tablelands livestock exchange, Nestle Purina Petcare, Australian Queen Bee Exporters, Goat abattoir (proposed), Blayney Foods / SeaLink
Bogan	KJ Halal meats
Cabonne	Manildra Flour Mill, MSM Milling, Billimari Olive Processing, Canobolas Eggs, Kangaroobie Vinegar Brewery, Vineyards and Wineries / cellar doors, Tableland Premier meats
Coonamble	Agrigrain
Cowra	Cowra abattoir, Kerry Ingredients
Dubbo	Fletchers Grain, Fletchers International Exports (sheep meat abattoir), Dubbo Regional Livestock Exchange, Australian Pet Brands factory, Little Big Dairy, Furneys flour mill, Maverick Bioscience, Australian Organic Meats
Forbes	Central West Livestock Exchange, Superbee honey, Moxeys Dairy, Ooma Enterprises, Hoey Holdings
Lithogow	Ferrero Rocher
Mid-Western	Rylstone Olive Press, 40 x winery / cellar doors, Mudgee Fine Foods, Bevco, Oatley Wines
Narromine	Namoi Cotton, Narromine Transplants, Trangie Ag Research Station, Enza Zaden, Agrigrain
Orange	Fresh Fodder, Caernarvon Cheery Co
Parkes	Linfox, SCT Logistics, Pacific International, Food Services Central,
Warren	Auscott

COMMODITY MOVEMENT AND SUPPLY CHAIN LOGISTICS

The main regional population centres and agricultural production areas generate significant freight flows within the Central West & Orana region. Products from the region are usually transported to Port Botany (Sydney), Port Kembla (Wollongong) or the Port of Newcastle for export or to major distribution networks. For example, the Central West to Port Kembla corridor transports 7 million tonnes per annum (comprising an estimated 4 million tonnes of grain) and is one of the top 10 inter-regional freight flows in NSW (NSW Government 2013)

An estimated 27,000 tonnes of wool is transported from the Dubbo, Lachlan, Parkes and Cabonne LGA to Port Botany. An estimated 34,000 tonnes of cotton lint is transported from Warren and Narromine through to Port Botany. These significant commodity movements and selected corridors are shown in Figure 57. Future freight planning is focussed on preserving and further developing strategic transport corridors, especially in the vicinity of Sydney and Newcastle to ensure efficient passage of regionally produced commodities to the ports[14]

Movements between origins and destinations for individual commodities and associated transport decisions relate to 'supply chain logistics'. There is a mix of supply chains, servicing four broad markets: export, interstate, regional and metropolitan. A range of examples follow:

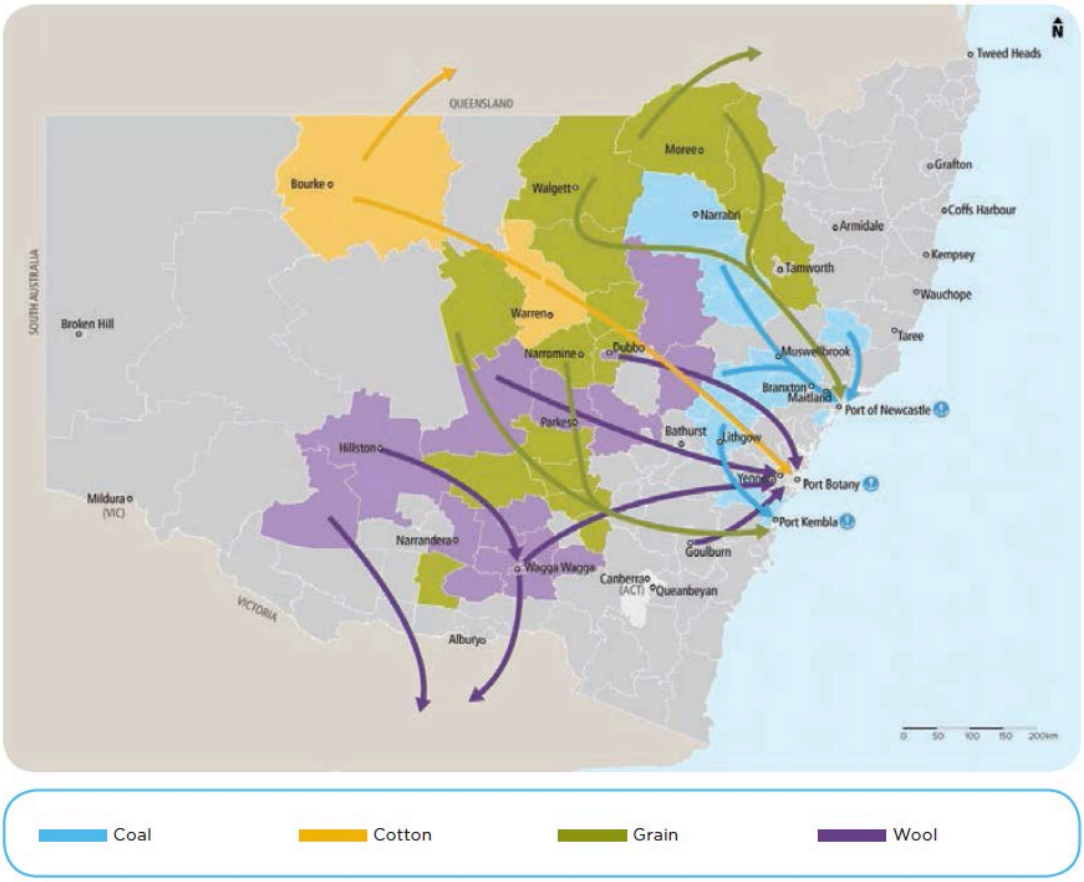
A large proportion of bulk grain for export is freighted by rail to the ports whereas domestic feed grain is usually delivered using more flexible road deliveries to individual customers.

Cotton is mostly grown in the LGA of Narromine and Warren. Warren, on the Macquarie River, is the major hub for transporting cotton. Cotton gins are located in Warren and the nearby town of Trangie. The majority of cotton is freighted to Sydney by rail and there is some warehousing in Dubbo.

Lint is almost exclusively (90 to 95%) exported and there are various major logistics and transport tasks involved in the export supply chain, in particular, these include the movement of:

- Modules of raw cotton (a mixture of lint, seed and trash) from farms to gins
- Bales from gin to warehouse
- Bales from warehouse to port / wharf.

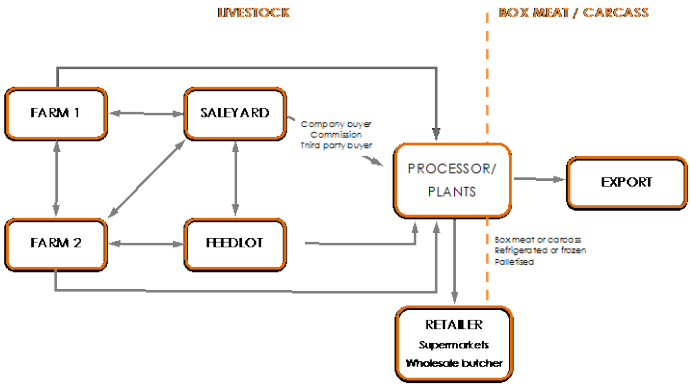
FIGURE 57COMMODITY MOVEMENTS ON SELECTED CORRIDORS[14]



Transport of livestock occurs across the whole region within each LGA. Livestock is transported from the farm to saleyards or feedlots, from the saleyard to feedlots or to one of the many abattoirs in the region. Refrigerated box meat and carcasses are transported to warehousing locations or retailers, either within or outside the region, or to the ports for export. Some livestock is also transported to the ports for export. Approval has been given for livestock to move to a 'volumetric-based' loading scheme to allow carriers to operate at higher mass limits which will provides significant productivity benefits to the industry.

Supply chains for meat and livestock have a number of different production stages and the logistics of livestock transport is outlined in Figure 58.

FIGURE 58: LIVESTOCK AND BOX MEAT SUPPLY CHAIN (ADAPTED FROM NSW GOVERNMENT[14])



TRANSPORT INFRASTRUCTURE

The freight network supports the regions large agricultural industry where rail freight services move bulk commodities such as grain and cotton to Sydney for export. Road freight services the movement of products within the region and to various destinations outside of the region. Intermodal terminals (privately owned) operate out of Parkes (one), Bathurst (two), Dubbo (two) and Blayney (one). There are 45 GrainCorp sites and a further six AWB sites including seven non-grain bulk terminals in the Central West[16] (SKM 2009). Central West & Orana also has excellent airports in Bathurst, Dubbo, Orange and Parkes, providing daily air services to and from Sydney.

The significant road and rail freight networks are described in Table 11. The rail network comprising main lines, branch lines and closed lines is shown in Figure 59.

TABLE 11: MAJOR ROAD AND RAIL FREIGHT NETWORKS (ADAPTED FROM SKM[16]) IN CENTRAL WEST & ORANA

INFRASTRUCTURE	DESCRIPTION OF MAIN LINKS
Highway & road network	
Newell Highway	The Newell Highway provides an inland connection between Melbourne and Brisbane. It passes through the western part of Central West, through the towns of Forbes and Parkes.
Great Western Highway	The Great Western Highway is the main road link between Sydney and Bathurst via the Blue Mountains.
Mid Western Highway	
Mitchell Highway	The Mitchell Highway heads north-west out of Bathurst, through Orange, Molong and Wellington, before continuing to Queensland via Dubbo, Nyngan and Bourke.
Lachlan Valley Highway	The Lachlan Valley Way links Boorowa and Cowra and then to Forbes, Condobolin and Lake Cargelligo.
Henry Lawson Highway	Henry Lawson Way links Young and Forbes via Grenfell.
Rail network	
East – west rail corridor - Main West Line	Key transport spine connecting the Central West & Orana region with Sydney, via Bathurst, Orange and Dubbo - Allows double stacking and long trains to go west
Inland rail (under construction)	Linking Melbourne with Brisbane – intersecting E-W rail linkages at Parkes - Will also connect with Transcontinental Railway linking Sydney, Adelaide and Perth
Several Branch Lines	Linking some of the important regional centres to the Main West Line

FIGURE 59: NSW REGIONAL RAIL NETWORK

GROWTH IN FREIGHT DEMAND

The NSW Freight and Ports Strategy[14] has projected that the NSW freight task will double (to 794 million tonnes) by 2031. Freight needs for agricultural commodities (including bulk grain, cotton, wool, wine, horticulture and fresh produce) are forecast to grow between 1 and 3% per annum[16,14]. It is expected that growth in freight demand in Central West & Orana will fall within this range.

[16] SKM (2009) Central West Transport Needs Study. Sinclair Knight Merz, St Leonards, NSW

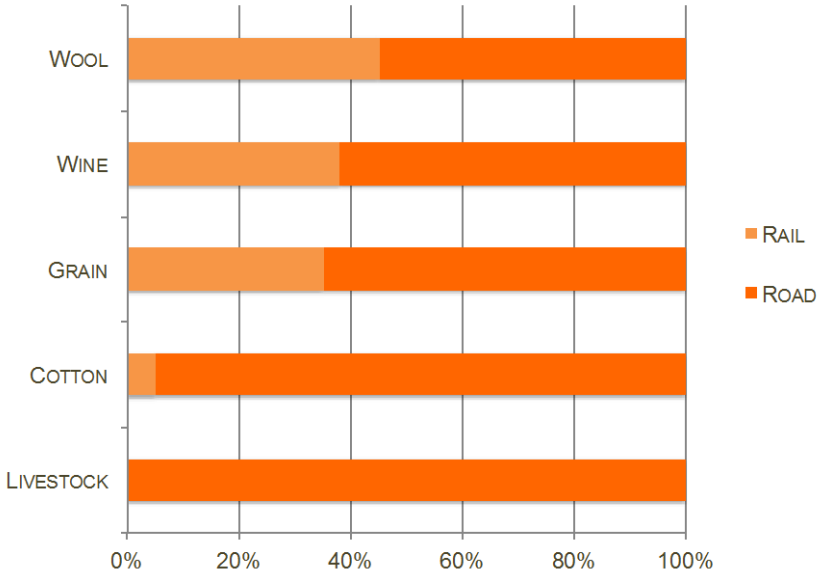
Government at all levels are seeking opportunities to shift more freight on to rail. For example, there is strong local support (five Councils comprising Blayney, Cowra, Harden, Weddin and Young) to re-open 200 km of line between Blayney and Harden, which has been out of operation since 2007.

Road freight is increasingly becoming more efficient and competitive, with high productivity vehicles (HPVs) allowing more freight to be moved using fewer trips. The highway network is extensive and well established and has capacity to meet the regional freight needs into the future[16].

The current freight mode share for agricultural commodities in NSW is shown in Figure 60. The overall rail mode share is expected to only slightly increase from 33% in 2011 to 37% in 2031, mostly due to forecast growth in the coal freight task[14].

A major constraint for increased rail freight between Central West & Orana and Sydney is the significant growth in passenger trains within the Sydney metropolitan network which, reduces the availability of freight paths from the Central West into Sydney[16]. The Main West line also has considerable limitations. For example, its existing low productivity operating standards (single track, low speeds and restricted axle loads) are due to the poor condition of bridges, track and tunnels and outdating signalling. The newly constructed Southern Sydney Freight line enables regional produce from the south west to access south Sydney and Port Botany via Cootamundra.

FIGURE 60: NSW FREIGHT MODE SHARE FOR SELECTED AGRICULTURAL COMMODITIES 2011[14]



STRATEGIC IMPLICATIONS

The agricultural industry generates significant freight flow, exporting products and importing production inputs such as fertiliser and fuel. Rail freight services move bulk commodities such as grain and cotton to major ports. Road freight services move products within the region and to various destinations outside the region. Freight needs for agriculture are projected to grow at between 1 and 3% per annum until 2031. Maintaining road and rail infrastructure and upgrading strategic roads assets to accommodate larger and heavier loads will be important for efficient agricultural freight movement.

9 IRRIGATION

Irrigated agriculture is an important component of the agricultural industry in Central West & Orana providing opportunities for production of high value commodities such as cotton, fruit and vegetables and continuity of production in low rainfall seasons. Water for irrigation is accessed via direct diversion from rivers, privately owned irrigation companies and groundwater pumping. There are two main irrigation districts in the region, being the Macquarie Valley in the centre of the region and the Lachlan Valley which extends across the south of the region.

There has been substantial restructure in irrigated agriculture driven by changes to government water policy including the introduction of water trading, the Murray Darling Basin Plan, NSW Water Sharing Plans, ACCC Water Charge & Trading Rules and ACCC Water Price Determinations and the fall out of significant reductions in water allocations during the millennium drought. Water trading has driven water into higher value irrigated businesses and environmental water recovery has reduced water availability in every traditional irrigation area throughout the Murray Darling Basin. The water recovery targets set for the Lachlan and Macquarie-Castlereagh catchments under the Basin Plan have been achieved. Therefore, it is expected that there will be no further reduction in irrigation entitlement in these catchments.

This restructure has been accompanied by significant investment in water efficiency improvements on farm and in water delivery infrastructure.

TABLE 12: SURFACE AND GROUNDWATER ENTITLEMENTS IN THE MACQUARIE AND LACHLAN VALLEYS[17]

	Surface Water (Long term diversion Limit) (GL)	HIGH RELIABILITY (GL)	GENERAL SECURITY (GL)	GROUNDWATER (GL)
Macquarie and Cudgegong	391	15	611	66
Lachlan	305	31	603	347

MACQUARIE VALLEY

The Macquarie River is one of the major inland river systems in NSW, forming near Bathurst and flowing northeast through the towns of Bathurst, Wellington, Dubbo and Warren to the Macquarie Marshes. Major tributaries in the Macquarie system are the Turon, Cudgegong, Bell, Little and Talbragar Rivers[18].

The Macquarie Regulated River System is the major source of surface water irrigation in the Macquarie Valley and irrigation farms are located along the fertile riverine plains of the Macquarie River. Figure 61 shows the extent of the regulated section of the Macquarie system, which also includes the Cudgegong Regulated River System.

Water flows in the Macquarie are highly variable and as a consequence, there is reliance on private water storage and irrigated production tends to be more opportunistic with an emphasis on generating high returns in good years to carry enterprises through years when there is insufficient water available for cropping. Cotton is widely grown in the Macquarie catchment.

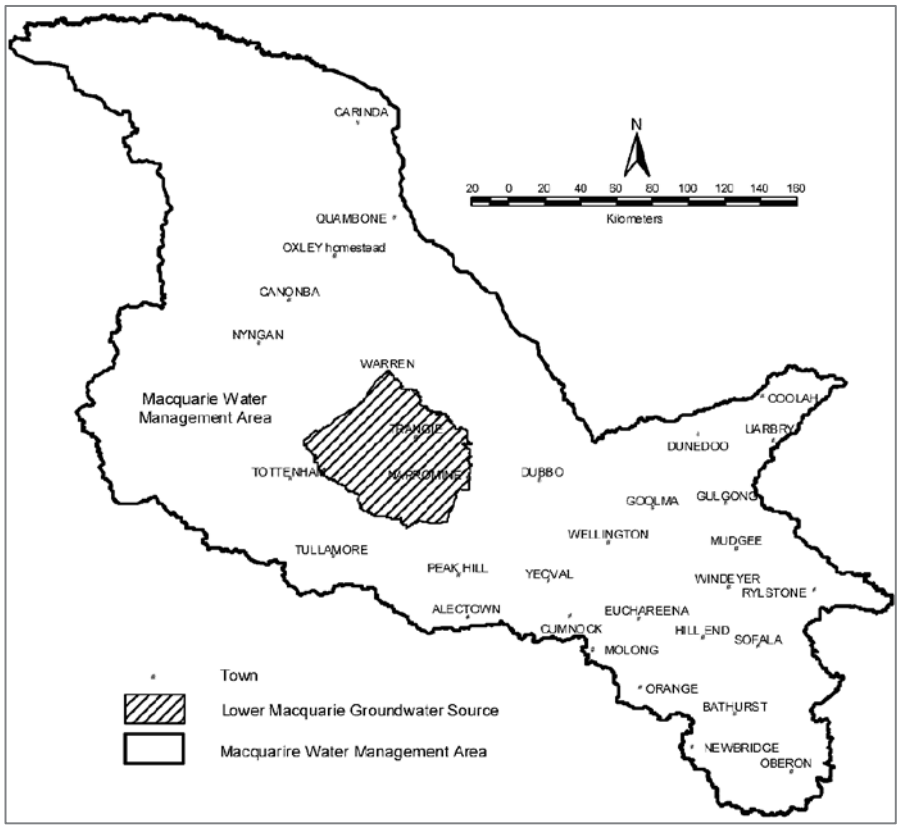
There is no inter-valley trade, other than minor trade between the Macquarie and Cudgegong, for the Macquarie catchment. This means that there is little opportunity for risk management, such as purchasing water from other catchments in years of low flows. However, there is considerable intra-valley trade.

Groundwater is accessed for irrigation from within the Lower Macquarie Groundwater Source via alluvial and sandstone aquifers. The Lower Macquarie Groundwater Source includes six aquifers and covers an area of approximately 4,050 square kilometres generally to the west of Narromine (Figure 61).

Cotton is the main irrigated crop in the Macquarie Valley and is concentrated on the floodplains around Narromine, Trangie and Warren. Due to the high water requirements for cotton, there can be large variances in the total cotton grown in the valley each year. Summer and winter cereals, pulses and oilseeds can also be grown under irrigation in rotation with cotton. Upstream of Narromine, irrigation entitlement is used to water lucerne, vegetables, pastures, cereals and oilseeds. Around Narromine and Dubbo there are also a number of citrus and other perennial horticulture and viticulture enterprises that rely on high security surface and groundwater[19].

[17] Murray Darling Basin Authority (2010) Guide to the Proposed Basin Plan
[18] Macquarie River Food and Fibre (MRFF) (date n/a) *The Macquarie Regulated River System* URL: http://www.mrff.com.au/Industry/MacquarieRiver.html#.VWZbA1p9u-I (Accessed 28 May 2015)
[19] Macquarie River Food and Fibre (MRFF) (date n/a) *Food and Fibre Production* URL: http://www.mrff.com.au/Industry/FoodFibreProduction.html#.VWZZWlp9u-J (Accessed 28 May 2015)

FIGURE 61: LOWER MACQUARIE GROUNDWATER SOURCE AND THE MACQUARIE WATER MANAGEMENT AREA[20]



LACHLAN VALLEY

The Lachlan catchment covers an area of 84,700 square kilometres in central NSW and extends across the south of the Central West & Orana region. The Lachlan catchment supports a diverse range of irrigated crops including high quality lucerne hay, winter and summer cereals, cotton, canola, grapes, potatoes, citrus, vegetables and other horticultural crops. Irrigation water is available via surface water diversions from the Lachlan River and Belubula River and their associated tributaries (Figure 62). Groundwater is also available via the Upper and Lower Lachlan Groundwater Management Areas.

The average annual surface water flow is estimated at 1,212,000 ML, and the average annual extraction is limited to 305,000 ML (25%). Total annual water usage for both surface water and groundwater is around 450,000 ML, depending on availability and seasonal conditions[21]. During the millennium drought general security irrigators in the Lachlan Valley along with much of Murray Darling Basin had zero allocation in five of the seven years between 2002/03 to 2008/09 [22].

There is a total of 654,987 ML in water entitlements for the Lachlan River, 26,634 ML for the Belubula River and 291,000 ML in groundwater entitlements (Table 12). There is no inter-valley trade for the Lachlan catchment. Nearly all horticultural production is generated from groundwater or high security entitlements.

Groundwater usage in the Lachlan catchment is projected to increase from 236 GL/year to 440 GL/year by 2030 with the increase from the Upper Lachlan Groundwater Management Area and surrounding aquifers. The Upper Lachlan Groundwater Management Area comprises the alluvial aquifers from Lake Cargelligo to 20km upstream of Cowra (Figure 63).

[20] NSW State Government (2014) *Water Sharing Plan for the Lower Macquarie Groundwater Sources 2003*. URL: http://www.legislation.nsw.gov.au/viewtop/inforce/subordleg+190+2003+FIRST+0+N/ (Accessed 28 May 2015).
[21] Lachlan Valley Water (2015) *About the Lachlan* URL: http://www.lvw.com.au/site/index.cfm?display=110615# (Accessed 28 May 2015).
[22] Lachlan Valley Water (2015) *Drought Impact* URL: http://www.lvw.com.au/site/index.cfm?display=127488 (Accessed 28 May 2015).

FIGURE 62: LACHLAN RIVER REGULATED SYSTEM[21]

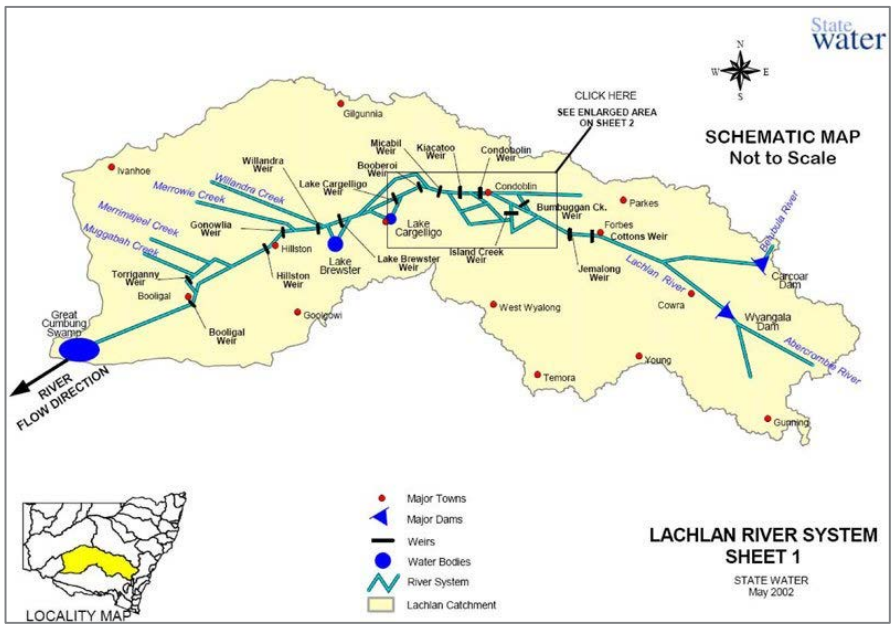
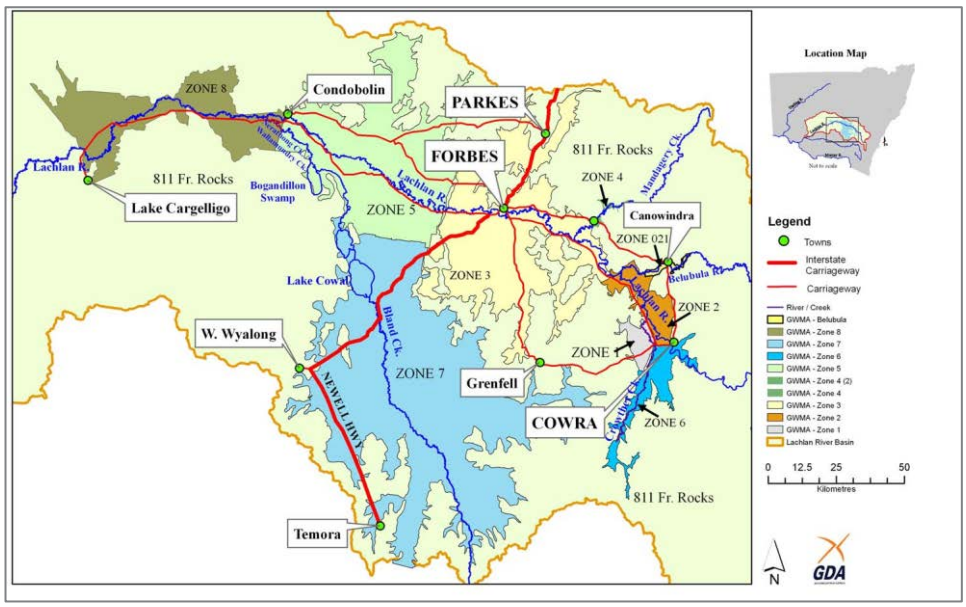


FIGURE 63: UPPER LACHLAN GROUNDWATER MANAGEMENT AREA[23]



STRATEGIC IMPLICATIONS

Irrigated agriculture is an important component of the agricultural industry in Central West & Orana providing opportunities for production of high value commodities such as cotton, fruits and vegetables and continuity of production in low rainfall seasons. There has been substantial restructure in irrigated agriculture driven by changes to government water policy and the experiences of the millennium drought. This restructure has been accompanied by significant investment in water efficiency improvements on farm and in water delivery infrastructure.

The water recovery targets set for the Lachlan and Macquarie-Castlereagh catchments under the Basin Plan have been achieved. Therefore, it is expected that there will be no further reduction in irrigation entitlement in these catchments.

Irrigation infrastructure is essential to the continued success of irrigated agriculture.

[23] NSW State Government (2010) *Upper Lachlan Alluvium, Groundwater Management Area 011, Groundwater Status Report – 2010*. NSW Office of Water, NSW State Government, Sydney, Australia.

10 CLIMATE VARIABILITY AND CHANGE

The climate of Central West & Orana ranges from wetter areas in the east with mild summers and cold winters (Orange and Bathurst, Lithgow) while lower rainfall, hotter and drier conditions occur further to the west.

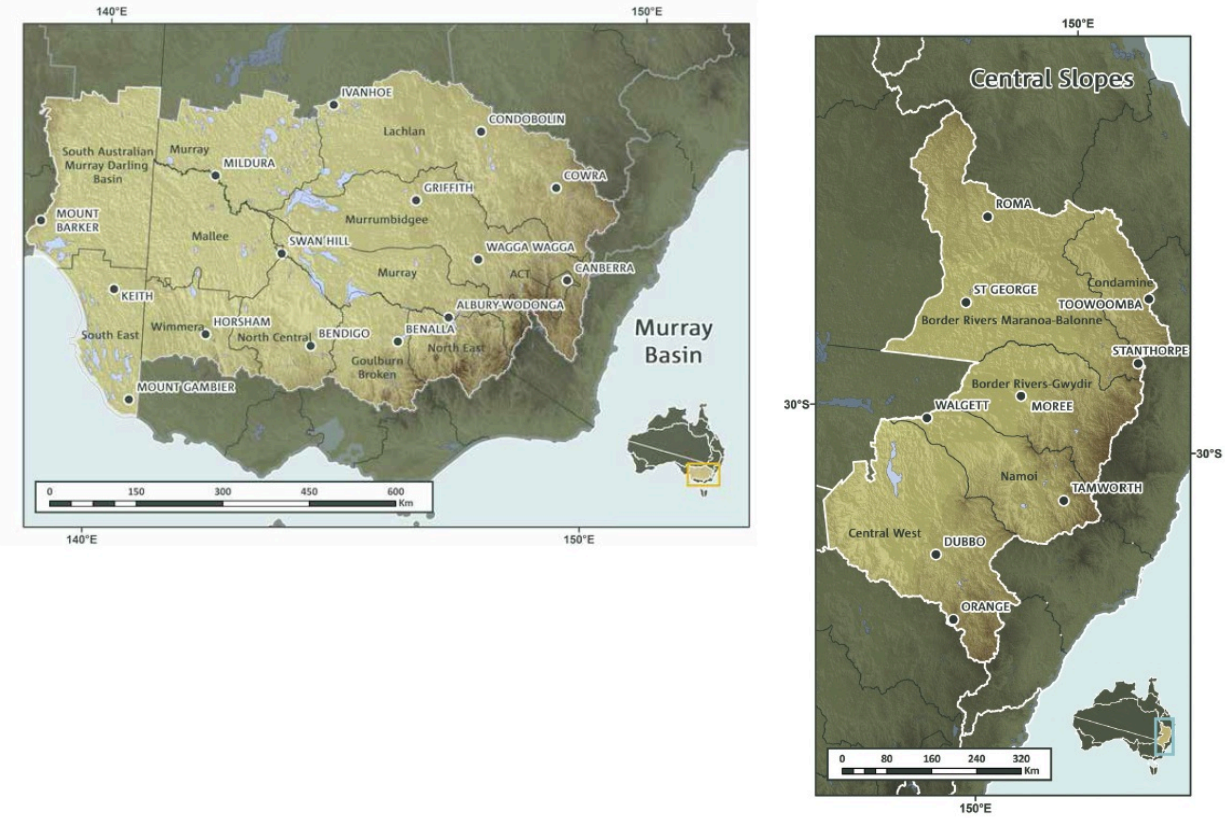
A recent series of reports prepared by CSIRO and the Australian Bureau of Meteorology[24] consider the impact of the future climate on Australia's natural resources. The studies are presented in 'clusters', which largely correspond to the broad-scale climate and biophysical regions of Australia. The Central West & Orana region is split between the Central Slopes cluster and the Murray Basin cluster (Figure 64). These reports present the best available climate science for the region.

The projections of future climate are based on the current understanding of the climate system in both clusters, historical trends and models of climate response to variations in greenhouse gas emissions. The study is also informed by the science of the *Fifth Assessment Report* of the Intergovernmental Panel on Climate Change (2013).

CLIMATE PROJECTIONS

A summary of the main climate change projections that are relevant to the Central West-Orana region follows.

FIGURE 64: LOCATION OF THE MURRAY BASIN AND CENTRAL SLOPE CLUSTERS[24]



Temperature

- There is *very high confidence* in substantial warming for both clusters for the mean, maximum and minimum surface air temperature.
- Surface air temperature has increased, especially since 1960. In 2013, mean surface air temperatures had risen by 0.8°C since 1910.
- In the Central Slopes cluster by 2030, the warming is projected to be in the order of 0.6 to 1.5°C relative to the climate of 1986 – 2005. In the Murray Basin cluster, the mean warming by 2030 is projected be around 0.6 to 1.3°C above the climate of 1986 – 2005.

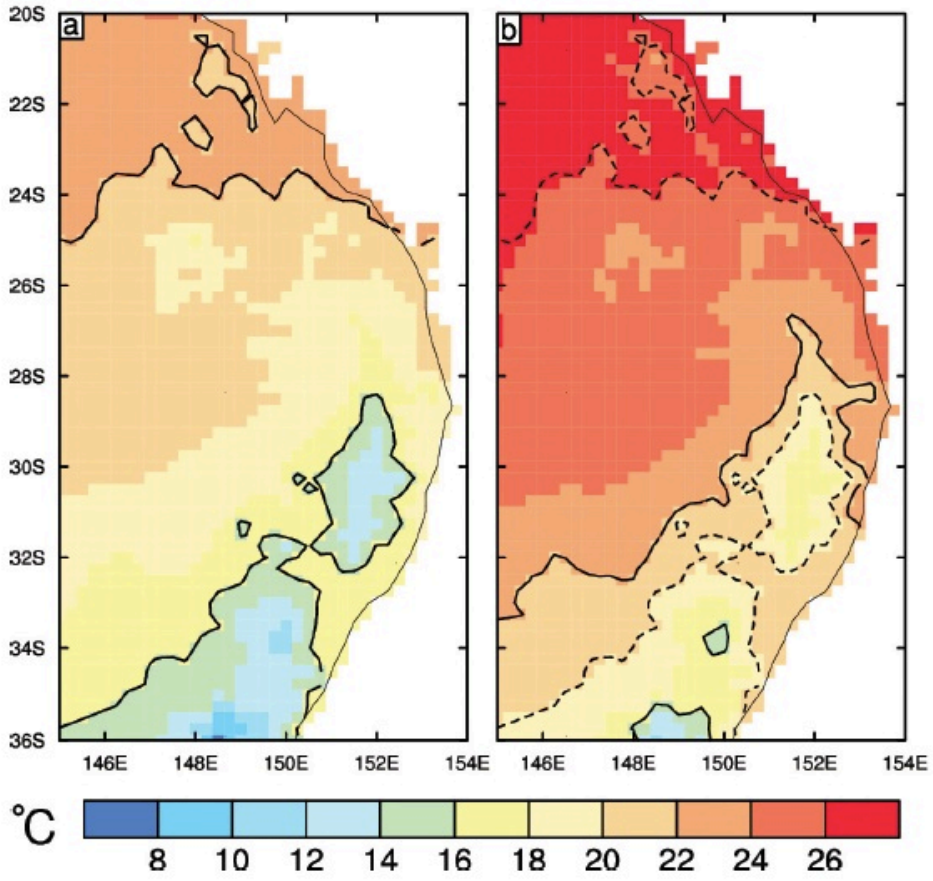
By 2090, there are expected to be larger temperature increases. In the Central Slopes cluster, under a medium emissions scenario warming is expected to be in the range of 1.4 to 2.7°C relative to the 1986 – 2005 climate, and in the order of 3 to 5.4°C under a high emissions scenario. This is shown in Figure 65: where current temperatures within the range of about 12 to 22°C are in the range of about 16 to 26°C for the 2090 climate.

- In the Murray Basin cluster, warming in 2090 is expected to be in the range of 1.3 to 2.4°C for a medium emissions scenario and 2.7 to 4.5°C for a high emissions scenario.

[24] Ekström, M *et al.* 2015 *Central Slopes Cluster Report, Climate Change in Australia Projections for Australia's Natural Resource Management Regions: Cluster Reports,* eds. Ekström, M. *et al.*, CSIRO and Bureau of Meteorology, Australia.
Timbal, B. 2015 *Muarry Basin Cluster Report, Climate Change in Australia Projections for Australia's Natural Resource Management Regions: Cluster Reports,* eds. Ekström, M. *et al.*, CSIRO and Bureau of Meteorology, Australia.

- There is very high confidence that there will be a substantial increase in the temperature reached on the hottest days, the frequency of hot days and the duration of warm spells in both clusters.
- There is high confidence that the frequency of frost days are projected to decrease in both clusters. Changes in the frequency of surface frost will have important implications for agriculture in the region.

FIGURE 65: ANNUAL MEAN SURFACE AIR TEMPERATURES (°C) FOR THE PRESENT CLIMATE (A) AND FOR MEDIAN WARMING IN 2090 UNDER A HIGH EMISSION SCENARIO (B)[24]



Rainfall

- There is high confidence that winter rainfall will decrease by 2090 in both clusters. The magnitude of this change varies. In the Central Slopes cluster, under the high emission scenario this variability in winter rainfall could range from -40 to +15% relative to the winter climate of 1986-2005. The southward shift of winter storm systems is considered to be the main mechanism driving this change.
- In the Murray Basin cluster, under the high emission scenario the change in winter rainfall spans around -40 to +5% relative to the climate of 1986 – 2005.
- In the Central Slopes cluster, there is likely to be some decreases in spring rain. The complexity of rain producing systems in the Central Slopes cluster makes it difficult to reliably project long-term changes in rainfall in summer and autumn.
- In the Murray Basin cluster there is medium confidence that rainfall will remain unchanged in the warm season (November – March).
- There is high confidence that the intensity of heavy rainfall events will increase in both clusters.
- There is medium confidence that the time spent in drought will increase over the 21st century under the high emission scenario for both clusters.

Extreme weather events

- There is projected to be some decreases in winter wind speeds in both clusters.
- In the Central Slopes cluster, there is medium confidence that cyclone intensity will increase, but be less frequent. This includes a potential decline in the number, but increase in intensity, of east coast lows causing damaging winds.
- There is high confidence that climate change will result in a harsher fire-weather climate in both clusters.

Solar radiation and humidity

- In both clusters there is projected to be some increase in solar radiation related to decreases in cloudiness associated with reduced rainfall. In the Central Slopes cluster there is medium confidence in increased winter radiation. In the Murray Basin cluster there is high confidence in winter and spring radiation.
- Overall a decrease in relative humidity is projected for all seasons, but particularly in winter and spring, by 2090 in both clusters.

Potential evapotranspiration

- Increases in potential evapotranspiration are projected for both clusters with high confidence for all seasons, with the largest changes in summer by 2090.
- Projections suggest decreases in soil moisture in winter and spring, particularly later in the century.
- In both clusters, a decrease in soil moisture and runoff are projected due to changes in rainfall and increases in potential evapotranspiration.

CLIMATE CHANGE AND HORTICULTURE

The potential impacts of these changes to climate on the horticulture industry include:

- Decreased water availability due to higher temperatures
- Increased water demand arising from greater evapotranspiration
- Increased incidence of damage from sunburn and other breakdown disorders due to increase in the number of hot summer days (over 35ºC)
- A reduction in the number of frost days reducing winter chilling (which is important for some fruit trees for setting fruit, meaning that it may become necessary to consider low chill varieties and alternative management options)
- Increased intensity of frosts during spring may damage developing fruit and production
- Increase in intense weather events (extremely heavy rainfall events) impacting on fruit quality.

Horticultural businesses would respond to a drying climate and uncertainty about water availability by buying more water to hold the same volume it initially held. Other short – to medium term measures include increasing use of shade/hail netting. A projected decrease in frost frequency and severity would reduce the risk of damage to those fruits that are sensitive to frost late in the growing season. However, temperate fruits that require winter chilling to ensure normal bud-burst and fruit set are at risk of lower yields and reduced fruit quality.

Over the long term, climate change (extreme temperatures) may encourage some of these industries to relocate to cooler areas to reduce the impacts of prolonged periods of extreme temperatures during the growing season.

The risk of crop failures due to more variable/volatile growing conditions is also predicted to increase, affecting the industry's ability to meet increasingly specific and targeted quality assurance/market requirements. The horticulture industry may also be affected by policies to mitigate climate change, which are likely to result in higher energy, input and transport costs, for example cooling.

Climate change impacts on specific horticultural crops are provided here[25].

Almonds are a perennial nut crop native to Mediterranean climates characterised by warm, dry summers and mild, wet winters. As a temperate nut, almonds require winter chilling to flower in the spring. Restricted winter chilling due to a warming climate is likely to delay flowering until later in spring, when high temperatures dwindle insect pollination an Almond plants can also lose significant amounts of water at night, which will be exacerbated temperatures, negatively affecting the quality and quantity of production.

Apples are sensitive to extreme heat conditions with very hot conditions during the maturation period (January to April) potentially lowering yield and quality. As little as 10 minutes through apple skin, so with climate change expected to increase the number of days hotter than 35°C in fruit-growing regions such as the Goulburn Valley, higher rates of sun damage are likely. Adapting farm practices, such as using shade netting will be required but, will also add to production costs.

Cabbages are easily grown under a wide variety of conditions. Cool, moist weather results in the best quality heads, though some varieties produce acceptable heads during warmer periods of the year. Climate change is likely to shorten the winter growing season of cabbage by up to a month by 2030 unless more adaptable varieties are developed. Higher temperatures will result in a longer period of pest activity, especially if production is extended into traditionally cooler periods.

Carrots can grow in temperatures between 10°C and 25°C but the best conditions are between 15°C and 18°C. Warmer temperatures adversely affect the carrot's flavour, texture and physical structure. Higher temperatures associated with climate change are likely to make carrot production less viable in warmer areas with shifts to cooler regions such as Tasmania.

As with other brassica crops, cauliflower is a rich source of minerals and compounds beneficial to health and may help prevent cancer. Cauliflowers grow better Excess heat negatively affects head development and size, while increases in soil temperatures promote a major soilborne disease, known as "clubroot", in brassicas. Rising temperatures may lead to cauliflower production shifting to cooler regions in Australia.

Olives are mainly produced in lower rainfall Mediterranean climates, meaning wet winters but hot, dry summers. Climate change could have a positive impact on the olive industry by extending the range in which the trees can viably grow, as they tolerate hot climates and drought conditions. In Australia, bush fires have destroyed large olive plantations, with younger trees more susceptible to death from fire. However, older olive trees can recover from fire with careful pruning.

In winter, peach trees enter a dormant phase, protecting the tree from cold weather damage. Once dormant, enough exposure to winter chill is needed before regrowth starts again. Without enough winter chill by spring, flowering is disrupted, leading to lower yields of fruit. Climate change effects on peach growing will differ greatly among regions. Minimal impacts are anticipated for Tasmania, for example, while the southwest of Western Australia is expected to experience notable declines in cold weather. Hormonal and other treatments can be used to partly compensate.

[25] University of Melbourne (2015) Appetite for change: Global warming impacts on food and farming regions in Australia

Plums are a perennial crop and ripen over spring and summer. Historical observations in Tasmania show plums are ripening earlier in the season. This trend is related to both warmer temperatures and drier conditions. If these trends continue, we may see various types of fruits ripen about the same time. This would compress the window of time for harvesting, requiring either more fruit pickers for a shorter period or, since securing such casual labour can be difficult, picking fruit too early or too late, reducing plum quality and value.

Walnuts are a perennial nut crop native to Mediterranean climates with w
other temperate nut crops, walnuts require winter chilling to flower in late spring. Global warming will affect winter chilling, resulting in late and erratic flowering. High temperatures at flowering and fruit set, together with potentially restricted supplies of irrigation water, make walnuts are particularly vulnerable to future conditions.

CLIMATE CHANGE AND BROADACRE AGRICULTURE

Winter grains are highly sensitive to climatic influences due to the relatively low winter / spring rainfall and high potential evaporation values as well as the total reliance on rainfall. Cropping, particularly in the lower rainfall areas will be an increasingly risky enterprise. There will be an increase in the frequency of winters when cropping will be unprofitable due to reduced crop yield and / or reduced grain quality. In the short to medium term, farmers may change crop rotations, incorporate shorter growing season varieties and fallow to increase stored soil moisture. Incorporating a livestock component to the enterprise, purchasing additional cropping land or moving the cropping enterprise to areas with more reliable rainfall or access to irrigation are more significant responses to reduce climate risk. In the long term, the area of cropped land is likely to contract and total grain production reduce in Central West & Orana.

While cotton prefers longer, hotter seasons, cotton production in Central West & Orana is likely to reduce in the future due to an increase in seasons when there will be insufficient water for irrigation and heat stress impacts on cotton yield. The Macquarie catchment is particularly vulnerable due to highly variable flows. There has been an increase in the area sown to cotton in the southern valley of NSW as cooler climate varieties have become available and growers have access to more reliable irrigation entitlements.

The reduced water balance arising from the predicted climate will result in lower and more variable pasture production. In Central West & Orana, there is likely to be a reduction in beef cattle and increase in sheep grazing with cattle grazing contracting to higher rainfall areas. Reduced pasture production will require enterprises to increase scale to maintain productivity. Feed lotting may become more attractive as there is capacity to reduce heat stress by providing shade and managing feed and water intake.

In addition, the distribution, abundance and management of insects, pathogens and weeds will be affected by climate change. For example, the likelihood that pests, particularly those of tropical or semi-tropical origin, will spread southward in Australia, or become established after an incursion, increases with climate warming. Stressed plants also are more vulnerable to insect and disease outbreaks and the efficacy of current control measures could be altered.

High rainfall areas of the region where the suitability for dryland cropping and grazing may improve in a future climate, have limited capacity to accommodate growth in these sectors due to fragmentation and the small scale of properties.

Climate change impacts on specific broadacre agricultural commodities are provided here[26].

Climate change has three key effects on barley. More atmospheric carbon-dioxide increases yields of crops such as barley by about 0.2 per cent a year and may lead to reduced grain protein. Hotter temperatures will lower yields. It is predicted that by mid-century these two factors will largely cancel each other out, followed by net declines in both yield and quality. There remains uncertainty about how global warming will affect rainfall but the risk appears to be for less rain, and hence lower grain yields, across southern Australia's cropping belt, although small increases in some areas are possible.

Beef production in southern Australia typically relies on cattle breeds of temperate origin, such as Angus and Hereford, grazing intensively managed pastures. Warmer and drier climates in the future will pose significant challenges to these beef-production systems. Pasture- growing seasons are expected to contract, leading to lower and r
stocking rates and increased reliance on supplementary grain feeding. Reduced rainfall will limit capture of runoff to supply drinking water, an issue highlighted during the Millennium Drought. Increased heat stress may lead to farmers choosing more heat-tolerant cattle breeds possibly of lower meat-eating quality.

Canola oil is classified as being cardio-protective because of its substantial amounts of essential unsaturated fatty acids but low amounts of saturated fatty acids. Increased carbon-dioxide levels in the atmosphere predicted by mid-century will diminish canola oil's health benefits, reducing the level of healthier unsaturated fatty acids by about 23 per cent while the level of unhealthier saturated fatty acids will remain the same.

Chickpeas are grown from northern Western Australia to Mediterranean-climate regions in south-western Australia, sub-tropical southern Queensland and more recently in eastern Australia. Climate changes are expected to bring more drought, heat and cold weather events in different climatic zones. Heat stress (35°C or above) during flowering and pod setting leads to flower drop, reduced pod and seed set, and consequent yield loss, especially in eastern Australia. Frost (below 0°C) and cold (below 10°C) also reduce the yield of winter sown chickpea, due to damage to flowers, reduced early pod formation and seed filling.

The "Spring lamb" production system relies on sheep grazing on highly nutritious pastures during winter and spring. Climate projections for reduced spring rainfall, and greater variability in rainfall patterns in southern Australia, will challenge this traditional production system. Alternative systems will be needed to adapt. In some regions this could include greater use of drought-tolerant native shrubs such as saltbush, and perhaps also increased feedlot-finishing of lambs to manage the uncertainty of seasons.

[26] University of Melbourne (2015) Appetite for change: Global warming impacts on food and farming regions in Australia

Wheat growing is strongly affected by rainfall and temperature. Future projections indicate lower and more variable production and increasing proportions of grain of -dioxide in the atmosphere will increase plant growth, termed the fertilisation quality with lower grain and levels of protein micronutrients. Zinc and iron concentra projected to be 5- 10% lower mid-century, adding to the already significant malnutrition. Increased heat stress will also reduce wheat's dough-making characteristics.

STRATEGIC IMPLICATIONS

Climate change has and will impact the agricultural industry within Central West & Orana. In the short to medium term producers will modify practices, production mixes and varieties to spread risk and reduce the impacts climate change. Some strategies are already being adopted such as buying or leasing land in areas with more reliable rainfall or irrigation water security. In the longer term, some areas may see significant change in the mix of agricultural industries.

11 MAINTAINING REGIONAL COMPETITIVE ADVANTAGES

The Central West & Orana's competitive advantages include[28]:

- Significant environmental advantages: a range of seasonal climates, soil types and growing seasons that support a diverse range of crops
- Substantial and robust agricultural industries: providing raw materials to advanced food processing companies, significant bulk commodities for export and supply of food to eastern Australia
- Local presence of advanced food processing companies: several regional centres host food and beverage manufacturing
- Geographical location, transport network and logistics: close proximity to Canberra and Sydney; traversed by major national road and rail routes; National logistics hub in Parkes; intermodal facilities at Blayney and Bathurst; warehousing and distribution centres; transportation services.

In order to capitalise on these advantages the region's farmers will need to maintain productivity levels. Farmers' business model will need to be adaptive and be able to manage climate, soil condition, agronomy, input costs and market risks.

Increasing farm size, in terms of physical size (hectares) and value has been most evident in the broadacre cropping sector in the Central West & Orana region. While farm size is important the most recent research into agricultural industry productive growth concluded that large farms achieve higher productivity through changes in production technology rather than through changes in scale[3]. This means that the ability for the region to attract capital investment is a major determinant to the region's future prosperity.

There is fierce competition around increasing farm size in the broadacre sector. Locating and acquiring more land is increasingly difficult with competition from funds / corporates and off shore investors in the land market. This can, however, create opportunities for existing farm businesses by enabling them to enter into share farming, leasing or profit sharing arrangements with corporate businesses for example – allowing family farms to increase their production without the exposure to increasing debt.

STRATEGIC IMPLICATIONS

Planning can support Central West & Orana maintain its competitive advantages for agriculture.

12 OPPORTUNITIES AND FUTURE OUTLOOK

POLICY AND REGIONAL DEVELOPMENT

The anticipated growth in demand for food and agricultural products in Asia should provide opportunities for further export of food manufactured from Central West & Orana. Numerous free trade agreements (FTAs), both agreed and currently being negotiated, will facilitate flow of locally grown agricultural produce and value-added food products from Australia e.g. Australian Government negotiations are well advanced for FTAs with China, India and Indonesia; and newly signed agreements with Korea and Japan have already paved the way for tariff free exports of goods such as beef, lamb, wine and cotton.

Global growth in the "middle class" in Asia is leading to increased demand for quality food, including high end agricultural products such as fruit, dairy, high grade meats. This means potential opportunities for the Australian agricultural sector to grow in export significance (in terms of proportion of National GDP) given it has been falling since the 1980s. Success will depend on a range of factors including how Australian governments handle the foreign investment concerns in some parts of the community, for example[27].

There is a wide range of factors that will influence the region's ability to capitalise on these opportunities.

The strengths of the Central West & Orana region[28] include its:

- Proximity to Sydney and other major population centres
- Agricultural productivity levels and diversity; the region is a major food basket for Australia
- Population growth in major centres (Orange and Bathurst)
- Land availability and affordability.

The competiveness of agriculture in the Central West & Orana region will be reliant on farmers being able to:

- Maintain previous productivity growth levels, especially in broadacre farming, in light of a flattening out of growth over recent years
- Innovate, adopt emerging technologies and improve their efficiency
- Manage high production costs, in particular labour costs
- Access an efficient supply chain – from farm to warehouse / manufacturer or bulk terminal to port
- Access secure water supplies for irrigated agriculture
- Manage natural resource pressures, especially associated with climate change
- Be highly attuned to international market developments.

Expansion in agriculture will require upgrades to freight, produce handling and transport infrastructure in some areas. Further diversification of some agricultural industries and value adding will need to attract increased capital investment. The location of the region has strategic competitive advantages for transport and logistics; however, the area is currently not well served by telecommunications and internet infrastructure. Future agricultural and processing business growth in the region will be reliant on a high speed, affordable and reliable communication network. This will be especially important for attracting manufacturing and technology based industries from Sydney.

The local Central West Chamber of Commerce identified the following infrastructure priorities in 2010[29] :

- Improved main road access routes from Sydney to the region
- Analysing opportunities for improved Intermodal facilities within the Region
- Increased activities for the Parkes Hub.

STAKEHOLDER VIEWS

Targeted engagement with industry stakeholders was undertaken in the preparation of this industry report. Main findings of these discussions are summarised here.

Cropping

Industry risks

Chemical (Herbicide and pesticide) resistance
Access to land in more climate resilient land in the eastern parts of the region
Succession planning and making farming and agriculture to ensure that the next generation want to farm
Security of irrigation water, particularly for perennial horticulture crops

Challenges

Fluctuation in the Australian dollar and global markets
Increasing lack of community acceptance of intensive agricultural practices e.g. intensive animal husbandry, horticulture
Accessing a secure labour supply

Opportunities

[27] Australian Government (2012). Australian Government (2012). Challenges and opportunities for the Australian economy Dr Martin Parkinson, Secretary to Treasury, Commonwealth of Australia. Accessed 27/5/15 http://www.treasury.gov.au/PublicationsAndMedia/Speeches/2012/Challenges-and-opportunities-for-the-Aust-economy
[28] RDA Central West (2013). Regional Plan 2013 – 2016. Regional Development Australia Central West
[29] CWBC (2010) Ten Big Ideas. Central West Business Chamber, Orange, NSW.

Better varieties to match changing climate conditions
Renewable energy resources e.g. biofuel
Increase use of rail transport
Buying and developing land for cropping further west – larger scale equipment is making this land viable for cropping
Capitalising on industry standards and quality of products to access high value export markets
Taking advantage of Free Trade Agreements and export markets
Proximity to labour supply is critical, particularly for horticulture
Land that becomes available through retirement

Adaptation Strategies
Trial work with research partners
Improvements in water use efficiency and irrigation technologies
Data capture and precision farming
Use of by-products e.g biochar, biosolids
Family succession is about being in the top 20% of growers i.e. need scale and ongoing investment to enable the next generation to farm
Close attention to monitoring and benchmarking
Mechanisation and large scale machinery
Increasing farm scale (used to need 1,000ha for cropping now need 2,000ha) – use of technology and larger equipment means that larger area can be farmed with less labour
Use of higher labour inputs in horticulture industry
Use of crop protection measures on horticulture corps e.g. netting
Increased use of consultant agronomists
Corporate family farms to achieve scale
Family corporates will be looking for investment partners to enable growth to next level
Purchasing or leasing land in areas with more reliable climate
To enable succession – need to be in the top 20% of growers (bottom 80% are the opportunity for expansion)

Climate change
Changes management practices – e.g. sowing times to avoid frosts, increased use of fallow in increase soil stored moisture
Zero till farming and soil moisture conservation has opened up new areas for cropping that were previously only grazed
Some increase in fallowing to increase soil moisture
Diversification e.g. mixed farming and diversity of cropping options
Buying or leasing land in different climate/rainfall areas
Growers are using BOM and other high tech climate data and websites for decision making
Engaging consultant agronomist to assist in decision making and technical advice

Horticulture

Industry risks
Increase in price of land above its agricultural/productive value
Reduced biosecurity vigilance on regional and local scale and the threat this poses to industry image and access to international markets
Impacts from mining - loss of land, off site impacts from mining, loss of labour
Urban sprawl – loss of land to hobby farms in the east of region and around major centers - land use conflict for agricultural industries in these areas e.g. perennial horticulture and wool particularly around larger centres, corridors into Sydney and high amenity locations
Land use conflict from non-agricultural neighbours is increasingly challenging annual horticulture in Central West & Orana
Increase in pests e.g. flying fox
Accessing labour
Power supply
Annual horticulture, particular more perishable products, need to be grown in relatively close proximity to a labour supply

Opportunities
Free trade
Clean and green image
Quality assurance programs

Adaptation strategies
High density plantings, trellising and other management tools to improve water use efficiency
Changing varieties to meet consumer demand
Improving water use efficiency by improving irrigation technology and practices
Need to have scale to cover harvest costs as well as get quantity of product of consistent quality for processor or wholesaler

Climate change
Netting and other crop protection measures
Changing varieties

Livestock

Trends
Productivity improvements through genetics - Sheep are now cutting more wool per head

Shift from sheep for wool to sheep for meat
Increase in scale or more off farm income and increase in non-commercial producers

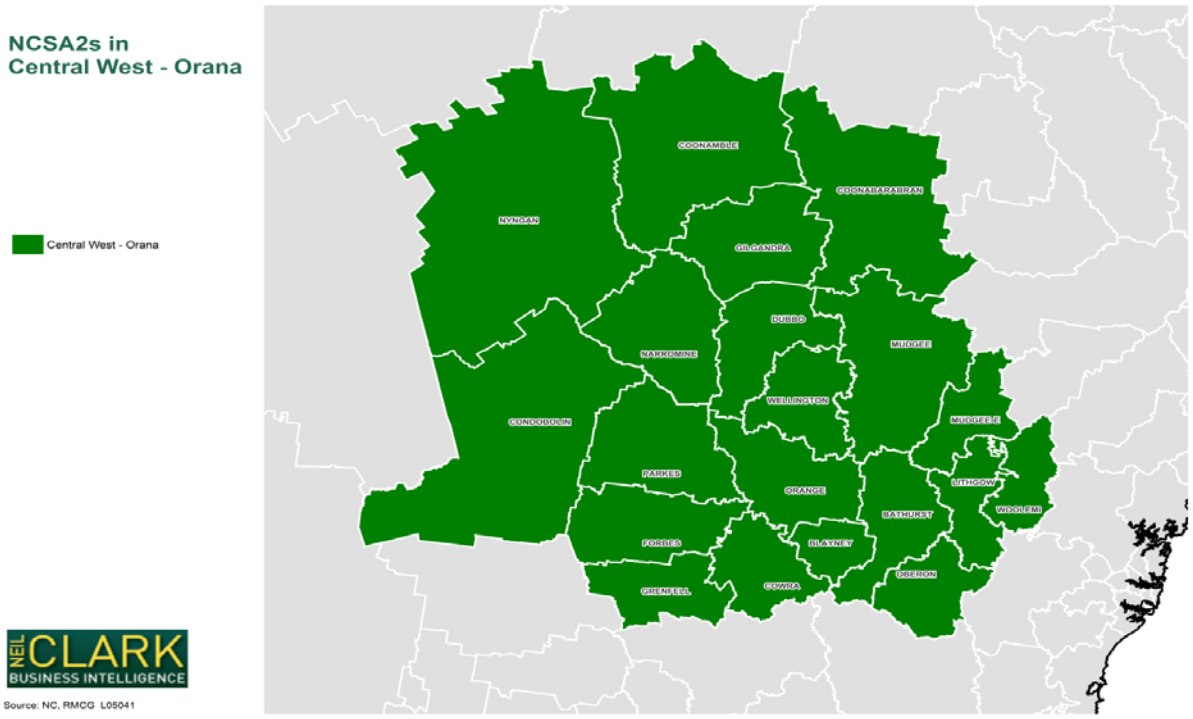
Challenges
One producer has 57 neighbours
Hobby farmers are often poor land managers and along with absentee landholders lead to pest problems
Livestock producers are frequently reliant on off farm income
Shift from wool to lamb production
Disorganised wool marketing body
Maintaining feed in increasingly seasonal fluctuating seasons
Labour
Animal welfare
Traceability / accountability to consumers
Freight costs

Opportunities
Marketing
Cost reduction
Technology
Selling wool direct to mills
Traceability of product

Adaptation strategies
Purchase a finishing farm
Planning stock numbers to meet food and pasture production
Scanning ewes
Flock age has come down

Climate Change
Keep more feed on hand
Avoid heat stress
Will cut stocking rates earlier in the season
Water security
Getting rid of wethers earlier
Changing lambing times / split lambing
Adjusting pasture mixed

APPENDIX 1: STATISTICAL AREA BOUNDARIES



APPENDIX 2: LGA GVAP DATA

LGA GVAP data for the Agriculture Census years 2000-01, 2005-06 and 2010-11. Data was sourced from http://www.dpi.nsw.gov.au/agriculture/resources/lup/analysis-census-data.

YEAR	COMMODITY GROUP	BATHURST	BLAYNEY	BOGAN	CABONNE	COONAMBLE	COWRA	DUBBO	FORBES	GILGANDRA	LACHLAN	LITHGOW*	MID-WESTERN*	NARROMINE	OBERON	ORANGE	PARKES	WARREN	WARRUMBUNGLE#	WEDDIN	WELLINGTON	TOTAL
2010/11	Crops	6.2	3.7	62.0	54.9	110.6	33.7	19.9	102.5	58.4	202.6	0.5	7.4	172.8	1.8	0.9	131.5	113.1	35.3	84.4	25.2	8,024.0
	Horticulture	10.8	1.2	-	37.3	-	15.0	2.6	13.3	0.1	-	0.3	4.3	8.3	5.1	9.6	0.2	-	0.5	0.2	1.1	1,416.2
	Livestock	38.8	32.8	31.5	85.9	41.5	37.4	31.4	56.6	27.0	57.3	17.8	51.1	34.8	23.9	5.2	40.9	36.1	76.8	49.2	46.1	6,279.5
	TOTAL	55.8	37.7	93.5	178.1	152.1	86.1	53.9	172.4	85.5	259.9	18.6	62.8	215.9	30.8	15.7	172.6	149.2	112.6	133.8	72.4	15,719.7
2005/06	Crops	2.1	1.5	34.4	26.4	6.5	2.9	9.7	45.6	33.0	102.5	0.1	2.8	82.9	3.8	0.2	57.4	80.8	27.6	47.4	16.9	584.7
	Horticulture	8.0	2.2	-	25.8	0.4	9.3	1.3	4.7	0.3	0.8	0.2	13.3	15.4	1.4	21.4	0.2	0.1	0.5	0.3	0.9	106.3
	Livestock	28.4	26.1	16.6	69.4	37.0	23.9	26.5	46.9	23.5	52.4	12.3	42.3	30.4	23.6	3.7	30.1	29.1	67.5	23.8	-	613.5
	TOTAL	38.5	29.8	51.1	121.6	43.9	36.0	37.5	97.3	56.7	155.8	12.7	58.3	128.8	28.8	25.2	87.6	110.0	95.6	71.4	53.3	1,340.1
2000/01	Crops	4.0	2.4	44.4	39.0	54.3	34.1	14.7	73.9	26.2	133.8	1.3	2.9	107.5	1.5	0.4	70.2	120.4	-	58.9	23.0	813.1
	Horticulture	8.9	3.3	-	23.7	0.2	16.3	1.9	3.8	0.2	0.2	0.6	10.3	9.5	2.1	13.1	0.1	0.1	-	0.4	0.7	95.4
	Livestock	35.7	30.0	22.5	78.3	45.8	40.5	31.4	38.6	26.3	62.0	16.1	40.2	26.1	19.2	6.1	35.6	35.1	-	28.0	39.9	657.6
	TOTAL	48.6	35.7	66.9	141.1	100.3	90.8	48.0	116.4	52.8	195.9	18.0	53.5	143.1	22.8	19.7	106.0	155.6	-	87.3	63.7	1,566.1

* Lithgow and Mid-Western LGA amalgamations in around 2004 and changes to LGA boundaires will affect comparison of GVAP between 2000-01 and 2005-06

Data not available for Warrumbungle in 2000-01

Note that due to a change in the scope of the Agriculture Census, comparisons of change between the 2000-01 and the 2005-06 Census years should be treated with caution. In 2005-06, the Census was expanded to include establishments with an Estimated Value of Agricultural Output of $5,000 or more, where previously it was $22,500 or more. This resulted in the inclusion of a number of small farms previously excluded and may affect the figures in areas where very small establishments are in the majority.