

# Macedon Ranges Shire – Jobs for the Future Blueprint – Technical Report – Economic Analysis

Economist Magdalena Borges Engineer Madeleine Johnson A/Professor Victor Sposito A/Professor Robert Faggian



Deakin University CRICOS Provider Code: 001138

#### DISCLAIMER

Deakin University has taken reasonable measures to ensure this information is correct at the time of publication, but gives no guarantee or warranty that the content is up-to-date, complete or accurate and accepts no responsibility for the completeness or accuracy of the material. To the extent permitted by law Deakin excludes liability for any and all loss caused by use of or reliance on this information.

© Deakin University 2018

Location:

Deakin Burwood Campus

221 Burwood Hwy,

Burwood, 3125, Vic

For more information about the *Centre for Regional and Rural Futures* (CeRRF), Deakin University visit the website <u>www.deakin.edu.au</u>

Macedon Ranges Shire Jobs for the Future Blueprint – Technical Report – Economic Analysis

**Final Report** 

## **1. EXECUTIVE SUMMARY**

The aim of the *Jobs for the Future Blueprint* project was to assist the Macedon Ranges Shire in its planning process for realising a sustainable and prosperous community, by analysing the potential of the Shire to create sustainable jobs. This report, *Macedon Ranges Shire Jobs for the Future Blueprint* – *Technical Report – Economic Analysis*, describes the analyses undertaken to comprehend the current economic situation of, and forecast possible economic growth and employment by 2036 in, Macedon Ranges.

Macedon Ranges is located to the north-west of Melbourne and comprises the areas of Gisborne, Kyneton, Romsey, Woodend, Macedon and Riddells Creek. As of 2016, the population of the Shire was 47,500 people. At a geographical level, the population is concentrated in the towns of Gisborne, Kyneton and Romsey, which together contain approximately 70% of the total population – see Map.



Of the 37,600 working-age people who lived in Macedon Ranges in that year, 21,700 had a job; that is, an employment rate of almost 60%. However, the majority of these (54%) work outside the Shire, with most travelling to Melbourne 23%. On the other hand, 40% of the working-age residents (8,600 people) work within the shire. Additionally, 4,500 people from other shires go to work in the Macedon Ranges Shire region. Therefore, although 21,700 of the Shire's residents are employed, **the amount of local jobs stand at around 13,100 (made up of 8,600 local people and 4,500 external people)** – see Figure.



In our economic analysis for Macedon Ranges, three approaches were utilised to forecast total employment, by industry and by location for to 2036. Additionally, the implications of such growth in the educational sector were assessed, as well as the infrastructure and other services required to support the forecasted growth.

Moreover, to inform the study, two comprehensive surveys were conducted (to industry/businesses and residents), and public data and information provided from REMPLAN were also utilised.

The results indicated that **there would be approximately 19,100 local jobs in Macedon Ranges by 2036**. This signifies a possible increase of around 50% above the current local employment numbers (13,100) with an annual average rise of approximately 2%. This increase is likely to be led by the continued growth of services and could take place in all geographic areas within the Shire. The intensification of agriculture could also be important for job creation because of its multiplier effect.

In terms of the qualifications' requirements of locally-based businesses, the increase in demand is also likely to be widespread, with Professionals and Certificate Level III and IV the most likely in demand for occupation and qualification, respectively.

Based on the results of the residential survey, providing appropriate working conditions (especially remuneration levels and work flexibility) are key requirements of potential employees. If these conditions are met in Macedon Ranges, the analysis revealed that there should be adequate numbers of professional within the Shire to account for business demand.

Similarly, it is likely that community and personal services and labourers will be underrepresented by business demand. Support for industry and business requiring these employees could be directed to rectify this.

Likewise, local technicians and trades workers, managers and clerical and administrative workers may be in surplus to requirements in Macedon Ranges in the future according to business demands.

To complement the broad analysis a case study of the potential of the agricultural sector to generate economic growth and job creation was conducted. With respect to this agricultural analysis, the results indicated that increasing the production of cherries, vegetables or grapes, not only would generate more profits to the producers, but also it is likely to result in an increase in employment much higher than the baseline forecast showed (considering both their direct and indirect effects).

## 2. CONTENTS

1.	EXEC	CUTIVE SUMMARY	iii
2.	CON	TENTS	vi
3.	FIGU	IRES	.viii
4.	TABL	LES	х
5.	INTR	ODUCTION	1
5	.1.	Project Aims	1
5	.1.	Population	2
5	.2.	Gross Regional Product (GRP)	4
5	.3.	Employment	6
	5.3.1	Employment by Location	6
	5.3.2	2. Employment by Industry	7
	5.3	3.2.1. Industry by Statistical Area	7
	5.3.3	8. Other Labour Indicators	9
6.	Emp	loyment forecast	. 10
6	.1.	Industry Survey	10
	6.1.1	. Sample Representativeness	10
6	.2.	Approach 1 – Output Forecast Derived from Survey	12
6	.3.	Approach 2 – Application of an Input-Output Analysis	14
	6.3.1	. Employment Forecast	18
6	.4.	Approach 3 – Employment Forecast by Trend Application	. 20
6	.5.	Employment Forecast Summary	. 22
7.	Impl	ications for the education sector	. 24
7	.1.	Occupations required in the future in the Macedon Ranges Shire	. 24
7	.2.	Qualifications required in the future in the Macedon Ranges Shire	26
7	.3.	Skills and Training required in the Future in the Macedon Ranges Shire	28
8.	Resid	dential Population in the Macedon Ranges Shire	. 30
8	.1.	Residential Job Preferences	31
8	.2.	Comparison of required and available occupations and qualifications	34
9.	Infra	structure and Services Required to Support Growth	. 35
ç	.1.	Responses from the Business Survey	35
ç	.2.	Youth Requirements	37
10.	Ро	tential of Agriculture to Generate Economic Productivity	. 38
1	0.1.	Specialisation and Competitive Advantages Analysis	38
1	0.2.	Land Suitability Analysis	39
1	0.3.	Gross Margin Analysis	39
	10.3	.1. Margins Forecast Assumptions	40

#### TECHNICAL REPORT – ECONOMIC ANALYSIS

1	0.3.2	2.	Price Forecast	40
1	0.3.3	3.	Cost Forecast	41
10.4	4.	Cher	ry Forecast	43
10.5	5.	Wine	e Grape Forecast	48
10.6	6.	Vege	table Forecast	53
10.7	7.	Cattl	e (Beef) Margin Forecast	58
10.8	8.	Equir	ne Outlook	63
10.9	Э.	Resu	lts	64
10.1	1.	Discu	ussion	66
11.	Pot	entia	al of Agriculture to Generate Jobs	68
11.3	1.	Empl	loyment – Agriculture, Forestry & Fishing	68
11.2	2.	The A	Agriculture sectors linkages with other sectors	69
1	1.2.3	1.	Backward Linkages	69
1	1.2.2	2.	Forward Linkages	70
11.3	3.	Impa	ct of Technological Changes	71
1	1.3.3	1.	The Netherlands Model	72
11.4	4.	Discu	ussion	73
12.	Cor	nclus	ion	74
13.	REF	ERE	NCES	75
14	ΔΡ		NIX I - Acronyms	77
17. 4F				, , 70
15.	AP	PEINL	JIX II – Data Sources	/8
16.	AP	PENC	DIX III – The Multiplier Effect	79
17.	AP	PENC	DIX IV – Matrix of Direct REquirements	80
18.	AP	PENC	DIX V – Matrix of Total Requirements	81
19.	AP	PENC	DIX VI – Input – Output Analysis Assumptions	82
20.	AP	PENC	DIX VII – Macroeconomic Variables Assumptions	83
21.	AP	PENC	DIX VIII – Cattle (Beef) Assumptions	90
22.	AP	PENC	DIX IX – Netherlands Backward and FOrward Linkages	91

## 3. FIGURES

Figure 5.1 Project Structure 2
Figure 5.2 Macedon Ranges Shire Population and Age Structure (Source: ABS and REMPLAN)
Figure 5.3 Macedon Ranges Shire Population by Location 4
Figure 5.4. Macedon Ranges Shire Gross Regional Product (Source: REMPLAN)5
Figure 5.5. Employment by Location (Source: Economy.id)6
Figure 5.6. Employment by Industry (Source: REMPLAN)7
Figure 5.7. Employment by Statistical Area (Source: REMPLAN)
Figure 5.8. Labour Indicators (Source: ABS, IMIP)9
Figure 6.1. Industry Survey Representativeness11
Figure 6.2. Employment Forecast (from Input-Output Analysis and Elasticity Analysis)
Figure 6.3. Employment Forecast (Trend Extrapolation) 20
Figure 6.4. Employment in the Macedon Ranges Shire (current (left panel), future (centre panel) and variation (right panel))
Figure 7.1. Types of occupations required in the Macedon Ranges Shire in the next 20 years (from Industry Survey)
Figure 7.2. Occupations by Industry Sector Current and Future (2036)
Figure 7.3. Future Qualifications Required (From Industry Survey)
Figure 7.4. Required Qualifications - qualification type
Figure 7.5. Qualifications required Current and Future (2036)
Figure 7.6. Specific Training required in the future (from Industry Survey)
Figure 7.7. Specific Skills required in the future (from Industry Survey)
Figure 8.1. Summary Data - Residential Survey
Figure 8.2. Residential Survey Occupations and Qualifications
Figure 8.3. Residential Job Preferences
Figure 8.4. Features of Respondents not working at their preferred location: Occupation
Figure 8.5. Features of Respondents not working at their preferred location: Industry Sector
Figure 8.6. Occupations required vs. available
Figure 8.7. Qualifications required vs. available
Figure 9.1. Resources needed to support growth (industry survey)

Figure 9.2. Resources needed to support growth (Residential survey)
Figure 9.3. Youth Perspectives on Job Futures
Figure 10.1. Regional Specialisation & Competitive Advantages
Figure 10.2. Gross Margin Methodology
Figure 10.3. Price Dynamics
Figure 10.4. Evolution of variables influencing cherry margin
Figure 10.5. Cherry Economic Profitability (left panel: historic, centre panel: 2030 and right panel: 2050)
Figure 10.6. Cherry Forecasting Scenarios
Figure 10.7. Evolution of variables influencing grape margin
Figure 10.8. Grape Economic Profitability (left panel: historic, centre panel: 2030 and right panel: 2050) 
Figure 10.9. Grape Forecasting Scenarios 51
Figure 10.10. Evolution of variables influencing vegetable margin
Figure 10.11. Vegetable Economic Profitability (left panel: historic, centre panel: 2030 and right panel: 2050)
Figure 10.12. Vegetable Forecasting Scenarios
Figure 10.13. Evolution of variables influencing beef margin
Figure 10.14. Beef Economic Profitability (left panel: historic, centre panel: 2030 and right panel: 2050)
Figure 10.15. Beef Forecasting Scenarios
Figure 10.16. High Value Production Areas65
Figure 10.17. Competing priorities for agriculture and population growth
Figure 11.1. Cumulative Contributions to Value Added Output Growth (Agriculture, Forestry and Fishing) (Source: ABS (2016))71

## 4. TABLES

Table 6.1. Output Forecast (from Industry Survey)
Table 6.2. Employment Forecast from (Industry Survey)
Table 6.3. Input-Output Table
Table 6.4. Application of I-O table and elasticity analysis 17
Table 6.5. Employment Forecast by Industry (Trend Extrapolation) 21
Table 6.6. Summary of Employment Forecast 22
Table 6.7. Employment Forecast by Location 22
Table 10.1. Cost Forecast
Table 10.2. Cherry Gross Margin 2016/17 43
Table 10.3. Grape Gross Margin 2016/17   48
Table 10.4. Vegetable Gross Margin 2016/17
Table 10.5. Beef Gross Margin 2016/1758
Table 11.1. Employment by Primary Activity   68
Table 11.2. Agricultural Industry - Backward Linkages with other Industry Sectors   69
Table 11.2. Agricultural Industry - Forward Linkages with other Industry Sectors

## 5. INTRODUCTION

The Jobs for the Future Blueprint project aimed to assist the Macedon Ranges Shire in the planning process of a sustainable and prosperous community, by analysing the potential of the region to create sustainable jobs. This document, *Macedon Ranges Shire Jobs for the Future Blueprint – Technical Report – Economic Analysis*, describes the key analyses undertaken to comprehend the existing economic situation of the shire and forecast possible economic growth and employment creation within the shire by 2036. It also includes a case study analysis of the shire's agricultural capabilities, in particular, for economic growth and job creation.

This report explains three approaches that were applied to forecast total employment, by industry and by location for the next twenty years. Additionally, the implications of such growth in the educational sector were assessed, as well as the infrastructure and other services required to support it. The report also includes background to two comprehensive surveys that were conducted (to businesses and residents) and the public data and information provided from REMPLAN that was utilised in the study.

This report is a companion to *Macedon Ranges Shire Jobs for the Future Blueprint - Technical Report* – *Land Suitability Analysis*. That report explains the methodology used in the Land Suitability Analysis (LSA), as well as the results from the corresponding analyses for five agricultural commodities: Fruit, Horticulture (Vegetables), Viticulture, Pastures (as a proxy for livestock) and Cropping. The LSA report also discusses the implications and opportunities for agriculture production in the Shire out to 2050.

## 5.1. Project Aims

As indicated in the Brief, the aim of the project is to assist the Macedon Ranges Shire in the **planning** process of a **sustainable and prosperous community**, by analysing the potential of the Shire to **create jobs** in the **next 20 years**.

Such analysis will be guided by the following *principles*:

- Sustainable and even development
- Resilient and diversified economies
- Decentralisation (divert people from Metropolitan Melbourne to the Shire)
- Incorporation of infrastructure and services needed to support growth
- Incorporation of innovations
- Climate change adaptation
- GHG (Greenhouse gases) reduction.

The structure of the project is shown in the following diagram, Figure 5.1.



Figure 5.1 Project Structure

The following sections contain a brief description of the main socio-economic indicators for the Macedon Ranges Shire. In particular, the analysis focuses on the recent evolution and current situation of, the population, Gross Regional Product (GRP) and employment in the Shire.

This information is important in order to (i) understand the starting point of the employment projections, (ii) identify possible issues in the labour market, and (iii) ensure the compatibility between historical and future data series.

## 5.1. Population

Macedon Ranges Shire is located to the north-west of Melbourne and comprises the areas of Gisborne, Kyneton, Romsey, Woodend, Macedon and Riddells Creek. Its population grew at an annual average rate of 2% in the last decade, making it was one of the fastest growing area in regional Victoria in that period (State Government, 2016). As of 2016 there is a population of around 47,500. At a geographical level, the population is concentrated in Gisborne, Kyneton and Romsey, which together contain approximately 70% of the total population.

The median age in the Shire is 42 years (5 years above the median for the State of Victoria), and there is generally an equal spread of gender. The working age population, those aged more than 14 years, stood at 37,600 and accounted for 80% of the total population.



Figure 5.2 Macedon Ranges Shire Population and Age Structure (Source: ABS and REMPLAN)



Figure 5.3 Macedon Ranges Shire Population by Location

## 5.2. Gross Regional Product (GRP)

Economic activity in the Macedon Ranges Shire has grown steadily historically, despite shocks experienced in 2008 and, to a lesser extent, in 2010. According to information published by REMPLAN, the Gross Regional Product (GRP) showed an annual average increase of 2.5% in the last decade, reaching \$ 1.56 billion in 2016 (Figure 5.4). At an industrial level, Rental, Hiring and Real Estate Services is clearly the sector that contributes the most to the generation of value added, accounting for more than 20% of the total GRP.



## **Gross Regional Product - 2016**



Figure 5.4. Macedon Ranges Shire Gross Regional Product (Source: REMPLAN)

## 5.3. Employment

## 5.3.1. Employment by Location

Of the 37,600 working-age people who live in Macedon Ranges Shire, 21,700 had a job in 2016, an employment rate of almost 60%. The majority of these (54%), work outside the Shire, with most travelling to Melbourne and the City of Hume, 23% and 21% respectively (Figure 5.5). This situation implies that a considerable amount of the inhabitants travel relatively large distances every day to work, with potential additional negative impacts, further to removing economic productivity from the Shire, such as loss of time, stress derived from traffic jam and transport pollution.

On the other hand, 40% of the working-age residents (8,600 people) work within the shire. Additionally, 4,500 people from other shires go to work in the Macedon Ranges Shire region.

In summary, although 21,700 of the Shire's residents are employed, **the amount of local jobs stand at around 13,100 (made up of 8,600 local people and 4,500 external people)**.



This is the starting point of our forecast, the number of jobs generate within the Shire.



CeRRF, Deakin University – Technical Report – Economic Analysis

## 5.3.2. Employment by Industry

Local jobs in Macedon Ranges have increased over the last decade, growing at an annual average rate of 2.5% since 2006. Within the Shire, employment opportunities are concentrated in Kyneton, Gisborne and Romsey. In comparison to the sectors that underpin the GRP (clearly Rental, Hiring and Real Estate), employment amongst the key sectors is more varied, with Health Care and Social Services, Education and Training and Retail Trades closely clustered amongst the greatest employers. This varied range of industries is positive for the Shire, serving to lower the vulnerability of the Shire against a negative shock in a particular sector.



# Employment in Macedon Ranges - 2016



# Employment in Macedon Ranges - 2016



Figure 5.6. Employment by Industry (Source: REMPLAN)

### 5.3.2.1. Industry by Statistical Area

The key statistical areas in the Shire: Kyneton, Woodend, Romsey, Gisborne, Macedon and Riddells Creek are shown with their corresponding key industries in Figure 5.7. These graphs describe the area's five major employers. Services industries predominate each of the areas, with Romsey being the exception, in which agricultural sector is the most important.

#### **TECHNICAL REPORT – ECONOMIC ANALYSIS**



## 5.3.3. Other Labour Indicators

The unemployment rate in the Shire increased to 4.4% of the labour force (including those who are working and those who are actively looking for a job) in 2016, remaining low, and 1.4% lower than Victoria's average unemployment rate (as of 2016). This number does however account for all working residents in the Shire, regardless of if they work locally or not. Therefore, this number may include people working outside the Shire that would prefer to be working locally. According to findings from the Survey sent to the residents of Macedon Ranges, more than half of respondents working outside the Shire working in the Shire, but due to lack of available or suitable jobs are unable to work (see Section 8 for more detail).

Furthermore, the low unemployment rate may be masking a higher underemployment rate, that is, the part time or casual workers who would prefer, and are available for, more hours of work than they currently receive. It is possible that the underemployment rate in the Shire may be quite high, as the amount of part time jobs showed a considerably higher rise when compared with full time jobs (Figure 5.8); however, this is very difficult to calculate directly.



Figure 5.8. Labour Indicators (Source: ABS, IMIP)

## 6. EMPLOYMENT FORECAST

To forecast local employment in Macedon Ranges, three different approaches were used so as to arrive at the most robust and reliable projection possible with the information currently available.

Firstly, the answers obtained from a Survey sent to businesses/industry in the Shire, where regional companies were asked about their future plans in terms of production and employment, was considered.

Secondly, the increase in the final demand, implicit in the answers from the Survey, was combined with an Input-Output Analysis, which was aimed to better understand the connections between industries.

Thirdly, an extrapolation of current trends was carried out and compared with the results from the other two approaches.

It is important to stress that the projections obtained are *indicative only*. They rely on the understanding of economic trends and current situation and the assumption that the past can be extrapolated into the future. However, the future is subject to many uncertainties and there will be unanticipated events, like changes in technology or natural disasters, with unknown consequences. Therefore, the results obtained should be considered only as likely outcomes (i.e. *scenarios*) based on assumptions, and not as a reality that will necessarily happen. The projections provide, nevertheless, relevant pointers for planning and action by the Macedon Ranges Shire and its stakeholders to improve likely problematic situations in the immediate, medium and long-term.

## 6.1. Industry Survey

### 6.1.1. Sample Representativeness

A business survey was conducted with the aim of identifying local businesses future plans in relation to production and employment, as well as understanding their future needs in terms of the type of qualifications and skills required of their employees. The survey was sent to 2,690 persons and 255 answers were obtained, a response rate of almost 10%. In terms of business, the sample represented 2% of the total (according to the information available in REMPLAN). These responses, however, did account for 6% of the regional output and 16% of in-region employment.

At an industrial level, some sectors were poorly represented (e.g. construction, retail, transport, administration and support services and public administration), whilst in others the survey captured a high portion - like agriculture, manufacturing, accommodation, information media, professionals, education and other services. Figure 6.1 shows this in comparison with REMPLAN results.

In summary, the value of the information obtained from the survey is conditioned by features of the sample.



	BUSINESSES				E E	OUTPUT	OUTPUT (\$					EMPLOYMENT									
	Survey*		Survey*		Survey*		Survey*		Rem	olan	Sample representa- tiveness	Surve	y	Rempl	lan	Sample representa- tiveness	Surv	/еу	ABS	5	Sample representa- tiveness
	No.	%	No.	%	# Survey / # Remplan	\$ Million	%	\$ Million	%	\$ Survey / \$ Remplan	No.	%	No.	%	# Survey / # ABS						
Agriculture, For. & Fishing	25	9%	787	6%	3%	14	8%	133	5%	10%	68	3%	524	4%	13%						
Mining	0	0%	5	0%	0%	0	0%	1	0%	0%	0	0%	7	0%	0%						
Manufacturing	12	4%	455	4%	3%	17	10%	485	16%	4%	349	17%	983	8%	36%						
Ele., Gas, Water & Waste	2	1%	28	0%	7%	3	2%	37	1%	8%	4	0%	80	1%	5%						
Construction	18	6%	2,045	17%	1%	12	7%	408	14%	3%	63	3%	1,146	9%	5%						
Wholesale Trade	9	3%	225	2%	4%	7	4%	124	4%	5%	16	1%	172	1%	9%						
Retail Trade	26	9%	627	5%	4%	8	5%	153	5%	5%	75	4%	1,406	11%	5%						
Accommodation & Food Ss.	30	11%	326	3%	9%	39	22%	108	4%	36%	574	28%	1,106	9%	52%						
Trans., Postal & Warehouse	3	1%	434	4%	1%	2	1%	86	3%	2%	17	1%	355	3%	5%						
Inf. Media & Telecomm.	9	3%	138	1%	7%	3	2%	48	2%	7%	18	1%	73	1%	25%						
Financial & Insurance Ss.	14	5%	1,803	15%	1%	7	4%	215	7%	3%	55	3%	403	3%	14%						
Rental, Hiring & Real Est. Ss.	7	3%	653	5%	1%	3	1%	436	15%	1%	31	2%	183	1%	17%						
Prof., Scientific & Tech. Ss.	35	13%	1,588	13%	2%	26	15%	163	6%	16%	192	9%	713	6%	27%						
Adm. & Support Ss.	5	2%	715	6%	1%	0	0%	50	2%	1%	3	0%	348	3%	1%						
Public Adm. & Safety	1	0%	54	0%	2%	0	0%	122	4%	0%	1	0%	777	6%	0%						
Education & Training	17	6%	398	3%	4%	12	7%	127	4%	9%	318	16%	1,443	11%	22%						
Health Care & Social Ass.	17	6%	494	4%	3%	5	3%	139	5%	4%	100	5%	1,606	13%	6%						
Arts & Recreation Ss.	16	6%	458	4%	3%	3	2%	51	2%	7%	18	1%	258	2%	7%						
Other Services	33	12%	813	7%	4%	13	8%	57	2%	23%	129	6%	554	4%	23%						
Other		0%	301	2%	0%								534	4%	0%						
Tatal	270		10 247		20/	174		2 042		<b>C</b> 0/	2 020		12 671		16%						
IULAI	2/3		12,347		270	1/4		2,342		0%	2,030		12,0/1		10%						

Figure 6.1. Industry Survey Representativeness

## 6.2. Approach 1 – Output Forecast Derived from Survey

In this first approach to forecasting employment in Macedon ranges, the planned growth of production and employment obtained from the Industry Survey was applied to the total current figures for each sector.

It is worth clarifying that the question regarding future changes was structured in ranges of variation (instead of asking for a specific increase/decline): no change, grow by 5% - 25%; grow by 25% - 50%; grow by 50% - 75%; grow by 75% or greater; and the same ranges were applied in case of a decline.

The results shown in Table 6.1 consider the average increase/decrease of the ranges (e.g. if somebody answered grow by 5% - 25%, a rise of 15% was taken) as the *Baseline* scenario. To complement this, variations to the upper and lower limits of the ranges (25% and 5% applied respectively, following the same example) are presented as *Worst and Best* case scenarios.

The analysis looks at the expected variation for each output. The annual average change implicit in the responses from the survey appears to be very low, even in the best scenario, when compared to the historical variation in both the Shire and Australia.

However, it is to be expected that businesses, given the uncertainty involved in a long-term forecast, respond to the survey conservatively. At an industrial level, the underestimation is even clearer for some sectors; like for instance in construction, retail or rental services. It is worth noting that in these cases the sample survey was not quite representative. This is particularly the situation for the construction sector, since it is difficult to forecast a high activity level in this sector without knowing about specific construction developments that may take place in the future.

	OUTPUT		\$
	Worst	Baseline	Best
	Variati	ion 2016 - 20	36 (%)
Agriculture, Forestry and Fishing	3%	14%	24%
Mining	-	-	-
Manufacturing	22%	34%	46%
Electricity, Gas, Water and Waste Services	7%	17%	27%
Construction	11%	21%	32%
Wholesale Trade	12%	22%	33%
Retail Trade	19%	30%	42%
Accommodation and Food Services	30%	41%	52%
Fransport, Postal and Warehousing	29%	40%	51%
nformation Media and Telecommunications	70%	83%	95%
inancial and Insurance Services	45%	57%	69%
Rental, Hiring and Real Estate Services	19%	31%	43%
Professional, Scientific and Technical Services	59%	71%	83%
Administrative and Support Services	25%	34%	44%
Public Administration and Safety	25%	38%	50%
Education and Training	8%	18%	28%
Health Care and Social Assistance	62%	75%	87%
Arts and Recreation Services	-41%	-29%	-16%
Other Services	10%	20%	30%
Total	24%	35%	48%
Implicit Annual Average Change	1.1%	1.5%	2.0%

#### Table 6.1. Output Forecast (from Industry Survey)

CeRRF, Deakin University – Technical Report – Economic Analysis

Table 6.2 shows the expected increase of employment by industry, based on the results of the Industry Survey, for the next twenty years under the three scenarios discussed previously *Worst* (lowest of the range), *Baseline* (median of the range) and *Best* (highest of the range). Additionally, the graph reflects the annual trajectories associated with each scenario.

In general terms, the same low variation observed in the output forecast appears when the same method is applied to forecast employment based on responses from the Industry survey; in particular, when compared with historical trends for the Shire. Again, this accounts for several industries that are underestimated, which are also underrepresented in the responses of the survey.

	EMPLOYM		
	Worst	Baseline	Best
	Variati	on 2016 - 20	36 (%)
Agriculture, Forestry and Fishing	5%	15%	25%
Mining	-	-	-
Manufacturing	44%	56%	68%
Electricity, Gas, Water and Waste Services	23%	33%	44%
Construction	5%	14%	23%
Wholesale Trade	6%	15%	25%
Retail Trade	17%	27%	36%
Accommodation and Food Services	17%	27%	37%
Transport, Postal and Warehousing	59%	71%	83%
Information Media and Telecommunications	45%	56%	66%
Financial and Insurance Services	35%	47%	58%
Rental, Hiring and Real Estate Services	15%	25%	36%
Professional, Scientific and Technical Services	52%	64%	76%
Administrative and Support Services	4%	10%	16%
Public Administration and Safety	-5%	0%	5%
Education and Training	6%	16%	26%
Health Care and Social Assistance	16%	27%	37%
Arts and Recreation Services	7%	15%	24%
Other Services	10%	20%	30%
Other	23%	33%	44%
Total	18%	28%	38%
Implicit Annual Average Change	0.8%	1.2%	1.6%

#### Table 6.2. Employment Forecast from (Industry Survey)

Employment forecast from Survey





## 6.3. Approach 2 – Application of an Input-Output Analysis

Given the relative underestimation of output and employment forecast solely based on the survey responses, a second approach was uutilised, based on the answers of the survey for the best scenario, but to which adjustments were made in the cases that were clearly undervalued.

The adjustment approach used is an *Input-Output Analysis*, which offers the ability to analyse the consistency between the answers obtained by different industries (from the survey), based on their known interrelationships in the production process. The results obtained (in terms of output) were then combined with the *employment elasticity to output*, in order to arrive to a new employment forecast.

An Input-Output Table (

Table 6.3) shows the interrelationship between industry sectors, by displaying the destination of the goods and services produced in an economy. Read horizontally, the Input-Output Table describes the destinations of the products of each sector; while, read vertically, the origin of products obtained by each sector are described.

The first quadrant (blue) shows those goods and services that are sold with an *'intermediate use'* to other industries; i.e. those to be processed to obtain another good and service (for example, wheat sold by the agricultural sector to the manufacturing industry to produce bread) and, as a consequence, they are going to generate more jobs in other sectors. This quadrant describes the inputs that each sector buy to produce their own outputs. This is where the value added to production occurs, and can generate further income and economic productivity to get an additional outcome. This is reflected in the payment of salaries and taxes and in the generation of surplus by the owners of the businesses in these sectors.

Of a main interest in this analysis is the products that have a *'final use'*, including consumption from households and government, including industry investment (e.g. money spent on new buildings, equipment and software etc.), and products that are directly sold as their final usage.

The second quadrant (yellow) contains the details to measure the *indirect and induced effects* <sup>1</sup>of an increase of a product, i.e. an increase of the exports of a product, by considering the repeated and diminishing rounds of spending that are triggered after a rise in the final demand (*direct effect*).

An initial change in production, therefore, will generate subsequent and larger changes, i.e. multiplier effects. This analysis, hence, aims to identify the multiplier required to increase (or decrease) the change in final demand, to arrive at a forecasted total change in output in the future.

<sup>&</sup>lt;sup>1</sup> Indirect effects refer to the impacts on the sectors that supply the activity directly affected (under consideration) and Induced effects refer to the impacts of spending by households receiving incomes derived from direct and indirect effects (see APPENDIX 3)

#### Table 6.3. Input-Output Table

#### **Production Destination\***

												-
			Agr.	Con.	Ma.	Tra.	Tra.	Ser.	H & G Cons.	Net Exp.	Inv.	TOTAL
Production	[	Agriculture	INTE	RMEDIA		MAND		FINAL DEMA	AND			
Origin	[	Construction	Goods	and ser	vices use	ed by an	industry	Purchases by customers				
		Manuf.	produ	ce outpu	t.	su by un	maasery		outside the re			
		Transport						households an	OUTPUT			
		Trade						new buildings,				
	[	Services							and software.			
	[	Salaries	VALU	E ADDE	D							
		Taxes	Fauiva	lent to G	iross Rei	gional Pr	oduct. T	otal				
	[	Gross Surplus	value	of incom	e genera	ated from	n produc					
	[	TOTAL		OUTPUT								
•												



\*H & G Cons.: Household and Government Consumption Expenditure. Inv.: Investment. Net Exp.: Exports - Imports.

Initially, the expected increase in production/sales, between what is sold with an 'intermediate' and a 'final' destination was separated. This information was obtained from survey responses (whether the expected increase/decrease in sales is due to an increase/decrease in sales to other industries (intermediate) or to an increase/decrease in exports/sales to household/government (final).

Due to the presence of outliers in the responses, it was assumed that the structure of sales was maintained and this was applied the variation of total output, as the variation of the final demand. Additionally, the responses were adjusted to correspond to historical performance, as they were clearly underestimated (for example in construction, retail, transport, rental, education and health).

Subsequently, the increase in the final demand was multiplied by the output 'multipliers' (that are shown in the matrix of total requirements (see Appendix V) and thus the total increase in output in the following twenty years was obtained.

There is no significant variation observed in the total change; however, there are more significant changes identified at an industrial level. For example, initially, there was no consideration of any change in the final demand in the mining sector (due to no responses in the survey from this sector); the growth expected in other sectors may however lead to an increase of the activity in mining, which could be in turn necessary to support the production in the construction sector or manufacturing for instance.

Finally, after calculating the output expansion, corresponding increase in employment was estimated using the *employment elasticity to sector output*. According to ILO (2005) this method "examines how growth in economic output and growth in employment evolve together over time". The elasticity is

"the percentage-point change in the number of employed persons in a region associated with a 1 percentage point change in economic output, measures by gross domestic product (GDP)".

Elasticity in this case was obtained from the available data on Australian GDP by industries, and Australian employment by industries, for the last three decades. Table 6.4 shows the results of the analysis> The final column in the table indicates that the Professional, Scientific and Technical Services would be expected to grow significantly, followed by the Health Care and Social Assistance sector and Education and Training, and Administration and Support Services. Crucially, the table also indicates which sectors consist of more or less labour intensive industries.

It is worth mentioning that in the case of agriculture and manufacturing, the historical elasticity was negative (i.e. the output increased meanwhile the employment decreased) showing a structural decline associated with technological changes. However, there has been recently a reversal of this trend, and, with this newly positive trend, and considering also that the answers in the survey that were mainly positive for these sectors, this analysis considered the most recent trend in elasticity rather than the long-term historical average.

#### Table 6.4. Application of I-O table and elasticity analysis

Derived from the Survey for the next 20 years.	FINAL		0.1.1			Employment	
	DEMAND	×	Output	UUIPUI	*	Elasticity to	
	Variation - %		wurupners	Variation - %	~~	Output	Variation - %
Agriculture, Forestry and Fishing	24%			35%		0.30	11%
Mining	-			93%		0.32	30%
Manufacturing	46%			52%		0.72	38%
Electricity, Gas, Water and Waste Services	27%			50%		-0.28	-14%
Construction	121%	_		114%		0.42	48%
Wholesale Trade	33%			47%		-0.49	-23%
Retail Trade	100%			96%		0.32	31%
Accommodation and Food Services	52%			56%		1.16	65%
Transport, Postal and Warehousing	114%		Matrix of Total	90%		0.83	75%
Information Media and Telecommunications	95%		Requirements	86%		0.13	11%
Financial and Insurance Services	69%		Coefficients*	72%		0.08	6%
Rental, Hiring and Real Estate Services	94%			91%		0.52	48%
Professional, Scientific and Technical Service	83%			77%		1.81	140%
Administrative and Support Services	44%			65%		1.05	68%
Public Administration and Safety	50%			52%		0.47	25%
Education and Training	56%			56%		1.23	68%
Health Care and Social Assistance	111%			110%		0.73	81%
Arts and Recreation Services	-16%			-10%		1.07	-11%
Other Services	30%			45%		0.88	39%
Total	73%			74%			51%

Based on the answers obtained in the best scenario with adjustments in those sectors that were clearly

underestimated.

## 6.3.1. Employment Forecast

The growth rates obtained by the application of the *Input-Output and Elasticity Analysis* imply that in the next 20 years there would be 6,400 additional jobs created in Macedon ranges. This signifies an increase of around 50% of the current local employment, and an annual average rise of approximately 2%. Figure 6.2, shows this increase at a five-year time-step.

From a sectorial perspective, most of the employment growth is explained by the continued expansion of service industries. Particularly, by the expected increase in the Health Care and Social Assistance sector, Professional, Scientific and Technical Services, Education and Training, Accommodation and Food Services and Construction (Figure 6.2 (right panel). In the case of Health Care and Social Assistance, for example, labour intensive industries within the sector is responsible for its significant increase in employment when compared to its forecasted increase in output.

In addition, the growth expected in the Health Care and Social Assistance sector could be explained by a growing and ageing population, as well as the potential increasing demand for childcare and homebased care services. In the case of Professional, Scientific and Technical Services, the expansion may be driven by a strong demand linked to new commercial developments, while an employment rise in the Education and Training sector could be underpinned by a continued growth in the school-age population. The Accommodation and Food services sector could see a boost due to the increase in domestic demand in the Shire, with hospitality, in particular benefiting from a rise in families eating out for example. In line with population increases, the construction sector could be expected to see an increase in employment tied to the increase in residential construction demands (Department of employment, 2017 and id.community, 2018).

#### TECHNICAL REPORT – ECONOMIC ANALYSIS

**Employment forecast from I-O and Elasticity Analyses** 

Contribution to growth by Industry



#### Figure 6.2. Employment Forecast (from Input-Output Analysis and Elasticity Analysis)

## 6.4. Approach 3 – Employment Forecast by Trend Application

The third approach to employment forecast consisted of extrapolating the growth trend of the working age population ratio into the future. Assuming a specific behaviour for that ratio, and considering the forecast for the population by age structure, a future employment pathway, which is consistent with population growth, can be determined.

The working age population (WAP) projection for the Shire (published by id.community) was taken and it was assumed, conservatively, that the relation between employment and the WAP will continue increasing at the same pace shown in the last decade.

Then, future employment was determined by multiplying both trajectories with an increase of around 19,000 total jobs projected to be created by 2036, equalling a 50% growth, when compared to the current value, at an annual average increase of 2%.

These results are in-line with the results obtained in Approach 2 (Section 6.3.1).



## **Population and Employment**

## **Employment to Working Age Pop. Ratio**



Figure 6.3. Employment Forecast (Trend Extrapolation)

The same analysis was applied to employment specifically by industry sectors, starting with the historical trends for industries within the Shire (Table 6.5 left two columns).

This approach produced results higher than those compared approaches 1 and 2, likely due to accounting for analysis based only short-term data (2006 - 2016), where the rate of employment growth is accelerating and generally more volatile.

While this is a possible scenario, in order to consider a longer, and less volatile period, the projections released by the Department of Employment (Department of Employment, 2018) for a larger area, containing the Shire, but also encompassing all of North West Melbourne (also taking into account the peri-urban areas of Melbourne). This dataset predicts the future behaviour of a variable (to 2022) based on the information contained in a longer historical series. Because the timeframe for our study is to 2036, the annual average change implicit in those projections was taken to extend to 2036.

	EMPLOYMENT			*
	Macedon R. 2006-2016	Macedon R. 2011-2016	North West Melbourne	Rest of Victoria
	Accumulated varia	tion 2016-2036 (%)	Accumulated variation	on 2016-2036 (%)
Agriculture, Forestry and Fishing	-11.5%	13.2%	10%	6%
Mining	-39.5%	2864.2%	13%	39%
Manufacturing	-14.3%	69.1%	-50%	-4%
Electricity, Gas, Water and Waste Services	72.0%	419.1%	-44%	-48%
Construction	107.8%	92.4%	68%	58%
Wholesale Trade	-76.1%	-92.2%	-4%	-7%
Retail Trade	-1.5%	0.0%	26%	12%
Accommodation and Food Services	130.2%	304.2%	25%	62%
Transport, Postal and Warehousing	-13.2%	59.3%	55%	32%
Information Media and Telecommunications	-32.7%	-45.6%	-12%	-6%
Financial and Insurance Services	406.9%	69.9%	-3%	1%
Rental, Hiring and Real Estate Services	61.5%	-32.6%	57%	45%
Professional, Scientific and Technical Services	80.3%	77.2%	216%	33%
Administrative and Support Services	137.1%	236.2%	28%	33%
Public Administration and Safety	46.9%	165.0%	47%	30%
Education and Training	73.0%	137.8%	91%	35%
Health Care and Social Assistance	197.6%	172.5%	99%	56%
Arts and Recreation Services	101.0%	-43.8%	4%	39%
Other Services	152.0%	163.1%	18%	12%
Other	89.0%	116.6%	51%	31%
Total	89%	117%	51%	31%

#### Table 6.5. Employment Forecast by Industry (Trend Extrapolation)

Notes: The data contained in the first two columns was obtained from ABS and refers specifically to Macedon Ranges (Macedon R.) The data contained in the last two columns is based on information published by the Department of Employment.

## 6.5. Employment Forecast Summary

In summary, the forecast that emerges from the direct application of the survey seems to be conservative and low when compared with the projections derived from the Input-Output and the Elasticity analyses, thus appearing to be more appropriate. The total increase involved in the second approach to forecasting is also consistent with the expected population rise, and also with the forecast released by the Department of Employment for the North-West of Melbourne.

At an industrial level, there are some discrepancies with state and national averages. However, in the case of the manufacturing industry, the decrease forecasted by state agencies, responds predominately to poor performance of non-food industries. In contrast, the Shire expects a good performance of food-related industries, indicating a growth in Manufacturing as reported (Job Outlook, 2017).

	EMPLOYME	NT					👋			
	Current	SUF	VEY (Best	Sc.)	IN	PUT-OUTPU	JT	TREND	ATION	
	Current	Future	Varia	ation	Future	Varia	ation	Future	Varia	ation
	No.	No.	No.	%	No.	No.	%	No.	No.	%
Agriculture, Forestry and Fishing	524	654	130	25%	580	56	11%	576	52	10%
Mining	7	-	-	-	9	2	30%	8	1	13%
Manufacturing	983	1,655	672	68%	1,355	372	38%	495	-488	-50%
Electricity, Gas, Water and Waste Services	80	115	35	44%	69	-11	-14%	44	-36	-44%
Construction	1,146	1,404	258	23%	1,693	547	48%	1,927	781	68%
Wholesale Trade	172	214	42	25%	132	-40	-23%	165	-7	-4%
Retail Trade	1,406	1,916	510	36%	1,841	435	31%	1,769	363	26%
Accommodation and Food Services	1,106	1,515	409	37%	1,822	716	65%	1,388	282	25%
Iransport, Postal and Warehousing	355	648	293	83%	622	267	/5%	550	195	55%
Information Media and Telecommunications	73	121	48	66%	81	8	11%	64	-9	-12%
Financial and Insurance Services	403	638	235	58%	427	24	6%	392	-11	-3%
Rental, Hiring and Real Estate Services	183	248	65	36%	270	87	48%	287	104	57%
Professional, Scientific and Technical Services	713	1,254	541	76%	1,711	998	140%	2,254	1,541	216%
Administrative and Support Services	348	404	56	16%	584	236	68%	444	96	28%
Public Administration and Safety	777	816	39	5%	970	193	25%	1,138	361	47%
Education and Training	1,443	1,815	372	26%	2,428	985	68%	2,757	1,314	91%
Health Care and Social Assistance	1,606	2,201	595	37%	2,901	1,295	81%	3,197	1,591	99%
Arts and Recreation Services	258	319	61	24%	231	-27	-11%	270	12	4%
Other Services	554	722	168	30%	772	218	39%	654	100	18%
Other	534	769	235	44%	628	94	18%	809	275	51%
				• •						
Total	12,671	17,430	4,759	38%	19,126	6,455	51%	19,188	6,517	51%

#### Table 6.6. Summary of Employment Forecast

Specifically, forecasting employment by the areas within the Shire, was undertaken by multiplying the variation for each area obtained in the survey by the same factor in order to arrive to a total variation of 50% up to 2036. The results show a growth across the entire region, varying from around 40% in the case of Romsey and Riddells Creek, to 70% in the case of Macedon. According to these figures, the percentage of jobs absorbed by each of the areas would remain almost the same, with Gisborne and Kyneton as the major employers.

	EMPLOYN	ИЕМТ				- 25
	Current		Future		Variation	
	No.	%	No.	%	No.	%
Gisborne	3,740	30%	5,574	29%	1,834	49%
Kyneton	4,093	32%	6,226	33%	2,133	52%
Macedon	704	6%	1,211	6%	507	72%
<b>Riddells Creek</b>	574	5%	796	4%	222	39%
Romsey	1,809	14%	2,485	13%	676	37%
Woodend	1,751	14%	2,834	15%	1,083	62%
Total	12,671		19,126		6,455	51%

#### TECHNICAL REPORT – ECONOMIC ANALYSIS



Figure 6.4. Employment in the Macedon Ranges Shire (current (left panel), future (centre panel) and variation (right panel)

## 7. IMPLICATIONS FOR THE EDUCATION SECTOR

After arriving to a reasonable forecast of employment for the next twenty years in Macedon Ranges, the implications that such growth might have in terms of qualifications and skills required in the future were analysed.

This information is relevant, in particular, for educational institutions and to identify job and career opportunities in the Shire. As pointed out, these results are indicative projections and are subject to a high level of uncertainty.

## 7.1. Occupations required in the future in the Macedon Ranges Shire

According to the answers obtained from the Industry Survey, the occupation in greatest demand in the future will be professionals. In particular, professionals in businesses, human resources and marketing. Following this, clerical and administrative workers are also projected to be in demand, particularly office managers and program administrators. Thirdly, managers, in particular, the managers associated with hospitality, retail and services, will be required.





**Sub - Occupations Required** As a % of each type of occupation



To understand the approximate amount of people that would be required with a particular occupation/qualification that will be needed, the educational requirements for the next twenty years were forecasted, considering the expected jobs increases and the sectoral educational needs.

The proportion that each occupation currently represents within each sector was applied to jobs per industry (projections). As was expected (and in line with the results of the survey), professionals are expected to grow most noticeably, especially given they already make up a significant part of the health, education and professional services sectors, which are the also the fastest growing industries in Macedon Ranges. Following this, it is expected that community and personal service workers will expereince an important increase, driven mainly by the growth of the health, accommodation and food services and education sectors. Continued and increased activity in the construction sector would also be expected to lead to an increase in technicians and trades occupations.



## **Employment by Occupations - 2036**



Figure 7.2. Occupations by Industry Sector Current and Future (2036)

## 7.2. Qualifications required in the future in the Macedon Ranges Shire

The businesses surveyed answered that to meet their needs, the qualifications most required in the future are TAFE or Training Certificate and Bachelor's Degree. Some businesses did not requre formal qualifications or only secondary school level, but in those cases previous work experience in the specific industry was predominately also required.





TAFE/Training Certificate	
Non-Specific Qualifications (see TAFE/Training by Industry Table)	56
Cert IV	8
Real Estate Certification	6
Diploma	5
Cert III	4
Computer Literacy	4
Soft Skills (including common sense, people management etc)	3
Advanced Diploma	1
Licenses (eg. Heavy machinery)	1
In-house training	1
Bachelor's Degree	
Financial Services	15
Engineering	6
Health Sciences	6
Constal skills (writing, communication, computer literacy)	F
IT (including software development, and development)	5
	1
Marketing	4
law	т २
Life Environmental Sciences	3
Agriculture	2
Media (inlcuding journalism)	2
Non-Specific	2
Project/Construction Management	2
Fashion	1

No Formal Qualifications	
Experience (Industry Specific)	11
Individual Basis (personality, CV, passion, attitude)	3
NA, Not Required, Answer in Wrong Spot	3
Experience (Non Industry Specific)	2
On Site Training	2
Storeman	2
Drivers License	1
Labourer	1
Soft Skills (people management, common sense etc.)	1

Second	arv Sch	lool O	ualific	atior

Secondary School (including specifics regarding reading, writing	7
and mathematics)	'
Experience (Industry Specific)	6
Drivers License	2
Soft Skills (inlcuding common sense, attitude, demeanor)	1

Post Graduate Qualifications	
Business	3
Engineering	2
IT (Software development)	2
Psychology	2
Accounting (chartered)	1
Chiropractic	1
Education	1
Law	1
Research	1
Veterinary Science	1

CeRRF, Deakin University – Technical Report – Economic Analysis
As above, the proportion that each qualification currently represents within each occupation was applied to future job requirements. In this case, qualifications were related to occupation requirements. In line with the rise of professionals, community and personal services and technicians and trader workers, those jobs requiring a Certificate III and IV level or a Bachelor's degree are expected to be the fastest growing.





Figure 7.5. Qualifications required Current and Future (2036)

# 7.3. Skills and Training required in the Future in the Macedon Ranges Shire

Regarding the specific training required in the future, the survey showed that the industry specific training would be by far the most needed. In particular, by the construction and hospitality industries.



In addition to the 'formal and hard' skills (those which require an ability to perform specific tasks; Computer skills for example) that would be needed in the future, there are many other skills that are also very relevant. They are called 'soft' skills and refer to personal attributes that allow people to interact effectively with somebody else; for example, communication, conflict management, human relations, making presentations, negotiating, team building, common sense, sense of humour, and empathy.

In the future, it may be easier to automate hard skills, rather than the soft ones, and it is possible that skills required in the future will change quickly and, therefore, workers who are willing to learn and build on their *soft* skills and experience to deal with uncertainties and changes may find advantages in finding and/or maintaining a job. Particularly important will be the capacity to innovate and be competitive amongst global markets. In this regard, STEM (Science, Technology, Engineering and Mathematics) skills would underpin the potential to innovate (Prinsley and Baranyai (2015)). Many of these skills are to be found on a combination of qualifications and occupations, largely centred in TAFE and tertiary qualifications, but with strong potential for on-the-job learning.

It is important that this information is made available to job seekers in order for them to understand businesses' expectations.



Figure 7.7. Specific Skills required in the future (from Industry Survey)

# 8. RESIDENTIAL POPULATION IN THE MACEDON RANGES SHIRE

To complement the Industry Analysis, a second survey was sent to residents of Macedon Ranges. There was a total response of 171 questionnaires, which, while a low proportion of the total population, does still provide relevant insight into residents' experience in the labour market, including common themes that were established from comments in the survey.

Figure 8.1 describes the main statistics obtained from the residential survey. Most respondents were residents of Kyneton and Gisborne and are full-time employees. Almost 70% of the respondents work outside the shire and most of them have a second job, mainly due to personal preferences.



**Employment Status** 

Employed -Casually 7%

Unemployed looking for work

9%

Employed - Part

Time

18%

Retired

4%



Unemployed - not

looking for work 3%

Employed -Full Time 59%

## Work Place

Place of Work	Workers (%)	Place of Work	Workers (%)
Work at a business	81%	Work at home	19%
Melbourne CBD	33%	Kyneton	4%
Melbourne Suburbs	30%	Gisborne	2%
Macedon Ranges	13%	Romsey	2%
Bendigo	2%	Others	11%
Other	3%		

## Additional / Second Job



## Reasons for having a second job



## Figure 8.1. Summary Data - Residential Survey

In terms of respondents' occupations and qualifications (shown in Figure 8.2), the results correspond with the requirements businesses report in the Industry survey, with professionals and managers with Bachelor's degrees being highly represented.

Other relevant qualifications included industry specific, or other training to improve *hard skills*, such as leadership, management or OH&S training.



People with other relevant qualifications,



Figure 8.2. Residential Survey Occupations and Qualifications

# 8.1. Residential Job Preferences

In addition to residential characteristics, the survey also asked respondents to report their status regarding preference for occupation and workplace location. As shown in Figure 8.3, almost 80% of the respondents answered to be working in their preferred occupation. However, 64% of respondents reported to be dissatisfied with their place of work.

Respondents reported *lack of available jobs* and *low salaries* being the most predominate reasons for this dissatisfaction. Although numerous respondents pointed out the fact that some people could have a personal preference for commuting, such as niche or specialised occupation or industries, that would not reasonably be expected to relocate to within the Shire, and some consideration ought to be made regarding the "net social costs basis (i.e. taking into account the range of relevant economic and environmental costs)".

Professionals and managers (28% and 19% respectively) and those with tertiary degrees (bachelor and post-graduates (39% and 31%) were the most likely to be not working at their preferred location.



Figure 8.3. Residential Job Preferences

In particular (as Figure 8.4 shows) it is largely professionals and managers that are dissatisfied with their location of work, and within the Electrical and Electronics and Administration and Human Resource sectors (Figure 8.5). These figures support comments made by some respondents in the Residential Survey, regarding a lack of jobs that require higher education and the lack of jobs which provide enough hours to ern a reasonable income.

Moreover, professionals and managers (together with technicians and trades workers and community and personal services) tend to have on average a higher salary than other occupations. This reinforces the other comments regarding the relative weakness of local jobs in the Shire: low salaries compared to bigger cities, esepcially Melbourne.

#### **TECHNICAL REPORT – ECONOMIC ANALYSIS**



Figure 8.4. Features of Respondents not working at their preferred location: Occupation



Figure 8.5. Features of Respondents not working at their preferred location: Industry Sector

# 8.2. Comparison of required and available occupations and qualifications

As described above, from the employment forecast per industry, a projection of the occupations and qualifications that are required by businesses in the future, was obtained. This was then compared with the characteristics of respondents reporting to not be currently working in their preferred location – this group are potential local workers. In other words, if the needed resources are provided, they could work in the Shire. Figure 8.6 and 7 show the differences between resident workers and people working in the Shire, aiming to estimate the number of residents working outside the shire that could be potentially converted to local workers. Given that a number of local workers live in other shires, the figures obtained are underestimated.

This 'gap' analysis (*education required vs available*) therefore, does not intent to be highly precise/accurate, given the probable underestimation and is unable to take into account jobs undertaken by youths. Additionally, there is insufficient information to link the age of the people with their qualifications, in order to know the amount of people who may retire in the next twenty years. Therefore, the analysis identifies the occupations/qualifications where Macedon ranges could face clear shortage/excess of people and mainly in a short/medium term.

In summary, given businesses reported requiring mainly professionals in the future and those unhappy with their location of work are also professionals, it is reasonable to assume that, if desired working conditions are met, many of those conditions could be met (and potnentially continue to be an excess requirement).

The analysis shows that there could be some in community and personal services occupations and labourers regarding requirements when compared with residential characteristics. Compartively, the results also indicate that there may be an excess of technicians and trades workers, managers and clerical and administrative workers based on residential characteristics, given that businesses did not report needing representive numbers of these occupations.



# 9. INFRASTRUCTURE AND SERVICES REQUIRED TO SUPPORT GROWTH

The infrastructure and services needed to support the expected growth in Macedon Ranges is a key to appropriately inform planning for its future. In this regard, both businesses and residents were asked their requirements for infrastructure and support.

# 9.1. Responses from the Business Survey

Access to *telecommunications* was by far the most demanded resource by businesses. In fact, almost 60% of them (i.e. 150 companies) required it. Additionally, a reduction in red tape was also mentioned action, with around 35% of respondents requiring prompt action in this respect. Following that, roads and public transport and networking forums were the third services most required, with about 70 claims for each one (or 30% of total).



Figure 9.1. Resources needed to support growth (industry survey)

In relation to the resources needed to support employment growth, access to telecommunications was again the most demanded service with around 35% of respondents supporting this need. The option 'other' was the second resource more required, also with around 35% of answers. 'Other' refers mainly to the creation of local employment opportunities in relevant, specialised or niche fields.

Importantly, among the comments from the residential responses salaries comparable to Melbourne, affordable office space and development opportunities become key themes.

The following comments are paraphrased and summarise key comments from the residential survey:

• Public transport is inadequate

"frequently do not get a seat on the ingoing or outbound trains"

"Need more services stopping at Riddells Creek during peak hours"

- Appropriate resources to allow people to work from home include:
  - o telecommunications (NBN) and
  - o access to town gas (none in Riddells Creek)

"bottled gas that we use is very expensive, so we have to 'ration' our heating. So, to encourage more people to work from home, especially during the winter, expanding the piped town gas network would be a really positive move."





# 9.2. Youth Requirements

The Residential Survey asked respondents with school-aged children to report on the resources (jobs and education) they would like to have for their children. Around 60% of the surveyed, had school-aged children in their household and most of them are attending primary school. The survey generally captured parents' desire to have local job opportunities for their children, particularly part-time or casual jobs for students to undertake while studying. Access to TAFE teaching and qualifications were also high reported as being desirable.

In the preparation of this report a consultation session with representatives of youth in the Shire was conducted. This session discussed the youth perspective on job opportunities and growth around the Shire. Key themes from the discussion were:

- Students generally work in hospitality or retail, in part time jobs. There are many opportunities in that area and are flexible enough to let them study at the same time.
  - However there are not as many full time options and it is difficult to find a job in specific sectors, like health and art and recreation.
- It is important for students that companies offer experience and also ongoing support, in particular mentorship, as currently, apprenticeships / trainings /mentoring /practical works are not available for all industries.
- There was a sense that the preference was for more innovative employment opportunities and build a shire that is unique and diverse.
- Greater public transport opportunities to support further study.
- The possibilities for tertiary education in Shire was discussed
- Education to be more flexible, adaptable, not specific, should teach broad skills to allow people thrive in a changing world.
- There are some areas in the shire where there is limited internet connection. There should be a better technology / Wi-Fi connection.
- Value on entrepreneur, and support to encourage young people to start a new business, to allow people create their own jobs.





CeRRF, Deakin University – Technical Report – Economic Analysis

# 10. POTENTIAL OF AGRICULTURE TO GENERATE ECONOMIC PRODUCTIVITY

An extensive analysis of the agricultural industry, as a case study, was undertaken in order to illustrate how key economic sectors can generate sustainable local jobs and bolster the regional economy. Two important considerations led to this case study. The Macedon Ranges Shire is investigating opportunities regarding regional specialisation and competitive advantage in the agricultural sector. The analysis previously undertaken on the multipliers emerging from the Input-Output Table showed that agriculture is one of the sectors with the highest multipliers and spill-over effects in the rest of the economy.

The analysis in this case study is complemented by a Land Suitability Analysis – LSA (see the accompanying report *Technical Report – Land Suitability Analysis*). The LSA showed that Macedon ranges has an advantage when considering the opportunities likely to be created by climate change. Future climate projections show that the Shire and key commodities, may benefit from warmer and drier conditions that are increasingly being pushed southward from their historic home in northern Victoria.

# **10.1.** Specialisation and Competitive Advantages Analysis

The *Location Quotient* and *Shift-Share Analysis* explained in this section assesses the importance of primary industries in the Shire's economy. In particular, these techniques analyse the level of specialisation and the competitive advantages of a region in relation with a benchmark (Victoria). The analyses both show that agriculture and agro-industries are specialised or have competitive advantages.



Figure 10.1. Regional Specialisation & Competitive Advantages

# 10.2. Land Suitability Analysis

Land Suitability Analysis (LSA) assesses the appropriateness (i.e. suitability) of a defined geographic area of land for obtaining an optimal yield of a particular agricultural commodity cultivated (or to be cultivated) in the area-in-focus; it is based on the analysis of the key biophysical characteristics of the commodity in question. The methodology relies on three key inputs: climatic data (historical series, present, and future projections), soil data (chemical and physical attributes) and landscape (including topography and aspect). Changes in climatic conditions may create new opportunities for, or risk in certain commodities. Modifications in land suitability can be examined by comparing 'baseline' suitability maps (obtained from historical and present climatic data) with future ones (obtained from climatic forecasts). LSA thus offers a rational model to analyse the best use of land in the future giving, in particular, new (projected) climatic conditions. In other words, it provides a powerful decision support tool to inform land use planning (Faggian, R. et. al., 2016).

Therefore, to complement the agricultural case study analysis, LSA was undertaken for 5 key agricultural commodities - Vegetables, Fruit, Viticulture, Pasture (as a proxy for livestock) and Cropping - that are either already produced in the region, or are of a high value and, consequently, that should be considered for potential future production.

See accompanying report, *Technical Report – Land Suitability Analysis* for details of the methodology used in the analysis which also discusses the implications and opportunities for agricultural production in the Shire out to 2050.

# **10.3.** Gross Margin Analysis

Using results from the Land Suitability Analysis, the effects that the expected changes of yields would have on the economic margins of farmers was evaluated. Figure 10.2 depicts the methodology used in developing the gross margins for each agricultural commodity, with the assumptions made mentioned in the following sub-section.



Figure 10.2. Gross Margin Methodology

# **10.3.1.** Margins Forecast Assumptions

- The gross margin is a measure of *profitability*. It is calculated as the difference between the *gross income* (price \* quantities sold) and the *variable costs* (those that vary according to the production).
  - Variable costs include: fertilisers and agrochemicals, water, packaging materials, levies, sales commissions, insurances. Although the owner may be working a farm, salary costs are also considered, to properly reflect the production costs.
- Fixed costs are not included, nor is cost of land rent, financial interest and taxes over profits.
- The economic models constitute a *guide* to assist the planning process.
- Models were developed with *aggregate information* for the whole country, and, where was possible, validated with specific data for Victoria or the region under study.
- The results reflects the *average* performance of agribusiness. It is important to note that the margins obtained by farmers can vary significantly, depending on several aspects (price received, impacts of climate, technological advance, managerial practices, among others).
  - The *assumptions* made in estimating the margins for the last fiscal year *can be adjusted* to better reflect the particular circumstances of each farmer.
- The margins were estimated for the following products: *beef, cherries, grapes and vegetables*. However, it is recommended the analysis is complemented by a broader range of commodities to obtain a more comprehensive picture.
- *Margins* were estimated *per hectare*, to compare the relative profitability of the products.
- The margins are estimated for an existing, mature (established) business. The cost of initial investments needed to start the business is not included. The economic costs of changing / initiating a new business are not considered.
- The information provided here can be used to estimate the *Net Present Value* (NPV) of the investment needed to start any of the businesses analysed, according to the particular situation of each farmer (e.g. the investment required to produce wheat is different if you are currently producing barley or if you are producing meat).
- Other costs of change (social / cultural / organisational / regulatory) are not included.
- Due to the uncertain nature of the forecasting analysis, *four different scenarios* were calculated (a baseline, alternative sale price, exchange rate, and water price scenario).

# 10.3.2. Price Forecast

The analysis of price forecast considered the response to different external dynamics. Products classified as commodities (homogeneous and widely-available) are generally traded in international markets and, hence, an international reference for future prices is available. Products classified as non-commodities generally depend more on the dynamics of the domestic market where they are sold.

In this study, Beef (Cattle) analysis (as an agricultural commodity) considered fuels, fertilisers, agrochemicals and international price projections provided by the Food and Agricultural Organisation (FAO), World Bank and IMF. The remaining analyses, cherries, vegetables and grapes, (non-commodities), encompassed domestic variables, including salaries, population and consumer prices.



## Figure 10.3. Price Dynamics

## 10.3.3. Cost Forecast

Table 10.1 summarises the expected cost evolution for the main variables affecting production expenditures. An explanation of the trajectories assumed for each is provided in APPENDIX VII – Macroeconomic Variables Assumptions.

Two scenarios were developed to test the assumptions: a baseline scenario and an alternative scenario which assumed that the rate remains around the current value. The prices of fuels, fertilisers and agrochemicals were forecasted considering the projections released by international institutions, which tend to assume that in the long-term prices in American dollars remain stable. Therefore, the fluctuations considered in the forecast respond to the evolution of the exchange rate in the baseline scenario.

## TECHNICAL REPORT – ECONOMIC ANALYSIS

## Table 10.1. Cost Forecast

COSTS AN	D MACROECO	NOMIC ASS	UMPTION	S										
	СР	1	Exchan	ge Rate	Exchan	ge Rate	Wage	es	GDP		Fuels	5	Fertilisers & Agro	ochemicals
FISCAL	Index	Change -	Baseline	Scenario	Alternativ	e Scenario	Index	Change	Index	Change	Index	Change	Index	Change
YEAR *	2011/12=100	Inflation	US\$/\$	Change	US\$/\$	Change	2011/12=100	change	2011/12=100	change	2011/12=100	change	2011/12=100	Change
2016	110	2.0%	0.76	3.7%	0.76	3.7%	115	2.2%	113	2.0%	77	-2.0%	105	-0.5%
2017	113	2.0%	0.74	-2.0%	0.74	-2.0%	118	2.5%	116	3.0%	77	0.0%	104	-0.5%
2018	115	2.5%	0.70	-4.9%	0.75	1.4%	121	2.7%	120	3.3%	78	1.0%	106	1.1%
2019	118	2.5%	0.66	-5.9%	0.75	0.0%	125	3.2%	124	3.2%	81	3.7%	109	3.0%
2020	121	2.5%	0.64	-4.0%	0.75	0.0%	129	3.2%	128	3.1%	83	3.4%	112	2.5%
2021	124	2.5%	0.61	-4.2%	0.75	0.0%	133	3.4%	132	3.0%	89	7.4%	116	4.2%
2022	127	2.5%	0.60	-2.1%	0.75	0.0%	138	3.4%	136	3.0%	94	4.9%	121	4.2%
2023	131	2.5%	0.59	-1.8%	0.75	0.0%	142	3.4%	140	3.0%	96	1.8%	126	3.8%
2024	134	2.5%	0.59	0.0%	0.75	0.0%	147	3.4%	144	3.0%	96	0.0%	128	1.9%
2025	137	2.5%	0.59	0.4%	0.75	0.0%	152	3.4%	148	3.0%	95	-0.3%	131	1.9%
2026	141	2.5%	0.60	1.6%	0.75	0.0%	158	3.4%	153	3.0%	94	-1.6%	131	0.5%
2027	144	2.5%	0.61	1.7%	0.75	0.0%	163	3.4%	157	3.0%	92	-1.7%	132	0.4%
2028	148	2.5%	0.62	2.3%	0.75	0.0%	168	3.4%	162	3.0%	90	-2.3%	131	-0.3%
2029	152	2.5%	0.64	2.2%	0.75	0.0%	174	3.4%	167	3.0%	88	-2.1%	131	-0.1%
2030	155	2.5%	0.65	2.3%	0.75	0.0%	180	3.4%	172	3.0%	86	-2.2%	131	-0.3%
2031	159	2.5%	0.66	1.9%	0.75	0.0%	186	3.4%	177	3.0%	85	-1.8%	129	-1.8%
2032	163	2.5%	0.67	1.7%	0.75	0.0%	192	3.4%	182	3.0%	83	-1.6%	126	-1.6%
2033	167	2.5%	0.68	1.1%	0.75	0.0%	199	3.4%	188	3.0%	82	-1.1%	125	-1.1%
2034	171	2.5%	0.69	0.8%	0.75	0.0%	206	3.4%	193	3.0%	82	-0.8%	124	-0.8%
2035	176	2.5%	0.69	0.3%	0.75	0.0%	213	3.4%	199	3.0%	81	-0.3%	124	-0.3%
2036	180	2.5%	0.69	-0.1%	0.75	0.0%	220	3.4%	205	3.0%	81	0.1%	124	0.1%
2037	185	2.5%	0.68	-0.5%	0.75	0.0%	228	3.4%	211	3.0%	82	0.5%	124	0.5%
2038	189	2.5%	0.68	-0.8%	0.75	0.0%	235	3.4%	218	3.0%	83	0.8%	125	0.8%
2039	194	2.5%	0.67	-1.1%	0.75	0.0%	243	3.4%	224	3.0%	83	1.1%	127	1.1%
2040	199	2.5%	0.66	-1.3%	0.75	0.0%	252	3.4%	231	3.0%	85	1.3%	128	1.3%
2041	204	2.5%	0.65	-1.5%	0.75	0.0%	260	3.4%	238	3.0%	86	1.5%	130	1.5%
2042	209	2.5%	0.64	-1.5%	0.75	0.0%	269	3.4%	245	3.0%	87	1.6%	132	1.6%
2043	214	2.5%	0.63	-1.6%	0.75	0.0%	278	3.4%	252	3.0%	89	1.6%	135	1.6%
2044	219	2.5%	0.62	-1.5%	0.75	0.0%	288	3.4%	260	3.0%	90	1.5%	137	1.5%
2045	225	2.5%	0.61	-1.4%	0.75	0.0%	297	3.4%	268	3.0%	91	1.4%	139	1.4%
2046	231	2.5%	0.61	-1.3%	0.75	0.0%	307	3.4%	276	3.0%	92	1.3%	140	1.3%
2047	236	2.5%	0.60	-1.1%	0.75	0.0%	318	3.4%	284	3.0%	93	1.1%	142	1.1%
2048	242	2.5%	0.59	-0.9%	0.75	0.0%	329	3.4%	292	3.0%	94	0.9%	143	0.9%
2049	248	2.5%	0.59	-0.7%	0.75	0.0%	340	3.4%	301	3.0%	95	0.7%	144	0.7%
2050	255	2.5%	0.59	-0.5%	0.75	0.0%	351	3.4%	310	3.0%	95	0.5%	145	0.5%

 $\ensuremath{^*}$  From July of the indicated year to June of the following year.

# 10.4. Cherry Forecast

To forecast the profitability of the *stone fruit* industry in the Macedon Ranges, the analysis focused on *cherry production*. Initially, the gross margin achieved in 2016/17 was obtained (see Appendix II). This information generally applied to Australia as a whole, and was therefore validated with local experts and growers, to better reflect the particular situation in the Shire and therefore, avoid significant under/overestimations. The results reported in Table 10.2 show that in the last fiscal year cherry producers obtained on average, a positive gross margin in the Shire.

Figure 10.4 shows evolution of variables determining cherries' margin out to the year 2050. Overall, the perspective for cherry is positive. A continuation of current trends sees the price of cherries continue to rise, and the LSA determines that climate change offers opportunities to obtain higher yields than those currently obtained. Despite higher costs forecasted, it is expected that the farmer incomes will increase into the future, supporting the industries profitability in the long term.

The break-even yield was calculated to reflect the yield that should be obtained to cover the variable costs. As the margin is positive, the break-even point is lower than the average yield currently obtained, and in the future would remain below 4.5 ton/ha.

CHERRIES   Margin 2016/	′17 - \$/ha	
VARIABLE	UNIT	VALUE
Price	\$/kg	12.0
Yield	Kg/ha	10,000
% Packout		85%
INCOME		102,000
Fertiliser	\$/ha	1,674
Herbicides	\$/ha	250
Insecticides	\$/ha	510
Fungicides	\$/ha	910
Other chemicals	\$/ha	750
Freight	\$/ha	4,250
Contracts (1)	\$/ha	5,750
Irrigation	\$/ha	1,200
Crop load management	\$/ha	550
Canopy management	\$/ha	3,750
Helicopter hire	\$/ha	1,000
Harvesting labour	\$/ha	15,000
Contract grading & packing (2)	\$/ha	31,375
Levis and commissions	\$/ha	12,835
COSTS		79,804
MARGIN		22,196

## Table 10.2. Cherry Gross Margin 2016/17

Notes: (1) Includes mowing and slashing, pesticides, herbicides and other chemicals applications, harvesting, fertilising and pruning. (2) Also includes packing materials.



The gross margin for cherries covers the whole Shire (considering the average yield). However, the results obtained by producers can vary considerably depending on locally specific factors, such as biophysical conditions. Figure 10.5 displays the different margins obtained as a function of such conditions (soil, landscape and climate) for the historic, 2030 and 2050 climate scenarios.

The maps reflect the dispersion of yield that would be achieved across the Shire and therefore, the expected variability of gross margins. In the case of cherries the profits would be positive in all areas.



Figure 10.5. Cherry Economic Profitability (left panel: historic, centre panel: 2030 and right panel: 2050)

Three additional scenarios were developed to forecast Gross Margins to account for the high levels of uncertainty when working with future prices, costs and variables (see Figure 10.6).

*Scenario 1* estimated an average price for cherries 5% lower than considered in the baseline scenario. As a consequence, the margins obtained during the forecasted period are naturally lower than in the baseline situation, but they are still positive.

*Scenario 2* considered the exchange rate remaining around the current value throughout the forecast period. This scenario leads to lower costs (through a reduction of the price of fuels, fertilisers and agrochemicals measured in Australian dollars). As a consequence, the gross margin in this scenario is greater than the baseline scenario.

*Scenario 3* considered higher water prices than in the baseline case (20% greater). Since water costs still represent a small portion of total costs, the increase of this variable does not result in a significant decrease in margins.



Figure 10.6. Cherry Forecasting Scenarios



cheaper forms of fruit fly eradication\* are projected to result in continued growth of exports.

• A rise in the domestic sales is also expected, led by market research and marketing strategies.

## Competitors

• Australia compete directly with South America countries like **Chile** (due to they have the same growing season), but **lower airfreight costs** to Asia give Australia a competitive advantage.

\* The Japanese and Korean markets currently do not accept imports of cherries grown on mainland Australia, because of the risk of fruit fly contamination. Several other importing countries only allow cherries after a temperature-based treatment. The 'pest-free' status reached by Tasmania in 2015-16 allowed them to obtain prices 80% higher that the price received by other regions. Comments from Abares agricultural commodities report.

Finally, it is important also to analyse the prospect for the product in terms of demand and possible drawbacks due to increasing competition.

It is then expected that there will be a continuous increase in both the external and internal sales for the cherry industry. In the case of the exports to the Asian market, Chile would continue to be a relevant competitor (it is currently the main supplier of cherries in Hong Kong), although shorter distances would continue to benefit the export of Australian cherries.

According to the consultation with local producers, the cherries harvested within the Shire are largely sold on the domestic market. Additionally, local producers reported concerns regarding potential overproduction of cherries, historically leading to significant price cuts. So, despite the positive outlook for the industry, being both profitable and labour intensive, it is important to be aware of any increase in production that would tip it above expected increases in demand. In that sense, local producers pointed out, that despite population increases in the country, the consumption per capita has been hard to increase. Nevertheless, the overall perspective for this sector is positive, considering the forecasted gross margin and assuming that the demand remains strong and expansion of the production is supported without compromising profits.

# 10.5. Wine Grape Forecast

To forecast the profitability of the *viticulture industry* in the Macedon Ranges Shire, the analysis took the case of *wine grape production*. Initially, the gross margin achieved in 2016/17 was obtained (see Appendix II). This information generally applied to Australia as a whole, and was therefore validated with local experts and growers, to better reflect the particular situation in the Shire and therefore, avoid significant under/overestimations. The results reported in Table 10.3, show that in the last fiscal year grape producers obtained on average, a positive gross margin in the Shire.

**Figure** 10.7 shows evolution of variables determining grapes margin out to the year 2050. Overall, the perspective for grapes is relatively stable.

Despite a continuation of current trends seeing the price of grapes continue to rise, the LSA revealed that the suitability of growing the current varieties of cool climate grapes will significantly decrease, mainly as a direct consequence of forecasted climatic changes. In this context, the farmer income is expected to rise at a similar pace to costs, resulting in the average gross margin remaining below \$8,000 per hectare.

It is important to note that this analysis considered cool climate varieties of wine grapes. The LSA showed that a change to warm climate varieties would result in a continuation of relatively high suitability across the Shire for the production of wine (albeit warm grape varieties). The costs and prices of warm climate varieties (which is significantly lower than the price paid for cool grapes) and the cost of changing between the two has not been considered here. The break-even yield was calculated to reflect the yield that should be obtained to cover the variable costs. As the margin is positive, the break-even point is lower than the average yield currently obtained, and in the future would remain around 5 ton/ha.

Finally, this analysis focuses on the agricultural margin, therefore the profits obtained from wine production were not calculated, but it is acknowledged that they are a fundamental part of the grape production in the Shire.

GRAPES   Margin 2016/17 - \$/ha					
VARIABLE	UNIT	VALUE			
Price	\$/ton	3,000			
Yield	Ton / ha	7.5			
INCOME		22,500			
Fertiliser	\$/ha	436			
Herbicides	\$/ha	200			
Insecticides	\$/ha	100			
Fungicides	\$/ha	1,200			
Freight	\$/ha	525			
Contracts (1)	\$/ha	2,400			
Harvest (hand)	\$/ha	2,250			
Irrigation	\$/ha	960			
Labour (2)	\$/ha	1,350			
Canopy management (3)	\$/ha	5,198			
Levis	\$/ha	83			
COSTS		14,701			
MARGIN		7,799			

#### Table 10.3. Grape Gross Margin 2016/17

Notes: (1) Include mowing and slashing, pesticides and herbicides applications, fertilising, pre pruning and trimming. (2) Includes P & D Monitoring and Trellis manteinance. (3) Includes pruning labour (hand), leaf and crop removal, desucker/disbud, wire Lifting/dropping and netting.





The gross margin for grapes covers the whole region (considering the average yield). However, the results obtained by producers can vary considerably depending on locally specific factors, such as biophysical conditions. Figure 10.8 displays the different margins obtained as a function of such conditions (soil, landscape and climate) for the historic, 2030 and 2050 climate scenarios.

The maps reflect the dispersion of yield that would be achieved across the Shire and therefore, the expected variability of gross margins. In the case of wine grapes the profits would be positive in the majority of areas.



Figure 10.8. Grape Economic Profitability (left panel: historic, centre panel: 2030 and right panel: 2050)

Three additional scenarios were developed to forecast Gross Margins to account for the high levels of uncertainty when working with future prices, costs and variables – see Figure 10.9.

*Scenario 1* estimated an average price for grapes 5% lower than considered in the baseline scenario. As a consequence, the margins obtained during the forecasted period are naturally lower than in the baseline situation, but they are still positive.

*Scenario 2* considered the exchange rate remaining around the current value throughout the forecast period. This scenario leads to lower costs (through a reduction of the price of fuels, fertilisers and agrochemicals measured in Australian dollars). As a consequence, the gross margin in this scenario is greater than the baseline scenario.

*Scenario 3* adopted higher water prices than in the baseline case (20% greater). Since water costs still represent a small portion of total costs, the increase of this variable does not result in a significant decrease in margins.

<i>Lower Price Future Scenario</i> 5% lower than in baseline scenario	<i>Higher Exchange Rate</i> <i>Future Scenario</i> Exchange Rate remains around 0.75	<i>Higher Water Price</i> <i>Future Scenario</i> 20% higher than in baseline scenario			
Price	Costs	Costs			
5/kg	S/ha	5/ha 40.000			
0,000	40,000	40,000			
6,000	30,000	30,000			
4,000	20,000	20,000			
2,000	10,000	10,000			
0	0	0			
2016 2023 2030 2037 2044 2050	2016 2023 2030 2037 2044 2050	2016 2023 2030 2037 2044 2050			
Gross Income	Gross Income	Gross Income			
S/ha	\$/ha	S/ha			
44,000	44,000	44,000			
34,000	34,000	34,000			
24.000	24,000	24,000			
	14.000				
14,000		14,000			
4,000	4,000 2016 2023 2030 2037 2044 2050	4,000			
Marcin	Margin	NAi-			
S/ba	\$/ha	s/ba			
10,000	10,000	10,000			
8,000	8,000	8,000			
6,000	6,000	6.000			
4,000	4,000	4,000			
2 000	2,000	3,000			
2,000	0	2,000			
2016 2023 2030 2037 2044 2050	2016 2023 2030 2037 2044 2050	2016 2023 2030 2037 2044 2050			
Brook Even Vield	Break Even Yield	Break Even Vield			
Ton/ba	Ton/ha	Ton/ha			
6.0	6.0	6.0			
	5.5	5.5			
5.5		2.2			
5.0	5.0	5.0			
4.5	4.5	4.5			
	4.0	10			
4.0	2016 2022 2020 2027 2044 2050	4.0			

Figure 10.9. Grape Forecasting Scenarios

2023

2016

2037

2023





Index of value of Australian wine exports and total value of exports, selected countries 2006–07 to 2015–16



## Demand

 Wine sales in volume in the national market have remained relatively stable since 2009.

Positive

- After showing a clear downward trend, wine exports rose in the last two years, driven mainly by a strong demand from China.
- The China–Australia Free Trade Agreement is expected to improve Australian wine's competitiveness and support further growth.

## Competitors

 Despite the aforementioned, over the medium term the value of Australian wine exports is projected to decline, due to increased competition from Chile, Argentina and South Africa.

Finally, it is important also to analyse the prospect for the product in terms of demand and possible drawbacks due to increasing competition.

Regarding the demand and according to the information published by ABARES, the China-Australia Free Trade agreement and the Pacific Trade Agreement would imply, in particular, an increase on the sales of wine to the Asian market in the short-term. However, in the medium to long term, the increasing competition from South America and Africa could slow down that growth. Additionally, the sales in the domestic market have remained relatively stable in recent years, despite the increase in population and income, which raises some concerns about future expansion of that market.

In discussions with local producers, the wine produced within the Macedon Ranges Shire is sold in niche markets and the product is well known for its high quality. This situation allows the Shire to continue developing their grapes-wine production, even when the national trend for that product does not seem to be clearly positive. This could potentially be enhanced with a view to investigating diversification and capitalising on the potential reduction in suitability in grape production in the future in Northern Victoria. Finally, in relation to prices, growing international competition could affect the Shire, although transport costs would continue to be an advantage for Australia. In that sense, it worth noting that the imports of wine have risen in the last years, although they are still a small proportion of the total wine supply (less than 10%).

In summary, the overall perspective for this grape/wine producing sector in the Shire is positive. This is despite concerns for the future suitability of cool climate varieties, as there are possibilities for other varieties, and the projections for good margins for the production and sale of wine in niche markets.

# **10.6.** Vegetable Forecast

To forecast the profitability of the *vegetable industry* in the Macedon Ranges Shire, the analysis was based on several steps. Initially, the gross margin achieved in 2016/17 was obtained (see Appendix II). This information generally applied to Australia as a whole, and was not validated with local experts and growers, so there is some possibility for under/overestimations. The results reported in Figure 10.10 shows evolution of variables determining vegetable margin out to 2050. Overall, the perspective for vegetables is positive. In particular, the LSA determines that climate change offers opportunities to obtain higher yields than those currently obtained. Despite higher costs forecasted, it is expected that the farmer incomes will increase into the future, supporting the industries profitability in the long term.

Table 10.4, show that in the last fiscal year vegetable producers obtained on average, a positive gross margin in the Shire. The margin obtained refers not just to the production of vegetables, but also to other complementary activities, since it is common that farmers grow vegetables (as the main product) together with other crops or livestock. As the information available does not disaggregate the costs of each activity, there is not an estimate of the vegetables' profitability independently. However, since most of the margin is derived from vegetables, there is a high level of confidence that the value reached is representative of the activity analysed.

Figure 10.10 shows evolution of variables determining vegetable margin out to 2050. Overall, the perspective for vegetables is positive. In particular, the LSA determines that climate change offers opportunities to obtain higher yields than those currently obtained. Despite higher costs forecasted, it is expected that the farmer incomes will increase into the future, supporting the industries profitability in the long term.

VEGETABLES   Margin 2016/17 - \$/ha					
VARIABLE	UNIT	VALUE			
Price	\$/ton	1,096			
Yield	Ton / ha	31			
Other incomes	\$/ha	3,221			
INCOME		36,845			
Fertiliser	\$/ha	1,788			
Chemicals	\$/ha	878			
Seeds	\$/ha	2,127			
Freight	\$/ha	1,649			
Contracts (1)	\$/ha	5,871			
Labour	\$/ha	4,284			
Fuel, oil and grease	\$/ha	1,187			
Electricity	\$/ha	678			
Repairs & mantainance	\$/ha	1,988			
Packing charges &	ć/ha	2 620			
materials	Ş/IId	2,620			
Other costs (2)	\$/ha	5,840			
COSTS		28,909			
MARGIN		7,936			

## Table 10.4. Vegetable Gross Margin 2016/17

Notes: (1) Includes harvesting. (2) Comprise a large proportion of total cash costs, but individually the components are small overall and are not listed.



## TECHNICAL REPORT - ECONOMIC ANALYSIS

Figure 10.10. Evolution of variables influencing vegetable margin

The gross margin for vegetables covers the whole study region (considering the average yield). However, the results obtained by producers can vary considerably depending on locally specific factors, such as biophysical conditions. Figure 10.11 displays the different margins obtained as a function of such conditions (soil, landscape and climate) for the historic, 2030 and 2050 climate scenarios.

The maps reflect the dispersion of yield that could be achieved across Macedon Ranges and therefore, the expected variability of gross margins. In the case of vegetables the profits would be positive in all areas.



Figure 10.11. Vegetable Economic Profitability (left panel: historic, centre panel: 2030 and right panel: 2050)

As in the previous analyses, three additional scenarios were developed to forecast Gross Margins to account for the high levels of uncertainty when working with future prices, costs and variables (see Figure 10.6).

*Scenario 1* estimated an average price for grapes 5% lower than considered in the baseline scenario. As a consequence, the margins obtained during the forecasted period are naturally lower than in the baseline situation, but they are still positive.

*Scenario 2* considered the exchange rate remaining around the current value throughout the forecast period. This scenario leads to lower costs (through a reduction of the price of fuels, fertilisers and agrochemicals measured in Australian dollars). As a consequence, the gross margin in this scenario is greater than the baseline scenario.

*Scenario 3* assumed higher water prices than in the baseline case (20% greater). Since water costs still represent a small portion of total costs, the increase of this variable does not result in a significant decrease in margins.



Figure 10.12. Vegetable Forecasting Scenarios



- Australian vegetable farms mostly produce for the domestic market. Hence, vegetable prices are influenced by changes in the domestic supply and demand. Supply has a stronger influence on prices than demand in the short term. Consumer demand for vegetables tends to be relatively steady.
- In the medium/long term, population growth and the continuation of the recent trend towards more local and healthy sources of food, would lead to a sustain increase in food demand. At the same time, the expansion of urban developments would result in a reduction of food supply. Both drivers would determine higher fresh food prices.
- The market price for some vegetables can fluctuate significantly over the year and returns generated from the sale of vegetables can be influenced by the timing of harvest. Most vegetables (unlike grains) cannot be stored on-farm until prices improve.

Finally, it is important also to analyse the prospect for the product in terms of demand and possible drawbacks due to increasing competition.

The domestic supply and demand of vegetables play a key role in vegetables prices and economic results. In the long run, with a growing and increasingly 'health conscious' population, the prospect for this product looks positive.

# 10.7. Cattle (Beef) Margin Forecast

To forecast the profitability of the *cattle (beef) industry* in the Macedon Ranges Shire, the analysis was carried out in several steps. Initially, the gross margin achieved in 2016/17 was obtained (see Appendix II). This information generally applied to Australia as a whole, and was not validated with local experts and growers, so there is some possibility for under/overestimations. The results reported in Table 10.5, show that in the last fiscal year cattle producers obtained on average, a positive gross margin in the Shire. Such calculations correspond to a business with the characteristics described in Appendix VIII, which involves breeding and the first stages of feeding steers.

Figure 10.13 shows evolution of variables determining cattle's margin out to 2050. Overall, the long term perspective does not seem particularly favourable, due to increasing costs combined with relatively stable prices resulting in a downward margin trend. Cattle prices were forecasted considering the projection released by the International Monetary Fund (IMF) for beef export prices and their relationship with the price finally received by the farmer. This projects beef export prices, measured in American dollars, to remain stable in the long term, below the record reached in 2014, as a result of rising international competition. Therefore, the expected fluctuation for the domestic saleyard prices respond to the projected evolution of the Australian dollar in the baseline scenario. Despite the oscillations, the price would remain between \$ 3 and \$ 4 per live weight kg.

The forecasted margin supposes that the current technologies and practices remain in the future. Consequently, if the average weight of livestock continue to increase, as seen in the past, the margins projected could have a considerable improvement. Despite LSA results predicting climate may affect ryegrass and wheat yields, managerial changes could lead to greater rise in cattle weight than the projections show.

CATTLE (BEEF)   N	/largin 2016	/17 - \$/ha		
VARIABLE	HEADS	WEIGHT	PRICE	
Categories sold	#	Kg (LW)	\$/Kg (LW)	
Cows	10	550	2.4	
Youths	45	270	3.5	
Yearlings	31	400	3.2	
TOTAL INCOMES			95,036	
Veterinary & med	dicines (1)		1,926	
Freight	1,699			
Fuel, oil and grea	1,941			
Levis and commis	5,657			
Irrigation			4,804	
Pastures			32,693	
Wheat Hay			8,817	
Block/mineral mi	490			
Other costs (2)	1,194			
TOTAL COSTS	59,221			
TOTAL MARGIN	35,815			
MARGIN PER HA.			200	
Pastures - Ryegra	SS			
Kg/ha/year - D	5,720			
Sustainable le	60%			
Max. available	9.4			
Notes: (1) Includes costs of drench, ear tags, lice				

## Table 10.5. Beef Gross Margin 2016/17

Notes: (1) Includes costs of drench, ear tags, lice treatment and vaccines. (2) Includes insurances and other costs.



Figure 10.13. Evolution of variables influencing beef margin

The gross margin for cattle covers the whole Shire (considering the average yield for ryegrass and wheat). However, the results obtained by producers can vary considerably depending on locally specific factors, such as biophysical conditions. Figure 10.14Figure 10.5 displays the different margins obtained as a function of such conditions (soil, landscape and climate) for the historic, 2030 and 2050 climate scenarios.

The maps in that figure reflect the dispersion of yield that would be achieved across the Shire and therefore, the expected variability of gross margins. Unlike the previous products, in this case, the margin that would be obtained in many areas within the shire would be negative or very low over time.



Figure 10.14. Beef Economic Profitability (left panel: historic, centre panel: 2030 and right panel: 2050)

Three additional scenarios were developed to forecast Gross Margins to account for the high levels of uncertainty when working with future prices, costs and variables (see Figure 10.6).

*Scenario 1* estimated an average price for cattle 5% lower than considered in the baseline scenario. As a consequence, the margins obtained during the forecasted period are naturally lower than in the baseline situation, and become even negative towards the end of the forecast period.

*Scenario 2* considered the exchange rate remaining around the current value throughout the forecast period. This scenario leads to lower costs (through a reduction of the price of fuels, fertilisers and agrochemicals measured in Australian dollars). However, it also leads to lower sales prices, since they are determined in the international market in American dollars. The decline on prices would be higher than the costs reduction, resulting in a margin much more restricted than projected in the baseline scenario, tending become negative at the end of the forecast interval.

*Scenario 3* contemplated higher water prices than in the baseline case (20% greater). Since water costs still represent a small portion of total costs, the increase of this variable does not result in a significant decrease in margins.



Figure 10.15. Beef Forecasting Scenarios



- In the medium term Australian beef production and export volumes are expected to expand gradually, supported by strong income growth in major export markets and the stock rebuilding.
- Changes in consumers preferences (+ animal friendly), GHG emissions and 'clean / cultivated' meat may appear as a threat for the industry, but they can also signified an opportunity\*.

## **Competitors and Prices**

- As commented previously, beef prices measured in US\$ would remain relatively stable, below the record reached in 2014, as a result of rising international competition\*.
- US demand is expected to remain weak due to an increasing supply of domestically produced beef. Competition is also expected to increase from nations like Brazil and Uruguay.

\*Own comments. The rest of the comments come from Abares agricultural commodities report.

Finally, it is important also to analyse the prospect for the product in terms of demand and possible drawbacks due to increasing competition.

An increase in the sales to the external market (the major destination for this industry) is projected. Such expansion can be driven by strong income growth in main markets (Asian economies) and the national stock rebuilding. However, the increasing awareness about animal cruelty and GHG emissions may imply a reduction in the demand for meat. Nevertheless, changes in managerial practices can improve animal conditions, and the emission of gases can be reduced through changes in animal diets. Additionally, alternatives, such as the production of 'clean' meat (lab grown), which would appear as a substitute for traditional meat, it is still very expensive to produce.

An expansion of meat production in South America, where cattle prices are lower, is also expected to emerge as increasing competition. However, shorter distances to the Asian market can give Australia an advantage. Finally, beef production is also anticipated to grow in the United States, which would reduce their demand for Australian meats (which is traditionally one of the three main export markets).

Nevertheless, the overall perspective for this sector is stable, considering the forecasted gross margin, assuming that the demand remains strong and further expansion of production is supported, without compromising the profits.




Equine

Industry

National market

Breeding thoroughbred - mainly sold to trainers for the horse racing industry. Breeding other breeds - mainly sold to the public for recreational purposes. Breeding workhorses Operating stud farms

Horse racing

(Horse farming)

#### **Macedon Ranges**

- The national industry revenue grew at a 5.9% annual rate between 2012-17.
- Higher thoroughbred horse prices have supported industry revenue growth.
- In addition, export earnings have increased as a share of revenue.
- However, declining harness racing activity has reduced demand for standardbred horses. Demand for workhorses, such as the Australian stock horse, has also declined in line with rising use of technology on farms and worksites.
- The industry is expected to continue growing, although at lower rates due to falling demand from horse racing markets.
- The equine sector has also grown considerably in this region in recent years, driven by the closure of facilities in Melbourne and high land values in metropolitan areas.

Positive

- Horses are an important part of Macedon Ranges' culture and ethos and the shire wants to be seen as the 'Equine Capital of Australia'.
- 'Much of the equine industry operates in Farming Zone or Rural Conservation Zone'.
- Those zones do not cater to the needs of the business and present a significant barrier to investment'. <u>One of the core issues is the minimum</u> lot area of 40 hectares to use the land for a dwelling <u>as of right</u>. In fact, the equine industry can operate on significantly less than 40 hectares'.

The equine industry has grown considerably in the last years in the Shire and it is part of the local culture and ethos. Looking into the future, even when there are some factors that could limit its development (minimum lot area of 40 hectares), it is expected that the equine sector continue to grow supported by the demand for racehorses, although at a slower pace than in the past.

### 10.9. Results

In conclusion, the results indicate overwhelmingly, that cherries are the most profitable option, and are highly profitable across the entire Shire. However, it is not feasible to increase cherry production exponentially and across the entire Shire, so further analysis was done to identify key productive areas for either wine grapes or vegetables, as highly profitable industries in key locations.

Figure 10.16 illustrates areas that have the highest value for vegetables (green colour) and wine grapes (cream colour), with wine grapes highly profitable areas scattered around the north of the Shire and concentrated in the west and south west around Trentham and Bullengarook. Vegetables have a wider spread of highly profitable areas, although, mainly concentrated between Lancefield and Romsey, in the Rochford area.

Over time, the proportion of land where vegetables are of a higher value increases, with cherries maintaining the highest value across the entire Shire. By 2030, the Rochford area remains important for vegetables, with some expansion to the south of the Shire from Gisborne to Riddells Creek. As with the LSA results, the high value areas of wine grapes reduce, with key pockets around the Trentham area and Mt. Macedon remaining. By 2050, the entire Shire is highly valuable for vegetables, with cherries remaining the highest value and covering the entire Shire. There are scattered areas in the north that continue to be highly valuable for grapes.

The production of beef cattle was less profitable than the other three options in all scenarios across the entire Shire and was hence not mapped.

Both the biophysical and economic analyses demonstrated in this report and the accompanying LSA Technical Report, suggest that producing cherries, vegetables and/or grapes will be more profitable than beef cattle in the future. Importantly, they are also more labour intensive (see Section 11). Consequently, incentives to boost or facilitate the growth of those industries should be considered, in particular, to support new businesses.

Some limitations and barriers to entry in the horticulture and fruit industries include:

- If the production increases more than the demand, oversupply leads to a reduction of prices and therefore, margins.
- A large investment requirement in terms of infrastructure and machinery. For example, just the initial investment required to establish a cherry business is around \$ 55,000 per hectare and \$ 70,000 per hectare in the case of grapes (not including land price) (Department of Primary Industries, Parks, Water and Environment of Tasmania).
- Product maturing time can mean several years without income.
- Horticulture and fruit industries tend to be more volatile than cattle, in the sense that they are more vulnerable to climate and more risky. The development of insurance is an important instrument to mitigate that risk.

As mentioned previously, it is recommended that this analysis be undertaken for a broader range of industries to gain a more comprehensive picture of the opportunities available across the Shire.



Figure 10.16. High Value Production Areas

### 10.1. Discussion

In analysing agricultural productivity in *peri-urban areas* with rising populations, it is important to consider the increasing land demand and competition for uses. With changing population demographics in peri-urban areas, such as the Macedon Ranges Shire, land for residential, amenity and lifestyle usages need to be carefully assessed against the potential for such land for agricultural usage or biodiversity conservation.

According to the Peri-Urban Group of Rural Council's (2017), "many [...] developments have the potential to distort rural land prices, to further fragment agricultural landscapes already at risk from changing farming practices and create unrealistic expectations from new residents regarding infrastructure provision (e.g. road conditions, rubbish collection)". Indeed, growth and development does put upward pressure on the price of land, making agricultural production less attractive (compared to residential or recreational uses) and reducing the capacity of farmers to extend their production. Additionally, development can contribute to degrading landscapes and biodiversity, negatively affecting the resilience and sustainability of the area.

However, to account for significant and state-wide population growth, a balance between development and economic productivity, and the support of the agricultural sector needs to be established. Strategic land use planning, in order to find *'the right location'* for an activity is fundamental. In that sense, the Land Suitability Analysis carried out in this project provides relevant information to identify the most suitable land for agriculture and direct further resident growth to more marginal agricultural lands. However, the information in this document is research that can be used to inform other Council strategies.

Figure 10.17 illustrates, in a generic way, the competing priorities when comparing population growth with the economic productivity the agricultural sector can bring.

In the case of recreational or lifestyle land uses, the implementation of Strategic Foresight about potential future uses of land should be considered. The provision of lifestyle land uses, equine agistment for example, can be converted to food production if the need arises in the future. Dissimilar to this situation is residential development since the land occupied by housing and associated services loses its potential for food production.

Land price distortions can be a consequence of both residential and agricultural development. These can however be softened through governmental policies: subsidies to agriculture, purchases of strategic lands by the government, differential taxes (lower taxes for agriculture), other benefits (e.g. cheaper credits). The competing priorities amongst policies, and negative side-effects of unintended consequences are varied and not well understood. Nevertheless, governments can help to correct some 'market failures or distortions' and protect the most productive land for food production and conserve areas of important biodiversity, to avoid food security issues and promote a sustainable community.

Climate change projections for Macedon Ranges predict that expansion of agriculture is likely to be an opportunity in the future, but not necessarily in the entire region of the Shire. In fact, the analysis shows that traditional food producing areas to the north of the Shire would reduce in suitability. Nonetheless, there are significant opportunities for the Shire to capitalise on these projection.

#### **TECHNICAL REPORT – ECONOMIC ANALYSIS**



Figure 10.17. Competing priorities for agriculture and population growth

## **11. POTENTIAL OF AGRICULTURE TO GENERATE JOBS**

To complement the analysis of the economic productivity of the agricultural sector, an analysis was also undertaken on the possible impacts the previously discussed industries could have on job creation. Both the direct and indirect contribution to employment from the agricultural activities was calculated, by considering data from input-output tables (see Section 6.3). The impact of future technological changes on the primary sector is also briefly discussed in this section.

## 11.1. Employment – Agriculture, Forestry & Fishing

Table 11.1 displays the average number of jobs per 1,000 hectares of land in each primary activity. This information is used to determine the direct impact of the primary sector on the generation of employment. The table contains information for Uruguay, but the relative proportions between each activity is similar in Australia.

As expected, cherries, vegetables and grapes (measured as fruit, horticulture and viticulture) are more labour intensive than beef production. The average number of employees in the first three activities is around 150 people, while for beef the number is 5. Even considering, the most intensive beef cattle companies (those which work with more than 1 head per hectare), the employment numbers are only slightly higher, at 9 people per 1,000 hectares.

Therefore, increasing the number of hectares producing any of fruits, vegetables or viticulture not only generates more profit, but also has a positive social impact, via an increase in employment. Specifically, the employment is multiplied by approximately 30 when one hectare of beef is transitioned to one hectare of cherries, vegetables or grapes.

EWPLOTWENT PER PRIMARY ACTIVITY	
	JOBS per 1,000 Has
Forestry	2
Citrus	74
Other fruits	165
Viticulture	142
Horticulture	163
Cereals and Oilseeds (rice not included)	5
Rice	7
Nurseries and Seedlings	182
Beef Cattle	5
Milk Cattle	18
Sheep (meat and wool)	7
Horses	21
Pigs	119
Poultry	179
Other Animals	28
Agricultural Services	14
Agro tourism	32
Other	27
Total	7

BEEF CATTLE EMPLOYMENT	
Per level of Intensification	JOBS per 1,000 Has
< 0.7 cattle / ba	43
0.7 < cattle / ha < 1	4.5
cattle / ha > 1	8.9
Total	5

#### Table 11.1. Employment by Primary Activity

 $^{\ast}$  Based on information for Uruguay, MGAP (2011).

## **11.2.** The Agriculture sector's linkages with other sectors

### 11.2.1. Backward Linkages

As discussed previously (Section 6.3), the Input–Output Table identifies the connections between different industry sectors. The table shows Agriculture, Forestry and Fishing with an initial rise in output of \$ 100 million. Additionally, the sectors that have the greatest increase are manufacturing (primary activities need machinery for example, produced by the manufacturing industry) and professional, scientific and technical services. The total final effect of that initial change in agriculture is \$150 million, i.e. for an increase in primary activities by \$ 100 million, the total output in the economy increases to \$150 million. This total increase is due to the increase in the production of inputs required to support the agricultural expansion (e.g. a tractor), which is termed *'backward'* linkages.

Linked to the increase in the output is a rise in the employment. The Elasticity Analysis previously discussed (Section 6.3) estimates the number of jobs needed to produce the increased output. Table 11.2 displays employment multipliers - considering growth in all sectors - of the primary activities. *The employment multiplier of primary industries (mainly agriculture) in the Shire's economy is 1.7.* This means that for every 100 jobs created in Macedon Ranges in agriculture (and forestry and fishing – though not much exist in the study-region), another 70 jobs are also being created in the rest of the economy.

GRICULTURE, FORESTRY & FISHING				
oefficients obtained from the Input-Output Table - Aatrix of Total Requirements.	OUTPUT MULTIPLIER	•	Employment Elasticity to	⇒
	x \$100 Million		Output	
griculture, Forestry and Fishing	114		0.30	_
Aining	0		0.32	_
/Janufacturing	7		0.72	
lectricity, Gas, Water and Waste Services	2		-0.28	
Construction	4		0.42	
Vholesale Trade	4		-0.49	
tetail Trade	2		0.32	
Accommodation and Food Services	1		1.16	
ransport, Postal and Warehousing	3		0.83	
nformation Media and Telecommunications	0		0.13	
inancial and Insurance Services	3		0.08	_
tental, Hiring and Real Estate Services	2		0.52	_
vofessional, Scientific and Technical Service	5		1.81	_
Idministrative and Support Services	1		1.05	_
ublic Administration and Safety	0		0.47	_
ducation and Training	0		1.23	_
lealth Care and Social Assistance	0		0.73	
Arts and Recreation Services	0		1.07	
Other Services	1		0.88	
otal	150			
mployment Multiplier				

#### Table 11.2. Agricultural Industry - Backward Linkages with other Industry Sectors

### 11.2.2. Forward Linkages

To increase the robustness of the study, forward linkages were also analysed to complement the backward linkage analysis. In this case, instead of considering the increase in demand for inputs that an increment in the primary sector would trigger, the rise in the production of the industries that buy their inputs from the agriculture, forestry and fishing sector are analysed.

In the case of the Macedon Ranges, after the initial increase in agricultural production, the industries that would see the largest subsequent increases of their products, are manufacturing and construction. This is mainly due to more raw material available.

For forward linkages, then, an increase of \$ 100 million in the primary sector's output, would lead to a rise in the production of other sectors (by providing the inputs they need) of \$ 163 million. Such growth also facilitates the creation of new jobs and in this case, *the multiplier effects is 1.8.* 

AGRICULTURE, FORESTRY & FISHING				
Coefficients obtained from the Input-Output Table	OUTPUT MULTIPLIER		Employment Elasticity to	•
	x \$100 Million	·	Output	
griculture, Forestry and Fishing	114		0.30	
Aining	0		0.32	
Manufacturing	36		0.72	
lectricity, Gas, Water and Waste Services	0		-0.28	
Construction	4		0.42	
/holesale Trade	1		-0.49	
etail Trade	1		0.32	
ccommodation and Food Services	2		1.16	
ransport, Postal and Warehousing	1		0.83	
formation Media and Telecommunications	0		0.13	
inancial and Insurance Services	0		0.08	
ental, Hiring and Real Estate Services	1		0.52	
rofessional, Scientific and Technical Service:	0		1.81	
dministrative and Support Services	0		1.05	_
ublic Administration and Safety	0		0.47	_
ducation and Training	0		1.23	_
ealth Care and Social Assistance	0		0.73	
and Recreation Services	1		1.07	
Other Services	1	_	0.88	
	160	r		
Utai	103			
mployment Multiplier				

#### Table 11.3. Agricultural Industry - Forward Linkages with other Industry Sectors

## **11.3.** Impact of Technological Changes

There is a lack of consideration of the impacts of technological advancement in analysis using historical trends to project employment. This is particularly relevant in agriculture, forestry and fishing as the advances in technology to assist and improve farm and management systems are many and significant.

Figure 11.1, shows that the increase in the primary production has resulted from rises in productivity and it is not highly correlated with neither capital nor labour increases.

Multi-factor productivity, as depicted in Figure 11.1 (blue bars), reflects the changes in efficiency with which farmers use inputs to produce outputs, and is largely driven by technological changes. Productivity growth is largely driven by technological advancements, and farmers can capitalise on these by investing in higher-yielding, pest and disease-resistant crop varieties, automated or streamlined planting and harvesting techniques, and better livestock genetics.



Figure 11.1. Cumulative Contributions to Value Added Output Growth (Agriculture, Forestry and Fishing) (Source: ABS (2016))

### 11.3.1. The Netherlands Model

Analysing the impacts of future technological change is, of course, a very difficult task. However, examining the Netherlands Model, as an example of an agricultural industry that already incorporates many new technologies, and places strategic priority on increasing usage, is useful in order to identify key learnings, for use in Australia.

'Australia is now only second to the Netherlands which has the longest record of economic growth, at 26 years.' (Australian Industry Report, 2016)

# Socio- economic indicators

Country Profile	
	2016
World view	
Population, total (millions)	17.02
Population growth (annual %)	0.5
Surface area (sq. km) (thousands)	41.5
GNI, PPP (current international \$) (billions)	850.39
GNI per capita, PPP (current international \$)	49,930
Economy	
GDP (current US\$) (billions)	777.23
GDP growth (annual %)	2.2
Inflation, GDP deflator (annual %)	0.6
Agriculture, value added (% of GDP)	2
Industry, value added (% of GDP)	20
Services, etc., value added (% of GDP)	78

Source: World Development Indicators (2018).

# Agriculture & Food sector

'The Netherlands is the world's second-largest exporter of agri-food products. For decades, the Dutch agriculture sector has succeeded in maintaining its lead over international competitors through continual investment in innovation in agri-food value chains. The Netherlands is a hotbed of R&D in the area of agri-food, due largely to the excellent knowledge infrastructure and close collaborations between knowledge institutes, government and the private sector, the so-called "golden triangle". Key R&D centres include Wageningen University and Research Centre (WUR), the Top Institute Food & Nutrition and the public-private innovation program FND+. Some 12 out of the 40 largest Food & Beverage companies in the world have R&D facilities located in the Netherlands. WUR is the foremost university in Europe in the field of agriculture, and second in the world'

'Horticulture is by far the most important segment within the agricultural sector.' 'Holland is a leading innovator for rooftop farms and floating farms.'

Source: Holland trade and invest (2017).

The agriculture, forestry and fishing output multipliers for the Netherlands are higher than for Macedon Ranges suggesting that even if the overall importance of the agricultural sector reduces (due to the increase of service sectors), the spill on effects are likely to be greater in the future. Furthermore, although the direct employment in the primary activities do not increase strongly, the jobs developed in other sectors associated with agriculture could rise, such as technology, chemistry, science, and education.

See Appendix IX for disaggregation of the multiplier in the Netherlands Model.

### 11.4. Discussion

This analysis shows the potential for agriculture to generate jobs in the Macedon Ranges could be increased by adjusting the approach to agriculture across the Shire. An understanding of strategic, high value commodities, and the optimal locations to develop these, as well as incorporating technological advances into farming systems, will greatly benefit the local agricultural industry, helping to generate more incomes and jobs in the Shire.

In particular, labour intensive industries, could be key to capitalise on agriculture's potential. For every unit of land that currently produced beef cattle, and that is changed to cherries, vegetables or grapes, the number of jobs could be multiplied by 30. However, as mentioned, this analysis does not taken into account the economic and technological barrier to starting these businesses.

Also, the analysis does not account for other elements that are intrinsic to the farming experience, such as traditions, previous knowledge and experience, risk aversion, administrative regulations, among others. These, and individual practices and decision making could lead to different results than those derived from the previous analysis. Considering this, it is very difficult to estimate a precise number of hectares for the expansion of horticulture, viticulture and cherries production nor is it possible to arrive at a precise number of jobs that may be created. It is however clear that the number would be significantly higher than in the considered baseline in this study.

The indirect impacts on job creation of an expansion in the agricultural industry should also be considered. In particular, the effects of technological advancement, such is the case in the Netherlands. Again, it is difficult to arrive at a specific number of jobs that can be created, but it is also certain to be higher than the considered baseline.

Finally, it is important to mention the concept of the 'circular economy', which aims at building *resilience* in the region of concern as well as generating business and employment opportunities. Agriculture offers many options to realise this, some of which are already being undertaken, such as recycled water for irrigation use. There are opportunities to build on this, with the application of innovative ideas such as the reuse of wastewater in fertiliser production, processing facilities for new industry creation (tomato) and other recycling and reuse opportunities from paper or wood, captured in responses to the residential survey.

## **12. CONCLUSION**

The main purpose of this project was to analyse the potential of the Macedon Ranges Shire to create jobs in the next 20 years – i.e. by 2036. The most important conclusions of the study are summarised below:

- By 2036\_there is projected to be around **19,100 local jobs in the Macedon Ranges Shire**. It signifies an increase of around 50% from the current local employment and an annual average rise of approximately 2%.
- From a sectorial perspective, most employment growth can be linked to the continued expansion of services.
- Regarding *employment by location*, it is expected an expansion in all of the areas, varying from around 40% in Romsey and Riddells Creek, to 70% in the Macedon statistical area.
- It is estimated that most in demand *occupation* in the future will be professionals.
  - Based on an understanding from the residential survey, providing appropriate working conditions (pay, flexibility) is a key requirement of potential employees. If these conditions are met, the analysis shows there should be adequate numbers of professionals within the Shire to account for business demand.
  - By the same token, it is likely that community and personal services and labourers will be underrepresented by business demand. Support for industry and business requiring these employees could be directed to rectify this.
  - Similarly, local technicians and trades workers, managers and clerical and administrative workers may be in surplus to requirements in the future according to business demands.
- There does not appear to be a significant difference in the availability of more or less *skilled*, *or qualified*, persons, nor is there a clear preference for either of these.
- In relation to the *infrastructure and services* needed to support the expected growth, access to telecommunications was by far the most demanded resource both by businesses and residents.
- With respect to the agricultural analyses via a Case Study, the results shows that cherries are always the most profitable option. The second best option are vegetables or grapes, with vegetables becoming more widespread and high value out to 2050. Beef cattle was in all cases the least profitable.
- Increasing the number of hectares designated to cherries, vegetables or grapes, generates more profit and a resulting increase in employment. In this higher fruit and vegetable horticulture model employment numbers could be even higher than initially forecasted (considering both their direct and indirect effects), increasing by as much to 30 times the initial forecast.

## **13. REFERENCES**

Abares (2018), 'Agricultural productivity estimates', Abares, <u>http://www.agriculture.gov.au/abares/research-topics/productivity/agricultural-productivity-estimates</u>

ABS (2018), 'Estimates of Industry Multifactor Productivity', ABS <u>http://www.abs.gov.au/ausstats/abs@.nsf/0/E95A0098761C9EC9CA25807D00172D73?Opendocum</u> ent

Australian Government (2016), 'Economic conditions', Australian Industry Report, chapter 2.

BLS (2018), 'Employment Projections', Bureau of Labor Statistics <u>https://www.bls.gov/emp/ep\_projections\_methods.htm</u>

Department of Employment (2018), 'Employment Projections', Labour Market Information Portal, <u>http://lmip.gov.au/default.aspx?LMIP/EmploymentProjections</u>

Faggian, R, Johnson, MM, Sposito, V & Romeijn, H (2016), 'Technical Report: Fruit Production', CeRRF, Deakin University.

Ghofrani, Z., Sposito, V., & Faggian, R. (2017), 'A Comprehensive Review of Blue-Green Infrastructure Concepts', International Journal of Environment and Sustainability, 6(1).

Hollandtradeandinvest(2017),'HollandCompared'.https://investinholland.com/nfiamedia/2015/05/HollandCompared2nd-edition-2017.pdf

IBIS World (2018), 'Horse Farming – Australia Market Research Report'. IBIS World, <u>https://www.ibisworld.com.au/industry-trends/market-research-reports/agriculture-forestry-fishing/agriculture/horse-farming.html</u>

.id the population experts (2018), 'Demographic insights, tips and news from the population experts', <u>https://blog.id.com.au/category/economic-analysis/</u>

ILO (2005), 'Trends in the employment intensity of economic growth', International Labour Organisation,

http://bancadati.italialavoro.it/bdds/download?fileName=C\_21\_Strumento\_1721\_documenti\_itemN ame\_1\_documento.pdf&uid=cd9824ae-ef89-4742-adce-16113f0fa310

Job Outlook (2018), 'Future Outlook', Job Outlook, Australian Government, <u>http://joboutlook.gov.au/FutureOfWork.aspx</u>

Macedon Ranges Shire Council (2012), 'Equine Strategy for 2012 – 2016'.

MGAP (2011), 'Censo general agropecuario 2011, Resultados definitivos', Estadísticas Agropecuarias, DIEA, MGAP.

Peri Urban Group of Rural Council (2017), 'Supporting Agriculture In The Peri Urban Region', Peri Urban Group of Rural Council's Discussion Paper.

Prinsley, R. T., & Baranyai, K. (2013). STEM skills in the workforce: what do employers want?. Office of the Chief Scientist.

CeRRF, Deakin University – Technical Report – Economic Analysis

WorldDevelopmentIndicators(2018),'CountryProfile,Netherlands',<a href="http://databank.worldbank.org/data/Views/Reports/ReportWidgetCustom.aspx?Report\_Name=CountryProfile&Id=b450fd57&tbar=y&dd=y&inf=n&zm=n&country=NLD">http://databank.worldbank.org/data/Views/Reports/ReportWidgetCustom.aspx?Report\_Name=CountryProfile&Id=b450fd57&tbar=y&dd=y&inf=n&zm=n&country=NLD

## 14. APPENDIX I - ACRONYMS

TERM / INITIALS	MEANING
LSA	Land Suitability Analysis
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
RBA	Reserve Bank of Australia
BLS	Bureau of Labor Statistics - EEUU
ABS	Australian Bureau of Statistics
IMF	International Monetary Fund
WB	World Bank
SAGIT	SA Grain Growers Funding Research Solutions
GRDC	Grains Research & Development Corporation
PIRSA	Primary Industries & Regions SA

## **15. APPENDIX II – DATA SOURCES**

DATA SOURCES		
MACROECONON		
GDP		ABARES (Macroeconomic Indicators tables) and RBA (Economic and Financial Statistics)
CPI Australia		ABARES (Macroeconomic Indicators tables) and RBA (Economic and Financial Statistics)
CPI United Stat	es	BLS (Databases, Tables & Calculators by Subject)
Exchange Rate		ABARES (Macroeconomic Indicators tables) and RBA (Economic and Financial Statistics)
Wages		ABS (Wage price index) and ABARES (Rural Wages - Farm Inputs tables)
Fuel		ABARES (Farm Inputs tables) and IMF (Primary Commodity Prices Forecast)
Fertiliser & agr	ochemicals	ABARES (Farm Inputs tables) and WB (Commodities Price Forecast)
SECTORIAL VARI	ABLES	
CHERRIES		
Incomes	Yields	CeRRF (LSA - Land Suitability Analysis), ABS and Local Consultation
	Prices	FAOSTAT and Local Consultation
Costs		Department of Primary Industries, Parks, Water and Environment of Tasmania and AK
		Consultants (Profitability and Gross Margin Analysis)
GRAPES		
Incomes	Yields	CeRRF (LSA - Land Suitability Analysis), Abares and Local Consultation
	Prices	Wine Australia and Local Consultation
Costs		Department of Primary Industries, Parks, Water and Environment of Tasmania and AK Consultants (Profitability and Gross Margin Analysis)
VEGETABLES		
Incomes	Yields	CeRRF (LSA - Land Suitability Analysis) and Abares (Australian vegetable growing farms: an economic survey)
	Prices	Abares (Australian vegetable growing farms: an economic survey)
Costs		Abares (Australian vegetable growing farms: an economic survey)
CATTLE (BEEF)		
Incomes		MLA and SAGIT, GRDC, PIRSA and Government Of South Australia
Costs		SAGIT, GRDC, PIRSA and Primary Industries and Regions SA - Government of South
		Australia (Farm Gross Margin Guide)
PASTURES		
Incomes		SAGIT, GRDC, PIRSA and Government Of South Australia
Costs		SAGIT, GRDC, PIRSA and Primary Industries and Regions SA - Government of South
		Australia (Farm Gross Margin Guide)
WHEAT FOR HA	ΑY	
Incomes		SAGIT, GRDC, PIRSA and Government Of South Australia
Costs		SAGIT, GRDC, PIRSA and Primary Industries and Regions SA - Government of South
		Australia (Farm Gross Margin Guide)

## **16. APPENDIX III – THE MULTIPLIER EFFECT**

# Appendix 3 – Illustration of the direct, indirect and induced effects The multiplier effect



diminishing rounds of spending

If direct employment generation = 10 and total generation = 20  $\rightarrow$  <u>Multiplier</u> = 2

# **17.** APPENDIX IV – MATRIX OF DIRECT REQUIREMENTS

Matrix A - Matrix of Te	echnical C	Coefficie	ents or D	irect Req	uiremen	t													
	Agriculture,			Electricity,				Accommoda	Transport,	Information	Financial &	Rental,	Professiona	I Administrati	Public		Health Care	Arts &	
	Forestry &	Mining	Manufacturi	Gas, Water & Waste	Constructio	Wholesale	Retail Trade	tion & Food	Postal & Warehousin	Media & Telecommu	Insurance	Hiring & Real Estate	, Scientific &	& ve & Support	Administrati	Education &	& Social	Recreation	Other
INDUSTRIES	Fishing		ng	Services		ITaue		Services	g	nications	Services	Services	Services	Services	on & Safety	rraining	Assistance	Services	Services
Agriculture, Forestry & Fishing	0.12	0.00	0.08	3 0.00	0.00	0.00	0.01	0.01	0.00	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	) 0.0:	1 0.00
Mining	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manufacturing	0.05	0.04	0.07	7 0.01	1 0.08	3 0.02	0.02	0.10	0.06	5 0.0	2 0.0	0.00	0.0	1 0.02	L 0.01	0.01	. 0.02	2 0.0	5 0.15
Electricity, Gas, Water & Waste																			
Services	0.01	0.02	0.01	L 0.14	4 0.00	0.00	0.01	0.01	0.00	0.0	0.0	0.00	0.0	1 0.02	l 0.01	0.00	0.00	0.0	1 0.00
Construction	0.02	0.04	0.00	0.04	1 0.26	5 0.02	0.01	0.01	0.01	1 0.0	1 0.0	1 0.04	4 0.02	2 0.02	1 0.04	0.00	0.00	0.0	1 0.01
Wholesale Trade	0.03	0.02	0.02	2 0.01	1 0.02	2 0.02	0.01	0.02	. 0.02	2 0.0	1 0.0	1 0.00	0.0	1 0.02	2 0.01	0.01	. 0.02	2 0.03	3 0.04
Retail Trade	0.01	0.01	. 0.01	L 0.00	0.01	L 0.01	0.01	0.01	0.02	2 0.0	0.0	0.00	0.00	0.02	1 0.00	0.01	. 0.01	L 0.03	3 0.02
Accommodation & Food Services	0.00	0.01	. 0.00	0.00	0.01	L 0.01	0.01	0.00	0.01	1 0.0	0 0.0	0.00	0.0	1 0.02	1 0.01	0.00	0.01	L 0.03	1 0.00
Transport, Postal & Warehousing	0.02	0.01	. 0.02	2 0.00	0.02	2 0.04	0.01	0.01	0.08	B 0.0	1 0.0	1 0.00	0.0	1 0.02	2 0.01	0.01	. 0.01	L 0.0	1 0.01
Information Media &																			
Telecommunications	0.00	0.00	0.00	0.00	0.00	0.01	. 0.02	0.00	0.01	1 0.0	6 0.0	0.00	0.02	2 0.02	2 0.01	0.01	. 0.00	0.0	1 0.01
Financial & Insurance Services	0.02	0.02	0.00	0.04	4 0.01	L 0.01	. 0.01	. 0.01	. 0.02	2 0.0	1 0.0	9 0.06	5 0.02	2 0.02	1 0.02	0.01	. 0.01	L 0.00	0.01
Rental, Hiring & Real Estate																			
Services	0.01	0.02	. 0.00	0.00	0.02	2 0.06	6 0.05	6 0.04	0.02	2 0.0	1 0.0	1 0.03	3 0.02	2 0.05	5 0.02	2 0.01	. 0.01	L 0.03	3 0.02
Professional, Scientific &	0.02	0.02							0.01	- 0.0	- 00	c 0.07					0.07		- 0.00
Administrative & Support	0.03	0.02	0.01	L 0.02	2 0.04	1 0.06	0.06	0.01	0.05	5 0.0	5 0.0	o 0.02	2 0.1	/ 0.08	3 0.06	0.02	0.02	2 0.0	/ 0.03
Services	0.00	0.00	0.01	0.01	1 0.01	0.02	0.01	0.03	0.02	<b>,</b>	1 0.0	2 0.01	1 0.03	3 0.0/	1 0.01	0.01	0.07	0 0	1 0.01
Public Administration & Safety	0.00	0.00							0.02	1 0.0	n 0.0.			1 0.0-	1 0.07	0.01	. 0.02	0.0	- 0.01
Education & Training	0.00	0.00								1 0.0	0.0						. 0.00		
Health Care & Social Assistance	0.00	0.00								, 0.0		1 0.00							0.00
Arts & Recreation Services	0.00	0.00									1 0.0						, 0.00		
Ather Services	0.00	0.00	0.00				0.00	0.00		- 0.0	1 0.0			J U.U		0.01	. 0.00		5 U.UU
	0.01	0.01	. 0.00	0.01	L 0.01	L 0.01	0.01	0.00	0.05	5 0.0	I 0.0	J 0.00	0.0	L 0.0.	L 0.00	0.00	0.01	L 0.00	0.01

Direct Requirements Matrix. Shows the first round of inputs required to produce another dollar of output

## **18.** APPENDIX V – MATRIX OF TOTAL REQUIREMENTS

## (I - A)-1 - Total Requirement Coefficients (Direct and Indirect) - Output multipliers

	Aariculture.			Electricity,				Accommoda	T ransport,	Information	Financial &	Rental,	Professiona	l Administrati	Public		Health Care	Arts &	
	Forestry &	Mining	Manufacturi	Gas, Water & Wasto	Constructio	Wholesale Trade	Retail Trade	tion & Food	Postal & Warehousin	Media &	Insurance	Hiring & Real Estate	, Scientific a	& ve & Support	Administrati	Education &	& Social	Recreation	Other Services
INDUSTRIES	Fishing		ng	Services		Trade		Services	q	nications	Services	Services	Services	Services	on & Safety	Training	Assistance	Services	Jervices
Agriculture, Forestry & Fishing	1.14	0.01	0.10	0.00	0.01	I 0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.02	0.02
Mining	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00
Manufacturing	0.07	0.06	1.09	A 0.03	0.13	3 0.04	0.03	0.00	0.08	0.03	3 0.01	0.01	0.0	2 0.02		> 0.02	0.03	0.07	0.18
Electricity, Gas, Water & Waste	0.07	0.00	2.03		0.10		0.00	0.11	0.00	0.00				- 0.01			0.00	0.07	0.10
Services	0.02	0.03	0.01	l 1.17	0.01	L 0.01	0.01	0.02	0.01	0.01	L 0.00	0.01	0.0	1 0.01	L 0.02	2 0.00	0.01	0.01	0.01
Construction	0.04	0.06	0.01	L 0.06	1.35	5 0.04	0.02	0.02	0.03	0.01	L 0.01	L 0.06	0.0	3 0.03	3 0.06	5 0.01	0.01	0.02	0.02
Wholesale Trade	0.04	0.02	0.03	3 0.01	0.04	1 1.03	0.02	0.03	0.03	0.02	2 0.01	L 0.01	0.0	2 0.02	0.01	L 0.01	0.02	0.04	0.05
Retail Trade	0.02	0.01	0.01	L 0.01	0.02	0.01	1.01	0.01	0.03	0.01	L 0.00	0.00	0.0	1 0.01	L 0.01	L 0.01	0.01	0.03	0.02
Accommodation & Food Services	0.01	0.01	0.01	L 0.00	0.01	L 0.01	0.01	1.01	0.01	0.01	L 0.01	L 0.00	0.0	2 0.02	2 0.01	L 0.01	0.01	0.01	0.01
Transport, Postal & Warehousing	0.03	0.02	0.03	3 0.01	0.03	3 0.05	0.02	0.02	1.10	0.01	L 0.01	L 0.01	. 0.0	2 0.02	2 0.02	2 0.01	0.01	0.02	0.02
Telecommunications	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.01	0.01	1.0	7 0.01		0.0	0.03	0 01	0.02	0.01	0.02	0.02
Financial & Insurance Services	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.01	0.01	0.01	1 1 1 1		, 0.0.			0.02	0.01	0.02	0.02
Rental, Hiring & Real Estate	0.03	0.02	0.01	0.05	0.02	2 0.03	0.02	0.02	0.03	0.01		0.07	0.0	5 0.02	. 0.03	0.01	0.01	0.01	0.02
Services	0.02	0.03	0.01	L 0.01	0.03	3 0.07	0.06	0.05	0.03	0.02	2 0.02	2 1.03	0.04	4 0.06	5 0.03	3 0.02	0.01	0.04	0.03
Professional, Scientific &																			
Technical Services Administrative & Support	0.05	0.04	0.03	3 0.04	0.08	3 0.08	0.08	0.03	0.08	0.08	3 0.08	3 0.04	1.2	1 0.12	2 0.09	0.03	0.03	0.11	0.06
Services	0.01	0.01	0.01	L 0.01	0.02	2 0.02	0.02	0.03	0.02	0.01	L 0.03	3 0.01	. 0.0	3 1.05	5 0.02	2 0.02	0.02	0.05	0.02
Public Administration & Safety	0.00	0.01	0.00	0.00	0.01	L 0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.0	1 0.01	L 1.02	0.01	0.00	0.01	0.01
Education & Training	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0 1.00	0.00	0.00	0.00
Health Care & Social Assistance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	L 0.00	0.0	0.00	0.00	0.00	1.00	0.00	0.00
Arts & Recreation Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	L 0.00	0.00	0.0	0.00	0.00	0.01	0.00	1.09	0.00
Other Services	0.01	0.01	0.01	L 0.01	0.01	L 0.01	0.01	0.00	0.05	0.01	L 0.00	0.00	0.0	1 0.02	2 0.01	L 0.00	0.01	0.01	1.01
TOTAL	1.50	1.33	1.36	5 1.43	1.78	3 1.44	1.36	1.38	1.54	1.31	L 1.33	3 1.27	1.4	9 1.45	5 1.37	7 1.20	1.21	1.55	1.49

Total Requirement Matrix. Shows both the first and the subsequent rounds of inputs required to produce another dollar of output.

## **19. APPENDIX VI – INPUT – OUTPUT ANALYSIS ASSUMPTIONS**

- Lack of supply-side constraints: It is assumed that there is idle capacity and therefore, all the expansion of aggregate demand is attended with an increase in the production, being constant the proportion of demand that is satisfied with imports.
- *Prices* are assumed to be fixed: a constraint on the availability of inputs would lead to an increase on prices. Anyway, since it is assumed that there are no supply constraints, prices remain constant.
- The technical coefficients are assumed to be fixed: input structure in each industry is fixed.

## 20. APPENDIX VII – MACROECONOMIC VARIABLES ASSUMPTIONS

### **CPI – Consumer Price Index**

It was assumed that consumer prices will continue to grow at a 2.5% annual rate (the annual average growth shown in the last three decades).

## **CPI - Consumer Price Index**





Annual growth rate



### **Real Exchange Rate**

It was applied a Purchasing Power Parity model (PPP), which assumes that the exchange rate between two countries will adjust to ensure that purchasing power is the same in both countries.

That means that despite the real exchange rate has cyclical fluctuations (the country is temporarily expensive or cheap), it tends to return to a long term equilibrium average.

# **Real Exchange Rate**



# **Real Exchange Rate**

Annual growth rate



#### **Nominal Exchange Rate**







#### **Alternative Nominal Exchange Rate**

This graph shows the evolution assumed for the nominal exchange rate in the alternative future scenario.



CeRRF, Deakin University – Technical Report – Economic Analysis

### Nominal Wage Price Index (NWPI)

It was assumed that nominal wages will continue to grow at a 3.4% annual rate (the annual average growth shown in the last two decades).



# **WPI - Nominal Wage Price Index**

# **WPI - Nominal Wage Price Index**

Annual growth rate



## Real Wage Price Index (RWPI)

Considering the forecasted CPI and NWPI, the real wages would continue to grow at an annual rate of less than 1%.

# WPI - Real Wage Price Index

Index 2011=100



# WPI - Nominal Wage Price Index

Annual growth rate 6% 4% 2% 0% -2% -4% 1999 2016 2033 2050

### **Real Gross Domestic Product**

It was assumed that the gross domestic product will continue to grow at a 3.0% real annual rate (its trend growth rate).

## **GDP - Real Gross Domestic Product**



# **GDP - Real Gross Domestic Product**



Annual growth rate

#### Fuel

Even when the IMF forecasts an increase of international fuel prices, as prices paid by farmers in Australia did not decrease as much as the international reference, lower rise is forecasted.



#### Fertiliser / Agrochemicals



1995 2000 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050

In a similar way, the price of fertiliser was forecasted considering the projection set by the World Bank. As there is no international reference for agrochemical prices, the forecast is based on the fertiliser' projection (fertiliser and agrochemical prices tend to evolve in the same direction).



## 21. APPENDIX VIII – CATTLE (BEEF) ASSUMPTIONS



### 22. APPENDIX IX – NETHERLANDS BACKWARD AND FORWARD LINKAGES

### **Backward Linkages**

### **Output Multipliers**

These figures should be multiplied by 100 to be comparable with the values for Australia.

INDUSTRIES	Agriculture	Forestry	Fishing	Extraction of oil and natural gas	Mineral extraction (no oil and gas)
Agriculture	1.23	0.01	0.01	0.00	0.00
Forestry	0.00	1.04	0.00	0.00	0.00
Fishing	0.00	0.00	1.00	0.00	0.00
Extraction of oil and natural gas	0.01	0.00	0.00	1.05	0.00
Mineral extraction (no oil and gas)	0.00	0.00	0.00	0.00	1.13
Food industry	0.20	0.00	0.04	0.00	0.00
Beverage industry	0.00	0.00	0.00	0.00	0.00
Tobacco industry	0.00	0.00	0.00	0.00	0.00
Textile, clothing, leather industry	0.00	0.00	0.00	0.00	0.00
Wood industry	0.00	0.03	0.00	0.00	0.00
paper industry	0.00	0.01	0.00	0.00	0.00
Graphic industry	0.00	0.00	0.00	0.00	0.00
Petroleum industry	0.01	0.01	0.07	0.00	0.01
Chemical industry	0.02	0.00	0.00	0.00	0.03
Pharmaceutical industry	0.00	0.00	0.00	0.00	0.00
Rubber and plastic product industry	0.00	0.00	0.00	0.00	0.00
Building materials industry	0.00	0.00	0.00	0.00	0.00
Basic metal industry	0.00	0.00	0.00	0.00	0.00
Metal products industry	0.01	0.04	0.01	0.00	0.01
Electrotechnical industry	0.00	0.00	0.00	0.00	0.01
Electrical equipment industry	0.00	0.00	0.00	0.00	0.00
Machine industry	0.01	0.04	0.00	0.00	0.01
Car and trailer industry	0.00	0.00	0.00	0.00	0.00
Other transport industry	0.00	0.00	0.01	0.00	0.00
Furniture industry	0.00	0.00	0.00	0.00	0.00
Other industry	0.00	0.07	0.00	0.00	0.00
Repair and installation of machines	0.03	0.06	0.03	0.01	0.01
Energy companies	0.02	0.04	0.02	0.07	0.03
Water companies	0.00	0.00	0.00	0.00	0.01
Sewerage, waste management and remediation	0.02	0.00	0.01	0.00	0.01
General construction and project development	0.01	0.01	0.01	0.00	0.00
Ground, water and road construction	0.00	0.04	0.00	0.01	0.02
Specialized construction	0.02	0.03	0.01	0.00	0.01
Car trade and repair	0.01	0.02	0.00	0.00	0.00
Wholesale and trade mediation	0.02	0.04	0.01	0.00	0.01
Retail trade (not in cars)	0.00	0.00	0.00	0.00	0.00
Land transport	0.01	0.00	0.01	0.00	0.01
Transport over water	0.00	0.00	0.00	0.00	0.00
Transport by air	0.00	0.02	0.00	0.00	0.00
Storage, transport services	0.01	0.00	0.03	0.00	0.00
Post and couriers	0.00	0.00	0.00	0.00	0.00

#### TECHNICAL REPORT – ECONOMIC ANALYSIS

Accommodation provision	0.00	0.00	0.00	0.00	0.00
Restaurants in cafés	0.00	0.01	0.00	0.00	0.00
Publishing	0.00	0.00	0.00	0.00	0.01
Film, TV en radio	0.00	0.00	0.00	0.00	0.00
Telecommunications	0.01	0.00	0.01	0.00	0.01
IT services	0.01	0.01	0.01	0.01	0.01
Services in the field of information	0.00	0.00	0.00	0.00	0.01
Banking	0.02	0.03	0.02	0.02	0.02
Insurers and pension funds	0.01	0.01	0.01	0.00	0.00
Other financial services	0.00	0.00	0.00	0.00	0.00
Rental and trade of real estate	0.01	0.06	0.01	0.00	0.01
Legal services and administration	0.02	0.00	0.01	0.00	0.02
Holdings and management consultancies	0.02	0.01	0.01	0.02	0.04
Architects, engineering firms and the like.	0.00	0.00	0.00	0.01	0.01
Research	0.00	0.00	0.00	0.00	0.00
Advertising and market research	0.00	0.00	0.00	0.00	0.01
Design, photography, translation agencies	0.00	0.00	0.00	0.00	0.01
Veterinary services	0.01	0.00	0.00	0.00	0.00
Rental of movable property	0.00	0.00	0.01	0.02	0.01
Employment agencies and job placement services	0.02	0.02	0.01	0.02	0.03
Travel agencies, travel organization and informatior	0.00	0.00	0.00	0.00	0.00
Security and investigation services	0.00	0.00	0.00	0.00	0.00
Cleaning companies, gardeners and the like.	0.00	0.01	0.00	0.00	0.01
Other business services	0.01	0.00	0.02	0.00	0.00
Public administration and government services	0.01	0.00	0.01	0.00	0.02
Education	0.00	0.00	0.00	0.00	0.00
healthcare	0.00	0.00	0.00	0.00	0.00
Care and well-being	0.00	0.00	0.00	0.00	0.00
Art, culture and games of chance	0.00	0.00	0.00	0.00	0.00
Sport and recreation	0.00	0.00	0.00	0.00	0.00
Ideal, interests, hobby clubs	0.00	0.00	0.00	0.00	0.00
Repair of consumer goods	0.00	0.00	0.00	0.00	0.00
Other personal services	0.00	0.00	0.00	0.00	0.00
Households with staff	0.00	0.00	0.00	0.00	0.00
Goods and services n.e.c.	0.00	0.00	0.00	0.00	0.00
TOTAL	1.81	1.70	1.42	1.31	1.57

## Forward Linkages

INDUSTRIES	Agriculture	-orestry	ishing	Extraction of bil and natural gas	Vineral extraction (no oil and gas)
Agriculture	1.23	0.00	0.00	0.02	0.03
Forestry	0.00	1.04	0.00	0.00	0.00
Fishing	0.00	0.00	1.00	0.00	0.00
Extraction of oil and natural gas	0.00	0.00	0.00	1.05	0.00
Mineral extraction (no oil and gas)	0.00	0.00	0.00	0.00	1.13
Food industry	0.47	0.00	0.06	0.02	0.03
Beverage industry	0.00	0.00	0.00	0.00	0.00
Tobacco industry	0.00	0.00	0.00	0.00	0.00
Textile, clothing, leather industry	0.00	0.00	0.00	0.00	0.00
Wood industry	0.00	0.08	0.00	0.00	0.00
paper industry	0.00	0.01	0.00	0.00	0.00
Graphic industry	0.00	0.00	0.00	0.00	0.00
Petroleum industry	0.00	0.00	0.00	0.03	0.00
Chemical industry	0.00	0.03	0.00	0.05	0.12
Pharmaceutical industry	0.00	0.00	0.00	0.00	0.00
Rubber and plastic product industry	0.00	0.00	0.00	0.00	0.00
Building materials industry	0.00	0.00	0.00	0.01	0.14
Basic metal industry	0.00	0.00	0.00	0.00	0.00
Metal products industry	0.00	0.00	0.00	0.00	0.00
Electrotechnical industry	0.00	0.00	0.00	0.00	0.00
Electrical equipment industry	0.00	0.00	0.00	0.00	0.00
Machine industry	0.00	0.00	0.00	0.00	0.00
Car and trailer industry	0.00	0.00	0.00	0.00	0.00
Other transport industry	0.00	0.00	0.00	0.00	0.00
Furniture industry	0.00	0.00	0.00	0.00	0.00
Other industry	0.00	0.00	0.00	0.00	0.00
Repair and installation of machines	0.00	0.00	0.00	0.00	0.00
Energy companies	0.00	0.00	0.00	0.01	0.01
Water companies	0.00	0.00	0.00	0.00	0.00
Sewerage, waste management and remediation	0.00	0.00	0.00	0.00	0.00
General construction and project development	0.00	0.03	0.00	0.00	0.18
Ground, water and road construction	0.00	0.00	0.00	0.00	0.20
Specialized construction	0.00	0.01	0.00	0.00	0.13
Car trade and repair	0.00	0.00	0.00	0.00	0.00
Wholesale and trade mediation	0.01	0.01	0.00	0.01	0.06
Retail trade (not in cars)	0.00	0.00	0.00	0.00	0.01
Land transport	0.01	0.00	0.00	0.00	0.00
Transport over water	0.00	0.00	0.00	0.00	0.00
Transport by air	0.00	0.00	0.00	0.00	0.00
Storage, transport services	0.00	0.00	0.00	0.00	0.01
Post and couriers	0.00	0.00	0.00	0.00	0.00

INDUSTRIES	Agriculture	Forestry	Fishing	Extraction of oil and natural gas	Mineral extraction (no oil and gas)
Accommodation provision	0.00	0.00	0.00	0.00	0.00
Restaurants in cafés	0.01	0.00	0.00	0.01	0.00
Publishing	0.00	0.00	0.00	0.00	0.00
Film, TV en radio	0.00	0.00	0.00	0.00	0.00
Telecommunications	0.00	0.00	0.00	0.00	0.00
IT services	0.00	0.00	0.00	0.00	0.00
Services in the field of information	0.00	0.00	0.00	0.00	0.00
Banking	0.00	0.00	0.00	0.00	0.00
Insurers and pension funds	0.00	0.00	0.00	0.00	0.00
Other financial services	0.00	0.00	0.00	0.00	0.00
Rental and trade of real estate	0.00	0.01	0.00	0.01	0.04
Legal services and administration	0.00	0.00	0.00	0.00	0.00
Holdings and management consultancies	0.00	0.00	0.00	0.00	0.01
Architects, engineering firms and the like.	0.00	0.00	0.00	0.00	0.01
Research	0.00	0.00	0.00	0.00	0.00
Advertising and market research	0.00	0.00	0.00	0.00	0.00
Design, photography, translation agencies	0.00	0.00	0.00	0.00	0.00
Veterinary services	0.00	0.00	0.00	0.00	0.00
Rental of movable property	0.00	0.00	0.00	0.00	0.00
Employment agencies and job placement services	0.00	0.00	0.00	0.00	0.00
Travel agencies, travel organization and informatior	0.00	0.00	0.00	0.00	0.00
Security and investigation services	0.00	0.00	0.00	0.00	0.00
Cleaning companies, gardeners and the like.	0.00	0.00	0.00	0.00	0.01
Other business services	0.00	0.00	0.00	0.00	0.00
Public administration and government services	0.01	0.02	0.01	0.01	0.06
Education	0.00	0.00	0.00	0.01	0.00
healthcare	0.00	0.00	0.00	0.00	0.00
Care and well-being	0.01	0.00	0.00	0.00	0.00
Art, culture and games of chance	0.00	0.00	0.00	0.00	0.00
Sport and recreation	0.00	0.00	0.00	0.00	0.00
Ideal, interests, hobby clubs	0.00	0.00	0.00	0.00	0.00
Repair of consumer goods	0.00	0.00	0.00	0.00	0.00
Other personal services	0.00	0.00	0.00	0.00	0.00
Households with staff	0.00	0.00	0.00	0.00	0.00
Goods and services n.e.c.	0.00	0.00	0.00	0.00	0.04
TOTAL	1.82	1.28	1.09	1.30	2.30