

# Economic Contribution of the Hunter Valley Wine Sector to the Hunter Valley Economy

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## Executive Summary

This report is an economic impact assessment of the Hunter Valley wine sector's direct and flow-on contribution to the Hunter Valley economy. It was prepared for Macquarie University, on behalf of wine makers in the Hunter Valley.

The Hunter Valley wine sector includes grape growing, wine making and wine-related tourism. The wine sector makes a direct and significant contribution to output, value-added, income and employment. In addition to the wine sector's direct economic contribution, the sector also makes a flow-on contribution via linkages to other businesses that supply goods and services required for grape growing, wine making and the wine tourism experience, as well as the goods and services demanded by employees.

Revenue, expenditure and employment profiles were developed for each of grape growing, wine making and wine related tourism. Input-Output analysis was then used to quantify both direct and flow-on output, value-added, income and employment for each of grape growing, wine making and wine related tourism. The total direct and flow-on impact of the Hunter Valley wine sector was then estimated, adjusting to eliminate double counting inherent in summation of individual sectors– Table E1.

**Table E1 Direct and Indirect Impact of the Total Wine Sector**

	<b>Direct Effect</b>	<b>Production Induced</b>	<b>Consumption Induced</b>	<b>Total Flow-on</b>	<b>TOTAL IMPACT</b>
<b>OUTPUT (\$M)</b>	340.88	96.15	65.16	161.32	502.20
<i>Type 11A Ratio</i>	1.00	0.28	0.19	0.47	1.47
<b>VALUE-ADDED (\$M)</b>	184.30	40.89	40.59	81.48	265.78
<i>Type 11A Ratio</i>	1.00	0.22	0.22	0.44	1.44
<b>INCOME (\$M)</b>	76.55	16.28	11.03	27.32	103.87
<i>Type 11A Ratio</i>	1.00	0.21	0.14	0.36	1.36
<b>EMPLOYMENT (No.)</b>	1,979	501	321	821	2,800
<i>Type 11A Ratio</i>	1.00	0.25	0.16	0.41	1.41

Because Input-Output modelling only examines backward linkages this analysis does not capture margins on wine sales through wholesale, retail and restaurant sales. Values for wine sales and grape sales are at the winery/farm gate. Inclusion of wholesale, retail and restaurant sales would make the estimates of total direct and flow-on contribution higher. This would require more detailed study, and access to (commercial) enterprise data by survey and interview. It also tends to be a more problematic study than one based on the use of publicly available data bases. Companies are traditionally reluctant to provide commercial data via surveys and interviews.

Input-Output analysis has shown that the Hunter Valley wine sector, defined as wine grape growing, wine making and wine related tourism:

- Contributes \$502M in gross output to the Hunter Valley economy. Gross output includes \$266M in value-added and \$104M in wages and salaries to full-time and part-time employment.
- Supports 2,800 full-time and part-time jobs in the Hunter Valley region. Jobs supported by the wine sector include direct employment of 1,979 within the sector and a further 821 full-time and part-time jobs due to flow-on effects. Estimates of full-time and part-time employment

are associated with economic activity linked to grape growing, wine making and wine tourism and do not include forward linkages such as employment in the retail sector.

Input-Output analysis has shown that the average effects of a contraction or expansion within the wine sector would be as follows:

- The Hunter Valley economy would gain an extra 0.41 jobs for every job gained in the wine sector.
- The economy would gain an extra \$0.47M for every additional \$1M of gross output generated by the wine sector.
- The economy would gain an extra \$0.44M in contribution to regional value-added for every additional \$1M of value-added generated by the wine sector.

In general terms this means that if the Hunter Valley wine sector could increase its sales and related activities by \$1 Million per year, it would generate an additional \$470,000 in regional value added activities. For every 2 jobs generated in the sector, an additional job is created elsewhere in the region.

If government policies were in place to boost current direct output by 10% (approximately an additional \$34 Million per year), then we could expect to see an additional \$16 Million added to the regional economy in the flow-on effect, and possibly an additional 200 jobs in the wine sector and 80 additional jobs in the region.

## **1. Introduction**

The Hunter Valley wine sector makes a significant contribution to the Hunter Valley economy. This includes the economic activity associated with grape growing in vineyards and wine production, and extends to the economic activity from wine related tourism. These three components of the Hunter Valley wine sector also have strong linkages to other sectors of the Hunter Valley economy, in particular the businesses that supply the goods and services required for grape growing, wine making and the wine tourism experience, as well as the goods and services demanded by employees.

Consequently, the contribution of the Hunter Valley wine sector to the Hunter Valley economy is greater than just its direct effects. It is this greater contribution of the combined elements of the local wine sector that is worth noting. Tourism, winemaking and grape production are inexorably linked in this region.

This report is an economic assessment of the wine sector's direct and indirect contribution to the Hunter Valley economy. It was prepared by Gillespie Economics and AgEconPlus for Macquarie University, on behalf of wine makers in the Hunter Valley.

Section 2 of the report locates the industry geographically and provides an overview of the nature and scope of the components of the Hunter Valley wine sector. Section 3 outlines the Input-Output (IO) modelling method used to examine the direct and indirect economic effects of the wine sector. Section 4 combines available data to develop a revenue, expenditure and employment profile for the grape growing, wine manufacturing and wine tourism sectors of the Hunter Valley economy. The modelling of these sectors to assess their flow-on effects for the economy is then reported in Section 5. Conclusions are provided in Section 6.

## 2. Hunter Valley Wine Sector Background

### 2.1 Locality

Hunter Valley Wine Country is defined in the Hunter Valley Wine Country Destination Management Plan as the geographical area within the Cessnock and Singleton Local Government Areas (LGAs) (Tourism Research Australia (TRA) 2016) – see Figure 1. The Hunter Valley is Australia’s oldest wine growing region. Vines were first planted in the area in the early 1820’s from cuttings brought by James Busby, the father of Australian wine.

**Figure 1 Hunter Valley Wine Area**

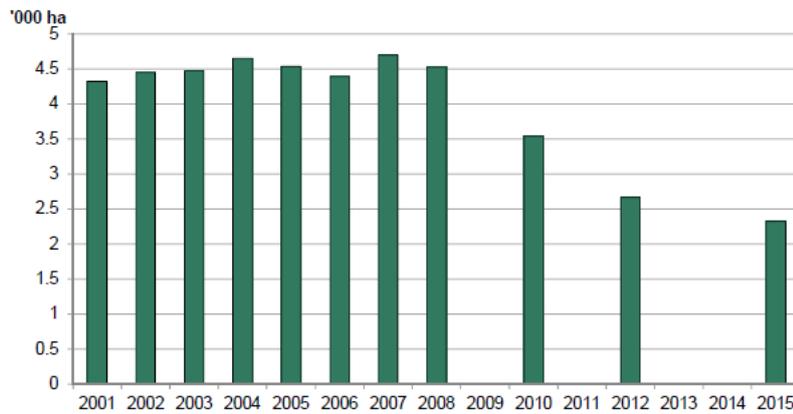


Source: TRA 2016

### 2.2 Wine Grape Growing

The total area of vineyards in the Hunter Valley in 2015 was 2,320 ha, down from over 4,500ha in 2007. 47% of plantings were red grape varieties and 53% were white grape varieties. The top five varieties by tonne produced in the Hunter Valley are Semillon, Chardonnay, Shiraz, Verdelho and Cabernet Sauvignon (Wine Australia 2016).

**Figure 2 Hunter Valley Vineyard Area**



Source: Wine Australia (2016)

Average grape yields per hectare for the region are approximately half the NSW average (NSW Department of Primary Industries 2013). In 2014-15 average Hunter Valley wine grape yield was 3.2 tonnes/ha (ABS 2015), with a higher yield for white wine grapes 4.1 tonnes/ha compared to red wine grapes (2.1/ha) (Wine Australia 2016).

The Hunter Valley benefits from relatively high annual rainfall and low evaporation rates compared to other warm climate wine areas. Consequently, not all vineyards are dependent on irrigation. Yields from vines of exceptional value may be sacrificed by restricting water in order to maximise desired characteristics. However, supplementary irrigation allows vignerons to adjust grape yields, the timing of harvest and wine characteristics (NSW Department of Primary Industries 2013).

## **2.3 Wine Making**

Wine production in the Hunter Valley is targeted at premium wine, rather than wine quantity. It produces between 2% and 3% of Australia's wine. The region has more than 150 premium wine makers across a small number of sub-regions – Broke, Fordwich, Lovedale, Mount View, Pokolbin and Wollombi Valley. (NSW Wine at <https://www.nswwine.com.au/hunter-valley/>).

The Hunter Valley's recognised branding and proximity to suppliers, domestic markets and export ports, attracts international winemaking expertise and creates attractive marketing options. Its wine heritage and reputation, rural landscapes and accessibility are key factors in supporting a vibrant domestic and international wine tourism sector (NSW Department of Primary Industries 2013).

## **2.4 Wine Tourism**

The Hunter Valley wine country is located within the Hunter Tourism Region. Tourism is an amalgam of activities across various industry sectors such as retail, accommodation, cafes and restaurants, cultural and recreational services. It is driven by final demand expenditure of domestic day visitors, domestic overnight visitors and international visitors.

## 2.5 Summary Statistics

Key Hunter Valley wine industry statistics assembled from various sources are summarised in Table 1.

**Table 1 Hunter Valley Wine Sector Statistics**

Measure	Year	Quantity	Unit	Source
<b>Wine Grape Growing</b>				
Wine grape vineyard area	2015	2,376	hectares	Wine Australia (2016)
Wine grape crush	2015	7,380	tonnes	Wine Australia (2016)
Gross value of wine grape sales	2015	8,752,680	\$	Wine Australia (2016)
Direct employment in grape growing	2016	155	number	ABS 2016 Census Employment by Industry 4 digit level
<b>Wine Making</b>				
Wine making enterprises	2017	150+	number	<a href="https://www.visitnsw.com/destinations/hunter/hunter-valley/hunter-valley-wines">https://www.visitnsw.com/destinations/hunter/hunter-valley/hunter-valley-wines</a>
Wine production	2010	25,000,000	litres	NSW Primary Industries (2013)
Sales value	2010	210,000,000	\$	NSW Primary Industries (2013)
Direct employment in wine making	2016	585	number	ABS 2016 Census Employment by Industry 4 digit level adjusted for 8% assumed employment in cider and other alcoholic beverages based on IBIS World 2015a)
<b>Wine Tourism</b>				
Domestic visitor nights	2014	2,316,000	number	TRA (2016)
Domestic visitor expenditure	2014	340,000,000	\$	TRA (2016)
International visitor nights	2014	126,000	number	TRA (2016)
International visitor expenditure		9,100,000	\$	TRA (2016)

The above summary statistics provide a foundation for analysis of the economic contribution of the Hunter Valley wine sector.

### 3. Input Output Modelling

There are two main methods that can be used to analyse the economic contribution of an industry, they are:

- IO analysis; and
- Computable general equilibrium (CGE) analysis.

However, the most appropriate method to use depends on what type of impact is being examined.

IO analysis can be used to:

- Develop a snapshot of an existing industry in a particular year including its direct and indirect linkages; or
- Assess the effects of a change or shock to the economy e.g. an expansion or contraction or a new activity.

CGE analysis is unsuitable for providing a snapshot of an existing industry and its inter-sectoral linkages and is more applicable to assessing the effects of a change or shock to the economy. For instance, NZIER (2014) used CGE to examine the impact of growth in the wine and grape industry in New Zealand compared to if growth had stagnated at 2008 levels. CGE modelling is also appropriate for examining the consequences of changes in government policies e.g. taxation and subsidies. However, for this study which is focused on providing a snapshot of an existing industry, IO analysis is used.

IO analysis is primarily concerned with the effect of an impacting agent e.g. an individual business or sector, on an economy in terms of a number of specific economic activity indicators, such as gross regional output, value-added, income and employment.

These indicators can be defined as follows:

- **Gross regional output** – the gross value of business turnover;
- **Value-added** (gross regional product) – the difference between the gross value of business turnover and the costs of the inputs of raw materials, components and services bought in to produce the gross regional output;
- **Income** – the wages paid to employees including imputed wages for self-employed and business owners; and
- **Employment** – the number of people employed (including full-time and part-time).

An impacting agent may be an existing activity within an economy e.g. an ongoing tourism venture, or may be a change to a local economy e.g. a new tourism development. In this study the impacting agent is the existing grape growing, wine making and wine tourism sectors.

The economy on which the impact is measured can range from a township to the entire nation (Powell *et al.*, 1985). This study is concerned with examining the impacts of the grape growing, wine making and wine tourism sectors on the Hunter Valley economy.

IO analysis essentially involves two steps:

- Construction of an appropriate IO table (regional transaction table) that can be used to identify the economic structure of a defined region and multipliers for each sector of the economy; and
- Identification of the initial impact or stimulus of an industry in a form that is compatible with the IO equations so that the IO multipliers and flow-on effects can then be estimated (Jensen and West, 1986).

For this study, a 2017 IO Table of the Hunter Valley economy was developed using the Generation of Regional Input-Output Table (GRIT) method developed by the University of Queensland and recognised internationally. The parent table for the analysis was a 2015/16 IO table for NSW.

Identification of the initial impact of the wine sector in a form compatible with the IO table required the development of a specific aggregate employment, revenue and expenditure profile for the grape growing sector, wine making sector and wine tourism sector, based on available industry information. For each of the grape growing sector and wine making sector, a specific intermediate IO sector was developed where:

- The estimated gross annual revenue was allocated to the output row;
- The estimated wage bill of employees (including imputed wages for the self-employed) was allocated to the household wages row;
- Non-wage local expenditure was initially allocated across the relevant 114 intermediate sectors in the economy;
- Purchaser prices for expenditure in each sector in the economies were adjusted to basic values and margins and taxes and allocated to appropriate sectors using relationships in the National Input-Output Tables;
- Allocation was then made between intermediate sectors and imports based on employment location quotients for each sector of the regional economy;
- The difference between total revenue and total costs was allocated to the other value-added row; and
- Direct employment was allocated to the employment row.

These sectors were inserted into the IO table to facilitate impact assessment.

As identified above, there is no intermediate sector in the IO table for tourism. Tourism relates to final demand expenditure on a range of goods and services across the 114 intermediate sectors of the economy. An expenditure profile for this final demand expenditure was developed based on the estimated total expenditure of domestic and international tourists, and the main categories of tourism expenditure. Purchaser prices for tourism expenditure in the economy were adjusted to basic values and margins and taxes and allocated to appropriate sectors using relationships in the National Input-Output Tables.

With new intermediate sectors for grape growing and wine making inserted into the IO table and a final demand expenditure for wine tourism developed, the computer program IO7 (Input-Output Analysis Version 7.1) was used to estimate the average annual direct and indirect output, value-added,

income and employment<sup>1</sup> impacts for each of the wine sector components. Indirect impacts are disaggregated into:

- Production-induced effects - economic activity from the purchase of goods and services that are used as an input into production or the wine tourism experience; and
- Consumption-induced effects - economic activity from the spending of employees of the wine sector and employees of those supplying inputs into production or the wine tourism experience.

In both cases, in addition to first-round purchases, there will be a series of indirect purchases as waves of second, third and subsequent-round effects make their way throughout the economy.

Ratio multipliers are reported in Section 5 for each of the components of the wine sector. These provide summary measures used for predicting the total impact on all industries in an economy from changes in the demand for the output of any one industry. They express indirect impacts or flow-ons in terms of the initial own sector effects e.g. employment flow-ons in relation to direct employment effects, output flow-ons in relation to direct output etc. Refer to Attachment 1 for a discussion of multipliers and the assumptions underpinning IO analysis.

Consideration is also given to aggregation of the impacts of each component being careful to avoid double counting. IO analysis examines backward linkages only. Consequently, because expenditure by tourists would include some expenditure on wine at the cellar door and expenditure by wine makers would include expenditure on grapes there would be double counting if the economic activity from each of the components of the wine sector were simply added together. Adjustment is required to expenditure profiles to remove double counting if the components of the wine sector are to be aggregated.

Because IO only examines backward linkages, this analysis does not capture margins on wine sales through wholesale and retail outlets. Values for wine sales and grape sales are at the farm/factory gate.

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<sup>1</sup> It is important to understand that the focus of IO analysis is on the economic stimulus provided by wine sector and not on the economic costs and benefits of the wine sector. Consideration of the economic costs and benefits of wine sector would require the undertaking of a benefit cost analysis. Like CGE analysis this would require the specification of a counterfactual.

## 4. Revenue, Expenditure and Employment Profiles for the Wine Sector

Section 4 develops revenue, expenditure and employment profiles for each of the components of the wine sector, to enable the subsequent estimation of their direct and indirect impacts on the Hunter Valley economy.

### 4.1 Wine Grape Growing

Total Hunter Valley wine grape growing revenue was estimated for 2015-16 using data from the Australian Wine Sector Survey, Wine Facts Snapshot (Wine Australia 2016) at \$8,752,680 (total Hunter Valley crush of 7,380 tonnes at a weighted average value of \$1,186/tonne) with an ABS wine grape growing area of 2,376 ha creating an average gross revenue of \$3,683/ha.

The gross revenue estimate of \$3,683/ha was aligned to industry gross margin budgets relevant to the Hunter Valley to provide a breakdown of industry expenditure. These data were then used to produce a total wine grape growing industry expenditure profile for the Hunter Valley – Table 2.

**Table 2 Wine Grape Growing Revenue and Expenditure Profile - Hunter Valley**

	<b>Average Gross Margin Hunter Valley (\$/ha)</b>	<b>Wine Grape Growing Industry Total Revenue and Expenditure – Hunter Valley</b>
<b>Revenue (A)</b>	<b>3,683</b>	<b>8,752,680</b>
Expenditure		
Farm labour	620	1,473,435
Contract labour	580	1,378,375
Fruit transport	200	475,302
Levies	75	178,238
Chemicals	510	1,212,019
Nutrition/fertiliser	146	346,970
Vineyard floor/canopy management	114	270,922
Sundry materials/supplies	116	275,675
Machinery expenses	172	408,759
Machinery fuel	180	427,771
Machinery hire	210	499,067
Water and drainage costs	550	1,307,080
Repairs and maintenance – vineyards	50	118,825
<b>Total expenditure (B)</b>	<b>3,523</b>	<b>8,372,439</b>
<b>Net revenue (A) less (B)</b>	<b>160</b>	<b>380,241</b>
<b>Employment</b>		<b>155 total *</b>

\*Expenditure breakdown was based on AgEconPlus and Gillespie Economics (2015) with adjustments based on Hunter conditions.

\*\* Employment data sourced from the ABS 4 digit 2016 census data for grape growing within the Cessnock and Singleton LGAs. The data was not adjusted for table grape and dried grape growing as these activities do not take place in the Hunter Valley.

Wine grape growing industry employment and income (wages) was estimated using the following data:

- 155 employed in all types of grape growing (ABS 2016, Census Employment by Industry 4 digit level). The data was not adjusted for table grape and dried grape growing as these activities do not take place in the Hunter Valley.

- Total wages exclude payment to contract labour – contract labour is recorded in the IO model in the ‘services to agriculture’ sector. Employment associated with contract labour is therefore captured in the employment ‘multiplier’.
- Total wages from Table 4.1 comprise ‘farm labour’ and ‘net revenue’ to reflect imputed wages from farm owners. Total wages are therefore estimated at \$1.9 million (\$1.5 million farm labour plus \$0.4 million net revenue).
- Average grape growing industry wage is therefore a modest \$11,959 per annum (total wages of \$1.9 million divided by 155 jobs). This estimate is broadly consistent with IBIS World (May, 2015) which estimated average grape growing wage for 2014-15 at \$17,021.

## 4.2 Wine Making

Hunter Valley total wine making revenue was estimated by the Hunter Valley Wine and Tourism Association in 2010 at 25 million litres with a total farm gate value of \$210 million (NSW Department of Primary Industries 2013). This level of wine production relies substantially on imported grapes from other grape growing regions.

Since this estimate was prepared the area of wine grape production in the Hunter Valley has decreased from 3,500 ha to 2,376 ha (Wine Australia 2016). On the basis of the lower local production area, annual wine production was estimated at 17 million litres with a total farm gate value of \$143 million or \$8.40/litre.<sup>2</sup>

Wine making production cost (expenditure) was sourced from Palousis (2015) and cross checked with the Winemakers’ Federation of Australia and Wine Australia Gross Margin Ready Reckoner (<http://www.wfa.org.au/resources/financial-ready-reckoner/>).

Table 3 provides a summary of estimated Hunter Valley average wine maker revenue and expenditure per saleable litre of wine along with the Hunter Valley wine making industry total.

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<sup>2</sup> Wine production was assumed to decline in proportion to the area of local grape production i.e. the ratio of imported to local produced grape production was held constant.

**Table 3 Wine Making Revenue and Expenditure Profile - Hunter Valley**

	<b>Average Revenue and Expenditure (\$/litre)</b>	<b>Wine Making Industry Total Revenue and Expenditure – Hunter Valley</b>
Revenue (sale price packaged)	8.40	142,800,000
Cost of packaging	1.79	30,430,000
<b>Revenue after packaging (A)</b>	<b>6.61</b>	<b>112,370,000</b>
Expenditure		
Winery labour	0.72	12,240,000
Grapes	1.26	21,420,000
Wine loss/waste treatment	0.13	2,210,000
Depreciation	0.22	3,740,000
Electricity/gas	0.08	1,360,000
Repairs and maintenance	0.10	1,700,000
Water	0.07	1,190,000
<b>Total cost (excluding packaging) (B)</b>	<b>2.58</b>	<b>43,860,000</b>
<b>Net revenue (A) less (B)</b>	<b>4.03</b>	<b>68,510,000</b>
<b>Employment</b>		<b>585 *</b>

\*Expenditure breakdown was sourced from Palousis (2015) and cross checked with the Winemakers' Federation of Australia and Wine Australia Gross Margin Ready Reckoner (<http://www.wfa.org.au/resources/financial-ready-reckoner/>).

\*\* ABS 4 digit census data for wine and other alcoholic beverage manufacturing (Table 2.7) less 8% associated with cider and other alcoholic beverage manufacture (IBIS World, May 2015a report cider and other alcoholic beverages at 8% of Australian and New Zealand Standard Industrial Classification total).

Wine making industry employment and income (wages) was estimated using the following data:

- 636 employed in the wine and other alcoholic beverage manufacturing sector (ABS 2016, Census Employment by Industry 4 digit level) less 8% associated with cider and other alcoholic beverage making i.e. 585 jobs
- Total wages that include the self-employed shown in Table 4.2 as \$12.2M plus 35% of Net Revenue for imputed wages to the self employed. This gives an average wage of \$62,000 (total wages of \$12.2M plus 35% of 68.5M divided by 585 jobs). This estimate is broadly consistent with IBIS World (May, 2015a) which estimated average wine making wages for 2014-15 at \$60,875.

### **4.3 Wine Tourism**

Wine tourism revenue and expenditure data was sourced from TRA (2016). Estimates are for Cessnock and Singleton LGAs and the data was compiled by TRA from REMPLAN and ABS. While estimates are dominated by the wine sector, they also include non-wine tourism such as weddings and farm stays. Separate estimates are provided for domestic and international visitors. Data is summarised in Table 4.

**Table 4 Wine Tourism Expenditure and Visitation - Hunter Valley**

	<b>Domestic Wine Tourism (\$'million)</b>	<b>International Wine Tourism (\$'million)</b>	<b>Total Wine Tourism (\$'million)</b>
<b>Expenditure item</b>			
Airfares	55.4	1.5	56.8
Tours	31.9	0.9	32.8
Transportation	27.8	0.7	28.6
Food, drink and accommodation	149.2	4.0	153.2
Shopping	32.0	0.9	32.8
Entertainment	8.1	0.2	8.3
Education	22.0	0.6	22.6
Other	13.6	0.4	14.0
<b>Total</b>	<b>340.0</b>	<b>9.1</b>	<b>349.1</b>
<b>Visitor nights ('000)</b>	<b>2,316</b>	<b>126</b>	<b>2,442</b>

Source: TRA estimates in <http://advancecessnock.com.au/wp-content/uploads/2015/07/Tourism-Research-Data-June-2016.pdf>  
# note it is assumed that 30% of wine sales at the cellar door is to wine tourists.

No ABS employment data is available for wine tourism because there is no specific tourism industry sector in the Australian and New Zealand Standard Industrial Classification. Employment data is generated from analysis of the wine tourism expenditure profile using the IO7 software.

## 5. Direct and Indirect Impacts of the Hunter Valley Wine Sector on the Regional Economy

### 5.1 Grape Growing Sector

#### Economic Activity

The total and disaggregated impact of grape growing on the Hunter Valley economy is shown in Table 5.

**Table 5 Direct and Indirect Impact of the Grape Growing Sector**

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
<b>OUTPUT (\$M)</b>	8.75	6.15	1.80	7.95	16.70
<i>Type 11A Ratio</i>	1.00	0.70	0.21	0.91	1.91
<b>VALUE-ADDED (\$M)</b>	1.91	2.21	1.12	3.33	5.24
<i>Type 11A Ratio</i>	1.00	1.16	0.59	1.74	2.74
<b>INCOME (\$M)</b>	1.85	0.71	0.30	1.01	2.87
<i>Type 11A Ratio</i>	1.00	0.38	0.16	0.55	1.55
<b>EMPLOYMENT (No.)</b>	155	17	9	26	181
<i>Type 11A Ratio</i>	1.00	0.11	0.06	0.17	1.17

The grape growing sector is estimated to make up to the following total annual contribution to the Hunter Valley economy:

- \$17M in annual direct and indirect regional output or business turnover;
- \$5M in annual direct and indirect regional value added;
- \$2M in annual direct and indirect household income; and
- 181 direct and indirect jobs.

#### Multipliers

Ratio multipliers provide a summary measure of the direct and indirect economic activity relative to the direct economic activity for a particular indicator. The Type 11A ratio multipliers for the grape growing sector range from 1.17 for employment up to 2.74 for value added.

The low ratio multiplier for employment is a reflection of the relatively labour intensive nature of the grape growing sector compared to the sectors that experience flow-on employment. The higher income ratio multiplier reflects the higher wages of those experiencing flow-on employment relative to the low wage in the grape growing sector. The high value-added multiplier reflects low wages and low profits in grape growing relative to the sectors that experience flow-on effects.

#### Main Sectors Affected

Flow-on impacts from the grape growing sector impact a number of different sectors of the Hunter Valley economy. The sectors most impacted by output, value-added and income flow-ons are the:

- Basic Chemical Manufacturing;
- Agriculture, Forestry and Fishing Support Services;
- Road Transport;

- Rental and Hiring Services (except Real Estate);
- Ownership of Dwellings;
- Retail Trade;
- Water Supply, Sewerage and Drainage Services ;
- Wholesale Trade;
- Employment, Travel Agency and Other Administrative Services;
- Other Repair and Maintenance.

Examination of the estimated direct and flow-on employment impacts gives an indication of the aggregated sectors with employment linkages to the grape growing sector (Figure 3).

**Figure 3 Sectoral Distribution of Grape Growing Employment Impacts on the Hunter Valley Economy**

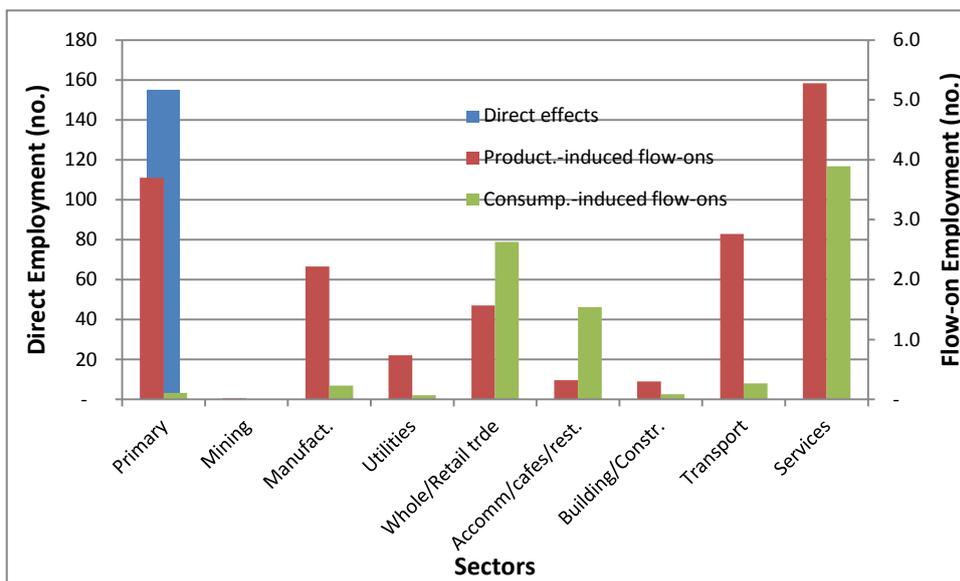


Figure 3 indicates that direct, production-induced and consumption-induced employment linkages of the grape growing sector on the Hunter Valley economy are likely to have different distributions across sectors. Production-induced flow-on employment occur mainly in the services sectors, primary industries sectors, transport sectors and manufacturing sectors while consumption induced flow-on employment are mainly in services sectors, wholesale/retail trade sectors and accommodation/cafes/restaurants sectors.

## 5.2 Wine Making Sector

### Economic Activity

The total and disaggregated annual impacts of the wine making sector on the Hunter Valley economy are shown in Table 6.

**Table 6 Direct and Indirect Impact of the Wine Making Sector**

	<b>Direct Effect</b>	<b>Production Induced</b>	<b>Consumption Induced</b>	<b>Total Flow-on</b>	<b>TOTAL EFFECT</b>
<b>OUTPUT (\$M)</b>	142.80	36.82	29.54	66.36	209.16
<i>Type 11A Ratio</i>	1.00	0.26	0.21	0.47	1.47
<b>VALUE-ADDED (\$M)</b>	84.66	13.04	18.40	31.44	116.10
<i>Type 11A Ratio</i>	1.00	0.15	0.22	0.37	1.37
<b>INCOME (\$M)</b>	36.22	5.86	5.00	10.87	47.09
<i>Type 11A Ratio</i>	1.00	0.16	0.14	0.30	1.30
<b>EMPLOYMENT (No.)</b>	585	246	145	391	976
<i>Type 11A Ratio</i>	1.00	0.42	0.25	0.67	1.67

The wine making sector is estimated to make up to the following total annual contribution to the Hunter Valley economy:

- \$209M in annual direct and indirect regional output or business turnover;
- \$116M in annual direct and indirect regional value added;
- \$47M in annual direct and indirect household income; and
- 976 direct and indirect jobs.

### Multipliers

The Type 11A ratio multipliers for the wine manufacturing sector range from 1.30 for income to 1.67 for employment. The high ratio multiplier for employment is a reflection of the flow-on employment being in labour intensive sectors such as grape growing while winemaking is relatively capital intensive. The low income flow-on multiplier is associated with the flow-on labour having relatively low wages compared to the wages associated with the direct employment.

### Main Sectors Affected

Flow-on impacts from the wine manufacturing sector impact a number of different sectors of the regional economy. The sectors most impacted by output, value-added and income flow-ons are:

- Grape Growing;
- Ownership of Dwellings;
- Retail Trade;
- Wholesale Trade;
- Metal Containers and Other Sheet Metal Product Manufacturing;
- Polymer Product Manufacturing;
- Glass and Glass Product Manufacturing;
- Road Transport;
- Electricity Transmission, Distribution, On Selling and Electricity Market Operation; and
- Food and Beverage Services.

Examination of the estimated direct and flow-on employment impacts gives an indication of the aggregated sectors with employment linkages to the wine making sector (Figure 4).

**Figure 4 Sectoral Distribution of Wine Making Employment Impacts on the Hunter Valley Economy**

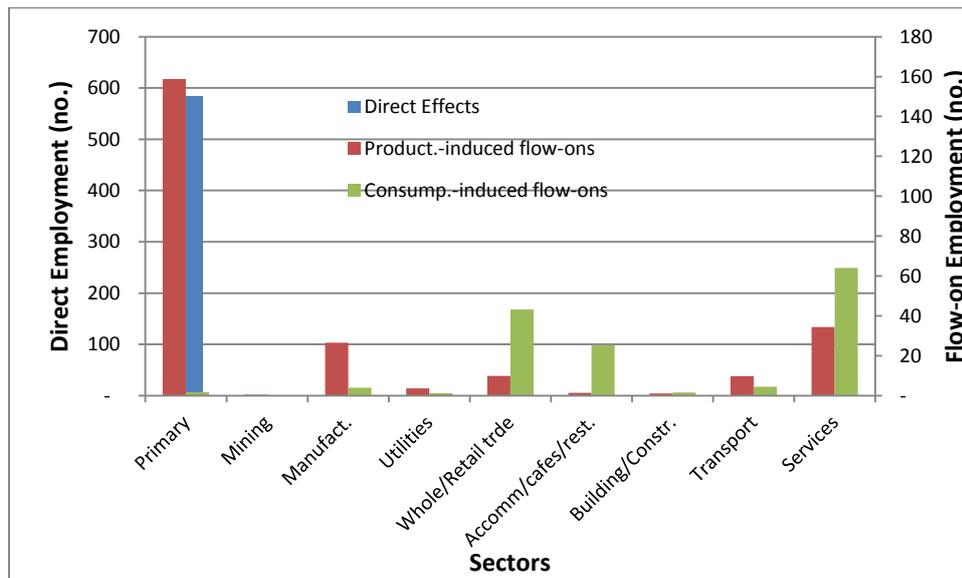


Figure 4 indicates that direct, production-induced and consumption-induced employment linkages of the wine making sector on the Hunter Valley economy are likely to have different distributions across sectors. Production-induced flow-on employment occur mainly in the primary industries sector e.g. grape growing, services sectors and manufacturing sectors while consumption induced flow-on employment are mainly in services sectors, wholesale/retail trade sectors and accommodation/cafes/restaurants sectors.

### 5.3 Wine Tourism

#### Economic Activity

The total and disaggregated annual impacts of the wine tourism sector on the Hunter Valley economy are shown in Table 7.

**Table 7 Direct and Indirect Impact of the Wine Tourism Sector**

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
<b>OUTPUT (\$M)</b>	240.92	70.38	44.49	114.86	355.78
<i>Type 11A Ratio</i>	1.00	0.29	0.19	0.48	1.48
<b>VALUE-ADDED (\$M)</b>	125.04	31.77	27.71	59.47	184.51
<i>Type 11A Ratio</i>	1.00	0.25	0.22	0.48	1.48
<b>INCOME (\$M)</b>	51.19	12.18	7.53	19.71	70.91
<i>Type 11A Ratio</i>	1.00	0.24	0.15	0.39	1.39
<b>EMPLOYMENT (No.)</b>	1,570	329	219	547	2,117
<i>Type 11A Ratio</i>	1.00	0.21	0.14	0.35	1.35

The wine tourism sector is estimated to make up to the following total annual contribution to the Hunter Valley economy:

- \$356M in annual direct and indirect regional output or business turnover;
- \$185M in annual direct and indirect regional value added;
- \$71M in annual direct and indirect household income; and
- 2,117 direct and indirect jobs.

### **Multipliers**

The Type 11A ratio multipliers for the wine tourism sector range from 1.35 for employment to 1.48 for output and value-added.

### **Main Sectors Affected**

Impacts from the wine tourism sector impact a number of different sectors of the Hunter Valley economy. The sectors most impacted in terms of output, value-added and income are:

- Employment, Travel Agency and Other Administrative Services;
- Retail Trade;
- Non-Residential Property Operators and Real Estate Services;
- Road Transport;
- Wholesale Trade;
- Food and Beverage Services;
- Electricity Transmission, Distribution, On Selling and Electricity Market Operation;
- Professional, Scientific and Technical Services;
- Automotive Repair and Maintenance.

Examination of the estimated direct and flow-on employment impacts gives an indication of the aggregated sectors with employment linkages to the wine tourism sector (Figure 5).

**Figure 5 Sectoral Distribution of Wine Tourism Employment Impacts on the Hunter Valley Economy**

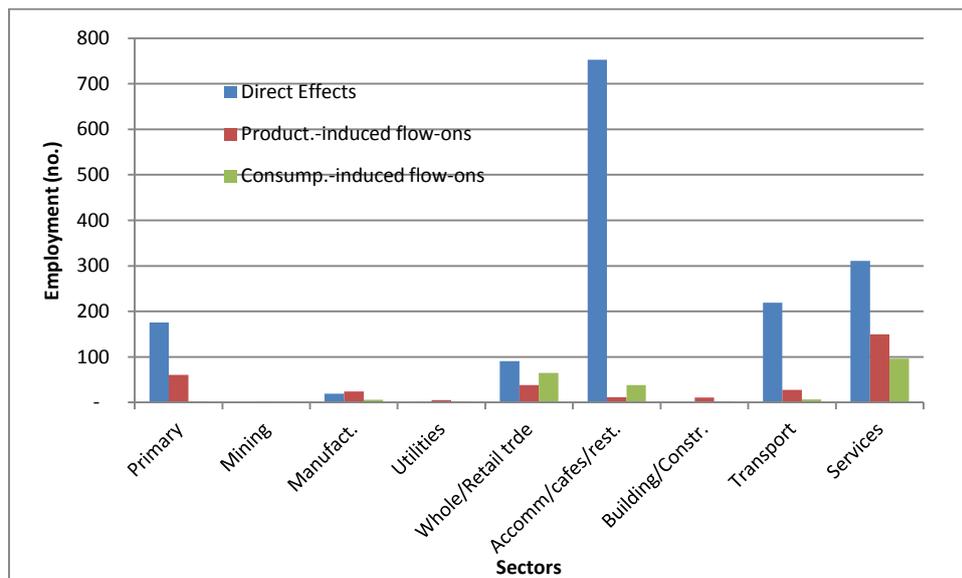


Figure 5 indicates that direct, production-induced and consumption-induced employment linkages of the wine tourism sector on the Hunter Valley economy are likely to have different distributions across sectors. Direct employment mainly occurs in the accommodation/cafes/restaurants sectors, services sectors and transport sectors. Production-induced flow-on employment occur mainly in the services sectors while consumption induced flow-on employment are mainly in services sectors, wholesale/retail trade sectors and accommodation/cafes/restaurants sectors.

## 5.4 Total Wine Sector

### Economic Activity

It is not possible to simply add the economic activity from grape growing, wine making and wine tourism to give the total economic activity from the wine sectors. This is because IO analysis captures backward linkages and so the economic activity impacts from the wine manufacturing sector already captures the backward linkages to the grape growing sector. Similarly, the economic activity impacts from the wine tourism sector captures some backward linkages to the wine making sector.

To estimate the economic activity for the total wine sector, comprising grape growing, wine making and wine tourism, additional IO analysis was undertaken for the wine tourism sector net of expenditure at the cellar door of wineries. This was added to the economic activity impacts of the wine making sector (which already captures backward linkages to the grape growing sector). So direct effects include wine making plus final demand expenditure on wine tourism related goods and services (net of cellar door sales to wine tourists). All other effects are reported in production and consumptions induced flow-on effects.

Using this approach the total and disaggregated annual impacts of the total wine sector on the Hunter Valley economy are shown in Table 8.

**Table 8 Direct and Indirect Impact of the Total Wine Sector**

	<b>Direct Effect</b>	<b>Production Induced</b>	<b>Consumption Induced</b>	<b>Total Flow-on</b>	<b>TOTAL EFFECT</b>
<b>OUTPUT (\$M)</b>	340.88	96.15	65.16	161.32	502.20
<i>Type 11A Ratio</i>	1.00	0.28	0.19	0.47	1.47
<b>VALUE-ADDED (\$M)</b>	184.30	40.89	40.59	81.48	265.78
<i>Type 11A Ratio</i>	1.00	0.22	0.22	0.44	1.44
<b>INCOME (\$M)</b>	76.55	16.28	11.03	27.32	103.87
<i>Type 11A Ratio</i>	1.00	0.21	0.14	0.36	1.36
<b>EMPLOYMENT (No.)</b>	1,979	501	321	821	2,800
<i>Type 11A Ratio</i>	1.00	0.25	0.16	0.41	1.41

The Australian wine sector is estimated to make up to the following total annual contribution to the Hunter Valley economy:

- \$502M in annual direct and indirect regional output or business turnover;
- \$266M in annual direct and indirect regional value added;
- \$104M in annual direct and indirect household income; and
- 2,800 direct and indirect jobs.

### **Multipliers**

The Type 11A ratio multipliers for the wine sector range from 1.36 for income to 1.47 for output.

### **Main Sectors Affected**

Impacts from the wine sector impact a number of different sectors of the Hunter Valley economy. The sectors most impacted in terms of output, value-added and income are:

- Retail Trade;
- Grapes Growing;
- Employment, Travel Agency and Other Administrative Services;
- Wholesale Trade;
- Road Transport;
- Food and Beverage Services;
- Non-Residential Property Operators and Real Estate Services;
- Electricity Transmission, Distribution, On Selling and Electricity Market Operation; and
- Professional, Scientific and Technical Services.

Examination of the estimated direct and flow-on employment impacts gives an indication of the aggregated sectors with employment linkages to the wine sector (Figure 6).

**Figure 6 Sectoral Distribution of Wine Sector Employment Impacts on the Hunter Valley Economy**

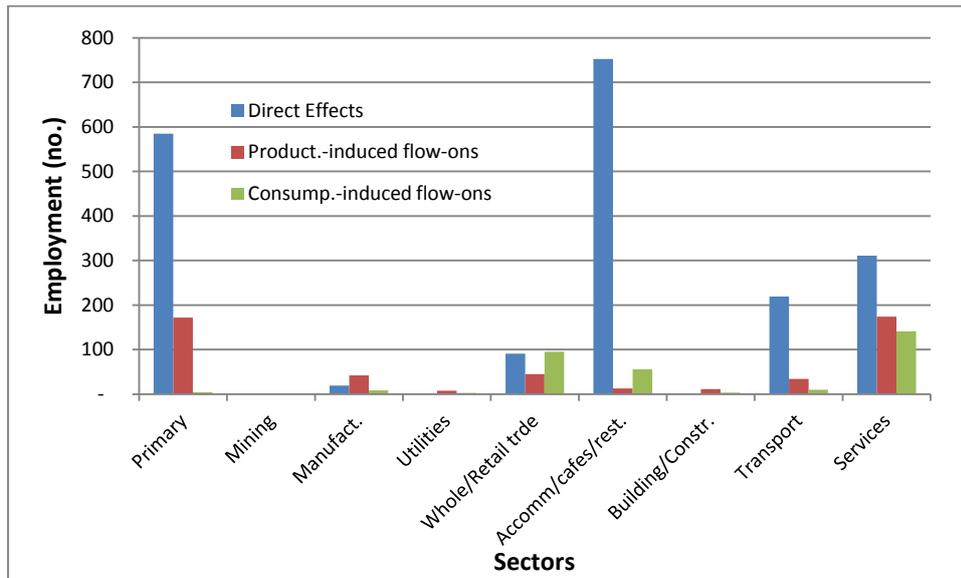


Figure 6 indicates that direct, production-induced and consumption-induced employment linkages of the total wine sector on the Hunter Valley economy are likely to have different distributions across sectors. Direct employment mainly occurs in the accommodation/cafes/restaurants sectors, primary sectors, services sectors and transport sectors. Production-induced flow-on employment occur mainly in the services sectors, primary industries sectors, wholesale and retail trade sectors and manufacturing sectors while consumption induced flow-on employment are mainly in services sectors, wholesale/retail trade sectors and accommodation/cafes/restaurants sectors.

## 6. Conclusions

The research has quantified the direct and flow-on effects of the Hunter Valley wine sector. The key results from the analysis are as follows.

The Hunter Valley wine sector defined as wine grape growing, wine making and wine related tourism:

- Supports 2,800 full and part-time jobs in the Hunter Valley region. Jobs supported by the wine sector include direct employment of 1,979 within the sector and a further 821 full-time and part-time jobs due to induced effects.
- Provides \$104 M in direct and indirect income to both direct and flow-on employment.
- Contributes \$502 M to the value of gross output for the Hunter Valley region.
- Adds \$266 M in value-added to the Hunter Valley economy.

The average effects of a contraction or expansion within the wine sector suggests:

- The Hunter Valley economy would gain an extra 0.41 job for every job gained in the wine sector.
- The economy would gain an extra \$0.47 M for every additional \$1 M of gross output generated by the wine sector.
- The economy would gain an extra \$0.44 M in contribution to regional value-added for every additional \$1 M of value-added generated by the wine sector.

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## Attachment 1 Assumptions and Interpretations, Input-Output Analysis and Multipliers

1. "The *basic assumptions* in IO analysis include the following:

- there is a fixed input structure in each industry, described by fixed technological coefficients (evidence from comparisons between IO tables for the same country over time have indicated that material input requirements tend to be stable and change but slowly; however, requirements for primary factors of production, that is labour and capital, are probably less constant);
- all products of an industry are identical or are made in fixed proportions to each other;
- each industry exhibits constant returns to scale in production;
- unlimited labour and capital are available at fixed prices; that is, any change in the demand for productive factors will not induce any change in their cost (in reality, constraints such as limited skilled labour or investment funds lead to competition for resources among industries, which in turn raises the prices of these scarce factors of production and of industry output generally in the face of strong demand); and
- there are no other constraints, such as the balance of payments or the actions of government, on the response of each industry to a stimulus.

2. The multipliers therefore describe *average effects, not marginal effects*, and thus do not take account of economies of scale, unused capacity or technological change. Generally, average effects are expected to be higher than the marginal effects.

3. The IO tables underlying multiplier analysis only take account of one form of *interdependence*, namely the sales and purchase links between industries. Other interdependence such as collective competition for factors of production, changes in commodity prices which induce producers and consumers to alter the mix of their purchases and other constraints which operate on the economy as a whole are not generally taken into account.

4. The combination of the assumptions used and the excluded interdependence means that IO multipliers are higher than would realistically be the case. In other words, they tend to *overstate* the potential impact of final demand stimulus. The overstatement is potentially more serious when large changes in demand and production are considered.

5. The multipliers also do not account for some important pre-existing conditions. This is especially true of Type II multipliers, in which employment generated and income earned induce further increases in demand. The implicit assumption is that those taken into employment were previously unemployed and were previously consuming nothing. In reality, however, not all 'new' employment would be drawn from the ranks of the unemployed; and to the extent that it was, those previously unemployed would presumably have consumed out of income support measures and personal savings. Employment, output and income responses are therefore overstated by the multipliers for these additional reasons.

6. The most *appropriate interpretation* of multipliers is that they provide a relative measure (to be compared with other industries) of the interdependence between one industry and the rest of the economy which arises solely from purchases and sales of industry output based on estimates of

transactions occurring over a (recent) historical period. Progressive departure from these conditions would progressively reduce the precision of multipliers as predictive device" (ABS 1995, p.24).

Multipliers indicate the total impact of changes in demand for the output of any one industry on all industries in an economy (ABS, 1995). Conventional output, employment, value-added and income multipliers show the output, employment, value-added and income responses to an initial output stimulus (Jensen and West, 1986).

Components of the conventional output multiplier are as follows:

*Initial effect* - which is the initial output stimulus, usually a \$1 change in output from a particular industry (Powell and Chalmers, 1995; ABS, 1995).

*First round effects* - the amount of output from all intermediate sectors of the economy required to produce the initial \$1 change in output from the particular industry (Powell and Chalmers, 1995; ABS, 1995).

*Industrial support effects* - the subsequent or induced extra output from intermediate sectors arising from the first round effects (Powell and Chalmers, 1995; ABS, 1995).

*Production induced effects* - the sum of the first round effects and industrial support effects (i.e. the total amount of output from all industries in the economy required to produce the initial \$1 change in output) (Powell and Chalmers, 1995; ABS, 1995).

*Consumption induced effects* - the spending by households of the extra income they derive from the production of the extra \$1 of output and production induced effects. This spending in turn generates further production by industries (Powell and Chalmers, 1995; ABS, 1995).

The *simple multiplier* is the initial effect plus the production induced effects.

The *total multiplier* is the sum of the initial effect plus the production-induced effect and consumption-induced effect.

Conventional employment, value-added and income multipliers have similar components to the output multiplier, however, through conversion using the respective coefficients show the employment, value-added and income responses to an initial output stimulus (Jensen and West, 1986).

For employment, value-added and income, it is also possible to derive relationships between the initial or own sector effect and flow-on effects. For example, the flow-on income effects from an initial income effect or the flow-on employment effects from an initial employment effect, etc. These own sector relationships are referred to as ratio multipliers, although they are not technically multipliers because there is no direct line of causation between the elements of the multiplier. For instance, it is not the initial change in income that leads to income flow-on effects, both are the result of an output stimulus (Jensen and West, 1986).

A description of the different ratio multipliers is given below.

Type 1A Ratio Multiplier = 
$$\frac{\text{Initial} + \text{First Round Effects}}{\text{Initial Effects}}$$

Type 1B Ratio Multiplier =  $\frac{\text{Initial} + \text{Production Induced Effects}}{\text{Initial Effects}}$

Type 11A Ratio Multiplier =  $\frac{\text{Initial} + \text{Production Induced} + \text{Consumption Induced Effects}}{\text{Initial Effects}}$

Type 11B Ratio Multiplier =  $\frac{\text{Flow-on Effects}}{\text{Initial Effects}}$

Source: Centre for Farm Planning and Land Management (1989).

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