



Gippsland Food value chain: Data-driven regional development

Final Report

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CRC Project Sprint Gippsland Food value chain: Data-driven regional development

Summary

1. This report comprises a conceptualisation of regional food chains, a preliminary analysis of one region, Gippsland, where food and fibre comprise around half the regional gross domestic product and an identification of possible projects for the CRC Food Agility. It delivers a baseline of data and analysis for consideration by stakeholders in the Gippsland region for future initiatives and strategies. Of note, the report presents an introduction to regional food value chains in the dairy, beef and horticulture sectors. While not complete, it constitutes a foundational analysis for future Food Agility CRC (FACRC) projects and it aims to serve as an exemplar for analysis of regional development opportunities.
2. The project was led by Agribusiness Gippsland and RMIT University, in consultation with the City of Greater Dandenong and Federation University.
3. It brings together the majority of Victorian FACRC partners including Agribusiness Gippsland, City of Greater Dandenong and the Victorian Government.

4. Aims

The project report aims to develop analytic procedures, methods and recommendations regarding regional food and fibre development strategies. Further, it identifies and summarises baseline data across examples of regional food value chains.

The report provides a platform and reference point for FACRC partners to develop future projects that focus on regions and/or on mapping regional food value chains. It also informs the second phase to this project, which is to build on the initial analysis via other regionally focused studies. It involves the elaboration of a conceptualisation and methodology, which previously was relatively embryonic and underdeveloped. The outcome will be a more informed understanding of regional food value chains. Further, it provides the methodology for developing a robust database and decision-making service for regional stakeholders and thus justify investment in future end user-led projects. Finally, the approach provides the basis for studies that require such baseline data, which will enable the FACRC to promote and enable projects concerned with the efficacy and investment process in relation to the food and fibre industry.

5. *What this report does*

- a. The report identifies both barriers to and opportunities for understanding regional food value chains. The claim is that to understand where opportunities lie to enhance the robustness of the value chains, to identify value add relationships and to appreciate how value may be captured, then it is necessary to begin with a comprehensive and disaggregated view of value chains.
- b. The report presents an overview of the variation of data, the forms in which the data comes and the absences that are evident, due either to proprietary arrangements or genuine absences. Indeed, one factor that characterises the use of data is the relatively narrow base that most analyses rest upon, in particular ABS data. This means that we must be careful with our claims about knowledge and understandings based on the secondary data, and in making innovative proposals to enhance the efficacy of these social relationships.
- c. The report presents a methodology whereby we can lay the foundation for the next stage of work in relation to the promotion of food agility at a regional level, for activity by the industry more generally, and firms and enterprises in particular.

6. *Gippsland Region*

- a. The Gippsland region is a major site for food production and processing. It lies to the east of the Melbourne metropolis and formally comprises six shire Councils: Baw Baw, Bass Coast, East Gippsland, Latrobe, South Gippsland and Wellington. Three more metropolitan fringe councils, Cardinia, Casey and Greater Dandenong have historic and ongoing connections to the region.
- b. Data was collected and analysed from a range of sources, including the Victorian Government, Gippsland Regional Partnership, Agribusiness Gippsland and local councils.
- c. The food and fibre sector is key to the social and economic strength of Gippsland. Based on gross product methodologies, the industry contributes an estimated \$7bn of Gippsland's \$15bn economic output.
- d. Some developed food sectors, particularly dairy, have clearer and more accessible data to construct value chains than others. Horticulture is at the other end of the spectrum – a rapidly growing sector but with limited data. Nonetheless, even for the more established chains such as dairy, there remains a data deficit and uncertainty, which must be taken into account when developing project proposals.
- e. There are major opportunities across the region to diversify and enhance sustainable farming and this requires information. While much data is available, in emerging industries of olives, garlic, saffron and truffles there is limited detailed knowledge of best production techniques, value chains

and markets. Hence, to realise these prospects different approaches and understandings are required.

7. Conceptualising Regional Value Chains

The regional food and fibre value chains are constructed via three cumulative steps

- a. **Sectors:** The baseline of most regional social and economic analysis in Australia comprises seven key industries (sectors), usually presented in terms of some version of the ANZSIC industry coding used by the ABS. For example, in considering issues in the Gippsland workforce, KPMG (2016) used Health, Aged Care and Community Services; Hospitality and tourism; Retail; Building and Construction; Agribusiness, Timber and Forestry; Advance Manufacturing; and Energy and Mining. This classification system does not account for the integrated form of industry as a value chain, which is particularly pertinent for agriculture. Usually it is defined as part of the ANZSIC categorisation 'Agribusiness, Timber and Forestry' or a version thereof, and does not take into account the food industry as an integrated network involving, production, processing, transportation and storage, and retail and consumption, the food chain. Therefore, focusing on narrow definitions of 'Agriculture' alone does not reveal the scope and scale of the food chain.
- b. **Value chains:** To understand the food industry in relation to the social and economic underpinnings for utilisation of digital applications and the benefits of technological innovation, it is necessary to understand the regional food value chain. In this way we can identify value added nodes along the chain and determine how value is collected and by whom, which in turn leads to opportunities for developing applications that foster regional development.
- c. **Value chains and regional development:** Value chains can be viewed as an extension of the analysis of supply chains. By overlaying the farm-to-plate supply chain with analyses of the points of profitability and who controls the associated markets and production, value chains provide insight into how regions can capture a greater share of profits and increased employment. Its application to regional areas adds a focus on the relationships between participants within the region, as well as those in the surrounding cities and regions. Of note, using the region as the starting point for value chain analysis is not the standard procedure; hence the study opens up understandings which are likely to be beneficial for analysis of food value chains, which by definition have a regional basis, even when the end point is international consumption.

8. Process

To translate the supply chain into a value chain for an industry, a three-stage process is required:

- a. Develop a preliminary structure for the value chain, based on desktop research.
- b. Consult with the industry to verify and refine the value chain, and investigate relationships and governance; and,
- c. Estimate the value added of the product at each stage of the chain, based on secondary data sources.

9. Translation to Regional Development Initiatives

The approach to translating recommendations for individual sectors to regional development interventions is depicted in Figure 1 below.

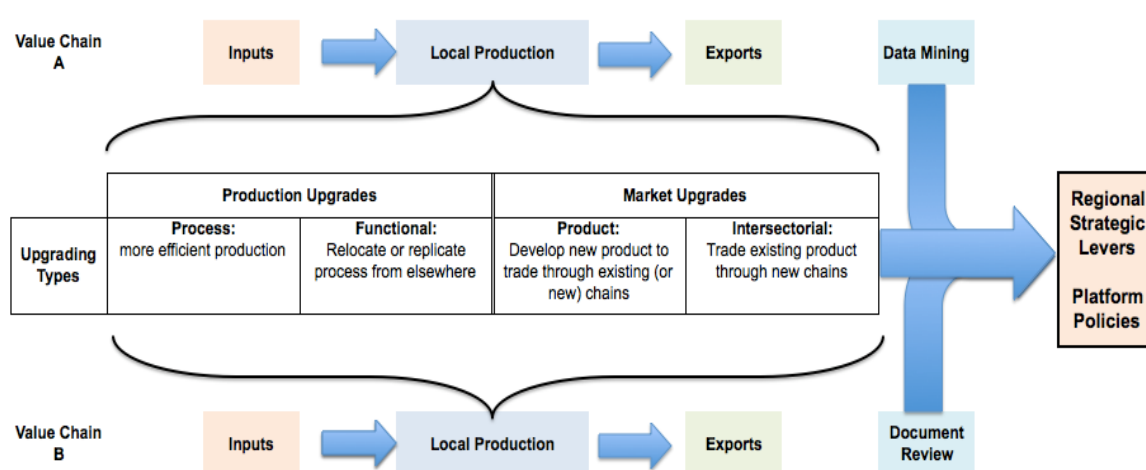


Figure 1: Regional Value Chain Process

Value Chain A and B indicate individual sector analyses, that in combination point to upgrade possibilities within the region. The upgrade possibilities are then compared across the chains to identify initiatives that facilitate upgrading in multiple chains, as well as within individual chains.

Gippsland Food

10. The Food and Fibre Value Chain

An understanding of the food value chain provides the foundation of the social and economic strength in Gippsland (Bowman et al., 2014). Currently, the industry contributes an estimated \$7 billion of Gippsland's \$15 billion economic output, based on gross regional product calculations. The food & fibre sector is a complex supply and value chain, and is in a strong position to become a core economic driver and contributor to the prosperity and vitality of Gippsland.

11. Regional Food Chain Governance

Numerous government entities, interest groups, coalitions and sectors operate in regions, each with a particular agenda, geographical and sectoral focus. Gippsland has many organisations pressing their own and other sectoral interests, and no desire for more layers of governance. Pockets of cooperation have existed for some time; however, there are also contentious areas of overlap and divergence.

12. Regional Development Plans

Regional development plans, including those for the food value chains require explicit elaboration, further data collection and incorporation, and specification in terms of the regional food value chain, and its sub-forms. The documents reviewed for this report are based on interviews, consultations with stakeholders or unpublished data, as well as from publicly available Australian Bureau of Statistics sources. While the plans provide information to base value chain analysis, it is through case studies that set out the activities of particular companies and the environment and relationships within which they work. This indicates a narrow base of readily available information that can be used to construct value chains within and across established industry groupings at local or regional geographies. The analysis requires primary data collection, since detailed value chain data is either held in confidence or does not exist.

Regional Food Value Chains

Two types of chains are used in the analysis, long and short:

- a. Long Value Chains: nodes of the production process are segmented, with agents typically providing one step in the production and profiting on the basis of economies of scale and horizontal integration of production. The resulting product is likely to be *generic* and *standardised*.
- b. Short Value Chains: nodes of the production process of production are concentrated: farmers may also process, store, transport, market and distribute their own product and thereby profit through vertical integration. The resulting product is likely to be *dedicated* and *specialised*.

13. Gippsland Value Chains

Three indicative supply chains for Gippsland agriculture focus the report. They are:

- a. Dairy
- b. Beef
- c. Horticulture, specifically lettuce and garlic

Each displays varied features about their prominence, their evidence base with which to understand how they organise and operate and their prospects within the region.

14. Example One: Dairy

The dairy value chain is a mature industry comprising long and short value chains. This industry consists of two distinct elements: the long value chain, the disaggregated farmer – milk product or dairy ingredient manufacturer – domestic or export food manufacturer using dairy ingredients - supermarket chain, and short chains typified by artisan cheese production, where milk producing, cheese making, storage and sales to consumers may all occur on-farm.

Dairy is important to Gippsland in terms of both the scale of production in the long value chain and the internationally recognised quality of the short value chain produce. There is indication that the short value chains are increasingly engaging with the supermarket chains at the apex of the long value chain, while maintaining adherence to artisanal production methods: for example, Jindi and Maffra Cheese, and Gippsland Jersey. For the analysis of long value chain operations, the focus on the relationships between profitability and value chain governance are integral to industry sustainability, as highlighted by how the domestic effects of \$1 litre milk were distributed amongst producers and processors (Australian Competition and Consumer Commission 2018).

15. Example Two: Beef

The beef value chain is prominent and well established in Gippsland. The long value chains exemplify a complex of buyer and producer-driven chains. Hence there is a focus on production methods and less so on provenance, although there is a growing recognition of this aspect, at least in rhetoric. In contrast, short value chain examples are indicative of producer-driven supply chains, with value added to the product through provenance and production methods.

The examples of beef value chains illustrate the paths from production to consumption and where value and profits may be created within Gippsland. The direct marketing and farmers' co-operatives are examples of what would be classified as producer-led value chains, as the producers are co-ordinating the types of product, how it is produced, and the flow of product through the value chain. The analysis of the beef value chain in national distribution systems provides a distinctly different chart, with a greater emphasis on transport and likelihood that less value adding would occur in the region. This would also be an example of a buyer-led value chain, where the co-ordination of production is undertaken by the retail and marketing end of the chain. For example, one of the major supermarkets may set standards, pricing, packaging and the timing of product delivery within the value chain.

16. Example Three: Horticulture

Case One: Lettuce

Lettuce is a prominent part of the Gippsland horticultural and vegetable sector, dominated by several large scale, integrated growing and processing operations located within the region, but also with strong external connections. Some of these operations extend out of Gippsland, co-owning processing facilities with growers in the nearby City of Casey, as well operating farms further afield. While the beef examples were prepared from the perspective that the producer leads the value-chains, the lettuce example is based on the assumption that these processors are providing coordination within the value chain. The digital capacity of the chain is likely to be critical.

Case Two: Garlic

There is a cluster of garlic farms in central Gippsland, located around the Strzelecki Highway. Garlic production is re-emerging in Australia following years of decline due to cheap imports, from China, Mexico, Brazil and Argentina. The demand for locally grown garlic is a result of increasing consumer preferences for higher value products that are chemical-free and have transparent provenance. As a case study of regional value chain methodologies, it is unusual in that it is an emerging industry, value chain analysis can inform the development of efficient industry structures and relationships. As garlic is a niche within the horticultural sector, secondary data is not readily available and therefore is reliant in interviews and workshops for data collection. This feature differs from the dairy industry particularly, where data is available through ABS categorisations, industry reports and international examples of value chain analysis.

Gippsland Future

17. Conclusions

There are six key opportunities to develop and embed the food and fibre sector in relation to Gippsland's long-term future.

First, a deeper integration of the “before farm gate” and “after farm gate” relationships within the supply chain (i.e. between food production, food retail, and food hospitality) could fast-track economic development and promote investment both locally and internationally.

Second, the future of the food and fibre sector requires a thriving workforce and SME sector. The food and fibre sector could become the means to attract, retain and develop people, as farm workers, producers, suppliers, distributors, providers and consumers.

Third, it necessary to take steps to understand where expertise and research innovation connects with the development and upgrading of short and long value chains. Taking this dimension of value chain development may mean, in every day terms, a trade-off between volume and value-add.

Fourth, research capacity in the sector will drive both innovation and sectoral growth, as well as serve as a foundation for the education/career pathway recruitment strategy.

Fifth, building on the above capacities, the industry is likely to generate new investment. Such steps could be reinforced with the support of the educational sector, in relation to business training (developing current outreach programs) and research expertise. SMEs within the food and fibre sector would benefit from these measures.

Sixth, and central to these opportunities, is the need for a carefully designed and well- resourced campaign to bolster the food and fibre sector of the region and inspire future careers and opportunities in farming and food manufacture.

Through such engagement, rural communities will be strengthened socially, culturally and economically.

18. Future Directions

Based on the report, we make the following recommendations for consideration in relation to the ambit and remit of the CRC Food Agility.

Project 1: Gippsland Global Value Chain (GVC)

This project aims to investigate and identify the constituent elements of the Gippsland regional food and fibre value chain to enable decisions about the efficacy, organisation and focus of regional food value chains. The purpose is to supplement, underpin and enhance the Hi-Tech (Food Central) initiatives being taken by the State Government (Latrobe valley Authority, Regional Development Victoria, Regional Development Australia, Gippsland), Federation University, Local councils (including Greater Dandenong) and a range of key regional stakeholders (Agribusiness Gippsland).

Project 2: Replication

The methodology for identifying and specifying regional food value chains can be replicated in other regions, particularly those that are food rich, but which have different and distinct socio-economic features. These aspects include industry balance, structure and organisation of the value chain(s), the role of regional governance and externally-based governance relations, research capacities, and their outcomes. As indicated there is now a robust methodology in place and this will be refined and further developed, with more comprehensive outputs than the current report. One reason for this confidence is that the conceptualisation of regional value chains is now in place.

Project 3: Decision making along the chain

The first stage in laying the foundation for the construction and implementation of decision-making practices in relation to the efficacy of the

chain as well as the minimisation of risk because of the enhanced knowledge basis for decision-making. These developments matter both for the participants in the chain, regionally and elsewhere as well as for financial and related support institutions for food production and consumption.

This project will use data-mining, with a methodology comprising six stages:

1. Big Data Capture and Logging and App- and Internet of Things (IoT)-based Citizen Science
2. Text Summarisation, Text Mining, and Sentiment Analysis from large scale unstructured text, web documents, and social media streams
3. Visual Data Processing and Analytics
4. Multi-factor trend profiling and value network analysis
5. Predictive and prescriptive analysis tools
6. Pilot testing and Evaluation

Project 4: Food Innovation Regions

The report identifies the various ways in which food value chains are constructed in the region. This provides the basis for developing initiatives to promote Gippsland as a food innovation region, currently disaggregated and uncoordinated. Comparative studies will allow an identification of both the opportunities and barriers to such proposals and applications.

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1 Introduction

This report presents a conceptualisation and a methodology for regional analysis founded in global value chain theory. This work has not been done before, as most analyses using this theory begins with firms and industry. We are starting from place, which enables an assessment of regional relationships and activity in connection with the food chain from production to consumption. The report presents a methodology to develop a robust understanding of relationships within the agriculture sector and possibilities to enhance and develop the food and fibre industry. It sets the scene for a comprehensive analysis that will generate data currently missing and recast the available data in ways that will provide a basis for understanding the region. This will lay the foundation for dashboard applications for the core food and fibre participants - farmers, processors, and retailers - as well as the service providers to the value chain such as transport, finance and other professional services.

The aim is to conceptualise and explain the regional food value chain. This requires an understanding of the food supply and distribution chain: that set of relationships from source, the producer, the harvester and transporter, to the retailer and the consumer, and the networked arrangements that enable the supply chain to operate, such as logistical and financial relations. Debates about the supply chain as a set of coordinated relationships, networks and logistics, have led into considerations about the management and organisation of such chains, their governance (Carter & Rogers 2008; Gereffi et al. 2005).

Previous studies have largely concentrated on single sectors within countries or supra-national regions (see Jespersen et al. 2014 for example). The approach here connects the value chain research to the concept of regional development platforms, which:

... can be defined as regional resource configurations based on the past development trajectories but presenting the future potential to produce competitive advantage existing in the defined resource configurations. The possible competitive advantage is based on the business potential of the actors working for the platform. The actors of a regional development platform are the firms, technology centres, expertise centres, research centres, education organizations, etc. contributing to the defined development platform (Harmaakorpi 2006, p. 1089).

In this way we can identify value-adding nodes along the chain and determine how this value is collected and by whom. In turn, this provides an understanding of the food industry in relation to the social and economic underpinnings for utilisation of digital applications and the benefits of technological innovation

This report outlines how value chain theory and methods can be applied to the agricultural sector in sub-national regions such as Gippsland and provides data to construct value chain frameworks for further investigation. This indicates the benefit of the application of these methods and the potential to develop the analytical methods further, as well as the potential for application to other regional areas across the country.

National Context

There are a number of initiatives proposed to address the challenges and enable realisation of the prospects that lie before the food industry. The CRC Food Agility program is one such initiative and it is characterised by a commitment to address value chain activity from production to consumption. As it develops it will be the case that particular initiatives focus on specific stages of activity within a value chain: for example, using sensing and data analysis to improve food safety in the oyster industry (Food Agility CRC, 2018).

Another significant initiative has been taken by the national Farmer's Federation "Talking 2030: Growing Agriculture into a \$100bn industry". With the support of Telstra and KPMG, the National Farmers' Federation presents a vision for a 70 per cent increase in farmgate output by 2030, from the current \$59bn. Such an initiative recognises the importance of technology and innovation in development processes (KPMG, National Farmers Federation, 2018).

1.1 Gippsland Case Study

The Gippsland case study enables investigation of the two interconnected purposes for this research. The first relates to the use of data to understand the construction of food value chains as well as the underlying politics of food and fibre, as practised in Gippsland. As the region's economy transitions away from the 20th century stalwarts of electricity generation, mining and sawmilling, gross regional product data is used to support claims regarding the importance of food and fibre in providing employment and prosperity in the region. However, the ABS measures are segmented, and links between agriculture, its support industries, and downstream processing, transport warehousing and retail are not expressed in a way that is useful at regional level. Value chain analysis provides an account of the entire flow of the region's agricultural product, from paddock to plate, which will provide a better basis for the discussion of the role of food and fibre in building prosperity and resilience in the Gippsland economy.

The second is to uncover interventions that serve to create additional value for Gippsland from its food and fibre produce. Via value chain analysis, the links where profits are made are identified, as are the relationships between agents within the chain that preserve or distribute these profits. The research outlined here is novel in its focus on the interaction of supply chains within a region, which can identify opportunities and restrictions for a whole-of-industry development.

This report applies the value chain theory and methods to the Gippsland food and fibre sector although it has been limited to secondary data sources. It is a preliminary

scoping of the application of this theory to regional development questions. The results indicate the benefit of the application of these methods and the potential to develop the analytical approach further. It also demonstrates the potential for application to other regional areas across the country.

2 Value Chains

A value chain is:

... the full range of activities which are required to bring a product or service from conception, through the intermediary phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use (Kaplinsky & Morris 2000, p. 4).

Global Value Chain (GVC) analysis extends across national boundaries. It is applicable to geographical scales from local to global, as:

Linkages may be forged within the same building, across town, or across great distances ... Regional, national, and local value chains are nested firmly within global value chains, as we perceive them, and GVC governance theory operates equally well at any and all of them (Sturgeon 2008, p. 123)

These dimensions raise challenging questions for the ways in which value chains are conceptualised and applied.

The application of the methodology to a sub-national region, however, has rarely been undertaken. It is also complicated by the porosity of the regional boundaries; for global industry analysis, international trade data collected by customs processes and guided by strict borders can be used to measure the locations of supply and demand (Gereffi & Fernandez-Stark 2016). One example of regional application of the theory is provided by King and colleagues (2010), who compared the in-region value generated by local, national and intermediated supply chains. Although the research is not referred to as value chain analysis, it includes and apportions a percentage of the final retail price to each stage of production for similar sectors to those investigated in this report: Washington DC dairy production, the Minnesota beef industry and salad leaf vegetables in Sacramento, amongst others. While conducted over a small area, this research was still industry specific as well as regionally constrained.

2.1 Introduction to Value Chains

There are three key elements for the analysis of value chains:

1. The first is where the economic rents (over-the-odds profits) are made in the chain. Profits are closely related to the competition for the goods and services provided in that link, where barriers to entering the market restrict competition and provide the basis for capturing profits. As noted by early exponents, Gereffi and colleagues in 1994, analysis of production chains “explains the distribution of wealth within a chain as an outcome of the relative intensity of the competition within different nodes” (cited in Kaplinsky 2000, p. 144).
2. The second aspect is governance within the supply chain, which can be understood as who controls and co-ordinates the type, amount and quality of

production, which can occur through legislative, executive and judicial powers. Gereffi & Korzeniewicz (1994, p. 4) suggests two types of value chains, buyer- and producer- driven. Buyer-driven value chains are those controlled by the retail end of the market and are typically commodities or undifferentiated products. Supermarket chains are an example, as they control production through purchasing power and setting standards for producers to meet. Producer-driven value chains are more likely to involve value added and branded products, the automotive industry for example. While this two part categorization of value chains is seen as a simplification of the complex and dynamic relationships in value chains (Ponte & Gibbon 2005), it is a useful starting point for governance analysis.

3. The third aspect is systemic efficiency, which is a shift from considering the efficiency of individual points, to how greater efficiency can be created through interaction and co-operation between the agents involved. Prospects for increasing systemic efficiency are dependent on the relationships and trust within the value chain (Kaplinsky 2000).

These three elements can be further condensed into two main threads for investigation: quantitative assessment of the value added at each stage of the chain; and, qualitative assessment of the interactions between the links in the chain.

To translate this into a value chain for an industry, a three-stage value chain process is proposed:

1. Develop a preliminary structure for the value chain, based on desktop research.
2. Consult with the industry to verify and refine the value chain, and investigate relationships and governance; and,
3. Estimate the value added of the product at each stage of the chain, based on secondary data sources.

The aim of the process is to:

...link these pieces of information and create a united and self-explanatory chain that includes the principal activities of the industry. The segments of the chain illustrate how different value adding processes contributed to the product or service, and in turn, the differing returns netted for the chain actors behind them (Gereffi & Fernandez-Stark 2016, p. 8).

Such a way of presenting these relationships sets the scene for a more intense and detailed study, which will lead to interventions that support the processes of production and consumption.

2.1.1 Upgrading

The central purpose of value chain analysis is to identify opportunities for upgrading, which are the strategies and interventions to improve the outcomes for the participants and stages within value chains that are the focus of the research. Within the GVC framework, Humphrey and Schmitz (2002) identified four types of upgrading:

- Process upgrading, which transforms inputs into outputs more efficiently by reorganizing the production system or introducing superior technology;
- Product upgrading, by moving to more sophisticated product lines;
- Functional Upgrading, which entails acquiring new functions (or abandoning existing functions) to increase the overall skill content of the activities;
- Chain or inter-sectoral upgrading, where firms move into new but often related industries.

These four types of upgrading provide a framework for considering interventions to generate greater regional benefits from food and fibre and the associated post-farmgate elements within the value chain. It is necessary to note that some interventions may result in de-skilling, re-skilling or up-skilling and such implications must be taken into account when planning intervention.

2.1.2 Value Chain Structures

Value chains are typically comprised of research and design, inputs, production, distribution and marketing, and sales (Gereffi & Fernandez-Stark 2016). For sub-national regional value chains, distinguishing between stages and inputs that occur internally and externally is integral to the application to regional development. Therefore, an additional dimension has been added to create a matrix showing the stages of production in the vertical axis, and location of production in the horizontal axis, as shown in the indicative example below.

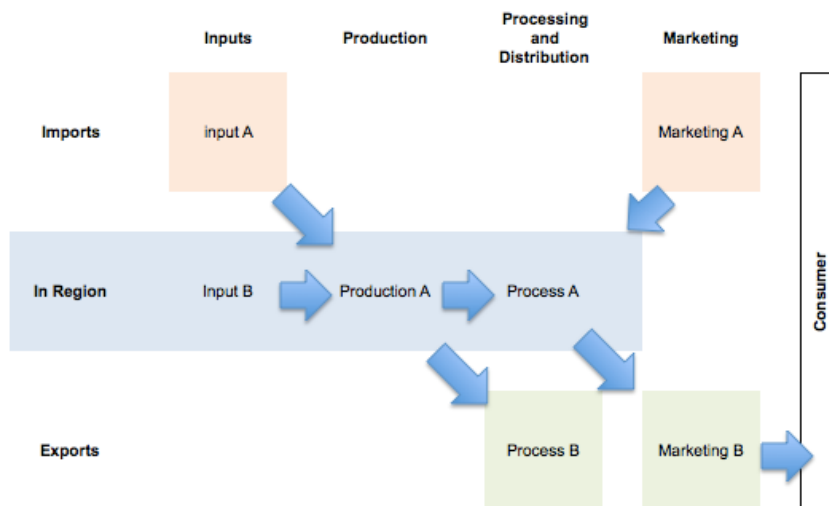


Figure 2: Indicative regional value chain

In this instance imports and exports indicate where the inputs to and products of the value chain enter and leave the study region. For agricultural products integrated into national distribution chains, it is possible that they are bred or grown within a region, exported for processing and then return to the region for the marketing stage, which includes retailing. Alternatively, they may remain outside the region and hence

not benefit the region in any direct way as the produce moves through the value chain towards consumption.

The distinction between imports and exports from a region may appear clear, but as discussed in the section on regional porosity there is a challenge in relation to the different boundaries of administrative and functional regions. Economic activity is often oblivious to the borders of Local Government Areas (LGAs), which means categorising imports, exports and in-region stages within a value chain needs to reflect local circumstances and neighbourly interactions.

2.2 Long and Short Value Chains

A conceptual challenge is to distinguish between different types value chains. One distinction is in terms of product. Storper (1997, p. 109) sets out dimensions of products on two axes: the supply oriented *standardised* or *specialised*, and the demand oriented *generic* or *dedicated*. On the first axis, *standardised* products are easy to supply and cheap to produce and compete on price; and, *specialised* products require specialist inputs that are “rare or costly and time consuming to reproduce” and compete on quality. The distinction between *standardised* and *specialised* products is evident in a value chain analysis of the garment industry, with the distinction between *standardised* clothing items and *specialised* fashion apparel and its impact on the geography of value adding and supply chain governance (Gereffi 1994). The second axis relates to demand: *generic* products are undifferentiated in the market while *dedicated* products are targeted to the end-user by the producer.

As shown on by the figure on the following page, these traits exist on a spectrum, which Marsden et al. (2000) used to illustrate the evolution of agricultural production. Lowe and Gereffi (2009) note the benefits of shifting the US beef industry from producing a commodity to a value-added product, essentially moving south on the *standardised* – *specialised* axis.

Based on these distinctions, two types of chains are used in the analysis, long and short:

- Long Value Chains: nodes of the production process are segmented, with agents typically providing one step in the production and profiting on the basis of economies of scale and horizontal integration of production. The resulting product is likely to be *generic* and *standardised*.
- Short Value Chains: nodes of the production process of production are concentrated: farmers may also process, store, transport, market and distribute their own product and thereby profit through vertical integration. The resulting product is likely to be *dedicated* and *specialised*.

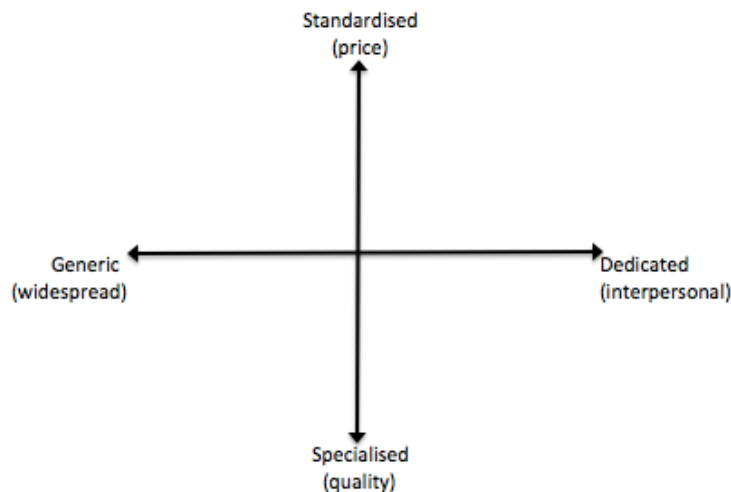


Figure 3: Storper's Four Worlds of Production (Storper 1997, also see Marsden et al. 2000)

While Marsden et al. (2000) base their conceptualisation of short value chains on the connection between producer and purchaser, for the purpose of this analysis the distinction is made on the concentration of the production stages within a single entity and the degree of product specialisation. Long and Short Value Chains, much like the four worlds of production, are a spectrum, rather than an either/or proposition. However, agricultural producers in the middle ground are in decline as they are “often too big to benefit from direct sales models such as CSAs (Community Service Agriculture) or farmer’s markets, they are also too small to build partnerships with larger supply chain partners” (Pullman & Wu 2012, p. 8).

2.3 Governance and coordination within Value Chains

The understanding of the governance within global value chains is integral to the research as it “shows how corporate power exercised by global lead firms actively shapes the distribution of profits and risks in an industry” (Gereffi & Lee 2016, p. 27). The concept of governance and the co-ordination can be seen as an investigation into the institutional arrangements that determine profits and risk within the value chain, as:

... the key to sustaining the growth and spread of incomes lies in the ability to influence the behavior of groups of people acting in concert, rather than that of individuals who benefit from these joint activities (Kaplinsky 2004, p.92).

Originally separated into two categories, buyer- and producer- driven chains, as research into value chains progressed it became apparent that a more detailed typology was required (Gereffi & Lee 2016). As a result, a typology of five governance systems was developed, ranging from market based to hierarchical vertical integration in terms of interaction between actors, with the process complexity, requisite knowledge transfer and supplier capabilities central in determining the level of interactions between agents within a value chain (Gereffi, Humphrey & Sturgeon 2005). Kaplinsky (2000) arrived at a different framing of a

similar conclusion, finding the intangible competencies of research and development, design, branding and marketing as pivotal determinants of value chain co-ordination.

For value chain analysis, both global and regional, the consideration of governance within the chain provides insight into the potential for upgrading (Humphrey & Schmitz 2002). The Australian Competition and Consumer Commission (2018, p. xix) report on the dairy industry provides a stark example of the relationship between value chain governance and the capturing of profits:

Consumption of drinking milk is largely insensitive to price changes. Total supply chain profits would, therefore, be likely to rise if there was an increase in retail prices, such as for private label milk. However, this by itself would be unlikely to benefit farmers. Any increases in margins flowing from an increase in the retail price would likely be captured by the major supermarkets, or at best shared between the supermarkets and processors.

Therefore, lead firms not only control the flow of production within the value chain, but in circumstances of dominance can change supply chains to capture increased profits, as well as be more resilient to factors outside the value chain that may impact on profitability.

There is a further dimension to the question of governance that arises once the focus shifts from industry/firm to region. As noted by regional studies theorists, there is a tension between the dimensions associated with territory (spatiality) and the socio-economic relations that define a region. It is not always clear what is meant by 'region'; hence, definition is critical for analysis (Allen & Cochrane 2007; Amin 2004). Three considerations are important here:

First, institutional arrangements and the policy discourse in relation to 'region' are important. In Australia, for example, popular discourse refers to urban and regional localities, whereas policy discourse more accurately could distinguish between rural and urban (metropolitan) with regard to the institutional arrangements that may apply (Beer et al. 2005, pp. 14-56). More generally in the Australian context, there are also definitional matters with regard to the place of regions relative to national, state and local government arrangements. While all three levels of government participate in forms of regional governance, (typically identified at the sub-state level and often involving multiple local governments), regional structures, including regional food value chains, stand ambiguously separate from the official three-tiered structure of the Australian state.

Second, 'regions' figure in important ways in the scalar dimensions of political processes. The concept of 'scalar politics' considers both the material and discursive elements of political struggle (Huber & Emel 2009; MacKinnon 2011). Scalar identities, such as the 'region', can be constructed or deployed strategically by actors, organizations, and movements in their efforts to advance specific interests (MacKinnon, 2011). However, when actors exercise their capacities to advance social and political projects they do so in

terms of prevailing power relations and specific institutional and structural arrangements (Jessop, 2001).

Third, regional institutions operate in terms of territorial and relational (network) dimensions (Goodwin 2013, pp. 1188-9). Territory refers to spatiality, while the relational dimension addresses connectivity (Goodwin 2013, p. 1182). The importance of this distinction is that it counters an over-emphasis on the relational, at the expense of the spatial. This distinction draws attention to the ways that political practices take place at different scales and over different territories. The task is to explain both “the scalar and territorial dimensions of particular political practices” (Goodwin 2013, p. 1189).

These three dimensions underpin this analysis of regional food value chains.

2.4 Theoretical Challenges

2.4.1 What is a region?

The use of region and regional as a geographical descriptor in Australia is different to other places. Here, it is used to describe non-metropolitan areas in total - regional cities as a widely used phrase for example – or parts there-of, such as the Gippsland region. In Europe, where much of the value chain and smart specialisation literature hails from, region may mean a major city and its hinterland, a cross-national border area with strong links, or a collection of countries such as the Asia-Pacific region. The translation of regional development initiatives to Australia needs to consider these different conceptualisations of *region*, as well as the distinct monocentric nature of the economic and population distributions of Australia.

2.4.2 Regional Porosity

Regional porosity is a problem that we must wrestle with in all placed-based analysis (Wilson et al. 2015). Regional boundaries are dissolving as people travel further between work and home, ownership structures and production are increasingly national if not global, and intermediate inputs to production are likely to be sourced from outside the region, particularly for information-based services (Collits & Rowe 2015; Scott 2011). These developments mean that it is important to consider the question of regional boundaries and the degree to which they are closed and/or open.

One of the most common ways of defining boundaries is in relation to formerly administrative arrangements, such as local government borders. Gippsland, for example, can be clearly defined by the Local Government Areas. Currently it comprises six shire councils – Bass Coast, Baw Baw, East Gippsland, Latrobe City, South Gippsland, and Wellington. Nonetheless, it must be noted that the current administrative definition of Gippsland is of relatively recent origin, with shifts in the cultural and administrative boundaries from the Dandenong-Casey-Cardinia area eastwards. These three councils are part of the South East Melbourne Group of Councils, along with four other councils, although it is not that long ago that the

“Welcome to Gippsland” sign was west of Pakenham. In 2001, Cardinia changed from being included in ‘Gippsland’ geographies to become part of the South East Melbourne Group of Councils.

The point to note is that the Gippsland food value chains and economic activity do not correspond to these arrangements. At the territorial level, while effectively bounded on three sides, by the Great Dividing Range, Bass Strait and the distance to another sizable centre from the eastern end, it is the interaction with Melbourne and its hinterlands that generates uncertainty. Gippsland Beef refer to a boning facility that they operate in northern Melbourne, and there is a butcher in the Melbourne suburb of Armidale, part-owned and stocked by from a Gippsland farm. Gippsland lettuce growers co-own processing facilities with growers based in the nearby Cardinia shire. Milk processing in Gippsland has strong global linkages, with ownership including France’s Lactalis, New Zealand’s Fonterra and Canada’s Saputo, as well as significant investments in the industry from Asia.

Whether these examples are in Gippsland, or part of the Gippsland food chain, may depend on what is being assessed: for gross regional product they may be included, but for employment they may not. As other regions may have more complex interactions with their surrounds, Gippsland is a good place to test resolutions to this issue.

2.4.3 Regional Growth or Welfare

As study areas reduce in size, there is a need to differentiate between interventions that grow the regional economy through increasing the productivity of the wider region and regional welfare interventions, whereby more prosperous areas ‘donate’ economic activities. This is a trade-off between regional economic efficiency and distribution.

Therefore, recommendations for value chain uplift and regional development need to make sense in a broader geography, they need to not create subsidised regional industries for the sake of it. That is, they need to be based on an underlying efficiency in the proposed location. This issue was addressed in a report providing alternative economic strategies for Wales:

... do we really want a monopoly Welsh NHS bed pan supplier? Can we agree that the Welsh NHS should continue to buy the macerators for single use bed pans from Haigh Engineering in Ross on Wye (which is a world leader in this technology)? ... it is surely pointless for Welsh Government policy to award jobs and contracts for Welsh firms if that means diverting orders from more competitive SMEs in, for example, adjacent Cheshire, Hereford and Gloucester? (Brill et al. 2010, p. 47).

For this reason, value chain analysis needs to take into account what stages of production occur out of the region in addition to those within it. The recommendations arising need to be for the region, but cognisant of the interactions with the surrounds and systemic efficiency outcomes.

3 Methodology

The research team has developed a distinctive approach to regional studies. Building on an extended case-study approach the project will focus on the interplay between actors' experience and structural complexity (Burawoy 1998). The novelty is twofold: **first**, it grounds and centre stages regional governance (as suggested by Beer & Clower 2014) and **second** it locates analysis in relation to the social specificities of particular regional economies and societies (illustrated by Bowman et al. 2014).

3.1 The Steps

3.1.1 Determine Sectors

The first step in the process is to select the food and fibre sectors that will be subject to the analysis. For Gippsland, the Dairy, Beef and Horticulture sectors have been selected for preliminary analysis. In this instance, these initial sectors have been chosen to inform the development of the methodology, as they highlight different aspects of value chain analysis, such as industry maturity, supply chain typologies and legislative impacts.

Future decisions would be based on agricultural production data and in consultation with regional stakeholders.

3.1.2 Data Sources and their Limitations

The second step by the research team was to identify publicly available data. This comprised statistics, documents, and related compilations of data, for example, in relation to the quality and security requirements demanded from milk producers.

3.1.3 Application

The third step is to identify methodologies and analytic approaches to both extending the data base as well as using it in ways that enable informed decision-making about the food value chains.

3.2 Value Chains

Value chains typically comprise research and design, inputs, production, distribution and marketing, and sales. For sub-national regional value chains, distinguishing between stages and inputs that occur internally and externally is integral to the application to regional development. Therefore, an additional dimension has been added to create a matrix showing the stages of production in the vertical axis, and location of production in the horizontal axis, as shown in the indicative example below.

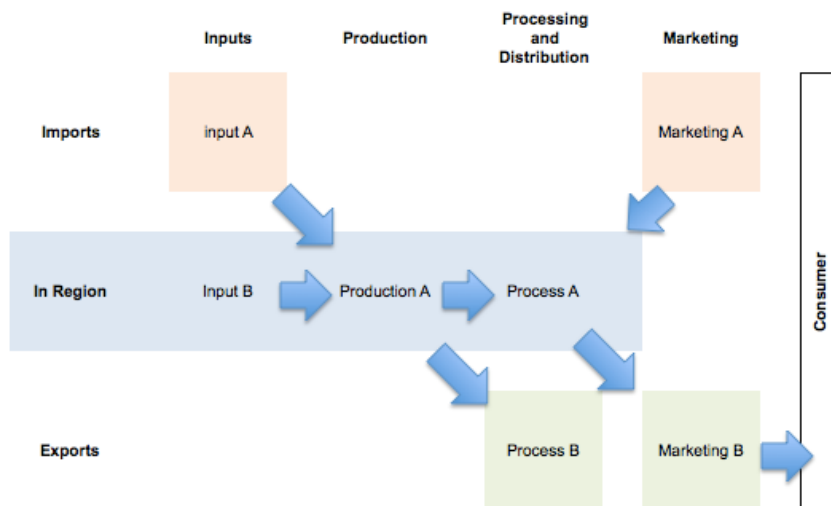


Figure 4: Indicative regional value chain

In this instance imports and exports indicate where the inputs to and products of the value chain enter and leave the study region. For food and fibre products integrated into national distribution chains, it is possible that they are bred or grown within a region, exported for processing and then return to the region for the marketing stage, which includes retailing.

The distinction between imports and exports from a region may appear clear, but there is a challenge arising from the different boundaries occasioned by varied administrative and functional definitions of region or sub-region. Economic activity is often oblivious to the borders of Local Government Areas (LGAs), which means categorising imports, exports and in-region stages within a value chain needs to reflect local circumstances and neighbourly interactions. The close links between the Gippsland study area and the Greater Dandenong, Cardinia and Casey LGAs is a prime example of this aspect, with these areas being including in Gippsland prior to their envelopment by Melbourne. Evidence of the close links in this area is the lettuce processing facility owned by a group of four growers located in central Gippsland and the City of Casey.

3.3 Trade and Employment Data Analytics

Global trade-based studies of value chains can use readily available international trade data, which is a result of border crossings providing data collection at a clear point of entry and exit. Trade data is not readily available at a sub-national/provincial level as a result of the porosity of regional areas such as Gippsland. The available data from the ABS provides indication of the employment and value of agriculture in the region, which informs regional decision makers and often those from outside, such as governments or corporations and firms contemplating investment in the region.

These often-aggregate analyses can be complemented by two relatively standard techniques to assess and evaluate regional impacts, as defined by employment

within a region, thereby underwriting the foundational aspects of an economy (Brill et al. 2010). These assessment techniques are the location quotient (LQ) and shift share analysis. Together they define regional employment within broader provincial and national transitions. Location quotients are an indication of the proportion of employment within an industry sector compared to the average for the wider area: Australia in this instance whereas the shift share analysis enables the analysis of regional employment changes over time. This latter move extends LQ analysis by decomposing employment changes in terms of National share (NS), the part of change attributable to overall national trends; Industrial mix (IM), the part of change attributable to the industrial composition or mix of the region; and Regional shift (RS): the part of change attributable to regional advantage or competitiveness (Stimson et al. 2006, p. 114).

In a variety of ways these measures are drawn upon in the development of plans and briefing documents, the next consideration for understanding the regional value chain.

3.4 Document Analysis

Internet searches and consultation with regional representatives for the study area, the industry sectors and key regional stakeholders and industry bodies provides a library of documents for review. There are two outcomes from the current document review:

1. Developing a catalogue of data sources for further analysis, based on the references included in the review documents; and,
2. Establishing the context for the value chain study, including industry conditions and prospects and regional strategies and plans.

The document analysis uses the 'What's the problem?' approach to policy assessment. The central tenet of this method is that in exploring the assumptions that underpin policy formulation and analysis, it is necessary to foreground what is not studied and discussed as well as explicit dimensions and parameters of such enquiry. In this respect, the insights of scholars such as Bacchi and Goodwin (2016) suggest important steps, methodologically and in terms of understandings. The ways in which regional social and economic development plans are cast, indicates a range of implicit understandings about the structures that define labour markets, their potential in the context of social and economic transition, as well as prospects for state supported policies that are equitable and inclusive. It would appear that policies are cast in terms of what is possible, for example, as articulated in terms of a neo-liberal framework which underwrites the tradeable and competitive rather than the foundational and the mundane. Such prescriptions must be at the forefront of analysis and guide methodological approaches to this type of study.

The team used the research software *Citavi* to build up a database of key reports and other documents food and fibre value chains in general and how they applied in Gippsland in particular. We are able to identify over two hundred different sources of

data used in the literature, and have been able to further investigate their utility and links to other related potential sources of data.

We are able to identify, where it is noted, which documents use the same or similarly sourced data, and the range of data sources used in particular documents. Following on from this step we allocated categories to data and analysis presented in the reports, and were able to search within or across documents for analyses dealing with the same subjects.

To illustrate the potential of this approach, an aspect of the dairy industry analysis is presented. The references we have considered that deal with “Dairy” and associated “Value chains” or “Value Chain Data” include Dairy Australia publications, the Dairy Farm Monitor Project, the ACCC (Australian Competition and Consumer Council) final report from its Dairy Inquiry of 2018, and the Accenture Report for the National Association of Retail Grocers in 2010. While time consuming, it does allow identification of references or groups of references, their data sources and subjects dealt with. Such a procedure will feed into the practices and arrangements that will underpin the food and fibre central repository, to be constructed at the Hi-Tech Precinct, Morwell, Gippsland, and administered by Federation University.

Thus, for the Productivity Commission’s research paper “Relative costs of doing business in Australia: Dairy Product Manufacturing” we can identify the range of references used in the text, including ABARES, the ABS, Dairy Processing Companies, the Department of Agriculture, the Australian Dairy Industry Council, and so on. We can identify particular sources and other references that use them, so for example, none of the other references cite the Australian Dairy Industry Council.

These dimensions are captured in the depiction below.

These procedures will provide the database for the next stage in analysis, namely the extension and validation of global value food chains.

3.5 Validating and Extending Databases

The validation phase comprises standard qualitative research techniques designed to generate hitherto unavailable data and understandings of the relationships that make up value chains. This phase of such research will authenticate the conceptualisation of the regional value chain. It will provide evidence of governance and associated relationships and will provide additional data on value added at each stage of the production process. Two methods will be employed, interviews and extreme scenario workshops complemented by structured data analysis.

Gereffi and Fernandez-Stark (2016) indicate the scope and direction of the interview element of research, listing companies, industry associations, workers, educational institutions, government agencies and ministries as areas for investigation. They also note “it is important to consider how relations between these actors are governed at the local level and which institutions are in a position to drive change” (Gereffi & Fernandez-Stark 2016, p. 16).

Extreme scenario analysis is a form of participatory engagement, used to collect data that cannot be readily obtained by other methods. This process is sequential and begins with the presentation of extreme scenarios, which are then discussed, refined and presented again, with structured reflection between workshops. By starting with extreme cases, the participants respond with innovative thinking and redefine the issues, including coverage of political, economic, social, technological, ecological and legal structures. Extreme scenarios were used in analysis of the labour market in the Geelong region in 2012. Three scenarios were developed, ‘A place for every generation’; ‘A place in transition and a transitory population’; ‘The time is now! Ten years on’, which projected different states of key industries to facilitate discussion on interventions that would support progress towards the preferred outcome (Fairbrother et al. 2013).

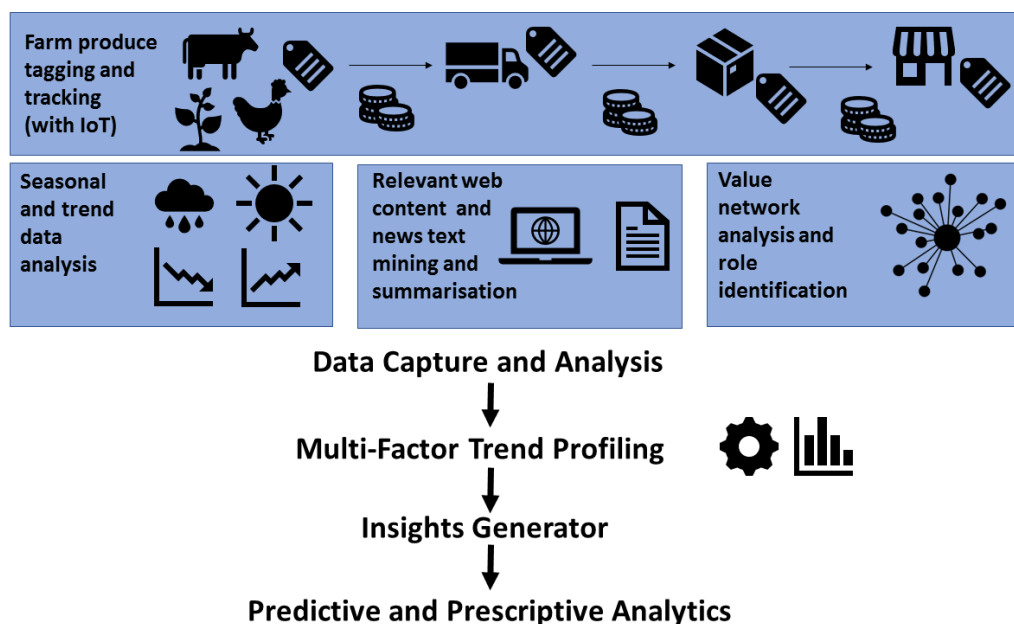
The final step is to utilise the data identification and capture to date in forms that allow application to stimulate support for sustainable and efficacious food and fibre regional value chains. This step involves data mining and the development of comprehensive and targeted digitally-based uses.

3.6 Regional Food Value Chain Intelligence Platform with Big Data Capture and Mining

The purpose of the next methodological step is to develop an intelligence platform to describe and understand the regional food value chains, by discovering behaviours

and insights from the rich data to be captured in the project. The biggest challenge in such an approach is the absence of data or repository that could be used to construct the regional food value chain, and to describe the complex interrelationships between different factors that could influence the market value of the produce and commodities that are generated and passed on across the food chain. To realise this ambition the aim is to track the value generated by produce from the farm gate to the market, either as raw or processed food, to map out the regional food value chain and to identify and discover the factors that influence the value at different times and in different stages within and beyond regions.

This identification and discovery is achieved by harnessing the multi-faceted, heterogeneous data sources available that, individually, only provide a limited view of the food value chain, but together provide a rich representation necessary to construct the regional food value chains. The massive amounts of web and open data that are available online captures the seasonal and trend data that could potentially be the factors influencing market prices (e.g. weather, petrol prices, etc). In addition, such an approach involves work with farmers and producers to set up and trial a tagging and tracking system to capture the flow of produce to market, either raw or processed. It also means generating data via more traditional methodological procedures, such as interviews, surveys and where appropriate observation.



There are vast amounts of latent information hidden in online reports and publications, that can help identify relationships and indicate the complexity of reported value chains. Moreover, much research is now online, in the form of articles, books, reports, presentations and so on; the task as exemplified by this report is to conceptualise the food value chains in useable and informed ways. As noted above, value chain and network analysis can be used to identify the roles played by the nodes in the value chain as well as identify the influential nodes and where decisions are made about adding value and capturing value. The combined

extraction and analysis will provide a fine-grain detailed chain of produce, logistics, transformations, and value-add processes from the farm gate to the dining table.

To undertake such a project, six work packages should be undertaken, including evaluation and trial.

1. Big Data Capture and Logging and App- and IoT-based Citizen Science
 - a. Setting up a big data platform repository: A common access method to this repository would be set up, including raw data and processed data which can be queried as raw or summarised data.
 - b. Fine-grain data capture: IoT- based tracking and value monitoring of farm produce from farm gate to the market to the dining table
 - c. App-based data capture: Spatio-temporal, visual, and textual data capture, experience sampling, and diary study by citizens and stakeholders of farm produce activities along the value chain (farmers / producers, logistics, food company workers, etc) to capture the *in situ* activities.
 - d. Large-scale web data capture: Open and web data crawling and logging of commodity and market prices, company, organisation and textual documents, as well as demographics, seasonal, trend, and weather data. The type of data and the data sources that can be captured include: fuel prices, weather, currency and stock market changes, World bank, news, logistics repository.
2. Text Summarisation, Text Mining, and Sentiment Analysis from large scale unstructured text, web documents, and social media streams
 - a. Text mining, topic tracking and detection: Approaches for identifying important keywords, concepts, topics, and patterns in unstructured text data will be employed using text mining approaches and topic modelling techniques. The purpose is to deploy and expand on recent neural-based approaches that have been shown to be highly flexible and robust across domains. A primary aim is to identify key sources including reports, social media, and other online documents, and to then create robust topic tracking and detection processes to identify relevant online information as soon as it is made available.
 - b. Text summarisation: Insights from unstructured relevant text-based data identified in the previous step will be created through multi-document summarisation, where key information around a topic is identified, across multiple sources, and presented in condensed form. Multiple sources help to ensure consistency and robustness, and may also help to protect against bias in reports. In particular, this step will build on recent approaches to real-time summarisation, where a

system monitors a stream of documents and keeps the user up to date on relevant topics and events as they unfold.

- c. Sentiment Analysis: Alongside the analysis of key messages and content in documents is the understanding of sentiment, as the direction of opinions, which may not even be explicitly expressed yet in reports. These measures can give early and substantial signals about upcoming trends and directions. Use could be made of machine learning approaches such as Bayesian classifiers as well as recent deep learning techniques, to gain insights into the role of opinions on the food supply/value chain.

3. Visual Data Processing and Analytics

- a. Extracting and analysing information from images: Non-text information provided by different sources (e.g. Regional Development Victoria) might be in geographical maps, satellite imagery and various other image formats. These documents might have limited text description and could contain essential information (e.g. spatial relationship among the entities and the road networks between them) for in-depth understanding of the value chain and who are the main beneficiaries in the supply chain. Techniques for extracting and analysing such data will include the study of transportation efficiency between different entities in the food supply/value chain.
- b. Capturing unavailable visual data: Information, such as the landscape terrain around the producers and time-series information crop condition, might not be readily available so steps would be taken to collect this data.

4. Multi-factor trend profiling and value network analysis: Inferring relationships between semantics, topics, events of interests in the Gippsland region.

- a. Semantics inference of contexts, such as places of interests, activities, temporal contexts, which can signify the value and semantics behind the movement and chaining of goods and produce.
- b. Value network analysis combined with semantic inference to identify roles played by nodes in value chain and identify influential and bottleneck nodes.
- c. Analysing and summarising topics and events from news, web, and social media that are relevant to the food value chain in Gippsland.
- d. Constructing multi-factor spatio-temporal profiles and knowledge representation of food-value-chains in Gippsland, combining spatio-temporal contexts and semantics extracted from the previous tasks.

5. Predictive and prescriptive analysis tools

- a. Predictive analytics: Enabling time-series forecasting and spatio-temporal prediction of different target variables in the food-value chain.
- b. Causality analytics: Developing causal models that can explain the prediction results, enabling stakeholders to ask questions and form hypotheses for prescriptive analytics.
- c. Prescriptive analytics: Enabling hypothesis testing with large scale decision variables.
- d. Interactive Visualization of the lineage of data ranging from different sources and integrated to enrich the food value: enabling the stakeholders to investigate the role and importance of different data sources contributing to the food-value chain
- e. Integration of the above tools

6. Pilot testing and Evaluation

- a. Review and establishment of evaluation metrics
- b. Refinement
- c. Implementation, replication, and scaling across different food sector.

Once completed, the food value chain intelligence platform will:

1. Provide a robust and clear picture of the value chains, where is generated and where captured. This analysis will provide the basis for project development in the long-run, in the case of Gippsland inform the Hi-Tech Precinct – Food Central.
2. Create and implement a decision-making dashboard, targeted and operating for those that comprise the value chains from production and sourcing to retail and consumption.
3. Allow strategic policy development in relation to the regional food value chain, within Gippsland and in relation to Gippsland as a significant food-based region.

3.7 Transition from Value Chains to Regional Development Initiatives

The approach to translating recommendations for individual sectors to regional development interventions is depicted in Figure 6 below. Value Chain A and B indicate individual sector analyses that point to upgrade possibilities within the region: only two chains are represented for clarity, in practice more chains will be included in the fully developed analysis. The upgrade possibilities are then compared across the chains to identify initiatives that facilitate upgrading in multiple chains, as well as within individual chains.

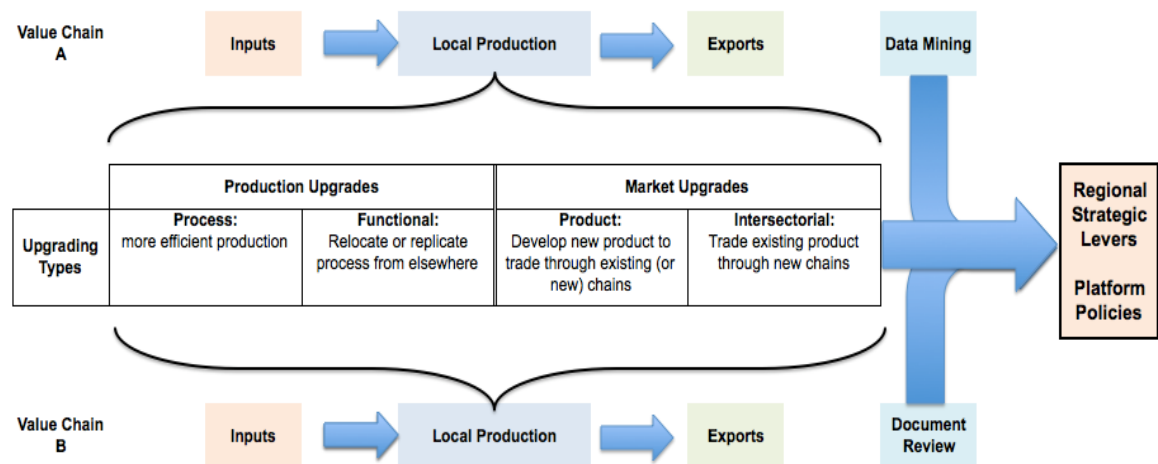


Figure 5: Regional Value Chain Process

The multi-chain recommendations are known as strategic levers or platform policies; interventions that work across industries, rather than being industry specific. This is in accordance with the view that:

... there is a need for tailor-made policy strategies, geared towards specific potentials, and focused on tackling specific bottlenecks in regions. As a result, regional policy needs to evolve, capitalising on region-specific assets, rather than selecting from a portfolio of specific policy models and recipes that owed their success in different environments (Asheim et al. 2011, p. 17).

This step underwrites the purpose of undertaking the value chains, to identify bottlenecks and region-specific assets, as well as pointing towards the regional development initiatives that respond to prevailing capacities and opportunities.

Following the selection of industry sectors for analysis, such as food and fibre, there are three strands to the methodology, as depicted in the following diagram.

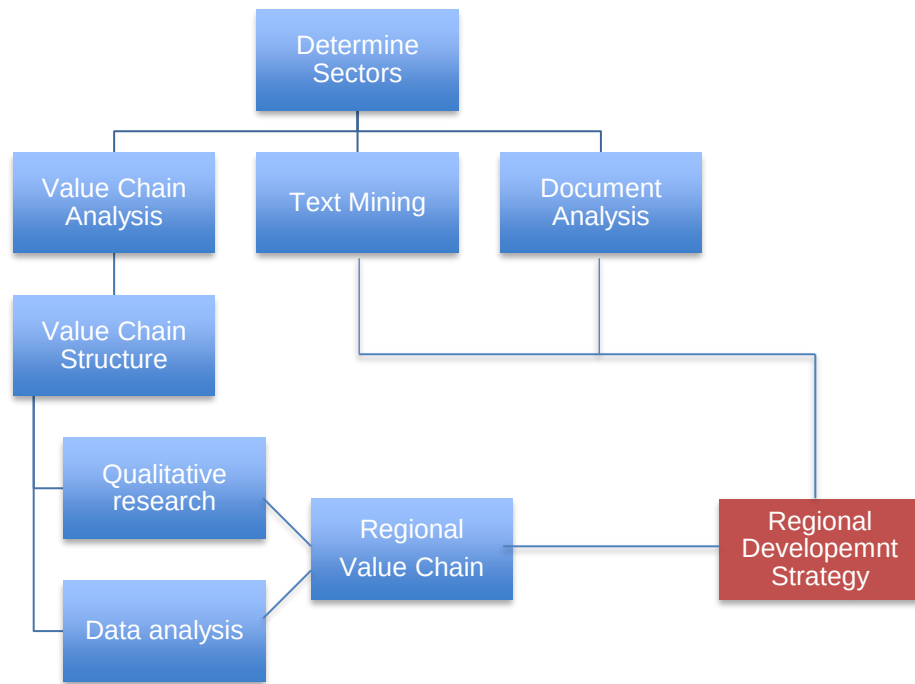


Figure 6: Regional value chain methodology

The first strand is the value chain analysis, which investigates the distribution of profits and control of production flows through the chain. The second is text mining, which involves relationship analysis across different entities, to recognise the important entities within this value chain, the type, and how this relationship can be abstracted to inform a knowledge base or extract a summary. The third strand is a review of regional development, planning and agriculture strategies, which provides a critical basis for recommendations and development opportunities.

4 Gippsland

The Gippsland region lies to the east of the Melbourne metropolis, bounded by mountains in the north and the sea in the south. It is an administratively-recognised region formally comprising six shire councils: Baw Baw, Bass Coast, East Gippsland, Latrobe, South Gippsland, and Wellington.

The analysis of Gippsland data in this report uses the ABS's *Australian Geographical Statistical Standard*, based on the Latrobe-Gippsland SA4, indicated in red on the map below. The boundaries within the SA4 are the Baw Baw, Gippsland East, Gippsland South-West, Latrobe Valley and Wellington SA3s. The four blue SA3s represent the metropolitan interface region with historic and ongoing economic connections to Gippsland: Cardinia, Casey North and South, and Dandenong. Where only SA4 data is available for the Interface region the South East Melbourne SA4 is used.

The boundaries depicted within the designated region (SA4) are Baw Baw, Gippsland East, Gippsland South-West, Latrobe Valley and Wellington (defined by ABS SA3). The blue area represents the metropolitan interface region with historic and ongoing economic connections to Gippsland: Cardinia, Casey North and South, and Greater Dandenong (SA3). For clarity, the Latrobe-Gippsland SA4 is referred to as 'Gippsland', and Cardinia, Casey North and South, and Dandenong as 'the Interface'.

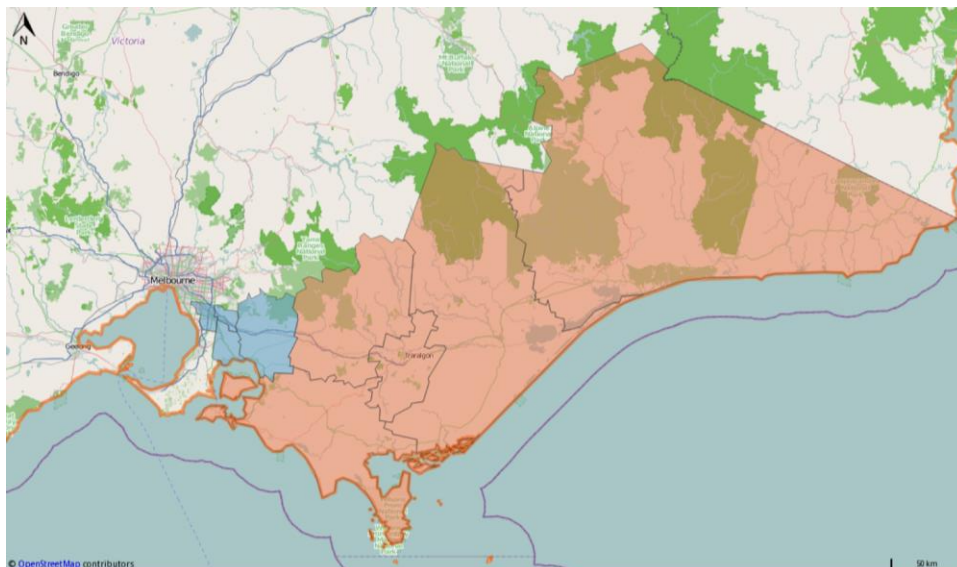


Figure 7: Gippsland and the city-region

Source: Pink (2011) mapping on AURIN

The ABS (2018b) designed the SA4s to represent labour market areas, and in the regions generally include a population of 100,000 people. SA3s are divisions within an SA4, include 20,000 to 30,000 people and are constructed to represent social, environmental and economic consistencies

4.1 The Importance of Industries to Gippsland

In 2016, KPMG published the following data in the *Gippsland Regional Workforce Plan*. It indicates the industry contribution to gross product in 2014, based on data produced by National Economics (2015). The number of employees by industry sector is from the 2011 census, using industry classifications tailored by KPMG for the report. Of note, the Industry Contribution is not titled Gross Regional Product, which would require distinguishing between the local and non-local value-added in each of the sectors.

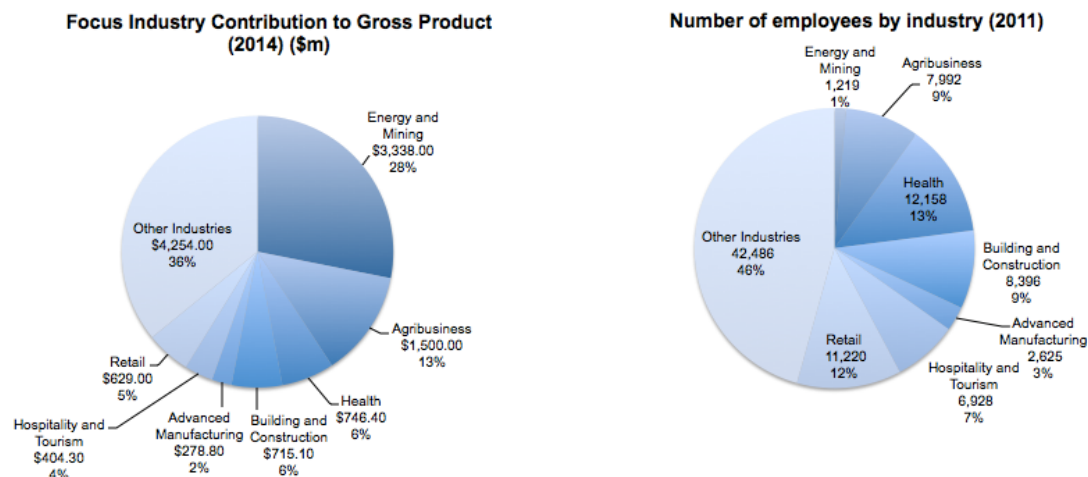


Figure 8: Industry gross product and employment – Gippsland

Source: KPMG (2016, p. 36)

The striking disparity in this data is that *Energy and Mining* accounts for 28% of the Gross Product but only 1% of the employment in the region. The first point to note is that the employment data is likely to be an understatement, since it only refers to direct employment and *Energy and Mining*, like the other sectors, generates regional employment in other industries. For example, it has been estimated that for every job lost in the *Energy and Mining* sector another 0.732 jobs would be lost in associated industries and a further 0.533 jobs lost due to reduced consumption (Committee for Gippsland 2016, p. 43). It should also be noted that according to the 2016 Census, within the *Mining* ANZSIC Level 4 industry code, 29 per cent of employment was Coal Mining, while 38% were employed in Oil and Gas and Extraction. This distinction is important due to the uncertain future of the region's coal based power industries, while gas is seen as having an ongoing role in power supply (AEMO 2018).

The second feature that requires further explanation is what is meant by 'Contribution to Gross Product' and its relevance to the Gippsland economy¹. It is likely that the Gross Product measure is similar to the "Gross Regional Product" included in the 2014-15 State of the Region report prepared by National Economics (2014), but decomposed into industry sectors. While in theory GRP is the "sum of the value of outputs by its industries and subtract from it the region's net import" (Isard et al.

¹ NIEIR (2014) is cited as the source, but is not included in the reference document list on pg. 137 of the report

2017, p. 358), it is unlikely that this, or other available, estimates account for net imports given the complications associated with regional porosity. Place of work data strongly reflects what occurs in the region, collating employment and incomes based on workplace addresses. Calculations of GRP are estimations of the regional economy based on the application of regional averages. Also, GRP calculations cannot determine the location of the value creation and the extent that elements of the supply chain from outside the region add value to the product. For industries such as *Energy and Mining*, where the Gippsland generators have been and are owned by national and international entities, if the central office and market aspects of the production are considered as imports the value to the local economy may be significantly less than the total market value of the production.

This calculation does not mean that the gross product data is incorrect: it is a representation of the value of production from *Energy and Mining*, or any other of the sectors. Rather, it is a questioning of whether it is a useful indicator of the sector's importance to Gippsland, as Stiglitz, Sen and Fitoussi (2010, p. 56) note:

GDP mainly measures market production, though it has often been treated as if it were a measure of economic wellbeing.

They go on to recommend a greater focus on household income, consumption and wealth as a better measure. They also provide an example, where in Ireland national income declined while GDP increased, a result “of an increasing share of profits that are repatriated by foreign investors” (Stiglitz et al. 2010, p. 29).

It is also of note that the application of input-output multipliers from the national accounts for analysis of small areas is not recommended, as the smaller the area the fewer goods and services offered internally (Gretton 2013). This impacts on the size of the multipliers, as the ABS (2015, p. 563) state, “Inter-industry linkages tend to be shallow in small regions since they usually import a large proportion of these goods from other regions”. Regardless of these concerns, Gross Regional Product has become a frequently used measure of regional economies, estimated using Gross State Product, National Input Output Tables and place of work data sourced from the ABS (see REMPLAN 2018, SGS 2018).

As an alternative measure, the following graph provides the percentage of the total wages received by industry within Gippsland in the 2016 census. The method of calculation is to multiply the number of census responses per industry by the middle point of each of the 15 income bands. Negative income is set to \$0, and the average of the unbounded category of \$156,000 per year or more is set to \$165,000. The results have also been divided by the number of employees per industry to provide the average wage, shown as the squares and on the right hand axis of the table below.

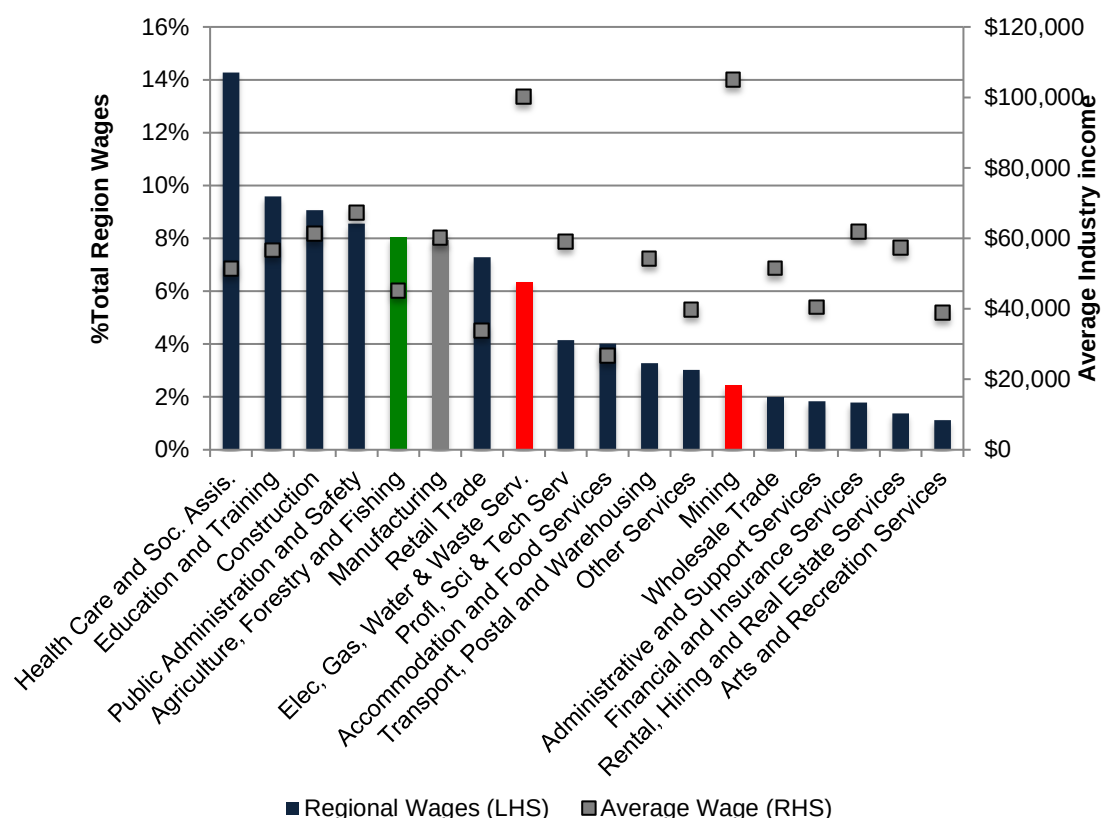


Figure 9: First order income by industry: Gippsland

Source: 2016 Census, Place of Work database, derived from TableBuilder Pro.

On this basis, *Health Care and Social Assistance* is the dominant industry, providing nearly 5 per cent more of Gippsland household incomes than the second category, *Education and Training*. If *Electricity, Gas, Water & Waste Services* are added to *Mining*, then as a sector it is equivalent to *Construction* and *Public Administration and Safety* at approximately 9 per cent, but it should be noted that this category includes standard utility supply services, not just electricity generation industry. The average wages in the *Electricity, Gas, Water & Waste Services* and *Mining* sectors are significantly higher than those in other industries, indicating that they provide well-paying employment, although the impact is concentrated in fewer households. *Agriculture, Forestry & Fishing* contributes 8 per cent of household incomes, but as reflected in the need for regional value chain analysis, this value only includes on farm values. Analysis of ANZSIC Level 2 codes for manufacturing indicates that 68% of the incomes in this sector are food and fibre related; when these manufacturing incomes are added to the *Agriculture, Forestry & Fishing* value, the combined sector provides 13 per cent of regional household incomes. While there are limitations to this analysis depending on the purpose of compilation, it excludes government transfers and business operating surpluses. It also does not account for second order effects, which are the incomes in other sectors attributable to an industry.

This indicates that there are two substantive issues with gross product as a measure for industry sector importance in a regional context. Firstly, when applied to smaller regions, or porous regions such as the Irish example, it is important to measure imports as well as exports to establish the net effect. Secondly, there may be other

measures that provide a better understanding of the impact of industry sectors on the wellbeing of regional residents. Regional Value Chain analysis can provide insights into the importance of industry sectors to regions, as its outcomes include the determination of in- and out- of region production inputs as well as how sectors interact and generate employment and incomes across the Gippsland economy.

The final point to make is a conceptual one. Distinctions should be drawn between foundational (education, health care, hospitality) and competitive (branch plants often owned and operated by corporations outside the region) features of the economy (Bowman et al., 2014). Moreover, the foundational economy that defines regions also includes those natural and embedded resources indicated by landscapes, water, soil and so forth. Specifically, the provision and requirement of daily necessities, goods and services mean populations can live and function, and indeed generate the social and economic basis of a prosperous region. This aspect of an economy refers to embedded (regional) resources, those that define the critical to the place-based community (education, health, housing) and thereby the means of everyday life (Bentham et al. 2013; Bowman et al. 2013).

The distinction between regional product and regional benefits suggests caution and care about promoting cases for support as well as acknowledging resources within a region. The focus of much policy is on the promotion of competitive and tradeable parts of the economy, such as hi-tech industries and inward investment by mobile capital. Complementing this dimension is the foundational economy, those goods and services that are embedded within the economy, as social, economic and material infrastructure (Bowman et al. 2014), which includes utilities, financial services, health and social care and education. Moreover, tradeable and competitive regional natural resources are embedded and place-based, often defining a region's economy. The development and trajectory of the Gippsland economy through the brown coal and agricultural resources exemplify this. The salient point is that regional development initiatives and considerations of industry importance to regions need to begin with a clear understanding of what is being measured and how, particularly with evidence of the decoupling of employment and productivity growth in recent years (Australian Treasury, 2017).

4.2 Food and Fibre

The food and fibre sector is a crucial part of the Gippsland foundational economy, providing the basis for social and economic strength in Gippsland. Currently, the industry contributes an estimated \$7 billion of Gippsland's \$15 billion economic output using GRP methodology. The food fibre sector is a complex supply and value chain and is in a strong position to become a core economic driver in relation to tradeable goods, contributing to the future prosperity and vitality of Gippsland.

Challenges to development include:

- Water access and usage: Water is critical for the extension and 'intensification' of agriculture. It sets a limit to growth in primary production, in broad acre and dairy farming as well as in horticulture and cropping. At

present, agriculture in the Latrobe Valley region is essentially at capacity in terms of what can be produced from the water available. The entire food and fibre sector requires sufficient water resources to prosper and grow, however the other side of this is that the region may not prepare for drought.

- Labour shortages: Agriculture faces on-going labour shortages in a range of areas including relief work, seasonal work and specialist technical staff. Low wages and casualization create a further challenge in the industry
- Entry into the sector, particularly in relation to dairy and broad acre farming, is becoming more difficult due to increased capital costs (including land), declining profit margins and negative perceptions about farming as a career path.
- Transport infrastructure: At present, food processors in the region are reliant on roads to transport their products for domestic consumption and export, with a major destination for companies being the Port of Melbourne. There appears to be a very mixed, overlapping and inefficient set of arrangements in relation to supply and exit of products into and out of as well as across the region, particularly in dairy processing but also in other areas.

The task thus is to develop a cohesive and region-wide approach. The aim is to secure the active engagement of producers, processors and consumers in shaping the supply and value chain.

4.2.1 Agriculture and Regional Development Plans

The need to extract and use value chain data has been a recurring theme in a number of the reports that have been produced in relation to Gippsland and the Food and Fibre industries. The following discussion indicates that value chain analysis cannot be rely on readily available secondary data sources, and that a range of consultation processes a required to inform a thorough and robust analysis of regional food chains.

The Gippsland Food Plan set as its aims the development of a database of food system connections, and to extract statistics that could assist with to inform advocacy and policy. The plan was based on consideration of the region's "food system, including production, processing, distribution, marketing and export opportunities" (RDA Gippsland 2013a, p. 16), which indicates an alignment with the value chain methodology. The associated Food Plan Resource document refers to initiatives across the value chain of the Gippsland food system, provides further evidence of a value chain perspective being applied to regional development:

The Food System includes all operations from primary producers to consumers. The committee has taken into consideration consumer wellbeing and community activities related to food and recognises food waste and its management as part of the system. We have focused our recommendations on areas that are within the scope of RDAG's remit to promote regional economic development. We recognise that the hospitality and tourism sectors are important parts of the Gippsland Food System, which offer both market outlets and opportunities to promote and celebrate Gippsland's food industries (RDA Gippsland 2013b, p. 4)

The Food Plan Resource Document indicates that their analysis of the industry is restricted to farm gate values for statistical analysis, although employment in the food processing sector and its requirements are noted (RDA Gippsland 2013b). As a result, the implementation recommends regional performance statistics to:

Support the collection and reporting of information on the economic value of the Gippsland food system and develop abilities to identify the economic impact of growing the capacity and capability of the system (RDA Gippsland 2013b, p. 35).

A report on the Gippsland workforce indicates that agribusiness contributes \$6.5 billion to Gippsland's Gross Product, based on data supplied by Agribusiness Gippsland (KPMG 2016). A note on the data used to make this estimation provides support for the need to undertake in-region consultation and source customised datasets for value chain analysis:

Through Phase 1, the agribusiness component of 'Agribusiness, Timber and Forestry' focussed on pre-farm gate activity. Given potential in post-farm gate activity, RDV and KPMG considered broadening this industry's definition to include a more detailed analysis of post farm gate, however the nature of training package allocation and government data breakdowns do not allow KPMG to provide analysis on opportunities in the broader agribusiness sector in enough detail to feature in this report. As such, broader agribusiness opportunities have been identified only through consultation, however they have been assessed primarily through prospective benefits to the agriculture sector (KPMG 2016, p. 4).

The KPMG estimate of \$6.5 bn based on farm gate data augmented with consultation is considerably larger than the farm gate sales data included in the Gippsland Food Plan, of \$1.5 bn (RDA Gippsland 2013b, p. 4), indicating a combination of a significant post-farm gate sector in the region and less restrictive methodologies.

The Food and Fibre Fact Pack provides data on agricultural production and food processing for Victoria. The report attempts a whole of market chain analysis of employment in the food and fibre sector, albeit limited due to allotted time. The analysis is based on the ABS categories of Agriculture, forestry and fishing; Food and beverage product manufacturing; Animal and wood fibre processing. Based on this criterion, the Gippsland-Latrobe region has the largest employment in agriculture, forestry and fishing in the state (Boston Consulting Group 2015).

The Gippsland Regional Growth Plan indicates that the region could benefit from more efficient supply chains, including designating routes for higher productivity freight vehicles (Department of Planning Transport and Local Infrastructure 2014). This was seen as an important initiative for the export of food products, paper, coal, horticulture and manufacturing; the prospects for more efficient supply chains listed include:

- food processing and fisheries in the region;
- future coal export possibilities;

- road and rail freight capacity constraints;
- intermodal terminal requirements and consolidation opportunities; and,
- technology advances (Department of Planning Transport and Local Infrastructure 2014, p. 65).

In summary, these documents base supply or value chain analysis on interviews, consultations with stakeholders or unpublished data, as well as from publicly available ABS sources. Where the Gippsland Food Plan deals with value chains, for example, it is through case studies that it sets out the activities of particular companies and the environment and relationships within which they work. This indicates that information on value chains within and across established industry groupings at local or regional geographies is not readily available and thereby requires primary data collection, using methods indicated above.

4.3 Regional Governance

Gippsland has many organisations pressing their own and other sectoral interests, and no desire for more layers of governance. In addition to the six councils within Gippsland and the three in the adjoining metropolitan area, there are numerous government entities, interest groups, coalitions and sectors in Gippsland, each with a particular agenda, geographical and sectoral focus. Pockets of cooperation have existed for some time; however there are also contentious areas of overlap and divergence.

One state level geographic definition is provided by the six Gippsland councils. Formally, the six councils cooperate via the Gippsland Local Government Network (GLGN). Moreover, within the Gippsland region, there is evidence of sub-regional state level activity.

First, the Latrobe Valley sub-region (as defined by the Commonwealth and Victorian State governments in 2011) comprised of three local councils - Baw Baw, Latrobe City, and Wellington. The designation Latrobe Valley sub-region arises from referencing by the State of Victoria and Commonwealth of Australia has become significant although not obviously for any sound territorial or relational reason (for example Commonwealth Government 2012a; Commonwealth Government 2012b; Department of Education and Early Childhood Development 2012). There is no formal institutional arrangement between the three councils, although informal relationships operate.

Second, in 2017, a new designation emerged, namely Inner Gippsland, comprising the three councils that made up the Latrobe Valley region, with the addition of South Gippsland, an area more or less spatially part of the former sub-region. In both cases, these designations were not accompanied by formal and public institutional cooperation.

Third, while the six Gippsland councils cooperate formally through the Gippsland Local Government Network (GLGN). a seventh, Cardinia Shire,

which sits in the south eastern corridor of the Greater Melbourne region, was formerly part of the Gippsland region and is still sometimes considered so. Two other councils historically were part of Gippsland, Casey and Greater Dandenong, with the latter a partner in the CRC Food Agility. These three councils sponsor Agribusiness Gippsland.

On 3rd November 2016 an important development took place following the announcement of the closure of the Hazelwood Power Generator, when the Department of Premier and Cabinet established the Latrobe Valley Authority (LVA). The LVA was set up as the key service provider for the wide range of people affected by transition, for example, workers, families, local businesses and so on in a wide range of locations. It links with key local organisations to provide multiple entry points to a range of associated services. Established by the Latrobe Valley Cabinet Taskforce, chaired by the Premier, the Authority administers a \$22 million support package and has sponsored a Worker Transition Centre in partnership with the Gippsland Trades and Labour Council (GTLC). This followed promotion of proposals developed by the GTLC over the preceding 18 months, involving RMIT University (see CPOW, 2017). The LVA provides and enables education, counselling and financial advice, as well as subsidised training for displaced workers. It also offers business support to expand job opportunities and to develop transition plans, including expansion of the 'Back to Work' employer support scheme to employ retrenched workers. The provision of multiple entry points to a range of linked services to allow for an extension of the reach of these services into other areas and sectors, should the need arise.

Overlaying these local government areas are the State of Victoria and the Commonwealth of Australia (including departments and related administrative and support services). While State and Commonwealth governments have acknowledged a degree of responsibility for regional development outcomes, the emphasis has been on fostering empowered local-level institutions. Several local institutions have thus emerged in Gippsland over the years, representing different voices in the region. No single entity, however, appears to have the support, legitimacy or authority to represent Gippsland, and to be the single voice for the economic and social development in the region.

What is clear is that while there is the desire to speak with one voice and to work together, this is not occurring. Obstacles to this include:

- Limited capacity and power of local government. This level of government has a limited ability to influence and finance the scale of facilitation and transformation needed in the broader region, either within the Latrobe Valley or Gippsland as a whole. Traditionally, local governments must be seen to be working for the citizens within their boundary, which can limit true collaboration across boundaries. While the broad remit of local government should help to bring different perspectives to the table, the experience, skills and resources to do this are not always available. It is challenging for the three core Latrobe Valley councils to address this current high-pressure and high-stakes environment.

- Multiple interests. Across Gippsland, multiple interests are evident, sectorally-based, well-organised and significant in size. This reinforces disparate voices, rather than forming a unified, single voice.
- Coordination. Pockets of coordination have existed for some time between interest groups; however there are also contentious areas of overlap and divergence.
- Finance. The large sum of money on the table for the region in light of the impending closure of a major employer heightens the sectoral lobbying and interest.
- Elections. Key funding decisions are made at state and federal level, and are often made with the electoral cycle in mind, rather than regional needs or realistic planning requirements.

4.4 Employment

There were 98,754 people employed in Gippsland in 2016, and a further 181,285 in the Interface region. While Gippsland's employment was 54% of that in the Interface region, it is of note that Gippsland's population is only half of that of the Interface area. The following figure indicates the percentage of employment within the two areas by industry sector, which illustrates the different structure of the economies within the two regions.

Gippsland has a greater proportion of Agriculture, Forestry and Fishing, Accommodation and Food Services and Electricity, Gas, Water and Waste Services, which is a reflection of the traditional economic bases of the region. The greater proportion of Public Administration and Safety and Health Care and Social Assistance may be attributed to Gippsland being more self-sufficient in these areas, while the interface region may source these services from elsewhere in metropolitan Melbourne.

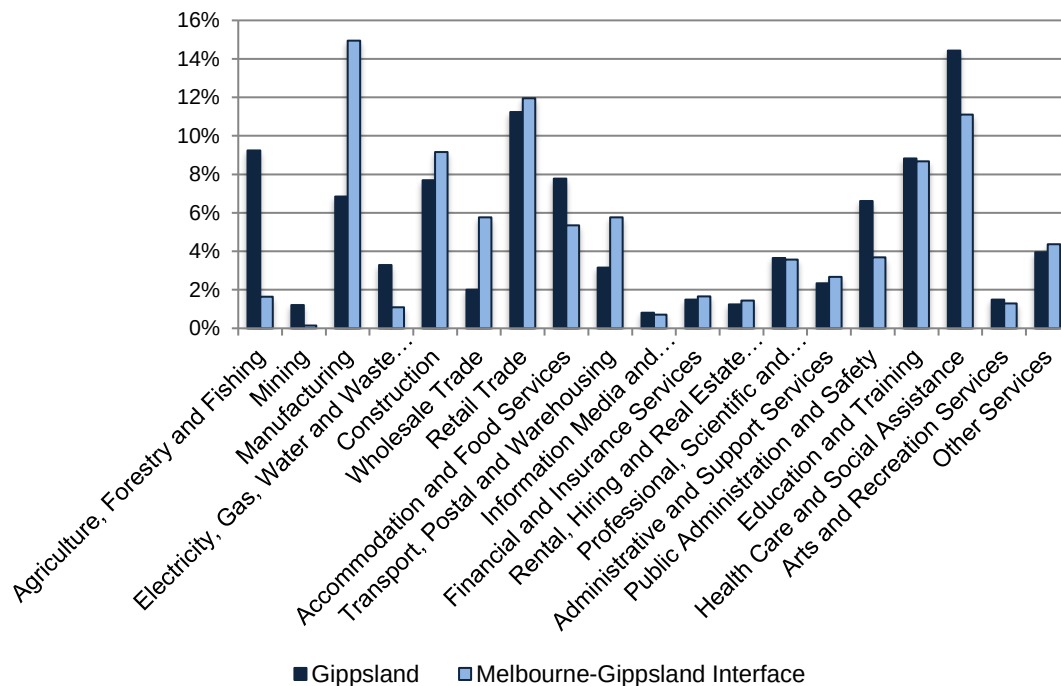


Figure 10: Gippsland and metropolitan interface employment 2016

Source: ABS (2016b)

The data also indicates that the Interface has greater employment concentrations in Manufacturing, Transport, Postal and Warehousing, and Wholesale Trade, showing a stronger reliance on these industries than for Gippsland. Further investigations may uncover complementary relationships between Gippsland and the Interface based on these different industrial strengths..

4.4.1 Location Quotients

One way of extending the analysis to focus on regional employment is to use two standard techniques for assessing regional employment, location quotient (LQ) and shift share analysis, to consider changes within Gippsland employment and how they may be a result of broader transitions. The Interface regions have not been included in this section, as their industry mix and size would obscure the analysis of the regional food and fibre sector.

Location quotients are an indication of the proportion of employment within an industry sector compared to the average for the wider area, Australia in this instance. The method of calculation is the proportion of local employment in the industry being considered divided by the proportion of employment in the same sector in the wider area, as outlined in the example equation for agriculture in the Baw Baw SA3 below:

$$LQ = \frac{\left(\frac{\text{Baw Baw Ag. Employment}}{\text{Baw Baw Total Employment}} \right)}{\left(\frac{\text{Aus. Ag. Employment}}{\text{Aus. Total Employment}} \right)}$$

As shown in the table below, the proportion of *Agriculture, Forestry and Fishing* employment in the Latrobe-Gippsland SA4 is 6.5 times the proportion for all of

Australia, and 4 times that of Victoria. This, as expected, is due to the high levels of overall employment in the country's major cities, where there is little agricultural employment.

Table 1: Agriculture, Forestry and Fishing Location Quotients

		2016			2011			LQ Change
		Ag Emp	Total Emp.	LQ	Ag Emp	Total Emp.	LQ	
SA3	Baw Baw	1,972	15,865	8.9	1725	14,505	8.3	0.6
	Gippsland - East	1,426	15,735	6.5	1253	14,912	5.8	0.6
	Gippsland - South West	2,784	21,004	9.5	2613	21,692	8.4	1.1
	Latrobe Valley	627	30,565	1.5	482	26,616	1.3	0.2
	Wellington	2,348	17,024	9.8	1920	15,294	8.7	1.1
	Latrobe - Gipps' SA4	9,155	100,188	6.5	7991	93,022	6.0	0.5
	Victoria	60,331	2,730,341	1.6	55033	2,451,896	1.6	0.0
	Australia	266,952	19,037,278		249827	17,363,696		

Source: ABS (2011, 2016b), Tablebuilder Pro customised data

The Agriculture, Forestry and Fishing LQs for the Latrobe Valley SA3 is lower than for Victoria as a whole, which comes about because the SA3 includes the major service hub in the region, as well as the electricity generating infrastructure. The other SA3s within the Gippsland region range between 6.5 in Gippsland East, through to 9.8 in Wellington, indicating the importance of the agriculture to these regions.

While the LQ in Victoria did not change between 2011 in 2016, it increased in the each of the five SA3s indicating the increasing importance of food and fibre sector. It is positive to note that this increase is associated with growth in Agriculture, Forestry and Fishing employment in all of the SA3s, with only the Gippsland - South West SA3 declining in total employment over this period.

4.4.2 Shift Share

Shift share analysis is a method for analysing regional employment changes over time, which extends LQ analysis by decomposing employment changes into three elements:

- National share (NS): the part of change attributable to overall national trends
- Industrial mix (IM): the part of change attributable to the industrial composition or mix of the region
- Regional shift (RS): the part of change attributable to regional advantage or competitiveness (Stimson et al. 2006, p. 114).

The important factor is RS, which represents the employment change attributable to factors within the region. Where the RS is positive it indicates an increase in regional

competitiveness in that particular industry over the five years between censuses, negative indicates a decline. As the following table indicates, when wider economic transitions are considered, Gippsland has significantly increased its competitiveness in Agriculture, Forestry and Fishing and Manufacturing, with a major decline in Construction. The decline in *Construction* competitiveness can be attributed to metropolitan growth in this sector as industry growth is correlated to population growth and housing and there is an infrastructure boom underway, particularly in Melbourne and Sydney.

Table 2: Gippsland shift share analysis – 2011 to 2016

INDP - 1 Digit Level	Australia			Gippsland SA4			Shift Share
	Change 2011-16	2011	2016	Change 2011-16	NS	IM	RS
Agriculture, Forestry and Fishing	1.07	7991	9155	1.15	8476.4	62.4	616
Mining	1.01	1218	1202	0.99	1292.0	-66.5	-23
Manufacturing	0.76	8012	6756	0.84	8498.7	-2431.4	689
Electricity, Gas, Water and Waste Services	1.00	3084	3250	1.05	3271.3	-183.5	162
Construction	1.10	8395	7606	0.91	8904.9	322.1	-1621
Wholesale Trade	0.76	2659	1980	0.74	2820.5	-794.0	-46
Retail Trade	1.00	11219	11095	0.99	11900.5	-718.5	-87
Accommodation and Food Services	1.14	6925	7725	1.12	7345.6	514.6	-135
Transport, Postal and Warehousing	1.04	3054	3126	1.02	3239.5	-56.1	-57
Information Media and Telecommunications	1.01	701	792	1.13	743.6	-37.4	86
Financial and Insurance Services	1.02	1559	1472	0.94	1653.7	-64.7	-117
Rental, Hiring and Real Estate Services	1.15	1104	1230	1.11	1171.1	94.8	-36
Professional, Scientific and Technical Services	1.06	3327	3610	1.09	3529.1	7.2	74
Administrative and Support Services	1.13	1944	2317	1.19	2062.1	133.8	121
Public Administration and Safety	1.03	5934	6531	1.10	6294.4	-160.8	397
Education and Training	1.15	8214	8714	1.06	8712.9	741.4	-740
Health Care and Social Assistance	1.16	12157	14262	1.17	12895.4	1170.9	196
Arts and Recreation Services	1.17	1208	1483	1.23	1281.4	126.6	75
Other Services	1.06	3534	3906	1.11	3748.7	-14.5	172
Total	1.06	92950	98859	1.06	98595.9	0.0	263

Source: ABS (2011, 2016b), Tablebuilder Pro customised data

As shown in the table above, the scale and variation in change in Australia-wide employment between 2011 and 2016 indicates the importance of including this context in assessing the changes in Gippsland employment. For example, while *Manufacturing* employment declined in the Gippsland SA4 between 2011 and 2016, the region increased its competitiveness in this sector as the nation-wide change would indicate an even greater reduction in this sector. Conversely, while Gippsland employment grew by 12% in *Accommodation and Food Services*, when national and industry shifts are considered there was a decline in regional competitiveness.

4.4.3 Summary

The LQ and Shift Share analyses indicate that the *Agriculture, Forestry and Fishing* sector is of increasing importance to the Gippsland economy: it is growing in absolute and proportional terms, as well as above the national and industry growth rates over the previous five years. Also of note, *Manufacturing* is of increasing importance to the region, as more detailed analysis of employment in this sector in Gippsland SA4 indicates that it predominantly comprises food processing.

4.5 Value of Agriculture – GRP Method

This section provides an example of how the Australian National Accounts data on inter-industry linkages, production and value added is used to generate estimates of regional productivity. The Australian National Accounts for 2015-16 indicates that the total Australian production in the *Sheep, Grains, Beef and Dairy Cattle* industry was \$43.2 billion, including \$27.1 billion in intermediate uses and \$15.8 billion in gross value added. The summary data for the *Sheep, Grains, Beef and Dairy Cattle* industry, included in the table below, indicates that 6% of the total production is used for the compensation of employees, and 29% is gross operating surplus and mixed income.

This approach informs the estimates of GRP and industry productivity prepared by consultancies such as .id Forecast, REMPLAN and NIEIR, and is used by Councils to support funding submissions and inform economic development initiatives. It is important to note that consultancies will have developed more involved, and proprietary, methodologies to apply national input-output factors to regions and their industries.

Table 3: Sheep, Grains, Beef and Dairy Cattle Input Output Summary Data

	National Accounts		Pro-rata - Gippsland	
	Value (\$s million)	%Australian Production	Gippsland Estimate (\$s million)	Interface Councils Estimate (\$s million)
Compensation of employees	2,803	6%	268.7	27.1
Total Intermediate Use	27,175	63%	2821.6	284.5
Gross operating surplus & mixed income	12,343	29%	1298.8	130.9
Taxes less subsidies on products	312	1%	44.8	4.5
Other taxes less subsidies on production	612	1%	44.8	4.5
Complementary imports	0	0%	0.0	0.0
Australian Production	43,245		4478.8	451.5
Gross value added	15,758		1632.0	164.5

Source: (ABS 2016b); ABS (2016a) Table 2. Input By Industry And Final Use Category And Australian Production And Imports By Product Group

According to the 2016 Census, total income received by workers in the *Sheep, Grains, Beef and Dairy Cattle* industry within Gippsland was \$268.7 million, and an additional \$27.1 million for the Interface. The 2015-16 Australian National Accounts indicates that in this sector, compensation of employees accounted for 6% of the total Australian production (ABS 2016a). Therefore, if it is assumed that the national averages for intermediate use, gross operating surplus, production and value added are applicable to Gippsland, then the gross regional product of the *Sheep, Grains, Beef and Dairy Cattle* sector in Gippsland and the Interface region is \$4.93 billion, as per the table above.

This methodology can be applied across the *Agriculture, Forestry and Fishing* level 1 ANZSIC coding using the parameters in the table below, which are calculated from the 2015-16 Australian National Accounts.

Table 4: Agriculture, Forestry and Fishing, 2016 (\$s million)

	Baw Baw	Gippsland - East	SA3 Gippsland - South West	Latrobe Valley	Wellington	SA4 Latrobe - Gippsland	State Victoria	
Total Output	659	506	951	271	775	3,194	20,647	90,459
Value Added	294	225	424	121	346	1,424	9,207	40,338

Source: (ABS 2016b); ABS (2016a) Table 2. Input By Industry And Final Use Category And Australian Production And Imports By Product Group

An important foundation for food and fibre value chain research is that the industry does not stop at the farmgate. Any estimation of the value of the sector to the region should at least include food and fibre processing and manufacturing. Similar to the pre-farmgate data analysed above, for *Agriculture, Forestry and Fishing* input-out data is also published for food product manufacturing, as shown below for *Total Food and Fibre Product Manufacturing*². The table indicates that the total output of the *Food and Fibre Product Manufacturing* sector was approximately \$122 billion in 2017, a third greater than the \$90.459 billion of total output generated pre-farmgate.

Table 5: Food and Fibre Product Manufacturing Input Output Summary Data, 2016

	Value (\$s million)	%Australian Production
Compensation of employees	20,385	17%
Total Intermediate Use	86,606	71%
Gross operating surplus & mixed income	13 748	11%
Taxes less subsidies on products	719	1%
Other taxes less subsidies on production	910	1%
Complementary imports	0	0%
Australian Production	122,368	
Gross value added	35,043	29%

Source: (ABS 2016b); ABS (2016a) Table 2. Input By Industry And Final Use Category And Australian Production And Imports By Product Group

² Food and Fibre Manufacturing is calculated from the following ANZSIC codes: Food Product Manufacturing, Pulp, Paper and Converted Paper Product Manufacturing, Wood Product Manufacturing, Textile, Leather, Clothing and Footwear Manufacturing; and, Beverage and Tobacco Product Manufacturing.

When the national averages based on employment data for *Food and Fibre Product Manufacturing* are translated to Gippsland, they indicate that the sector generated \$2.08 billion of production and \$0.596 billion in value-add in the region in 2016.

Table 6: Food and Fibre Product Manufacturing, 2016 (\$s million)

	Baw Baw	Gippsland - East	SA3 Gippsland - South West	Latrobe Valley	Wellington	SA4 Latrobe - Gippsland	State Victoria	
Total Output	309	401	429	661	280	2080	37935	122368
Value Added	89	115	123	189	80	596	10864	35043

Source: (ABS 2016b); ABS (2016a) Table 2. Input By Industry And Final Use Category And Australian Production And Imports By Product Group

When taken in conjunction with the *Agriculture, Forestry and Fishing* output above, the total Food and Fibre sector produced \$5.274 billion in output and value-add of \$2.020 billion, as shown in the table below. This includes an allocation for intermediate uses, such as chemical production, transport and inputs from other agricultural sectors: intermediate uses are discussed in detail in the following section.

Table 7: Total Food and Fibre Output, 2016 (\$s million)

	Baw Baw	Gippsland - East	SA3 Gippsland - South West	Latrobe Valley	Wellington	SA4 Latrobe - Gippsland	State Victoria	
Total Output	659	506	951	271	775	3,194	58,582	212,827
Value Added	294	225	424	121	346	1,424	20,071	75,831

Source: Calculated from previous tables

The method estimates regional food and fibre gross regional product by proportioning industry output within a region based on the employment data. Nonetheless, it cannot account for variations in regional productivity based on the resources and capacities, industry structures and wage rates. There also are variations in importing intermediate uses and the degree of outsourcing within a region's industry; an issue alluded to by the ABS (2015) as well as the Productivity Commission (Gretton 2013). To illustrate, at a national level most intermediate uses for an industry will be sourced from within Australia. For a region such as Gippsland, a higher percentage of intermediate uses will be sourced from Melbourne and other areas, reducing the regional production of the sector. For one of the SA3s, it is likely

that intermediate uses will come from other SA3s within Gippsland, as well as external sources. While it is likely that the GRP data purchased by Local Government uses the employment structure within a region to somewhat mitigate this issue, the result is still an application of national averages to heterogeneous regional economies. It is also of note that the source data is not produced annually, thus impacting on the accuracy in the years between censuses.

A further complication is the classification of employment in the census data, which can lead to changing allocations between intermediate uses and production. For instance, if a dairy processing firm outsources its freight services, total regional employment and production may not change but there will be a shift in employment from dairy product manufacturing to transport. A further example may be short value chain producers – ice creameries, cheese producers and wineries for example – where agricultural, manufacturing, hospitality and retailing activities are all occurring within the one organisation and likely to be by the same person. At a national level these changes will average out, although regional analysis variations may further distort the estimated GRP.

4.5.1 Intermediate Uses

An example of the breakdown of intermediate uses is the *Sheep, Grains, Beef and Dairy Cattle* industry; the industry sectors that provide inputs into production are shown in the figure below. The data indicates strong interdependencies within agriculture, as well as finance and manufacturing inputs.

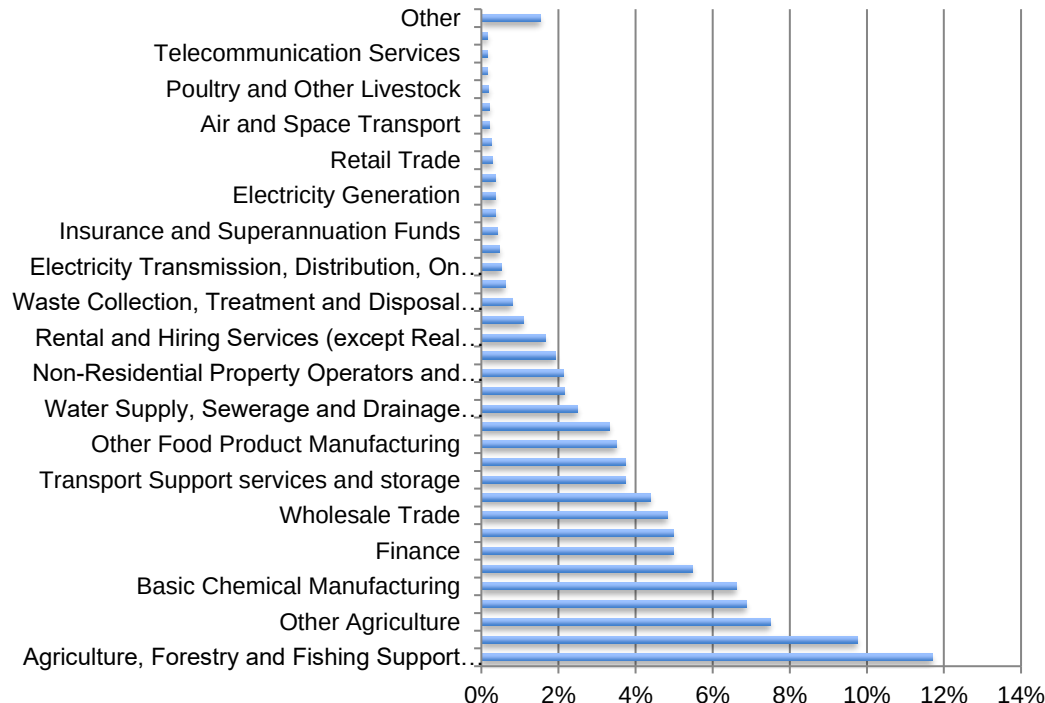


Figure 11: Sheep, Grains, Beef and Dairy Cattle Intermediate Industry Uses

Source: ABS (2016a) Table 2. Input By Industry And Final Use Category And Australian Production And Imports By Product Group

The next table has consolidated the intermediate uses into ANZSIC 1 codes and provides industry expenditure based on the estimate of \$1,038 million for the Gippsland region, to provide an estimate of the effect of region's Sheep, Grains, Beef and Dairy Cattle on other sectors. These allocations are estimates based on national averages and as such the previous qualifications apply.

Table 7: Sheep, Grains, Beef and Dairy Cattle intermediate industry allocations

ANZSIC 1	National Average	Gippsland Allocation (\$s million)	Interface Allocation (\$s million)
Agriculture, Forestry and Fishing	29%	305	39
Manufacturing	20%	205	26
Financial and Insurance Services	12%	125	16
Rental, Hiring and Real Estate Services	11%	117	15
Transport, Postal and Warehousing	8%	82	11
Construction	7%	68	9
Wholesale Trade	5%	50	6
Electricity, Gas, Water and Waste Services	4%	44	6
Other Services	2%	24	3
Accommodation and Food Services	1%	7	1
Retail Trade	0%	3	0
Information Media and Telecommunications	0%	3	0
Administrative and Support Services	0%	2	0
Mining	0%	1	0
Public Administration and Safety	0%	0	0
Professional, Scientific and Technical Services	0%	0	0
Health Care and Social Assistance	0%	0	0
Education and Training	0%	0	0
Arts and Recreation Services	0%	0	0
TOTAL		1 038	133

Source: (ABS 2016b); ABS (2016a) Table 2. Input By Industry And Final Use Category And Australian Production And Imports By Product Group

This data is useful in that it provides a list of industry areas to begin developing regional-specific estimates of industry interactions.

4.5.2 Summary

This introduction to GRP methods is important as it is similar in intent to value chain analysis. These methods consider the interaction between industries operating in the same supply chains. However, it approaches the interaction between industries in a statistical, top-down way, rather than via the sociological and bottom up methods used in value chain analysis. GRP data is obviously of use to regional LGAs, or they would not continue to subscribe to the commercial providers. The comments here are intended to point out the underlying assumptions and that the results are a proportional allocation of national productivity rather than the value of Gippsland production as such. Whether GRP is useful depends on the question asked; it

provides a better estimate of regional contributions to national economies than insight into the importance of industry sectors to regional economies.

The GRP method does not provide the detailed data and industry inter-linkage information that is at the core of regional value chain analysis. It is an example of what can be done, although it cannot estimate with a high degree of confidence what is expended in Gippsland and what is expended beyond the region. However, GRP does provide a starting point for regional value chain analysis, by identifying the industry sectors that are significant within the regional context, as well as the sectors that provide intermediate inputs to production.

It is of note that the regional variations in GRP are based in census employment data, which is also a likely starting point for tracing the value chains through Gippsland. Therefore, we need to read the data and analysis as part of the process of the unravelling the specificity of the Gippsland socio-economic region and its complexity. The first step has been to conceptualise the regional value chain and as we proceed we are locating the regionally based value chain within set of global value chains that define the industry sectors.

5 Gippsland Value Chains

This section provides examples of supply chains for the three largest agricultural sectors in Gippsland: dairy, beef and horticulture. Within each of the industry sectors distinct long and short value chains are considered. The range of food products resulting from Gippsland agriculture can be placed within the four dimensions of production identified above: Standardised – Specialised and Generic – Dedicated (Storper 1997). Fresh milk is typically standardised and generic, whereas the niche cheese producers, such as Maffra Cheeses, are the results of specialised production, and highly dedicated within the cheese market (Pittaway 2016). Similar distinctions could be drawn between the feedlot-based industrial scale beef producers and Gippsland Natural Beef (n.d.) and also in horticulture, between lettuce and the emerging garlic sector.

The dairy value chain is a mature industry comprising long and short value chains. This industry consists of two distinct elements: the long value chain, the disaggregated farmer – processor – supermarket chain, and the short chains typified by artisan cheese production, where milk producing, cheese making, storage and sales to consumers may all occur on-farm.

The beef sector also comprises long and short value chains. The long value chains exemplify a complex of buyer and producer-driven chains. Hence there is a focus on production methods and less so on provenance, although there is a growing recognition of this aspect, at least in rhetoric. In contrast, short value chain examples are indicative of producer-driven supply chains, with value added to the product through provenance and production methods. Another important aspect of these chains is the extent of the control over the product by the producer through to the consumer, through direct or co-operative selling.

Lettuce is an example of a long horticultural value chain, it is focused on regional processing and warehousing facilities that collect produce and distribute through to national supply chains and export facilities. As a short value chain, Garlic provides a contrasting example. It is an interesting example as it is a nascent and industry sector. It is difficult to obtain data from standard sources as it does not have a specific industry code, and there is innovation in production, distribution and marketing.

The three sectors have widely varying levels of available data and reports on which to base this analysis on. Dairy has received significant attention in recent years, and dairy and beef are subject to more stringent licensing requirements than horticulture. There is also considerable variation in the data available between short and long value chains, with a tendency for more marketing and public interest media reports on short chains, and more industry led research, reporting and data collection for long chains.

5.1 Dairy Value Chains

Gippsland is a major dairy production area in Australia, producing 1.974 billion litres of milk in 2016/17, which was 22% of the total national output (Dairy Australia 2018b). Compared to other States, Victorian milk regions are more oriented towards export and dairy products, with only 10% of State production ending up in the liquid milk market (Department of Economic Development 2014). The dairy value chain is embedded as a core dimension of the Gippsland social and economic world: as of 2017, there were an estimated 439,504 dairy cattle across 1,139 dairy businesses in the Gippsland SA4 (ABS 2018a). In all, dairy sustains many households in the region, often located around relatively small townships across the region, with a concentration in South Gippsland. As well as producing significant quantities of dairy product, Gippsland also produces cheeses that have received international awards.

Of the Gippsland value chains investigated in this report, the dairy sector has the most exposure to global markets as Australia is one of the five top dairy product exporters and Gippsland is a major region for dairy exports (CIIP 2016; Dairy Australia 2018; Department of Economic Development 2014). As a result, the issues facing the industry are redolent of those facing the sector in other countries, including farm profitability and susceptibility to fluctuating global milk prices (CIIP 2016). A particular example is the Welsh dairy industry, which has been in crisis due to the large UK supermarket chains capturing farmer and processor profits (Brill et al. 2010). Also, dairy supply chain analysis in the US indicates that while the largest volume of milk is produced in the long value chain, this production is marginally profitable, while the short value chain, a minor part of the total industry captures a greater share of revenue (King et al. 2010).

The Gippsland dairy value chain is complex and critical to the Gippsland economy. To establish the specificity of the chain(s) we developed an annotated preliminary value chain for the dairy industry, at national level, with some regional information where it can be identified. This was undertaken to gain a sense of the data that is available, and how it may fit together. Of note, dairy is among the better documented food or fibre industries operating in the Gippsland region.

Dairy Industry Geography

The Gippsland dairy value chain is complex and critical to the Gippsland economy. To establish the specificity of the chain(s) we developed an annotated preliminary value chain for the dairy industry, at national level, with some regional information where it can be identified. This was undertaken to gain a sense of the data that is available, and how it may fit together. Of note, dairy is among the better documented food or fibre industries operating in the Gippsland region. The figure below maps dairy farming and processing employment by SA2s in Gippsland, indicating that it is concentrated in the eastern half of the region. The largest number of people employed in dairy processing is in Leongatha with 284, followed by Maffra, Korumburra and Morwell. There are large numbers of dairy farmers in the south of the region, particularly around Foster, although there are fewer processors here than in the central areas.

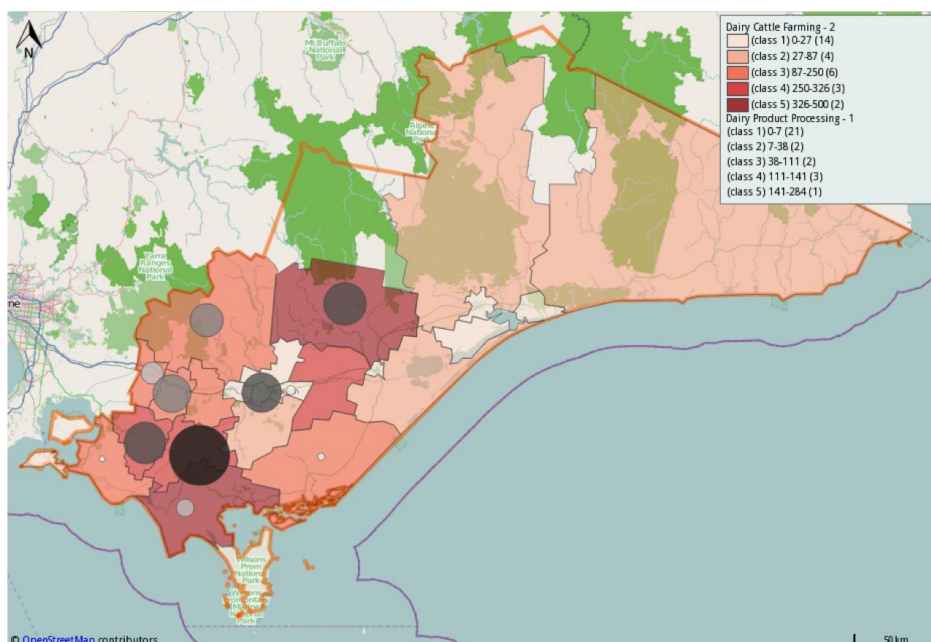


Figure 12: Dairy industry mapping

Source: ABS (2016b), mapped in AURIN

It is of note that Dairy Food Safety Victoria does not list licenced processors in the eastern section of the region (DFSV 2015), which correlates with the employment data included in this map. Also, the dairy employment in the area around Traralgon and Morwell is split over four smaller SA2s, due to the higher population density. In total there were 53 people employed in dairy farming across these SA2s, equivalent to the Churchill SA2 to the direct south.

However, on-the-ground information from within the Gippsland agriculture sector highlights how the ABSs interpretation of industry sectors, as well as outsourcing, can create different measures of industry employment. While in 2016 the ABS recorded 957 working in processing and another 3,357 on dairy farms, industry estimated 2,000 in collection, manufacture, storage and transport, and another 5,500 on farms, which includes workers such as tanker drivers that would not be picked up in the ABS statistics. These informed estimates are based on media reports, such as the reported 240 employees at Saputo Leongatha in 2017, which have been extrapolated to other producers, and consultation with administrators and executives within the industry.

5.1.1 Constructing Dairy Value Chains

The data on the value added and profitability of the participants in the value chain is patchy and at times contradictory. This includes determining industry participants as well as data on employment, inter-firm relationships and profitability.

There are a range of processors located within the region, as well as external processors servicing the region, usually from Melbourne. We conducted a preliminary search for dairy processing operations in the Gippsland area. In 2014 the Gippsland Food Plan Resource document identified there were over 16 factories in the region; the ACCC identified 7 major processors in the region in 2018. Using the Dairy Food Safety Victoria manufacturing licence register, and by checking individual

websites, we have been able to identify 12 “industrial” processing plants of various sizes, with a further 11 farm or retail-based processors. These processors include a few large enterprises, such as Fonterra and Saputo (formerly Murray Goulburn) and a number of smaller ones, often integrated into the business. These distinctions become important in relation to the value chain analysis. Further local knowledge is needed to build up a comprehensive and up to date list. There is also a dearth of up to date, publicly available information about production, intermediate uses and employment at plant or locality level.

Production values appear to be drawn from a range of similar sources, and sometimes vary substantially. These sources include: ABS input output tables, ABS production figures, ABARES, Dairy Australia, and IBIS industry reports. This feature is more so at regional levels, and hence the Gippsland dairy data while more robust than other value chains is still deficient. To illustrate these features, where there are different values for the chain stages this data are incorporated in the chain. It is also important to note that the presentation of value chains can be fluid, depending on the perspective, in terms of the end or start point of the chain, the extent to which downstream or upstream processes are incorporated, items that are considered, such as employment or wage levels for example, and the boundaries that are set in place. The regional porosity question is illustrated in the Gippsland dairy industry, where production is often processed out of the region and sold across the country. In fact, it is likely that most of the end use of Gippsland dairy product is outside the region, given the volume produced in comparison to the local population. These features complicate the value chains and hence the assessments of where innovation and investment should occur. Moreover, these dimensions raise complicated questions when assessing the regional presence in relation to the chain; hence, financial and product links extend outside the region, although considerations of employment and production are more firmly anchored in the region. Emphasis on the former can be at the expense of sustainable and on-going engagement in the industry within a region.

Such an observation implies that all stages in the value chain are important, as out of region uses impact on living standards, employment and production in the region. For example, the National Association of Retail Grocers of Australia report, “The challenge to feed a growing nation” produced by Accenture Australia in 2010, sought to develop a value chain for food and non-food items, working back from the retail point of sale, although not behind the farm gate. (All farm production was considered ‘value add’.) The report remains useful, and is one of the few attempts to populate a value chain for food with values that we have been able to find. It is also one of the few discussions of value chains in relation to Australian food that has attempted to furnish data on retail sales. An increasingly evident problem in relation to this work is the lack of information provided (although certainly held somewhere) in relation to major supermarkets, which are the single greatest destination for food production.

Reports have estimated the regional value and employment components of value chains, including KPMG (2016), Boston Consulting Group (2015), The Gippsland Food Plan and its associated resource document (RDA Gippsland 2013a, 2013b), Dairy Australia and so on. The ACCC, Productivity Commission and parliamentary inquiries have alluded to it, but not provided detailed data.

Sources:

- For dairy, regional production data exists. Sources include the ABS, ABARES, Dairy Australia, REMPLAN, and the Dairy Farm Monitor Project. Some of the data provided
- For dairy processing, up to date and accurate data is not publicly available. It could be obtained in a fairly straightforward manner, by direct contact with processors.
- End use information however is not publicly available.

5.1.2 Long Value Chain

The long value chain segment of the dairy industry has been regularly in the news in recent years, including the impact of \$1 per litre private milk sales (Graham 2017), the consolidation and foreign ownership of processors (Johnson 2017), global milk product market volatility (CIIP 2016) and concerns over the sustainability of farms (Day 2018). The recent Australian Competition and Consumer Commission (2018, p. xix) report on the dairy industry in Australia provides insight into governance within the fresh milk supply chain and how that impacts on farmgate prices:

Farmers' weak bargaining power means that an increase in processors' profits would not necessarily result in higher farmgate milk prices. This is illustrated by our finding that farmers do not receive additional benefit from the sale of milk at higher retail prices, such as branded milk ... Processors set farmgate prices in response to market conditions and at the minimum level required to secure necessary volumes. Farmers are not paid according to the type or value of the end product that their milk is used in.

While there is a relationship between local and export farmgate milk prices following industry deregulation, as Gippsland predominantly produces export products, it is the international rather than local market that sets the milk price for Gippsland dairy farmers. One key informant estimated that approximately 80 per cent of the 200,000 tonnes of dairy product produced in Gippsland each year is processed into ingredients within the region, including milk powder, casein, infant formula, and some UHT milk for export. The remaining 20 per cent of the region's raw milk is either exported for processing at Bega or by cheese producers in Dandenong, or for the domestic liquid milk market at the Saputo facility in Altona.

This also suggests that there are three main stages within the milk value chain: producers (farmers), processors and retailers. Dairy product wholesalers have been increasingly bypassed in recent years, particularly in fresh milk due to the dominance of the major supermarket chains and consolidations within the processing sector (Thomson 2018).

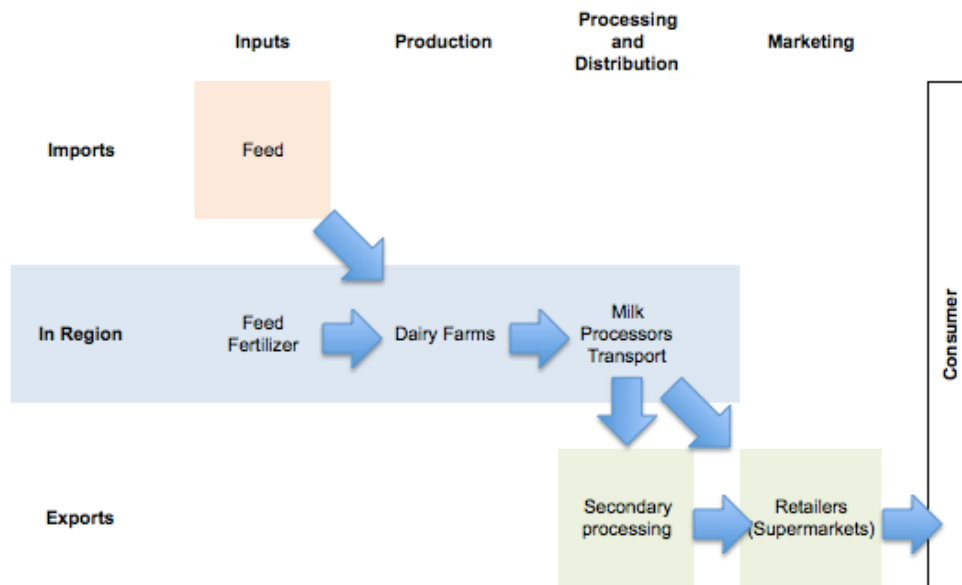


Figure 13: Dairy Long Value Chain

This long value chain is dominated by the major supermarkets, as shown by setting prices \$1 per litre milk and \$6 per kg cheddar cheese for their private label products. While the Australian Competition and Consumer Commission (2018, p. 106) found that this was not predatory pricing, it had “leveraged their buying power to drive wholesale prices down and reduce the profit margins of processors. This has particularly been the case with private label drinking milk and private label cheese”.

The long chain processing sector includes large scale facilities owned by major international conglomerates such as Lactalis and Fonterra (CIIP 2016), as well as the part-locally owned Burra Foods and the export oriented ViPlus. In 2016, there were 977 people employed in Dairy Product Manufacturing within the six Gippsland LGAs, and a further 445 in the metropolitan interface councils indicating the importance of dairy processing in the regional economy (ABS 2016b). Large producers include the Fonterra Darnum plant, which produce a range of milk powders for consumer markets and as inputs to other food production (Fonterra 2018). The Lion site at Morwell produces 70,000 desert products, cream and yoghurts per year and Murray Goulburn operates facilities at Maffra and Leongatha (RDA Gippsland 2013a). Burra Foods also provides milk powders and bulk liquids for other producers, as well as exporting Pure Source Milk to Taiwan. When purchased by Parmalat in 2014, the Langwarry Food Park produced cream cheese, UHT, milk powders and fresh milk (Smith 2014). Also, of note, milk transport costs are borne by the processors, and are therefore accounted for in the farmgate price paid to producers.

The Dairy Farm Monitor Project surveys 25 Gippsland milk producers on conditions, costs and income each year, which provides the basis for the value chain structure. The 2016/17 Annual Report for the project indicates that it was a year of below average rainfall, increasing the costs of production Average earnings before interest

and taxes (EBIT) were \$0.84 per kilo of milk solids (Dairy Australia 2018a; Dairy Australia & Agriculture Victoria 2018).

While the indication is that the supermarkets have the most influence within the value chain, production pivots through the processing phase, which may be attributed to the regulations and standards applied to the production of fresh drinking milk and milk products. Also, of note is that much of Gippsland dairy production is used as intermediate ingredients in the production of other foods, such as milk powders and bulk liquids and concentrates. Future investigations will focus on the links between ingredient production and the regions' large scale food production industry, such as Patties foods in Bairnsdale. The dairy long value chain is likely to be the largest in the Gippsland food and fibre industry, in terms of employment and economic impact, and possibly the largest of all Gippsland industry sectors, depending on the definitions and aggregations used in the calculations. Given the importance of the industry and the recent turmoil within the sector, developing a greater understanding of the relationships and value added within the elements of this long value chain are central to advancing Gippsland through development of food and fibre.

This analysis of the national value chain chart and data was undertaken to identify some of the issues that would arise when seeking to conceptualise a value chain from real world data. One of the key aims was to conceptualise the relationships within the chain. The information draws on different sources and from different time frames. The object was to identify information that was not present, for dairy as a national industry, which is fairly well documented, or where particular data was significantly at odds with other data or configurations (detailed in the Appendix).

5.1.3 Short Value Chains

The short dairy value chains in Gippsland are predominantly cheese producers, such as Tarago River, Pangrazzi, Jindi, Maffra Cheese Co, Berry's Creek and Bassine. There is also an emerging specialised fresh milk industry, including Gippsland Jersey and Bass River Dairies. Saint David Dairy, located in the inner Melbourne suburb of Fitzroy, sources milk daily from a single farm in Drouin, and produces cultured butter, milk, cream and yoghurt. These are examples of highly specialised products, using traditional techniques and creating additional value through the transfer of information alongside the goods; the use of geographic naming by these producers indicates the value of connecting to place and also that there is an inherent value in Gippsland produce.

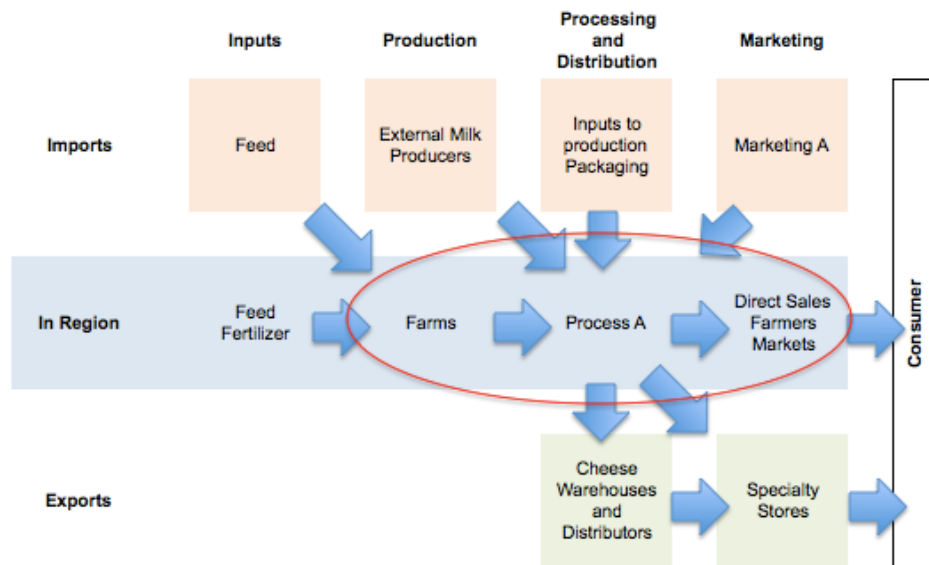


Figure 14: Dairy Short Value Chain

These producers all have high levels of vertical integration in their value chains, with many producing cheese on farms using at least some milk from their own herds, such as Maffra Cheese Co (Pittaway 2016) and Gippsland Jersey (n.d.). Those who do not have their own herds claim strong connections to their milk suppliers, to ensure the milk meets the required standards for cheese production (Berry's Creek n.d.), as suggested by the value chain literature on standards and interactions (Humphrey & Schmitz 2002). The red circle in the diagram indicates that these stages in the value chain are frequently undertaken within the same farm or establishment in the short dairy value chains. Also, of note is that wholesaling is more likely to be involved in the short value chain process, linking producers to speciality retailers and the food service sector (Gippsland Cheese 2018; Thomson 2018).

Also of note is how short value chains are a response to the concentration of governance and market power in the long value chains, as suggested in the value chain literature (Pullman & Wu 2012). In particular, Gippsland Jersey (n.d.) note that "(b)ypassing the large milk processors allows Gippsland Jersey to ensure a fair price is paid to farmers". However, the Gippsland dairy sector illustrates the distinction between the short value chain construct used in this report, and short food supply chains, which are defined by connections between producer and consumer (Marsden et al. 2000; Renting et al. 2003). This distinction is due to the availability of much of the dairy short value chain produce in the major supermarket chains, such as Jindi and Maffra Cheeses, as well as the recent deal between Gippsland Jersey and Woolworths (Cornish 2018).

The dairy short value chains also raise questions about what is local, or within region. Jindi Cheese, named after its location at Jinidivick, was sold to French company Lactalis in 2012 (Niesche 2012), the wholesaler Gippsland Cheese (2018) is based in Keysborough, and as noted previously the St David Dairy in Fitzroy receives daily milk deliveries from Drouin. These examples, as well as the

increasing presence of Gippsland short supply chain produce in national food markets, suggest complex relationships between ownership, value creation, geography and regionality that are not considered in the practical application of value chain analysis (Gereffi & Fernandez-Stark 2016). Nonetheless, they are integral to understanding how agricultural production generates regional prosperity, in particular, how the widely recognised and high value regional produce can cross over into other industry sectors, such as tourism and hospitality, as well as the development of consumer associations focused on region and quality. These processes are well established in the wine sector, such as the Hunter Valley, Yarra Valley and the Barossa region of South Australia, and there is greater focus on food and wine tourism as a driver of international visitation and expenditure (Tourism Australia 2018).

5.1.4 Summary

Dairy is important to Gippsland in terms of both the scale of production in the long value chain and the internationally recognised quality of the short value chain produce. There is indication that the short value chains are increasingly engaging with the supermarket chains at the apex of the long value chain, while maintaining adherence to artisanal production methods, for example, Jindi and Maffra Cheese, and Gippsland Jersey. For the long value chain operations, value chain analysis's focus on the relationships between profitability and value chain governance are integral to industry sustainability, as highlighted by how the effects of \$1 litre milk were distributed amongst producers and processors (Australian Competition and Consumer Commission 2018).

5.2 Beef Value Chains

While there is sheep and other livestock production in Gippsland, beef is the dominant type of meat produced in the region. In 2013, Gippsland produced 25 per cent of the state's beef by value, including high value export products (Agriculture Victoria 2017; RDA Gippsland 2013b). As of 2017, there were an estimated 590,413 meat cattle across 2,562 businesses the Gippsland SA4: these totals are greater for the comparable dairy figures (ABS 2018a). For such a major industry in the region, there is limited data available on production for the long value chain, particularly in comparison to dairy.

The price of beef has increased 25% since 2014, which is associated with export demand for both beef and cattle as well as variable weather conditions (Thomson 2018a). Within the region, Gippsland Natural Beef³ received a State Government grant in 2017, which will support the group in developing export markets for their free-range and environmentally conscious production methods (Pulford 2017). A processor in Moe, Greenham Gippsland, has also received funding from the Regional Jobs Fund to employ an extra 170 people at its facility, which processes premium beef from Tasmania and southern Victoria (LVA 2018) This indicates both

³ Referred to as Gippsland Natural Meats in the press release, but more commonly Gippsland Natural Beef.

the government support for developing export markets for food and fibre, as well as the quality of Gippsland beef products.

Much like the Gippsland dairy industry, there are two distinct value chains within the beef industry. Beef processing is a major element of the long value chain, accounting for most of the revenue in the beef industry (Thomson 2018a), and according to research commissioned by Meat and Livestock Australia (Green 2014), the manufacturing of value-added products returning the highest margin in the value chain. There may be connections from beef producers to Patties Foods, located in Bairnsdale, who make a range of beef value-add products under the Patties, Herbert Adams and Four'n Twenty brands. Analysis of the 2016 census suggests that Patties is classified as a producing bakery rather than of beef products, indicating that there may be additional unacknowledged industry benefits from and linkages with the region's beef industry.

Meat Industry Geography

Meat farming is concentrated in the south west of Gippsland, with more than 768 people employed in the sector in the Foster SA2, and more than 1,000 located across the Leongatha and Korumburra SA2s. There are also more than 600 located in the Maffra region, and another 398 in the Bruthven-Omeo SA2 to the north.

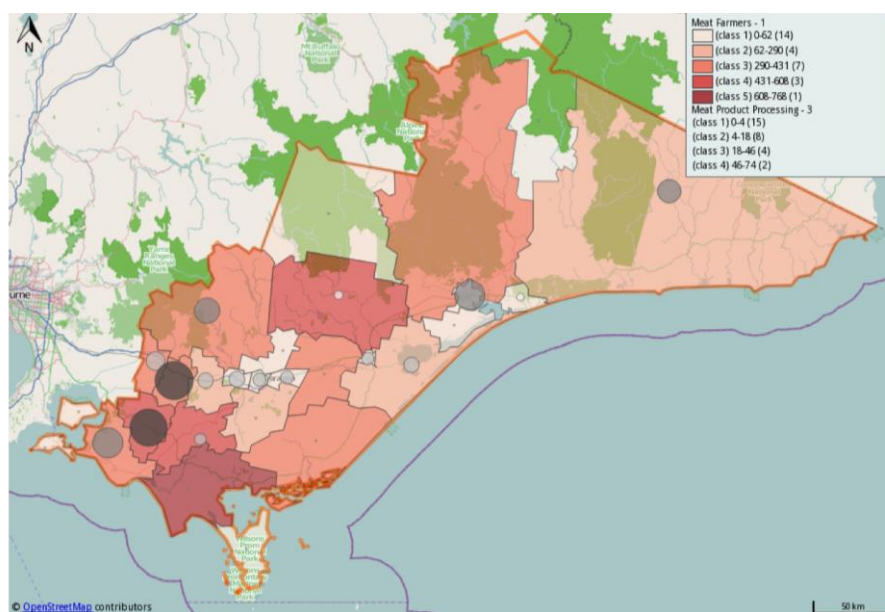


Figure 15: Meat industry mapping

Source: ABS (2016b), mapped in AURIN

There is a distinct geography to the locations of processing employment in Gippsland: a ring around the western section of the region, and a spine of smaller processing employment following the Princess Highway to Traralgon. Processing is more widely distributed in the beef sector compared to the dairy sector, reflecting the possibility that milk processing is more capital intensive as well as having gone through a period of consolidation as a result of increasing competition in recent years (Johnson 2017).

5.2.1 Long Value Chain

There is limited publicly available material on the beef long value chain specific to Gippsland, which is notable given the size of the industry captured in the previously cited ABS agricultural statistics. However, Meat and Livestock Australia have published an extensive and detailed analysis of the national red meat value chain, to inform opportunities for value adding in production and processing (Green 2014). The resulting model enables estimations of profitability at the livestock, processing, value-adding and marketing stages of the production process. Of note, it differs to the analysis proposed here by taking an industry and product development perspective. The following value chain diagram is based on the structure in the Meat and Livestock Australia report.

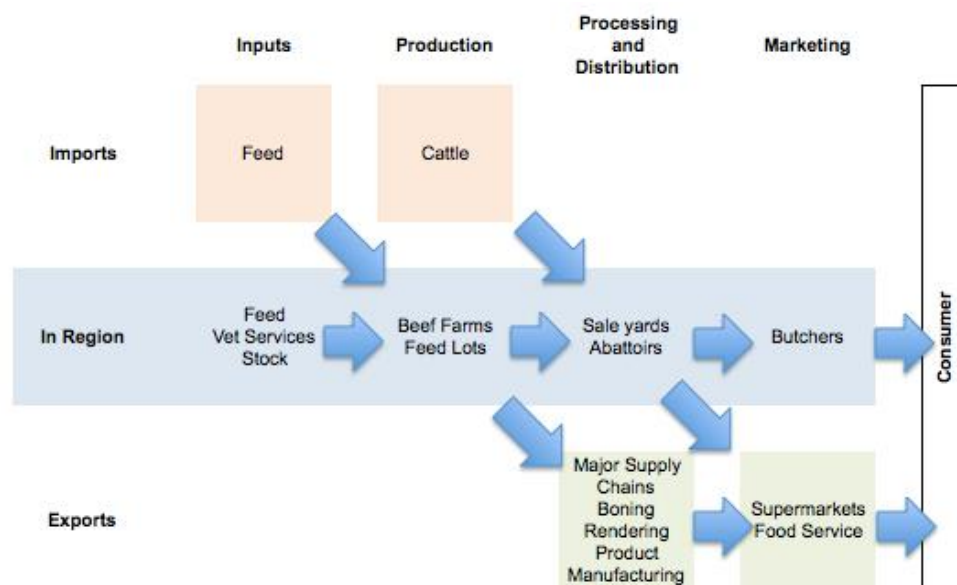


Figure 16: Beef Long Value Chain

There is some indication that long value chain beef production in Gippsland results in a higher-grade product than that produced in other areas, due to being predominantly grass rather than grain fed. In the US, the beef industry has prosecuted a long-term strategy to de-commoditise the beef value chain, which has resulted in increased per-capita expenditure on beef, even as per-capita consumption has declined. The strategy “focused on forming strategic alliances along the value chain to achieve a more brandable product with consistent quality” (Lowe & Gereffi 2009, p. 12), including major food service businesses as well as the development of value added beef products for sale in supermarkets. In the four worlds of production typology, this can be seen as a move from generic and standardised to dedicated and specialised (Storper 1997).

Along with the pathway within the region, from farm to sale yard, abattoirs and on to local butchers, this potential for branding and value-add suggests that the distinction between the long and short value chains in the Gippsland beef sector is not as great as those within the dairy sector.

5.2.2 Short Value Chains

The beef value chain is prominent and well established in Gippsland, and is the second largest agricultural production sector in the region (RDA Gippsland 2013b). In addition to the long value chain discussed above, there are multiple short value chains within the beef production sector, including:

- Organic production, reliant on direct-to consumer sales and Community Service Agriculture;
- Co-operative marketing of natural beef under the *Gippsland Beef* brand; and,
- A local chain from farm to local butcher.

The examples of short beef value chains in Gippsland introduced here are for the first two of the above list. The preliminary chains draw on desk-top research on beef production in Gippsland; analyses of beef production value chains in Wales (Marsden et al. 2000); beef production in the Minneapolis, St Paul and Bloomington region in the United States (King et al. 2010); and, of the US beef value chain more broadly (Lowe & Gereffi 2009). The Welsh example focuses on short food supply chains, whereby beef producers became more profitable through product differentiation and marketing and direct and local sales strategies. By developing a premium, branded product, the associated beef producers could charge a higher price for their product, and after the higher costs are taken into account, were more profitable as a result (Marsden et al. 2000, p. 434). This form of upgrading can be found in Gippsland Natural Beef (n.d.), also a producer-based co-operative selling a differentiated, premium product through direct selling mechanisms, as well as wholesale supplies.

The Minneapolis, St Paul and Bloomington analysis provides examples of three distinct supply chains, which may be also present in Gippsland:

- Nationally distributed natural beef sold in an upscale regional supermarket chain;
- Branded, grass-fed beef from a small family farm sold through farmers markets, buying clubs, and CSA⁴s; and
- Branded, grass-fed beef from about 40 producers distributed by a Minnesota-based company to supermarkets, food cooperatives, and restaurants (King et al. 2010, p. 6).

The research splits the beef value chain into four stages, inputs, production, processing and distribution, with key elements included for each stage and marketing as an additional input. While different in scope to the Gippsland beef industry, this value chain analysis highlights how market concentration in aspects of the industry creates influence over the other participants. High concentration was found in feedlot companies, beef production, supermarkets and the fast food franchises.

⁴ Community-Service Agriculture

Example 1: Direct Marketing

Direct marketing is based on a high-value beef product being sold via a web store, directly to customers⁵. In their analysis of the Minnesota beef industry, King et al. (2010, p. 42) estimated that 70.8% of the revenue generated through the supply chain was retained by the producer, and all revenue was retained within the region due to local processing.

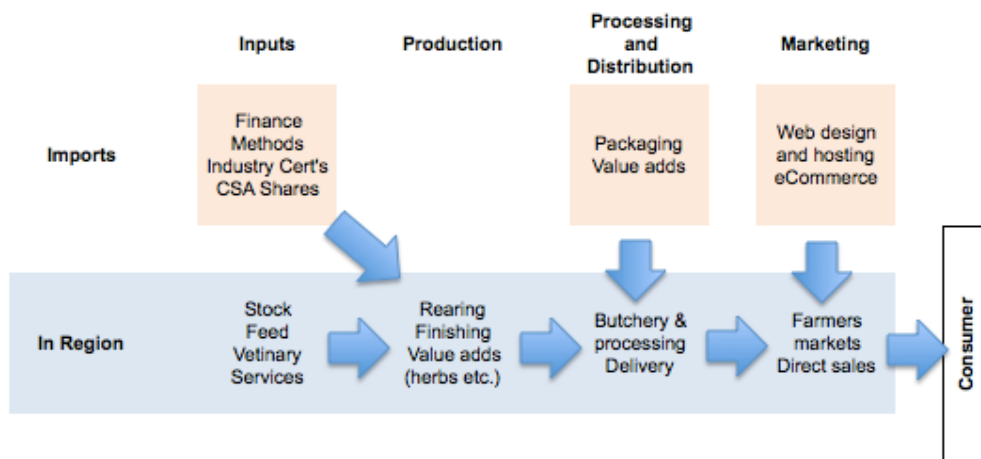


Figure 17: Direct marketing beef value chain

Example 2: Farming Cooperative

The second example is based on a farming co-operative, with product being sold via a web store and through wholesalers to wide markets⁶.

⁵ Based on information for [Colin & Sally's](#) organic lamb and beef.

⁶ Based on information for [Gippsland Natural Beef](#)

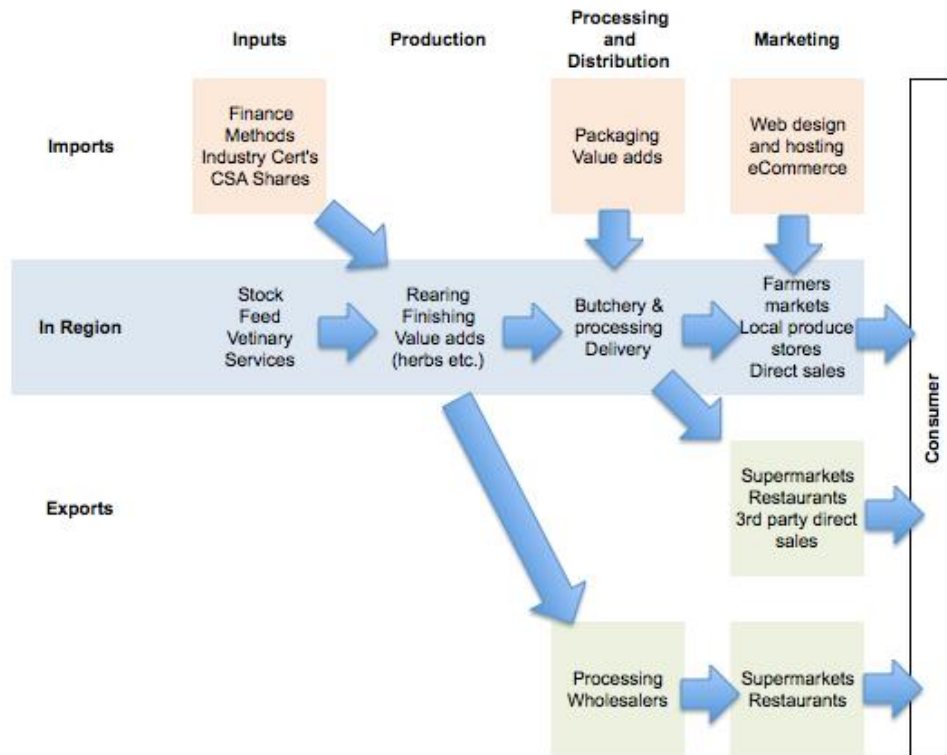


Figure 18: Farmers co-op value chain

In developing their short value chain analysis, Marsden, Banks and Bristow (2000) cite the Llyn beef example, where the establishment of the farmers' co-operative led to an increase in profit per head for the farmers as a result of the branding and value-adding, of £64 per head compared to £37 for traditional production (Marsden et al. 2000, p. 434).

Similar to the Llyn beef and direct marketing examples, the Gippsland case confirms that the transfer of provenance and quality information to consumers enables a premium price for the product (King et al. 2010; Marsden et al. 2000). Also, similarly to the Llyn beef example, there are multiple supply chains, a direct marketing channel, with beef packages offered through the co-operative's online web-site, a third party farmhouse foods retailer, as well as offering to supply wholesale markets.

One complexity to these types of chains is the location of services outside the region, although ownership remains within the region. Gippsland Natural Beef, confirms such arrangements, where their website refers to "our state of the art boning facility in Melbourne's northern suburbs". Additionally, a butcher shop in Ashburton is part owned and stocked by a Gippsland farmer⁷ under the brand name Gippsland Pure Beef.

⁷ See [Ashburton Meats](#)

5.2.3 Summary

These examples of beef value chains illustrate the paths from production to consumption and where value and profits may be created within Gippsland. The long value chain is under-researched given the extent of the sector, however there are indications that it is a significant part of the regional economy. The direct marketing and farmers co-operative are examples of what would be classified as producer-led as well as short value chains, as the producers are co-ordinating the types of product and how its produced, and the flow of product through the value chain (Humphrey & Schmitz 2002, p. 1021). The analysis of the beef value chain in national distribution systems would provide a distinctly different chart, with a greater emphasis on transport and a likelihood that less valuing adding would occur in the region (King et al. 2010). This would also be an example of a buyer-led value chain, where the co-ordination of production is the undertaken by the retail and marketing end of the chain. For example, one of the major supermarkets may set standards, pricing, packaging and the timing of product delivery within the value chain (Gereffi 1994).

5.3 Horticulture Value Chains

Extensive horticulture occurs across the region, as RDA Gippsland (2013, p. 13) noted:

... the region's diverse soil types and climates enable a range of vegetables, nursery products, cut flowers and fruit to be produced ... The main horticultural enterprises based on production are potatoes, broccoli, beans and lettuce as well as range of fruits such as apples, nuts and berries.

As of 2017, the Gippsland SA4 produced more than 10,000 tonnes of vegetables on 8,854 hectares of land, and a further 4,053 in the South Eastern Melbourne SA4. In comparison, this is far greater than the 251 hectares in Gippsland used for fruit and nuts, and as such the focus here is on vegetable production, lettuce and garlic in particular.

Horticulture Geography

The Gippsland horticulture industry is largely located in the central Bruthven-Omeo SA2, with processing in Bairnsdale. While the data above indicates that there is a large horticultural sector in Gippsland and the Interface region, it generates less employment than either the dairy or beef sectors, as indicated by the scale on the map

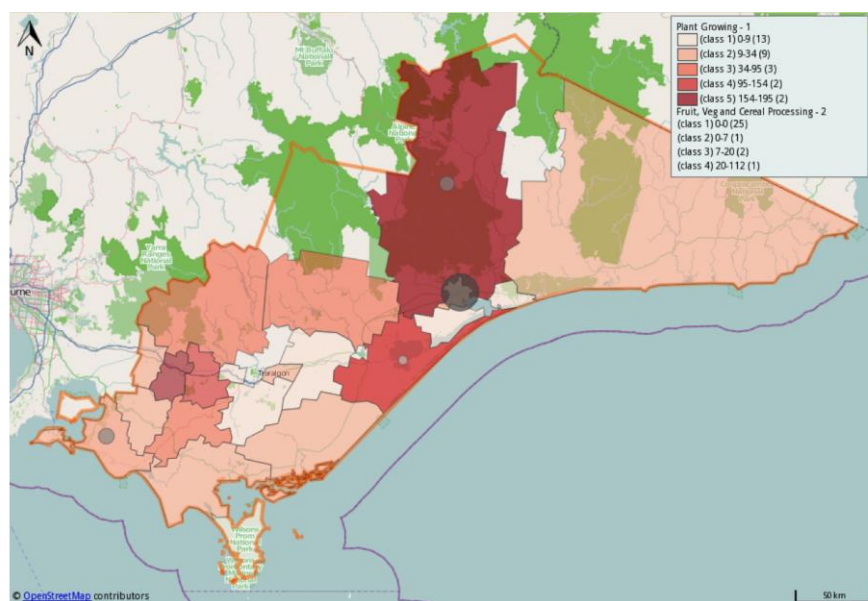


Figure 19: Horticulture Geography

Source: ABS (2016), mapped in AURIN

The Interface region has had a highly productive horticultural sector, but it has come under increasing pressure from residential rezoning due to Melbourne's population growth (see Cardinia Shire Council 2015 for example). It is possible that similar

processes may be in place in the west of Gippsland, as places such as Warragul and Korumburra attract new residents from Melbourne.

Horticulture Overview

As of 2017, there were an estimated 2,558 hectares of lettuce across 14 businesses in the Gippsland and South East Melbourne SA4s: the total production was approximately 30 million kilograms of lettuce. Lettuce has been chosen to represent the long value chain as it has the greatest total land area in production over the two areas, and the region is home to 58% of the total lettuce growing area in the state (ABS 2018). An implication of the growth of the industry may be that those in horticulture look to the acquisition of water licenses by other food sectors.

Garlic provides a distinct short value chain example, as it is an industry re-emerging as a high value product and from a methodological point of view provides an opportunity to explore value chains that have little data or reports relating to their development. Other high-value short chain agricultural products emerging in Gippsland include olives, saffron and truffles. Alongside the dairy and beef short value chains, the development of these products indicates that the region's agricultural sector is product upgrading – increasing the value of the output – and functional upgrading – adding new activities – in the typology set out by Humphrey and Schmitz (2002, p. 1020).

Table 8: Vegetable production in the Gippsland SA4, 2017

	Latrobe-Gippsland SA4		South East Melbourne SA4	
Fruit and Vegetables for human consumption - Area (ha)	Estimate	Number of agricultural businesses	Estimate	Number of agricultural businesses
Potatoes*	1,915	70	515	9
Lettuces	1,815	12	747	5
Broccoli	914	17	45	1
Sweet corn	796	12	-	-
Beans (including french and runner)	783	23	-	-
Peas*	427	17	-	-
Cabbages	381	9	17	1
Carrots	345	4	14	1
Cauliflowers	155	6		
Onions*	115	7	28	2
Capsicums (excluding chillies)	64	4	-	-
Tomatoes	53	6	-	-
Pumpkins	34	5	-	-
All other vegetables	1,057	19	7	1
Total - Area (ha)	8,554	111	4,053	64

Source: ABS (2018)

As can be seen, the geographical scale of lettuces and potatoes are relatively similar. Potatoes became a major industry in Gippsland shortly after WW2, associated with immigration; we have selected lettuces as it is still an expanding and

developing sector within the horticultural value chain. The absence of garlic from the table is explained by the fact that it is a new and relatively small industry; hence, the ABS does not collect data on its production.

5.3.1 Long Value Chain - Lettuce

Lettuce is a prominent part of the Gippsland horticultural and vegetable sector, with several large scale, integrated growing and processing operations located within the region. Some of these operations extend out of Gippsland, co-owning processing facilities with growers in the nearby City of Casey, as well operating farms further afield⁸. While the beef examples were prepared from the perspective of that the producer leads the value-chains, the lettuce example is based on the assumption that these processors are providing the coordination within the value chain. This is depicted in the following figure, which highlights that the processing stage is the only gateway between production and the consumer.

As the ABS (2018) agricultural commodities data indicates, the Gippsland lettuce production is highly concentrated, with 12 businesses operating on an average of 151 hectares of lettuce planting. Major firms in lettuce production include: Vegco, who produce 120,000 salad products a day; Bulmer farms, who plant 100,000 lettuces per week and supply Vegco as well as MacDonalds and Hungry Jacks; Bonnacord; and, Rivera Fresh. Green Acres Farms highlights the regional value chain complexities arising from regional porosity; it is a vegetable processing facility owned by four farming families located in East Gippsland and Cardinia, who operate a warehouse at the Melbourne Market in Epping.

These major lettuce producers are also product upgrading, or as with the US beef industry, de-commoditising their product to realise greater profits (Lowe & Gereffi 2009). The de-commoditisation of lettuce is realised through branding and packaging produce in ready to serve salad mix. Further product upgrading may result from the increasing interest in functional food and nutraceuticals.

As shown in the figure below, a notable aspect of the lettuce example is that the product leaves Gippsland at the wholesale and distribution phase, which connects into the national and export markets for fresh vegetables.

⁸ Examples – Vegco, Bonnacord, Rivera Fresh, Green Acres Australia, Tripod

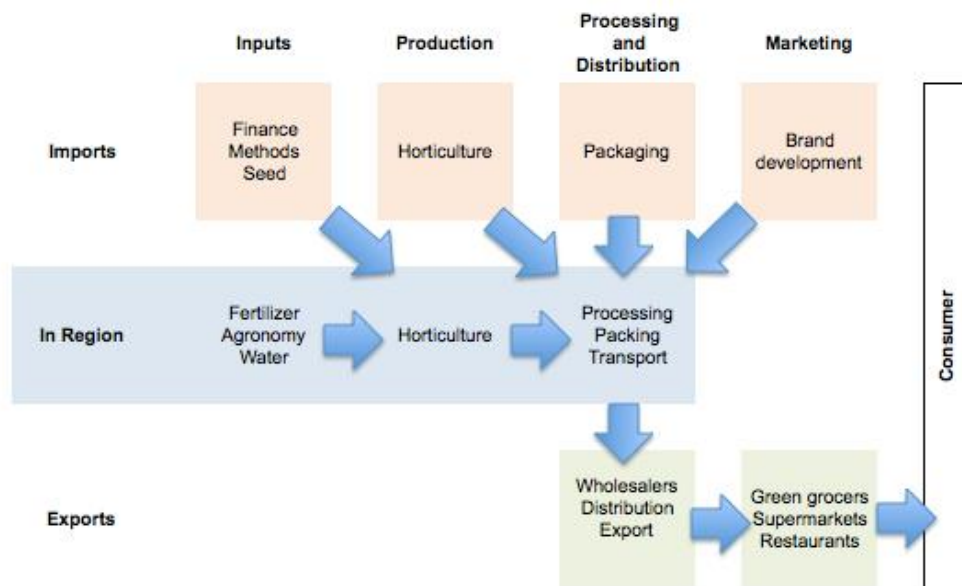


Figure 20: Lettuce Value Chain

While the lettuce is offered packaged and branded, and, as with beef, the lack of direct marketing indicates a difference in the public's greater interest in meat provenance and that beef, unlike lettuce, can be bought in bulk, frozen and used over many months.

This value chain is similar to the 'spring-mix' mainstream case study detailed by King et al. (2010), where a regional processing facility sources lettuce from local growers for supply to a supermarket chain. In this example, the product is branded as "Earthbound Farm", who is the major producer of organic produce in the United States. The case study also notes that ongoing partnerships along the supply chain, there is "significant information exchange and trust" (King et al. 2010, p. 31). However, the Earthbound Farm's prominence in the industry means that it has the most influence over the price of the lettuce product.

The figure also depicts that lettuce may be imported for processing at Gippsland facilities, however this is most likely from areas just outside the designated boundaries of the region, such as within the Casey and Cardinia local government areas. The geography of lettuce value adding is also complicated by the connections between local processing facilities and warehouse and distribution centres outside of the region, at the Epping Wholesale Fruit and Vegetable Markets for example⁹.

5.3.2 Short Value Chain - Garlic

Garlic production is re-emerging in Australia following years of decline due to cheap imports, from China, Mexico, Brazil and Argentina. The demand for locally grown garlic can be seen as a result of increasing consumer preferences for higher value products that are chemical-free and have transparent provenance.

⁹ Green Acres Australia

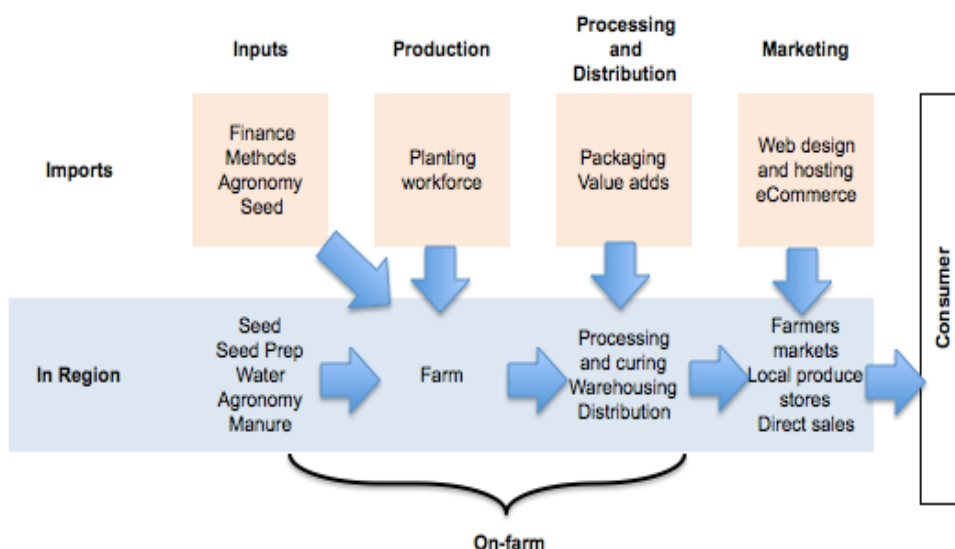


Figure 21: Garlic Value Chain

There is a cluster of garlic farms in central Gippsland, located around the Strzelecki Highway (Caskey 2016; Fitzgerald 2016) and the first annual garlic festival was held at Meeniyan in 2017, indicating the interest in and development of the industry in the region. Producers in Gippsland offer farm-gate sales and also sell direct to consumers through farmers markets¹⁰, similar to the first beef example. Where garlic differs from beef is that more of the process from planting to consumption can be carried out on farm, as currently there is not the need for specialised processing facilities such as abattoirs. Nonetheless, sorting and distribution facilities currently are in the process of construction and deployment in the township of Meeniyan.

Garlic provides avenues to explore the application of regional value chain methods. Firstly, as a niche industry within the broader horticultural sector, there is no specific reporting on production and output, indicating the need to collect data using interview and workshop methods. Secondly, as an emerging industry value chain analysis can provide insights before practices, processes and relationships become embedded. New methods and innovative uses of technology can lead the development of the value chain, creating systemic efficiencies and facilitating greater value from information transfer along with the product, as well as support the development of processing, storage and marketing hubs within the region. There is also potential vulnerability in the garlic from disease across a harvest, which may also be a focus of collaborative research and development for the region's garlic producers.

5.3.3 Summary

There is indication that there has been significant regional development within the lettuce value chain over recent years. Initiatives such as Green Acres Farms indicate functional upgrading (Schmitz & Humphrey 2000), by increasing processing and post-farm gate value chain operations within the region. Further investigation may reveal that an important factor in this development is the relationships and coordination between the major businesses that result from the industry

¹⁰ Based on Mirboo Farm, Weyhill Farm, Blue Sky Organics

concentration within the Gippsland and Interface horticultural sector. If so, this may provide a pertinent case study for other agricultural sectors that may profit from pooling resources and capacities.

Garlic is an example of a product reliant on differentiation to compete with imports. Differentiation implies the transfer of codified information with the produce to communicate its value over and above the standard lines, in this case imports from Asia and South America. As a case study of regional value chain methodologies, it is unique in that it is an emerging industry, indicating that value chain analysis can inform the development of efficient industry structures and relationships. As Garlic is a niche within the horticultural sector, secondary data is not readily available and therefore is reliant in interviews and workshops for data collection. This contrasts with the dairy industry, where there is data available through ABS categorisations, industry reports and international examples of value chain analysis.

6 Conclusions and Future Directions

6.1 Conclusions

There are six key opportunities to develop and embed the food and fibre sector in relation to Gippsland's long-term future.

First, a deeper integration of the “before farm gate” and “after farm gate” relationships within the supply chain (i.e. between food production, food retail, and food hospitality) could fast-track economic development and promote investment both locally and internationally.

Second, the future of the food and fibre sector requires a thriving workforce and SME sector. It is probable that there will be different outcomes, depending on the construction of value chains. Hence. It is necessary to encourage clearly defined and heavily promoted career pathways and recruitment, underpinned by robust, engaged relationships between education and industry. This requirement is especially so for agriculture and farming, which have experienced a decline in university enrolments over the last decade (KPMG, 2016). The food and fibre sector could become the means to attract, retain and develop people, as farm workers, producers, suppliers, distributors, providers and consumers. It may mean that attention should be given to the educational and training capacities available across the region and particularly from the publicly supported TAFE and university sector. Moreover, it may be the case a key driver in reshaping aspects of a long value chain such as specialist milk production, processing and distribution, or the promotion of a new product, such as garlic, rests on a very active and engaged SME sector.

Third, it necessary to take steps to understand where expertise and research innovation connects with the development and upgrading of short and long value chains. Taking this dimension of value chain development may mean, in every day terms, a trade-off between volume and value-add. For obvious reasons, an established, mature, value chain such as the long version of dairy, is characterised by an intimate and ongoing relationship with the areas of expertise. In comparison, a nascent, short value chain such as garlic is still experimenting with aspects of the chain such as when to plant and how to market and distribute the product. Unless an initiative emerges from within these expert or research based institutions then the short type of value chain may not benefit from the institutional relationships that have informed the long value chain analysis in this report. Nonetheless, as indicated within the beef value chain, it is the case that as producers establish the distinctive product they will seek out expert and research advice from a range of sources. The task is to learn from international examples and to take steps to make such opportunities readily and consistently available to those who constitute the long and the short value chains. Within Gippsland, the establishment of the

High-Tech Precinct managed by Federation University and the proposed Food and Fibre Central will enable this to happen.

Fourth, research capacity in the sector will drive both innovation and sectoral growth, as well as serve as a foundation for the education/career pathway recruitment strategy. Paradoxically, farming practice is heavily informed by specific research practices (agri-bio), while other aspects, such as business modelling or people organisation and capacity-building is underdeveloped. This step could involve the agri-research units in Gippsland, at Ellinbank (National Centre for Dairy Research and Development) as well as Federation University.

Fifth, the dairy industry is an exemplar of the food and fibre industry, contributing to \$3 billion in economic output for the region based on GRP calculations. The sector could be strengthened by recasting the regional food innovation ecosystem, drawing on the understanding of value add and market power resulting from value chain analysis. Such a transition would involve the systematic and rigorous identification of emerging issues across the region, reformulating and utilising mega data, as suggested in this report. The aim is to address the composition, operation and value chain governance of the region's emerging local, national and global networks. The task is to draw upon and adapt a range of innovation approaches and arrangements to manage a portfolio of programs that underpin the growth and vitality of the sector. This step will involve a collaborative approach and associated organisational structure with a clear sense of purpose.

Sixth, and central to these opportunities, is the need for a carefully designed and well- resourced campaign to bolster the food and fibre sector of the region and inspire future careers and opportunities in farming and agriculture. A Gippsland Provenance Story, for example, would bring together current food hubs, branding campaigns, relatively invisible pre- farm gate activity, and food retail and hospitality. Working alongside the 'Inspire Gippsland' tourism campaign, the food sector would be able to capitalise on its strengths by creating a distinctive Provenance Story, which in turn will stimulate investment across the food production and distribution supply chain.

Through such engagement, rural communities will be strengthened socially, culturally and economically.

6.2 Future Directions

1. Recommendations:

Project 1: The regional food value chain: Gippsland

Project 2: Replication

Project 3: Decision-making along the chain

Project 4: Food Innovation Regions

Project 1: The regional food value chain: Gippsland

This project aims to investigate and identify the constituent elements of the regional food and fibre value chain to enable decisions about the efficacy, organisation and focus of regional food value chains, in this case in Gippsland a major food region. The purpose is to supplement, underpin and enhance the Hi-Tech (Food Central) initiatives being taken by the State Government (Latrobe valley Authority, Regional Development Victoria, Regional Development Australia, Gippsland), Federation University, Local councils (including Greater Dandenong) and a range of key regional stakeholders (Agribusiness Gippsland).

The project will provide a robust database for regional decision-making so that regional actors can be mobilised to enhance food production, processing and distribution. The project hypothesizes that the absence of a robust database impairs decision-making to improve and enhance the chain, across dairy, beef, horticulture, aquaculture and so forth. The project will enhance the capacities of policy-makers, industry associations, producers and processors to address the challenges facing the industry in the region. It will enable processes to be introduced utilising appropriate and relevant digital technologies in relation to production, processing and distribution. It will identify and enable procedures to address the challenges and introduce through carefully constructed pilot and awareness activity. The prime objective is to secure the active engagement of producers, processors and consumers in shaping a digitally enhanced supply chain.

Project 2: Replication

The methodology for identifying and specifying regional food value chains can be replicated in other regions, particularly those that are food rich, but which have different and distinct socio-economic features, in terms of industry balance, structure and organisation of the value chain(s), place of regional governance and externally-based governance relations, research capacities, and outcomes. As indicated there is now a robust methodology in place and this will be refined and further developed, with more comprehensive outputs than the current report. One reason for this confidence is that the conceptualisation of regional value chains is now in place.

Project 3: Decision-making along the chain

The first stage in laying the foundation for the construction and implementation of decision-making practices in relation to the efficacy of the chain as well as the minimisation of risk because of the enhanced knowledge basis for decision-making. These developments matter both for the participants in the chain, regionally and elsewhere as well as for financial and related support institutions for food production and consumption.

The data capture and mining methodology will enable the above decision-making, as well as create a critical and useable resource. It comprises the following six stages:

1. Big Data Capture and Logging and App- and IoT-based Citizen Science
 - a. Setting up big data platform repository
 - b. Fine-grain data capture
 - c. App-based data capture
 - d. Large-scale web data capture
2. Text Summarisation, Text Mining, and Sentiment Analysis from large scale unstructured text, web documents, and social media streams
 - a. Text mining, topic tracking and detection
 - b. Text summarisation
 - c. Sentiment analysis
3. Visual Data Processing and Analytics
 - a. Extracting and analysing information from images
 - b. Capturing unavailable visual data
4. Multi-factor trend profiling and value network analysis
 - a. Semantics inference of contexts
 - b. Value network analysis combined with semantic inference
 - c. Analysing and summarising topics and events
 - d. Constructing a multi-factor spatio-temporal profiles and knowledge representation of food-value-chain in Gippsland
5. Predictive and prescriptive analysis tools
 - a. Predictive analytics
 - b. Causality analytics
 - c. Prescriptive analytics
 - d. Interactive Visualization of the lineage of data
 - e. Integration of the above tools
6. Pilot testing and Evaluation
 - a. Review and establishment of evaluation metrics
 - b. Refinement
 - c. Implementation, replication, and scaling across different food sector.

Project 4: Food Innovation Regions

The report identifies the various ways in which the food value chains are located in the region and in relation to initiatives taking place to promote Gippsland as a food innovation region. There is evidence that such strategies are supported by increasing national and international evidence that innovation in the food sector, broadly defined, is providing regions with the basis for sustained growth in employment and value add. It also found that Gippsland has many of the required attributes necessary to build on its existing strengths in the food sector. In other work undertaken by the researchers, similar features have been identified for Central Coast (Fairbrother and Rafferty, 2016).

These evaluations point to:

1. Building the capacity of food producers as suppliers for local institutions (including clubs, health and aged care food service providers), through improved aggregation and distribution systems and processes.
2. Research into existing and emerging business models in food production, processing and food services.
3. Comparative analysis and development that will enable existing businesses and new entrants, as well as regional governance actors to understand how their businesses can prosper and grow.

7 Appendix

7.1 Registered Dairy Manufacturers

Table 9: Dairy Data Analysis

Chain section	National	Gippsland
Pre-Farm Inputs	\$3.4 billion spent on farm input costs (calculated)	Approx \$740 million on costs (calculated) Which inputs are sourced and paid for within the region and which are sourced from without.
FARM Revenue \$4.3 billion IVA: \$1.3 billion* Profit: \$769 million Wages paid: based on the percentage of income quoted in the ACCC 2018 report, \$247,000 Establishments: 6689 Jobs: 16,332 Wages per employee \$14,989 Above from IBISWorld industry reports	IBISWorld farm numbers are shown above. ABS 71210DO002_201516 Agricultural Commodities, Australia- 2015-16 puts the number of establishments at 7,267. Dairy Australia, 2017 in Focus, puts the number of registered dairy farms at 5,789.	Revenue \$751 million (Dairy Australia) Wages \$67,590,000 Imputed wages: \$101,500 calculated for Gippsland from Dairy Farm Monitor Project Annual Report Net farm income: \$49,509 calculated for Gippsland from Dairy Farm Monitor Project Annual Report
	Dairy Australia claims 42,000 jobs in Dairy Industry in Focus 2017 pp.2. IBIS figures for Dairy farms and downstream = approx. 35,500 [calculated from employee numbers in various industry sectors. Dairy Australia claims [In Focus 2017, p.37], 24,500 working directly on farm, 17,600 in manufacturing. It is possible that Dairy Australia may include "imputed" labour in its figures, although IBIS reports (Dairy Cattle Farming) that it also includes imputed labour in its workforce calculations but not in its wages totals. "This means the industry's average wage underrepresents actual income earned per hired employee." * IBIS wages per employee include on-costs	Dairy Australia puts Gippsland dairy farm employment at 6,100 and manufacturing at 3,600. [Australian Dairy Industry in Focus 2017] The 2016 Census puts dairy farm employment for Latrobe Gippsland SA4 at 3426 (including owner operators) and total agriculture forestry fishing employment at 9157. The Dairy Australia number is much higher than the Food Plan (6800 on farm and processing p.5) and Regional Plan (6800 on farm and processing p.20) and KPMG for the total agriculture forest and fishing at 7,992 in 2011. The 2015 Gippsland regional plan puts total agriculture and processing at more than 6000, with dairy processing at 1284. The latter amount seems a bit low. However the ABS, Census 2016 has the processing workforce at less than 1,000.
	Is 'imputed labour' treated as a monetary cost or is its \$ value incorporated into farm profits/net income?	
DAIRY PROCESSING INPUTS Calculated from IBISWorld processing costs total approximately \$12.7 billion.	The national break up is set out in the Productivity Commission's 2014 paper (p.70) This varies according to processor and the type of work carried out in separate plants	In addition to ascertaining the configuration of dairy processing operations in Gippsland, more work is required to discover the nature and amounts of their spending on non-milk items in the region.

DAIRY PROCESSING Total revenue: approximately \$14 billion Total employment 19,264 IVA \$2,448,400,000 Profit \$725,500,000	IBISWorld industry sectors appear to be drawn from the ABS fine industry groups. The employment, IVA and revenue are roughly in accord with figures quoted by the Productivity Commission paper into dairy manufacturing in 2014 (p.41) and by an earlier Value Chain analysis for the National Association of Retail Grocers Association carried out by Accenture Australia.	We have not been able to find up to date documentary evidence as to the configuration of dairy processors in Gippsland. This is partly due to the sale in May 2018 of parts of Murray Goulburn.
	Different configurations of dairy processing sub-sectors' are used by various users which make comparison and analysis difficult. The sub-industry definitions used by IBISWorld, Dairy Australia, ABARES and even within different ABS products are not consistent.	
	Flavoured milk, a profitable item for many processors, seems to be allocated to a number of different sub-industry groups by different reporting entities	
	As processors produce a range of products which cover several dairy manufacturing industry subgroups, (sometimes within the same plant) it is not clear at this stage how employment, revenue, IVA and other are allocated to different industry sectors.	
	The summed export amount (based on IBIS figures) of \$2.1 billion does not accord with other sources, which generally value exports near \$3.2 billion: Dairy Australia 2017; Productivity Commission (2014) p.56; Boston Consulting Group (2015) \$2.7B; Dairy Australia Situation and Outlook 2018, p.24, \$2.8B. Either a manufacturing sector has been missed or the export figures for one of the sectors in this chart are not correct. Alternatively, there could be further exports from the sales of livestock (there surely are), and/or the other food manufacturing downstream purchases. However we have not found any clear publically available information that could indicate or not that this is the case	
DAIRY PROCESSING INPUTS Calculated from IBISWorld processing costs total approximately \$12.7 billion.	The national break up is set out in the Productivity Commission's 2014 paper (p.70) This varies according to processor and the type of work carried out in separate plants	In addition to ascertaining the configuration of dairy processing operations in Gippsland, more work is required to discover the nature and amounts of their spending on non-milk items in the region.
DOWNSTREAM PURCHASERS OF DAIRY PROCESSORS These include supermarkets (the major purchasers); wholesalers (particularly for cheese) convenience stores, downstream manufacturing, food services and exports	IVA, employment and profits of these has not been obtained. In some categories, Dairy would not be a major input.	The extent, employment, revenue and IVA of Gippsland supermarkets, wholesalers, food service and other outlets could be further investigated.
	Concerns remain in some quarters about the role of major supermarkets in the value chain. Adequate information on the large supermarkets' revenue, margins and IVA on dairy is not publicly available. The Accenture/NARGA study from 2010 included data on retail. The supermarkets did not make public submissions to either the Productivity Commission paper or the ACCC inquiry. It is clear that the supermarkets gave confidential information privately to the latter inquiry. Both bodies explicitly rejected the concept of investigating or impeding supermarket behaviour. The ACCC, whilst noting concerns from farmer groups in particular about value chain analysis (p.xxii) and issues of power imbalance between supermarkets and processors, did not consider any action necessary (p.31) while the Productivity Commission declared that market forces would resolve issues (pp.8 and 109). Downstream manufacturing is a substantial market for milk processors. These parts of the chain could loop back into the processing industry numbers or already be counted and possibly duplicated	

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