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## Australian agricultural restructuring and farmers' responses: a case study of the Illawarra region, New South Wales

Ren Hu  
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# **Australian agricultural restructuring and farmers' responses: a case study of the Illawarra region, New South Wales**

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Supervisors:

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This thesis is presented as part of the requirement for the conferral of the degree:

Doctor of Philosophy – Health & Society

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## Abstract

Rural geography has become an increasingly important subdiscipline of human geography since the 1980s. Over the past decades, farming in most developed countries has been transformed at a speed and to an extent that is unprecedented. Much of rural Australia has been experiencing constant financial difficulties which drove the restructuring of agricultural industries. Despite the importance of supporting family farmers and rural communities in terms of food security and sovereignty, there is still very limited theoretical and empirical knowledge regarding how the multiple forces over the past decades have intertwined and impacted farm development pathways. By focusing on dairy farmers' (in the Illawarra region, New South Wales) experiences of and responses to agricultural restructuring, this thesis aims to characterise and interpret change in contemporary agriculture.

Conceptually, agricultural restructuring has been researched from political economy and socio-cultural perspectives, which have alternately dominated the research agenda of human geography, and are both deployed in this study. Dairy farming dominates Illawarra agriculture, and has been constantly pressured by neoliberal policy reform (especially nationwide deregulation of the dairy industry in 2000), industry restructuring and the inflow of urban middle-class groups into rural areas. To maintain the century-long tradition of family farming, Illawarra dairy farmers do not just work hard but seek to improve their business from various angles. This process drives continued productivism, the rise of alternative agri-food networks, and the multifunctional transition of local agriculture. The thesis brings together scholarship examining the pathways of agricultural transformation, changing perspectives of farming businesses, and on-farm development.

The thesis is based on qualitative observational research supplemented by a media survey of local news articles on Illawarra agriculture. Qualitative observational research involved semi-structured interviews with dairy farmers and relevant stakeholders, and participant observation mainly through taking part in farm work and farmers' gatherings. Interviews form the main part of the empirical data. A total of 30 interviews were conducted with 21 participants including 13 participants with direct dairy farming experience and first-hand experience of industry change.

The results are multifaceted and may enlighten the formulation of agricultural policies. Firstly, the commercial operation of Illawarra dairy farmers is conditioned by the traditional family farming model as a result of local historical developments. This model has been adjusted to suit farmers' changing economic environments. Secondly, as institutional changes have brought Illawarra dairy farmers more market competition, and Australian dairy farmers have been losing capacity to harness the collective potential of the farm sector, Illawarra farmers have been compelled to improve their own business through using external investment and leased capital for expansion, operation intensification and the exploration of new commercial opportunities within and outside dairying. Thirdly, it is difficult for Illawarra dairy farmers to invest in their existing capital from a long-term perspective, and also difficult to invest in alternative or novel farming approaches. Many farmers tend to orient their farming systems towards short-term profitability and in this process deprioritise other farming values (e.g. the importance of the family farm). The commercial operating environment continues to be challenging for Australian dairy farmers, and will likely further restrict productivity growth, and drive the ongoing restructuring of the farm sector. Illawarra dairy farmers will likely continue to follow the mainstream business models with alternative or novel farming approaches being confined within small niche sectors. Based on the results, some key themes in agricultural geography, involving path dependence, political economy, neoliberalisation, socio-cultural dimensions of family farming, productivism and multifunctionality, are examined. Future research can help quantify and provide more details of the identified trends.

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Finally, I thank my family, especially my spouse Cassie Chen, friends and any others who supported this project.

## **Ethics statement**

This study has been reviewed by the University of Wollongong and Illawarra Shoalhaven Local Health District Social Sciences HREC, and has therefore been performed in accordance with the ethical standards laid down in an appropriate version of the Declaration of Helsinki/Declaration of Istanbul. All research participants have given their informed consent prior to their inclusion in the study. Details that might disclose the identity of the subjects under the study are omitted from this thesis.

## **Certification**

*I, Ren Hu, declare that this thesis submitted in fulfilment of the requirements for the conferral of the degree Doctor of Philosophy – Health & Society, from the University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. This document has not been submitted for qualifications at any other academic institution.*

---

***Ren Hu***

*25<sup>th</sup> June 2019*



## List of Acronyms

AAN	Alternative agri-food network
ABC	Australian Broadcasting Corporation
ABS	Australian Bureau of Statistics
AMPA	Australian Milk Producers Association
ASGC	Australian Standard Geographical Classification
CODFA	Certified organic dairy farming approach
DFMC	Dairy Farmers Milk Cooperative
EU	European Union
GVC	Global value chain
HMS	Herringbone milking system
LDD	Lion Dairy & Drinks
LGA	Local Government Area
LLSR	Local Land Service Region
MGC	Murray Goulburn Cooperative
NSW	New South Wales
NSWDPI	NSW Department of Primary Industries
OD	Organic dairy
PAT	Precision agricultural technology
PD	Precision dairy
R&D	Research and development
RMS	Robotic milking system
SA4	Statistical Area 4
SCD	South Coast Dairy
SD	Statistical Division

# Table of Contents

Abstract.....	II
Acknowledgements.....	IV
Ethics statement.....	VI
Certification.....	VII
List of Acronyms.....	VIII
Table of Contents.....	IX
List of Tables and Figures.....	XIV
Chapter 1 Introduction.....	1
1.1 Background.....	1
1.2 Aim and research questions.....	4
1.3 Thesis structure.....	4
Chapter 2 Literature Review and the Present Study.....	9
2.1 Introduction.....	9
2.2 Neoliberalisation.....	9
2.3 Agricultural change.....	12
2.3.1 Introduction.....	12
2.3.2 Research agenda.....	12
2.3.3 A political economy perspective on agricultural change.....	17
2.3.4 A socio-cultural perspective on agricultural change.....	25
2.4 Multifunctional agriculture.....	29
2.4.1 Introduction.....	29
2.4.2 Research agenda.....	29
2.4.3 Consolidated productivism.....	33
2.4.4 Alternative agriculture.....	40
2.5 Summary.....	46
2.6 The present study.....	47
Chapter 3 Methodologies and Analysis.....	51
3.1 Introduction.....	51
3.2 Study area.....	51
3.3 Qualitative observational research.....	53
3.3.1 Introduction.....	53

3.3.2 Maintaining ethical research .....	54
3.3.3 Semi-structured interviews .....	55
3.3.4 Participant observation .....	58
3.3.5 Qualitative data analysis .....	60
3.4 Media survey .....	63
3.4.1 Introduction .....	63
3.4.2 News searching procedure .....	64
3.4.3 General news reporting .....	65
3.4.4 Local news media .....	66
3.4.5 Media analysis .....	67
3.5 Summary .....	70
Chapter 4 Australian Dairy Industry .....	71
4.1 Introduction .....	71
4.2 Overview .....	71
4.3 General trends .....	72
4.4 The farm sector .....	74
4.5 Processing sector .....	76
4.6 Retail sector .....	77
4.7 Farmers' general coping strategies .....	78
4.8 Automation and precision dairying .....	81
4.9 Organic dairy .....	85
4.10 Recent challenges .....	86
4.11 Summary .....	88
Chapter 5 Dairying in the Illawarra .....	89
5.1 Introduction .....	89
5.2 A brief economic history of the Illawarra .....	89
5.3 Dairy farm sector .....	91
5.4 Farming system .....	96
5.5 Family farming .....	100
5.5.1 Characteristics .....	100
5.5.2 Adaptability .....	103
5.6 Conclusion .....	108
Chapter 6 Industry Change .....	109
6.1 Introduction .....	109

6.2 Deregulation and related trends .....	109
6.2.1 Introduction .....	109
6.2.2 Market determinism .....	110
6.2.3 Driving forces among dairy farmers .....	112
6.2.4 Direct impact .....	113
6.2.5 Government support.....	117
6.2.6 Climate challenges .....	119
6.2.7 Potential change .....	120
6.2.8 Summary .....	121
6.3 Changing supply chain relations .....	122
6.3.1 Introduction .....	122
6.3.2 Dismantling the old system .....	123
6.3.3 Supermarkets .....	125
6.3.4 Processor politics .....	129
6.3.5 Farmers' weak position.....	133
6.3.6 Potential change .....	135
6.3.7 Summary .....	137
6.4 Conclusion .....	138
Chapter 7 Urban Sprawl and Related Processes .....	141
7.1 Introduction.....	141
7.2 Urban sprawl and related processes .....	142
7.2.1 Development plans.....	142
7.2.2 A lifestyle region.....	144
7.3 Influence on dairy farmers .....	147
7.3.1 Opportunities .....	147
7.3.2 Conflicts.....	151
7.3.3 Competition for land .....	154
7.4 Conclusion .....	156
Chapter 8 Farmers' General Coping Strategies .....	159
8.1 Introduction.....	159
8.2 Pressure for change .....	159
8.3 Changing tradition .....	161
8.4 Business expansion .....	165
8.4.1 Productive capital.....	165

8.4.2 Value adding.....	169
8.5 Diversified income streams.....	173
8.6 Changing modes of operation .....	174
8.7 Consequences.....	181
8.8 Conclusion .....	186
Chapter 9 New Approaches .....	188
9.1 Introduction.....	188
9.2 Background.....	189
9.3 Robotic milking systems.....	190
9.3.1 Introduction .....	190
9.3.2 Advantages .....	191
9.3.3 Challenges .....	195
9.3.4 Summary .....	202
9.4 Organic dairy farming.....	202
9.4.1 Introduction .....	202
9.4.2 Why organic .....	203
9.4.3 Organic operation.....	206
9.4.4 Challenges .....	210
9.4.5 Summary.....	215
9.5 Prospects .....	216
9.6 Conclusion .....	218
Chapter 10 Conclusion.....	220
10.1 Introduction.....	220
10.2 What factors are driving agricultural change and how have farmers been affected?.....	220
10.3 How do farmers respond to their various pressures and shape their business?.....	223
10.4 What are likely pathways for the future of dairying and agriculture? .....	225
10.5 Reflection.....	227
10.6 Limitations and future research.....	234
References.....	236
Appendices.....	271
Appendix 1 List of news articles.....	271
1. News articles from Australian Broadcasting Corporation.....	271
2. News articles from Illawarra Mercury .....	272
3. News articles from other newspapers .....	284

Appendix 2 Interview questions .....	287
1. Questions for farmers and former farmers .....	287
2. Questions specifically for organic farmers .....	289
3. Questions for the Future Dairy and NSW DPI researchers .....	290
4. Questions for relevant stakeholders .....	291
Appendix 3 Questionnaire for farmers.....	293

## List of Tables and Figures

Table 3.1.	Participant serial numbers.....	57
Table 3.2.	Local farmers' gathering events.....	59
Table 3.3.	Relevant newspapers and the number of collected articles.....	64
Table 3.4.	Distribution of news articles over the study period.....	65
Table 4.1.	Two main milk markets in Australia.....	72
Table 4.2.	Australian dairy farmers' changing economic and policy environment.....	73
Table 4.3.	Dairy statistics of Australia and NSW from 1999/2000 to 2016/17.....	76
Table 4.4.	The proposed advantages and disadvantages of RMSs.....	83
Table 5.1.	Recent dairy statistics of the Illawarra SA4.....	93
Table 5.2.	Recent dairy statistics of the Southern Highlands and Shoalhaven SA4.....	95
Table 5.3.	Dairy statistics of the specific study area in 2010/11.....	96
Table 5.4.	Elements of Illawarra family farming culture.....	100
Table 5.5.	Dimensions of farmers' emotional links with farming.....	106
Table 6.1.	Supply chain arrangements before and after deregulation.....	137
Table 7.1.	Logics of dairy industry restructuring and urban sprawl related processes.....	157
Table 8.1.	The main elements of traditional family farming model and participants' general business model.....	165
Table 8.2.	A comparison between mainstream farmers and niche farmers.....	173
Table 8.3.	Adopted approaches/technologies and possible future choices reported by participants.....	176
Figure 2.1.	Hypothesised model for industry changes and farmers' responses.....	48
Figure 3.1.	Location and land use of the Illawarra SD.....	52
Figure 4.1.	The structure of Australia's domestic dairy supply chain.....	75
Figure 5.1.	Location and land use of the Illawarra SA4.....	93
Figure 5.2.	Location and land use of the Southern Highlands and Shoalhaven SA4.....	94

# Chapter 1 Introduction

## 1.1 Background

Since the 1980s, adverse market conditions have ‘left [Australian] agriculture and rural communities in what seemed to be perpetual states of financial crisis’ (Lockie, 2015, p.6). As part of this, Australia’s dairy industry has been seriously impacted. From 1978/79 to 2012/13, dairy farmers’ terms of trade (the ratio of output prices to input prices) declined by nearly 80%, while the number of dairy farms fell 64.3% (Ashton et al., 2014; Barr, 2014). This situation provides an impetus for the present study which aims to extend understandings of agricultural change, and thereby consider the lived experiences of restructuring and on-farm responses.

The current predicament facing Australian agriculture is strongly linked to global economic factors. Since the 1970s, the global economy has experienced a dramatic decline in profit rates (Harman, 2009) with a degree of economic sluggishness lasting to the present (Harvey, 2014). Under mounting economic pressures, global society has experienced a neoliberal turn in politics and economic systems. This thesis engages with and employs existing conceptualisations of neoliberalisation, which often highlight the rise of class power over workers (Harvey, 2005), and the rise of the power of multinational capital over national economies (Screpanti, 2014).

As part of the global process of neoliberalisation, the Australian government has significantly reformed agricultural policies (Lawrence et al., 2013). Agricultural policy reform characterised by deregulation and market liberalisation has intensified inter-regional and international competition (Gray et al., 2014), and facilitated the rise of corporate power in agri-food supply chains (Richards et al., 2012). Nationwide deregulation of the dairy industry in July 2000 has driven out numerous small businesses and pushed business amalgamation in the farm, processing and retail sectors (Ashton, 2014; Sinclair et al., 2015). Despite increased farm productivity, the dairy industry has seemingly been negatively influenced by events after deregulation, as evidenced by declined milk production (NSWDPI, 2014).



In Australia, dairy industry restructuring is also coupled with urban sprawl and related processes which have engendered the subdivision of farmland into residential and lifestyle land uses, particularly around, or close to, cities (Curran-Cournane et al., 2016). In peri-urban regions, the in-moving urban middle-class groups tend to dominate the real estate market, gain control or at least influence over local development, and promote what they perceive to be their rural idyll (Ilbery, 2014). Many peri-urban farmers are willing to sell up due to financial difficulty or the lack of successors to take on the future running of farms (Lockie, 2015).

The rearrangement of agri-food supply chains and the inflow of urban population into rural areas have been recognised as two dimensions of agricultural restructuring (Ilbery, 2014). The notion of restructuring denotes the turbulent process of change from one state of organisation to another. Restructuring is often a choreographed and contested process that reshapes relations between economic actors to support an accumulation strategy (Vanclay, 2003; Warren, 2019). Acknowledging there are different types of economic restructuring, I focus on the re-organisation of the dairy industry as experienced in the Illawarra region of New South Wales (NSW).

Restructuring pressure has threatened the culture of family farming. Many Australian farmers feel strongly about farming and their farm (Woods, 2014). The farm is usually inherited or partly inherited, and is the anchor of family ownership, family labour and an intimate connection to farming (Bryant, 1999). Agricultural restructuring has caused widespread anxiety (Kennedy et al., 2014), but also led farmers to innovate (Lockie, 2015). The concept of family farming, including farmers' adherence to their farm and lifestyle, partly explains the persistence of family farms in the western countryside, and has led rural scholars to base their research on the units of family farms (Woods, 2014).

Farmers' efforts to maintain viability through shaping their businesses towards different directions (e.g. intensification and alternative farming) correspond with the multifunctional transition (towards productivism or non-productivism) of rural space (Wilson, 2009). From a productivist perspective, Australian farmers have often tried to expand their business and intensify their operation (Barr, 2014). As farms get bigger, farmers become increasingly flexible in the choices of investment and financing (Weller et al., 2013), and farms become increasingly organised around corporate business models (Muenstermann, 2009).

Additionally, Australian dairy farmers have intensified their production through increased consumption of commodity feed, and intensified pasture-based feeding (Ho et al., 2013). Intensification is also linked to the adoption of certain technologies or equipment, such as precision dairy technologies (Ashton, 2014).

While commercial dairy farmers often go to considerable effort to improve their business, they tend to stick with proven production modes, which can hinder the development of alternative or new approaches. In Australia, for example, adoption of robotic milking systems by farmers has been slow by world standards (Pellet, 2013). The lock-in of farming systems in mainstream production modes can be facilitated by market-based research and development systems, increasing returns to adoption of existing techno-institutional systems, and farmers' lack of financial resources to invest in new approaches (Atkinson et al., 2014; Vanloqueren & Baret, 2009). The mainstream production modes characterised by intensified use of resources have exacerbated environmental degradation (Bell et al., 2014), and weakened farmers' resilience to market fluctuations (Woods, 2012).

As a response to these issues, alternative agri-food networks have proliferated in OECD countries, including Australia (Marsden & Morley, 2014). They often reflect the non-productivist elements of a multifunctional agriculture. The willingness of some urban consumers to pay premium prices for food of certain qualities allows some farmers to adopt alternative modes of agricultural production and/or distribution, for example, supply to niche markets (Woods, 2012). One salient alternative relevant to this thesis is organic dairying. The organic dairy sector in Australia has grown rapidly in market value in recent years (Australian Organic, 2014). However, the often inferior economic performance of organic farming has made farmers suspicious, and driven the simplification or conventionalisation of organic standards (Guthman, 2014; Willer & Lernoud, 2016).

Given the issues of existing farming systems, it is important to understand how agriculture has evolved to today's form, how farmers have shaped their business, and how agriculture will continue to evolve. At present, however, our theoretical and empirical knowledge is still limited regarding these questions (Wästfelt & Zhang, 2016). To contribute to existing conceptualisations, this thesis provides an in-depth, contextualised, actor-oriented analysis of agricultural change at the farm level, while also considering broader socio-cultural contexts

and politico-economic trends, seeking to avoid the widely acknowledged pitfall of overemphasising one research angle to the neglect of others (Mackinnon, 2017).

## **1.2 Aim and research questions**

By focusing on dairy farmers' experiences of, and responses to, agricultural restructuring, this study aims to characterise and interpret some of the changes unfurling in contemporary agriculture. The geographic focus is the Illawarra region in NSW. The Illawarra is close to Sydney, Australia's largest city, and undergoing rapid urbanisation. Dairy farming dominates Illawarra agriculture, and has been long pressured by wider industry restructuring, urban sprawl, and demand for rural land for lifestyle uses (Gill et al., 2010). To maintain the tradition of family farming, dairy farmers not only work hard but try to improve their businesses. The on-farm changes have further consequences in terms of the long-term resilience and capacity of local agriculture. Future trends as an extension of the current situation are likely to continue to pressure farmers. To collect empirical data, I conducted qualitative observational research supplemented by a media survey of local news articles on Illawarra agriculture. Qualitative observational research involves semi-structured interviews with dairy farmers and relevant stakeholders, and participant observation mainly through taking part in farm work and farmers' gatherings. To achieve the overall aim, I explore three research questions:

1. What factors are driving agricultural change and how have Illawarra farmers been affected by and experienced such change?
2. How do farmers respond to pressure from various sources and how does that influence their business?
3. What are some likely pathways for the future of dairying and agriculture in the Illawarra and beyond?

## **1.3 Thesis structure**

This thesis includes ten chapters. Following this introductory chapter, chapter 2 positions this project in the academic literature and provides a conceptual framework for understanding Australian agricultural restructuring and farm development pathways. I firstly introduce the multiscalar process of neoliberalisation as the background of agricultural restructuring,

recognising the continued importance of political economy approaches in agricultural geography (Robinson, 2017). Since the 1970s, political economy and socio-cultural perspectives have alternately dominated the research agenda of human geography, and both presented valuable insights helping to better understand the various aspects of agricultural restructuring (Mackinnon, 2017). Thus, I not only present macro-economic trends in Australian agriculture, but highlight socio-cultural and institutional changes. This body of literature also exposes research gaps to which this project contributes.

Amid a period of major restructuring, Australian farmers have shaped agriculture towards both productivism and non-productivism, which has underlain the multifunctional transition of agriculture. The multifunctional transition as an overarching conceptualisation of agricultural change (Wilson, 2009) has been criticised for its ambiguity (Marsden & Sonnino, 2008), which creates scope for further research to clarify the dimensions and on-farm experiences of agricultural change. I characterise some major farm development pathways including expansion, intensification, technology adoption, localisation, diversification and organic farming. After the literature review, I demonstrate the procedure of this study following the order of my research questions. I also propose a model explaining the logic/causal relations among various processes involved in Australian agricultural restructuring.

After outlining the conceptual framework, chapter 3 presents the research methods used for this study. I firstly introduce my study area, the Illawarra region, and then present my two approaches to collect and analyse empirical data. They are qualitative observational research and media survey. The former involves semi-structured interview and participant observation. The latter involves reviewing relevant local newspapers. Interviews form the main part of the empirical data. I conducted 30 interviews with 21 participants including 13 participants with direct dairy farming experience.

To facilitate analysis of Illawarra dairying, chapter 4 presents the restructuring of Australian dairy industry based on public data and academic literature. Dairy restructuring is marked by the 2000 deregulation of dairying, which comprehensively transformed the milk market and significantly increased competitive pressure for Illawarra farmers. Australian farmers' coping strategies and on-farm changes reflect both productivism (e.g. expansion and intensification)

and non-productivism (e.g. conversion to organic farming). In recent years, Australian dairy farmers face challenges of low milk prices, labour shortages and environmental degradation.

Chapters 5 to 9 present the empirical analysis. Chapter 5, in response to my research question one (inquiring into factors driving agricultural change, and farmers' experiences), details the historical, geographical and cultural contexts of Illawarra dairying. Since European colonisation, Illawarra dairying overall has declined to its current status as a minor local economic activity. Proximity to the Sydney milk market means local farmers have largely oriented their farming approaches towards intensive year-round production. Technical farming is organised under a cultural and business model of family farming. Farmer participants in this study mostly expressed strong emotional links with farming and their family farm. While previous studies usually highlighted farming as a cultural or family obligation (Bryant & Garnham, 2014), the present study underscores farmers' personal and voluntary choice in conducting and continuing in dairy farming.

Chapter 6, in response to research question one, covers major trends, especially those related to the 2000 deregulation, in the dairy industry. A major factor driving deregulation was Australian dairy farmers' declining terms of trade. Those benefiting less from pre-2000 regulation, such as numerous Victorian dairy farmers, were likely to be more affected by this pressure and to seek new opportunities. For example, those Victorian dairy farmers were driven to shift their pressure onto those who were relatively protected by this previous regulation, such as many NSW dairy farmers. This process contributed to a persistent institutional change where Illawarra dairy farmers have experienced retreat of government support and intervention (a more competitive market), lower and more unstable milk prices, and the temporary increase in availability of productive capital. Illawarra farmers have also faced rising corporate food governance. This thesis contributes to existing research by showing that the local agricultural experience of neoliberalisation was not merely one pushed by large corporate actors or the state. Market-friendly policies were strategically favoured by many farmers, suggesting that neoliberalisation, at least in its early life, had a broader social basis than has often been acknowledged in the literature.

Chapter 7, also in response to research question one, covers another dimension of agricultural restructuring, namely the urban-to-rural shift in people and non-agricultural services. In the Illawarra, property investors/land development companies and urban middle-class groups

came into rural areas, dominated local real estate markets, and rearranged local economies. Many farmers benefited from the injection of external wealth as they sold land for high prices. However, new social requirements around environmental externalities and animal welfare were usually imposed on dairy farmers who bore increased costs of accessing and using land locally. Under these intertwining forces, Illawarra agriculture has become characterised by industrial production, services, lifestyle and investment. The inflow of urban population into rural areas, and dairy industry restructuring are two independent trends usually discussed separately in academic literature. But as this thesis illustrates, both processes can be understood to follow similar logics.

Chapter 8, in response to research questions two (inquiring into farmers' responses to agricultural restructuring) and three (inquiring into likely future pathways), presents an analysis of how Illawarra dairy farmers have coped with economic challenges through improving their business. Farmer participants, to a certain extent, tended to deviate from traditional farming culture and become increasingly flexible in their choices of investment and financing. With a large amount of resources invested into business expansion, intensification and exploration of new commercial opportunities, it became difficult for farmers to invest in their existing capital from a long-term perspective (e.g. investing in long-term resilience and capacity). This study contributes to existing research by providing a contextualised empirical case of how multiple driving forces have intersected and impacted on-farm developments.

Chapter 9 also addresses research questions two and three by analysing how Illawarra farmers' adoption of robotic milking system and certified organic dairy farming approach has been influenced by agricultural restructuring. I focus on robotics and organics, as they have been increasingly promoted by the industry and some academic researchers as potential strategies to enhance business performance or cope with challenges like global resource constraints (through better and more efficient use of on-farm resources) (Bouttes et al., 2018; Britt et al., 2018; Migliorini & Wezel, 2017). The two approaches have potential to improve farmers' operational efficiency and long-term resilience. However, under significant challenges they have been oriented towards short-term profitability and anchored to intensive production regimes. The thesis finds that for the foreseeable future, their adoption and influence on the dairy industry will likely remain limited.

Finally, chapter 10 synthesises the thesis in light of some key themes or approaches in agricultural geography, while providing recommendations for future research. In the Illawarra, agricultural change has been shaped by local historical developments, geographical conditions, the broader context of neoliberalisation, and dairy industry restructuring. Farmers' investment choices (e.g. expansion and intensification) along with the various pressures on them potentially limit their adoption of technology and discourage transitioning to alternative or novel farming approaches. It has become difficult for farmers to contribute to the long-term resilience and capacity of local agriculture. Future research can focus on agrarian transformation in other contexts, and help provide more details of the identified trends through, for example, an ethnographic study which allows researchers to maintain closer contact with farmers.

# **Chapter 2 Literature Review and the Present Study**

## **2.1 Introduction**

Chapter 2 shows how this study is situated within, and contributes to, relevant academic literature, and presents major debates and perspectives on agricultural change. To understand the forces driving agricultural change, I firstly introduce characteristics of neoliberalisation, arguing that Australian agricultural restructuring has been part of this political economic process. I then introduce two major approaches (socio-cultural and political economic) to conceptualising agricultural change in recent decades. Based on these approaches, I present some major dimensions of Australian agricultural restructuring, including: neoliberal policy reform, rising corporate power, urban sprawl and related processes, socio-economic decline of agricultural communities, and challenges to family farming cultures.

Under agricultural restructuring, farmers have shaped agriculture towards both productivism and non-productivism. I introduce how the conceptualisation of rural/agricultural transition has evolved from post-productivism to multifunctionality, and highlight why the notion of multifunctionality needs further clarification. For productivism, Australian farmers have largely chosen business expansion, operation intensification, and the adoption of certain technologies. However, Australian agriculture has been experiencing resource constraints and limited environmental management. Given these problems, alternative agri-food networks have been on the rise in Australia. These networks contribute to the social functions of agriculture beyond commodity production. After the literature review, I demonstrate the procedure of this study.

## **2.2 Neoliberalisation**

Modern agricultural change is related to the neoliberalisation of national and global politics and economic systems (Harman, 2009). Hogan & Young (2013) indicated that neoliberal policies have significant and negative influences on Australian agriculture. Thus, it is important to disentangle this trend of neoliberalisation.



Although the term ‘neoliberalism’ has been widely used in the social sciences, its polysemy and analytical imprecision have induced criticism (Peck et al., 2013). Despite its ambiguity, neoliberalism is usually recognised as an ideological project and mode of capitalist economic governance that has ascended globally since the 1970s (Harvey, 2005). Harvey (2014) highlighted the hegemonic role of capital circulation and accumulation in capitalist social formations. Privately held capital must grow, as capitalists who accumulate capital fast tend to absorb that of others (Harman, 2009). This competitive pressure is especially acute in times of economic difficulty. To a large extent, the neoliberal age is such a period for global society. From the 1970s, profit rates in major capitalist countries declined significantly and have usually only partly recovered (Harman, 2009). For Australian dairy farmers, this phenomenon was expressed as significantly decreased terms of trade (Lockie, 2015). Behind the global economic difficulty has been continued resource constraints characterised by increasing costs in extracting key resources, such as evident in peak oil (Palmer, 2014), peak phosphorus (Cordell et al., 2009) and peak everything (Holmgren, 2009).

Facing economic difficulty, policy reforms and economic restructuring have been formulated globally and adapted locally. Neoliberalism has been understood as a ‘solution space’ for responding to crises and restoring accumulation typically based on market-oriented policies (Hall, 2011). For example, Australia’s agricultural policy reform since the 1980s was partly responding to adverse market conditions and the reality that protectionist policies had led to inefficient industries. Neoliberalism is originally ‘a theory of political economic practices that proposes that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterised by strong private property rights, free markets, and free trade’ (Harvey, 2005, p.2). Despite the neoliberal ideal, the process of neoliberalisation does not necessarily equate to the retreat of the state, but rather a re-orientation of the institutions and policies instituted by the state to facilitate market determinism and economic growth (Dibden & Cocklin, 2010). Political economic research usually views neoliberal regimes as imposed on the society and actively promoted by corporate power (Paul, 2014). This thesis highlights that with stalled accumulation in a specific sector, there tends to be an industry-wide push to change accumulation strategies. For example, Australia’s dairy deregulation and market liberalisation was initially supported by numerous farmers (see chapter 6).

When neoliberalisation is underway, powerful and advantaged interest groups both have and create opportunities to outcompete other market players and exert more influence on policy making to consolidate their advantages. Four decades of neoliberal freedom in major capitalist countries has witnessed concentrations of corporate power in major economic sectors including agriculture (Screpanti, 2014). The main substantive achievement of neoliberalisation has been to redistribute, rather than to generate, wealth (Harvey, 2005, 2014). The most important factor in coping with the profit decline since the 1970s was increased pressure on workers (Harman, 2009). The pressure was also on family farmers including those in Australia, and they have been increasingly subject to corporate food governance (Ilbery, 2014). To further capital accumulation, capital tended to flow from low-return sectors (which might have long-term social benefits) to high-return ones. Global investment has increasingly gone to non-productive financial activities (Harman, 2009). Since 1980, it has been common for corporations, including agribusinesses, to offset their losses in production by seeking to generate profits from financial operations, e.g. investing in stock and other capital markets (Harvey, 2005).

Overall, the process of neoliberalisation has normalised ‘a world of enormous income gaps between rich and poor, unaccountable corporate power, capitalist profiteering, structural adjustments, increased worker precarity, lives lived on credit, persistent unemployment, a weakened public infrastructure, environmental destruction, oppressive audit and surveillance regimes, narcissistic individualism and relentless commodification’ (Phelan, 2014, p.3). These negative impacts and the constant counteracting social forces reflect the reality that neoliberalisation can never be a fully completed project and will always be evolving and polymorphic (Peck et al., 2013). Since 2000, the Australian dairy industry has also undergone such a dynamic and complex transformation (Barr, 2014).

Neoliberalisation is also contextually embedded and conditioned by inherited institutions and regulations (Dibden & Cocklin, 2010). In Australia, with the election of the Hawke and Keating governments in 1983, an Anglo-American libertarian model of capitalism ‘based on the deregulation of the economy, the privatisation of the common wealth and the commodification of everything’ (Paul, 2012, p.1) became the leading policy framework. A full-fledged assault was waged against protectionism to integrate Australia into world trade. New policies were to apply economic rationalism and market determinism to the allocation of public funding (Pritchard & McManus, 2000). Australia has gone further in applying

neoliberalism to agriculture, in contrast with the USA and European Union where agriculture has been excluded from neoliberal policy reforms to a certain extent, and has been sheltered by trade barriers (Dibden et al., 2009; Hamblin, 2009). Enjoying bi-partisan support, neoliberalisation continued to be pursued by later Australian governments (Paul, 2014). Behind the push was usually large corporations and the wealthy motivated by the expectation of making fortunes by reducing barriers and regulations that appeared to hinder private wealth creation (Stilwell & Primrose, 2009). Given the dynamic nature of neoliberalisation, this thesis provides a case of actually existing neoliberalism within the context of Illawarra dairying, including how it has unfolded and influenced farming businesses. The next section examines the neoliberalisation and restructuring of Australian agriculture.

## **2.3 Agricultural change**

### **2.3.1 Introduction**

Neoliberalisation has significantly changed the operating environment of Australian agriculture. To understand agricultural change, the following section firstly reviews major conceptualisations in agricultural geography in recent decades, and highlights two dominant research angles (political economy and socio-cultural perspectives). Research gaps are discussed before I introduce details of Australian agricultural restructuring from these two perspectives.

### **2.3.2 Research agenda**

Four decades of agricultural restructuring in western developed countries has provided a consistent background for agricultural-related research (Woods, 2012). Over this period, rural geography has become an increasingly important subdiscipline of human geography (Milbourne, 2017). Ilbery (2014) indicated that conceptually agricultural restructuring has been researched from political economy and socio-cultural perspectives (including post-structuralism and feminist approaches). As shown in the following discussion, these perspectives have alternately dominated the research agenda of human geography (Mackinnon, 2017). At the end of this subsection, I briefly introduce the emerging field of evolutionary economic geography, which provides valuable insights in understanding the timeliness of economic change.

In the 1980s, when neoliberal policy reform and economic restructuring escalated, political economy became ‘the dominant discourse of human geography influencing debate, research and the very sociology of the discipline’ (Barnes, 1995, p.423). By the 1990s, political economy and structuralist approaches had also come to represent agricultural geography (Morris & Evans, 1999). Political economy theory offered an analytical framework that emphasised the capitalist structures and power relations that shaped agriculture and constrained individual agents (Morris & Evans, 1999). Political economists consistently focused on two dimensions of agricultural restructuring (Ilbery, 2014). First, in developed countries, large agribusinesses or corporations came to increasingly dominate one or more sectors of agri-food value chains comprising input providers, farm sector, processing sector, distribution and retail sector, consumer demand, agricultural policies, international food trade and financial markets (Bowler, 2014). Agricultural research has increasingly placed farms in this network (Bowler, 2014). The agri-food value chain also forms a key part of Illawarra dairy farmers’ operating environment. Second, many rural areas were being repopulated especially by urban middle-class groups, and characterised by consumption-based activities (e.g. tourism) as well as production. The amenity-led economic transition is also evident in the rural Illawarra. The above-mentioned two dimensions have been well recognised in research on Australian agriculture which has undergone the rise of corporate players, and persistent farmland loss to residential and lifestyle developments (Barr, 2014; Lockie, 2015). This thesis is also informed by a political economy approach in seeking to better understand farmers’ changing operating environment.

However, by the late 1980s political economy theory was being increasingly criticised. Political economists tended to overstress structural processes and largely failed to recognise human autonomy and agency (Marsden et al., 1989). In geography, mainstream work on agriculture consistently portrayed farmers as being solely profit oriented, rational market actors (Robinson, 2017). Agricultural populations were depicted as homogenous entities with analyses failing to engage with how geographical phenomena (e.g. space and place) shaped agricultural production and rural social life (Bowler, 2014; Marsden et al., 1989). Morris & Evans (1999) recommended refocusing on farmers who bore locally specific knowledge, cultural values, identities, and actively shaped the policy context. Local farmers’ agency is examined and unpacked in this thesis.

Due to those criticisms, political economy in the discipline of human geography was subsequently challenged by approaches emphasising culture and institutions (Mackinnon, 2017). In the late 1980s and 1990s, the ‘cultural turn’ occurred in social sciences, reviving interest in the cultural aspects of human life, including economic activities (Robinson 2017). Geertz (1973) interpreted culture as the pattern of meaning, values, ethics and beliefs that are historically transmitted and reflected in symbols, signs and customs/behaviours. The socio-cultural perspective was to recognise that culture is not a passive reflection of material circumstances, and to ‘contextualise rather than undermine the economic, by locating it within the cultural, social and political relations through which it takes on meaning and direction’ (Wills & Lee, 1997, p.xvii). Socio-cultural factors, such as traditions and routines, also shape and drive the decision-making and operation of economic entities, and should be considered as significantly influencing farmers’ adaptation to changing political economic environments. Socio-cultural researchers also drew insights from institutional economics. Institutions are generally defined as rules, conventions and norms, which are usually specific in local contexts. Institutionalist perspectives contributed to a rising regionalism in economic geography, examining how economic activities were rooted in particular places (Mackinnon, 2017). MacLeod (2001, p.804) indicated that in many developed countries ‘a whole host of academics, consultants, influential commentators, politicians and bourgeois interest groups are readily invoking the region to be the appropriate site for regulating global capitalism’. In the context of Australian dairying, Pritchard (1998) maintained that within globalisation processes, the internationally coordinated flow of commodities and financial capital has still been mediated by certain local institutions, for example farmer-owned cooperatives. In the 1990s, more and more rural geographers turned to new research topics, for example the social identity of farmers in specific regions (Milbourne 2017). This thesis examines how historically developed and geographically specific farming cultures condition farmers’ decision-making and interact with political economic trends, such as changing regional planning frameworks and agricultural policies.

By the early 2000s, shortcomings with new regionalism were also being criticised. The literature tended to take regions for granted as research objects and easily defined spatial units, overstressing endogenous capacities and relations. Exogenous networks and institutions, for example national policies, were analytically neglected (Mackinnon, 2017). Those critical evaluations prompted calls for a renewed political economy (Bowler, 2014). The continued relevance of political economy was related to the ongoing significance of neoliberalism in

shaping local economic development. Neoliberalisation has prompted interregional competition and revived interest in extra-regional relations. Recent studies on Australian agriculture continued to emphasise macro-economic trends, for example, the neoliberal policy environment (Lawrence et al., 2013), corporate food governance (Burch et al., 2013) and persistent urban sprawl (Ruoso & Plant, 2018). Cumbers et al. (2003, p.325) suggested: ‘The potential of institutional approaches can best be realized by linking these to a reworked spatial political economy.’ Geographers have been part of the long-term effort (since the 1970s) to reform conventional political economy, helping to culturalise and spatialise its core concepts such as value, markets, and commodity production (Barnes & Christophers, 2018). Political economy approaches have been conceptualising economic processes in relational rather than structural terms, and emphasising multiple actors rather than external domination (Ilbery, 2014; Robinson, 2017). As Massey (1995, 2001) argued, space is politically, socially, relationally and historically constituted. In the recent period, Australian agricultural researchers have intertwined political economy approaches with socio-cultural perspectives in studying, for example, family farming culture (Kuehne, 2013), farmers’ perception of rural change (Halpin & Guilfoyle, 2004), and rural masculine identity (Bryant & Garnham, 2014). As Barnes & Christophers (2018) argued, an amorphous geographical political economy has emerged, which draws influence and inspiration from Marxism alongside other critical sources, for example feminist, post-structural and cultural theories.

The revival of political economy has also enabled the continued influence of structuralism. For example, neoliberal regimes in Australian agriculture are still largely viewed as originating from top-level forces (Lawrence et al., 2013). Researchers have usually ignored the potential of farmers’ choices and various responses (e.g. pushing, fighting, accommodating or acquiescing in neoliberal policy reform) as part of the social forces dismantling protectionist regulation. The view of top-level imposition usually cannot well explain the division or competition between farmers’ groups or individual farmers, or why farmers have not united to resist such imposition (Sinclair et al., 2015). One way to explain farmers’ individualism is to relate it to individual entrepreneurship promoted by the neoliberal regime (McElwee, 2008). However, political economists often failed to account for how the longstanding virtue of independence might also contribute to individualism and narrow-mindedness (Emery, 2015). As such Dibden & Cocklin (2010) called for more nuanced analyses of specific neoliberal programs to better understand how farmers had influenced and been influenced by neoliberal projects.

While acknowledging the ongoing importance and explanatory power of political economy theory, the outcomes of neoliberal policy reform can never be easily predicted. The trajectories of policy reform and economic restructuring continue to warrant investigation at different spatial and scalar levels (Van Caenegem & Cleary, 2017). As Massey (2001) argued, national economic strategies have geographically and socially differentiated implications. Pritchard (1996) highlighted the importance of specific regulatory contexts in determining outcomes of Australian dairy restructuring, and the complex relationships between local, national and transnational players. In Australia's recent dairy policy reform, farmers and relevant stakeholders generally could not predict the extent of the changes, and had little understanding of how they should prepare for the future (Alston et al., 2017; Sinclair et al., 2015). As Wästfelt & Zhang (2016, p.173) have argued:

Our theoretical and empirical knowledge is still very limited regarding the processes of how these different layers of forces generated over the past decades intersect to impact the development pathways of farms which are integrated to different extents in the global agri-food system, and especially when the farms are located next to each other and close to cities [e.g. farms in the Illawarra].

With political economy and socio-cultural approaches emphasising macro-economic and regional factors, the emerging paradigm of evolutionary economic geography focuses specifically on the timeliness of economic change and has developed several key concepts, such as 'selection and adaptation', 'path dependence' and 'resilience', to help researchers understand how economic systems evolve over time and react to disturbances (Tonts et al., 2014). Although much work of evolutionary economic geography has been urban-centric, the development of rural economies, especially those based on agriculture, is also geographically and historically contingent and characterised by path dependence (namely shaped by past events and outcomes). This means the organisation of rural economies can be reinforced through fixed assets, specialised skills and knowledge, institutional structures, and social and cultural routines (Arthur, 1994; Higgins et al., 2017). These factors are also subject to disturbances, which are normal elements of an evolutionary process. Disturbances can be economic and political shocks that contribute to agricultural restructuring and the formation of new rural industries, companies and political responses (Plummer et al., 2018). A rural economy has to be resilient to be able to absorb shocks and adjust to a new growth path

(Hassink, 2010). The ability to be resilient is related to the broader political economic background enabling economic recovery, and also local conditions facilitating new economic opportunities (Tonts et al., 2014). The evolutionary perspective has been applied to, and examined in, rural geography, and uncovered the dynamics of some rural communities facing economic and political challenges (Plummer et al., 2018). This thesis also draws on the insights from evolutionary economic geography and examines how some of its key concepts can be applied to the Illawarra case to help understand local experiences of restructuring involving both political economy and socio-cultural factors.

After examining recent debates in agricultural geography, I try to avoid the pitfall of overemphasising one research angle and neglecting others. Instead, I follow an actor-oriented approach, which places emphasis on examining the on-farm changes while also considering the local economic development/evolution, socio-cultural contexts, and political economic trends. The significance of this study is that it tries to jump out of the dichotomy of macro-economic factors versus local cultural factors to instead explore how the motivations of individuals *interact with* systemic, structural changes. This thesis reveals that agricultural change can be driven by an industry-wide need, be perceived as a top-down project, and be contingent on and further shape local institutions. I suggest a more nuanced understanding of agricultural restructuring, particularly regarding farmers' experiences and responses.

### **2.3.3 A political economy perspective on agricultural change**

#### ***2.3.3.1 Introduction***

Subsections 2.3.3 and 2.3.4 illustrate Australian agricultural restructuring respectively from a political economy perspective and a socio-cultural perspective. The latter places emphasis on the socio-economic decline of Australian agriculture, and family farming cultures. Subsection 2.3.3 is organised according to Ilbery's (2014) two dimensions of agricultural restructuring: the restructuring of agri-food value chains, and rural areas being increasingly repopulated by urban middle-class groups. I introduce and examine agricultural policy reform, the rising corporate power in agri-food markets, and the influence of urban sprawl and related processes on agriculture.



### ***2.3.3.2 Agricultural policy reform***

Australian agricultural restructuring since the 1970s was primarily triggered by changing global market conditions and national policy frameworks. After 1945, agricultural policies were anchored to protectionism and subsidisation (Woods, 2014). By the 1980s, with global economic difficulty, Australia's agricultural markets were in their worst shape since the 1930s (Adams et al., 2013). The government's response was 'the most profound' agricultural policy reform since Federation in 1901, which also involved the dairy industry (Lawrence et al., 2013, p.6). The 'efficiency mantra' or pursuit for a more efficient agriculture came to dictate agricultural policies (Hogan & Young, 2013). Farmers with political influence often pushed the elimination of protectionism (Dibden et al., 2009). One overriding reason was to gain export markets. Given the growing size and scale of Australian agriculture, an increasing number of producers depended on export. But to argue against the heavy subsidies provided in Europe and North America, Australian political leaders recognised the domestic market had to be open itself (Pritchard & McManus, 2000). Although 'free trade' would not benefit the entire agricultural sector, subsequent federal governments actively advocated market liberalisation (Vanclay, 2003).

Gathering pace in the 1990s, the Australian government retreated from forms of market intervention, agricultural support and service provision. Nearly all tariffs and some other border protection measures for agri-food products were removed (Gray et al., 2014). The 1992 National Drought Policy recognised drought as part of farmers' normal operating environment and emphasised providing social welfare support instead of direct financial assistance (Gray et al., 2014). The 1992 National Competition Policy ensured that 'there is competition in the supply and management of government-funded services', and 'it is not the government's role to provide a service that could be provided by the market' (Hogan & Young, 2013, p.323). With declining protective measures, small-scale farmers have become especially vulnerable under market and environmental challenges

After 2000, the focus of regional development shifted from planning and extensive infrastructure building to instituting 'programs of capacity building, leadership development and farm financial counselling, which promote personal change and development' (Cheshire & Lawrence, 2005, p.439). Australia's agricultural support declined from 10% of farm receipts in 1986-88 to just 3% by 2010-12 (OECD, 2016). These changes in support and emergency funding for farmers and farming have also applied to dairying.

Australia is among a select group of countries to ‘have introduced the most radical degrees of deregulation and exposure to global markets’ (Woods, 2014, p.36). Australian farmers’ economic viability has become increasingly subject to trade policies of the European Union (EU) and USA (Halpin & Guilfoyle, 2004). The EU and USA have heavily subsidised their agriculture (Hamblin, 2009), maintained trade barriers to protect their farmers, and supported their farmers’ competition in global markets (Dibden et al., 2009). This protectionism has shut fair access to global markets (Paul, 2012), and depressed prices of agri-food products (Screpanti, 2014). In chapter 4, I examine how international competition has exerted significant pressure on Australian dairy farmers, including those in the Illawarra. This situation raises questions of how farmers perceive the neoliberal policies that have seemingly rendered them disadvantaged in global markets, and how the resilience of local agriculture has been influenced.

Overall, the Australian government has appeared reluctant or unable to withhold forces of globalisation from affecting agriculture (Hamblin, 2009). Some scholars have suggested that, with the number of farmers declining, their capacity for successful political actions against neoliberal policies also shrinks (Dibden et al., 2009). Farmers’ actions, like milk dumps, have been easily marginalised, as food manufacturers and retailers can switch suppliers and source commodities from other farmers. Rural communities compete for funding and contracts, and can be easily isolated (Woods, 2014). This division in rural communities can also be observed in Australia’s dairy farm sector. In their work on the challenges faced by rural Australia, Hogan & Young (2013, p.323) argued: ‘Market liberalisation has never been a central issue debated at or voted on at a national election.’ That begs the question of why this seemingly problematic principle was retained or supported socially in specific policy reform.

### ***2.3.3.3 Corporate power***

Governments rolling back regulation from major areas of agricultural governance left a political vacuum in certain agri-food markets, which led to re-regulation through private sector initiatives (Wilson, 2001). This has, to a certain extent, shifted regulatory power away from democratic political conventions, and potentially subsumed state sovereignty in food governance to global corporate power (Richards et al., 2012). With the globalisation of production and trade, corporate food governance belongs to the governance of global value chains (GVCs) which involve the value-added activities of a multitude of economic actors,

and have been key vehicles for the organisation of the global economy (Neilson et al., 2014). While a supply chain emphasises the manufacturing and distribution of products (Bowler, 2014), a value chain also involves other activities that add value to a product, for example design and branding (Neilson et al., 2014). The approach of GVCs helps to understand the organisation and power structure of commodity production. According to the framework of GVCs, the governance pattern of large, dominant corporate buyers over smaller suppliers or producers is identified as captive value chains (Gereffi et al., 2005). In Australia, corporate food governance has been salient, partly because Australia has a relatively small population. It has been relatively easy for multinational corporations to monopolise the processing of agri-food products (Vanclay, 2003). Australia's agri-food value chains, involving input providers, the farm sector, a processing sector, a distribution and retail sector, have been dominated by a limited number of multinational corporations (Lockie, 2015). The structure of the dairy value chain is explored in chapter 4, revealing the positions of various players within this network. Neilson et al. (2014) indicated that lead firms have continued to dictate the terms and conditions of activities in networks and chains. Most Australian farmers have seen their share of retail prices decline significantly since the 1980s (Andree et al., 2010).

Gereffi et al. (2005) highlighted the significant influence of actors at both ends of the GVC (input and equipment providers, and global buyers). Since the 1990s, global food retailers have played an increasingly important role in integrating agri-food industries (Richards et al., 2012). In Australia, two supermarket retailers, Coles and Woolworths (with significant foreign investment), and one wholesaler, Metcash, have accounted for around 80% of grocery sales and 60% of fresh food sales for at least eight years (Burch et al., 2013; Oxfam Australia, 2014). The monopsony (few retail buyers facing many suppliers) gives retailers the opportunity to pass operating costs down the supply chain through squeezing on prices, contracting terms and other devices, for example 'slotting fees' for shelf space (Konefal et al., 2007). As Burch et al. (2013, p.216) noted in this context 'supermarkets are coming to determine what is produced, where, to what standards and price, and the outlets from which food is to be sold'. Whilst the power of a select few corporate firms within Australian agriculture has been well identified, the specific trajectories of how supermarkets have gained, and sought to maintain, supremacy still needs further research.

With dominance established in agri-food markets, major supermarkets have been active in formulating standards for food safety and quality for food manufacturers and farmers (e.g.

Woolworths Quality Assurance, and Coles Supermarket Supplier Management Program) (Lockie, 2015). In their analysis on GVCs, Humphrey & Schmitz (2002) indicated that although effective governance requires substantial investment, the global buyers of developed-country markets often set product parameters to determine product design and reduce the risks associated with non-compliance with standards. Australian farmers, including dairy producers, usually bear the financial costs of following these standards (Richards et al., 2013). Small to medium-scale farmers have been increasingly marginalised by private standards for ‘unblemished, standardised, cheaply produced, high-volume products’ (Burch et al., 2013, p.218). Agricultural research has highlighted the increasing burden on many farmers, but more clarification is needed on how farmers have responded to private standards through transforming their on-farm operations (cf. Devin & Richards, 2018).

The power imbalance shows that major supermarkets legally govern beyond their business scope and wield disciplinary measures previously exclusive to governments (Pulker et al., 2018). When supermarkets are questioned publicly, the governments in Australia appear unwilling to challenge them by introducing legally-enforceable regulations, instead preferring to enact voluntary codes of conduct (Burch et al., 2013). Corporate food governance as a general background is often intertwined with other factors influencing Australian farmers. A major one is farmland loss to urban-related development, as elaborated in the following subsection.

#### ***2.3.3.4 Urban sprawl and related processes***

Another dimension of agricultural restructuring is urban sprawl and related processes that often involve the inflow of urban middle-class groups into rural areas. From 2006 to 2016, the population in Australia’s capital cities increased by 21.7%, while the rest of Australia increased by only 12.2% (ABS, 2017). Much of the population growth occurred in urban fringes or peri-urban regions. The expansion of housing development appears to be dominating in planning practices in the Sydney Basin (Ruoso & Plant, 2018), and the development pressure is also on the nearby Illawarra region.

In Australia, urban sprawl is usually related to the processes of ex-urbanisation, counter-urbanisation and amenity migration. Ex-urbanisation refers to urbanites migrating to areas peripheral to metropolitan regions, but remaining strongly tied to urban centres through, for example, daily commuting to work. Counter-urbanisation refers to the migration of people

from urban areas to rural areas, while amenity migration has been driven by a desire for rural lifestyles which usually involve more affordable housing, a slower pace of life, hobby/lifestyle farming, and closer proximity to natural amenities e.g. pastures (Klepeis & Gill, 2016; Race et al., 2010). Since the 1970s, with advanced transport and communication technologies, increasing income, and numerous relatively affluent people approaching retirement, there has been a continuous flow of middle-class groups to non-metropolitan regions close to urban or regional centres, and along the coast (particularly the east and south-west coast of Australia, covering the Illawarra region) (Burnley & Murphy, 2004; Gosnell & Abrams, 2011). This phenomenon has been described as a ‘sea change’ or ‘tree change’ (Abrams & Bliss, 2013). From 1996 to 2006, the rural Local Government Areas of the Illawarra and other regions around Sydney have experienced population growth of over 20%, with population growth in regions further away from Sydney much slower (Race et al., 2010).

Research has illustrated that urban-rural migrants often have unrealistic expectations about rural amenities, facilities and services, and place strong demands on local councils and community agencies (Race et al., 2010; Kondo et al., 2012). Urban sprawl and related processes have driven various forms of rural development. In the Municipality of Kiama (part of the Illawarra), there have been significant land use shifts towards residential development, lifestyle blocks, tourist facilities, tourism-oriented farming and small-scale sub-commercial farming (Klepeis & Gill, 2016; Sinclair, 2006). Small farms or land blocks for lifestyle and conservation purposes have grown persistently in Australia’s peri-urban regions (Butt, 2013). They contribute little to agricultural production and usually require income from non-agricultural activities (Millar & Roots, 2012). Peri-urban regions are suited for farmers to work elsewhere (for off-farm income) or diversify their income through for example on-farm tourism (Butt, 2013). Due to the interactions between different social groups in peri-urban regions, researchers often view peri-urban regions as being dynamic, rapidly changing and highly contested (Ruoso & Plant, 2018). When transforming rural landscapes, the in-moving middle-class groups tend to dominate the real estate market, gain influence over local development and promote what they perceive to be their rural idyll (Ilbery, 2014). Researchers have recognised the constant debates over rural landscapes: who defines what a landscape should look like, and which practices are considered legitimate (Ruoso & Plant, 2018, p.58)? Theoretically speaking, conflicts exist over the whole economic, social and cultural trajectories of those rural communities (Argent, 2011). Major development processes are more likely related to a national or global network of actors, and biased towards those

who have wealth and are influential in national policy-making (Curran-Cournane et al., 2016). How the development process is promoted and contested locally remains an area in need of further research (Ruoso & Plant, 2018). This thesis seeks to contribute to understandings of peri-urban agricultural change.

The urban and amenity/lifestyle development influences Australian farmers from multiple angles. Firstly, peri-urban farmers enjoy their proximity to urban consumers and lower costs to transport their products to markets (Goffette-Nagot & Schmitt, 1999). With the expectation of urbanisation, many farmers also enjoy market appreciation of their land assets (Sinclair, 1967). However, with more competition for land, it becomes difficult for farmers to expand their business locally (Argent, 2011). They also face an increasing economic rent (e.g. regulation costs and rent costs for land) (Sinclair, 1967). With urban migrants introducing different approaches to land management, values and expectations, and ways of engaging with the local community, local farmers' ways of valuing and managing rural landscapes can be threatened (Lockie, 2015; Race et al., 2010). A common issue is that with the encroachment of residential dwellings around externality-generating farming activities (e.g. dairying), new residents often find noises and odours of their neighbouring farms intrusive and make amenity-related complaints (Henderson, 2005). The increasing intensity of farming operations (e.g. higher fertiliser use and stocking rates) can increase certain externalities (Gibson et al., 2005). This and related conflicts can be exacerbated by the decline in knowledge of commercial agriculture among the increasingly urbanised population (PMSEIC, 2010). As peri-urban communities depend less on agriculture economically, government officers usually respond to complaints by imposing restrictions on farmers (Taylor et al., 2017). Although there have been recommendations of establishing buffer distances around intensive agriculture or informing potential land buyers about nearby farms, demand for suburban development can render such policies/strategies ineffective (Henderson, 2005). How the above-mentioned opportunities and pressures influence farming operations warrants more research and provides an impetus for the present study.

The disputes between newcomers and locals have been conceptualised as economic, class-based conflicts, as the interests of in-moving middle-class groups contradict those of the working classes and other residents (Milbourne, 2017). Peri-urban farmers' predicament in local politics is just like their weakness in agri-food supply chains dominated by corporate players. Both issues are related to changing policy frameworks (e.g. deregulation and

regional planning frameworks), but are usually discussed separately in geographical research. This thesis summarises their common logics under the background of neoliberalisation.

Overall, urban and amenity/lifestyle development can negatively influence agriculture and farmers' profitability (Curran-Cournane et al., 2016). Many farmers are willing to sell up due to approaching retirement or financial difficulty (Lockie, 2015). Developers, local councils and farmers occasionally see mutual benefits in facilitating such change (Gibson et al., 2005). Farmers have done much of the clearing and development work (Mason & Knowd, 2010). Intensive farming in peri-urban regions has often shrunk and been pushed away occasionally into poorer-quality areas where more inputs are needed (Gibson et al., 2005). Since around 2000, the economic focus of many rural areas and regional cities in the south-east Australia has been shifted away from agriculture and become post-productivist or multifunctional (multifunctionality is discussed in section 2.4) (Race et al., 2010). Since the late 1990s, 'lifestyle living' became a more common land use of acreage blocks than farming in Sydney (Mason & Knowd, 2010).

Farmland loss has been a persistent trend in Australia (CA, 2010). Ruoso & Plant (2018) reported unconstrained subdivision of lands in regions around Sydney to open up new housing supply. This strong need for housing is also reflected in planning frameworks shaping the Illawarra (NSW Government, 2015). In Australia, subdivision has engendered loss of quality agricultural soils especially on the fertile east coast covering Sydney (Butt, 2013; James, 2014). The value of peri-urban agriculture has been widely recognised by researchers. For example, Sydney had 0.2% of rural holdings in NSW, but generated 7% of the state's value of agricultural production (Wilkinson, 2011). Peri-urban agriculture can also reduce long-distance food transport and is increasingly recognised in terms of its contribution to public welfare (James, 2014). The loss of farmland to amenity/lifestyle development not only induces the loss of such benefits, but generates new social costs regarding the provision of services and facilities in more scattered settlements (Curran-Cournane et al., 2016). As Harvey (2014, p.253) noted: '[The] suburban lifestyle... is deeply embedded in the cultural preferences, the psyches of people and in a physical landscape lubricated by high energy consumption and wasteful use of land, air and water.'

As critical scholars have argued, farmland loss in Australia often reflects a lack of strategic planning for securing productive peri-urban agriculture and the social and environmental

values it brings (James & O'Neill, 2016). On limited occasions when planning measures were implemented, Australia's policies for peri-urban farmland protection largely adopted the green-belt model from England (Ali, 2008). Green belts, one of various urban land uses, aim to protect farmland through measures of broad countryside preservation, for example limiting land sales for development (Wilkinson, 2011). Since 1960, green belts historically intensified conflicts over the needs of farmland protection and peri-urban development (James, 2014). Many protection measures were abolished for population growth, lobbying of the housing industries, and protests from landholders (Merson et al., 2010). Whether peri-urban agriculture can be retained is related to farmers' financial capacity. This thesis examines how urban-related processes and other economic trends together have influenced the viability of Illawarra dairy farmers.

### **2.3.4 A socio-cultural perspective on agricultural change**

#### ***2.3.4.1 Introduction***

This subsection explores agricultural change in Australia from a socio-cultural perspective. I firstly introduce some indicators of the socio-economic decline of Australian agriculture, and then discuss traditional family farming cultures.

#### ***2.3.4.2 Agricultural decline***

Since the 1980s, Australian farmers have had to compete in oversupplied global markets with decreasing levels of government support. Adverse market conditions along with environmental and climate challenges 'left agriculture and rural communities in what seemed to be perpetual states of financial crisis' (Lockie, 2015, p.6). Rural growth has been concentrated in scenic regions and commuter belts of major cities (Pritchard & McManus, 2000). In 2009/10, farmers' average weekly disposable income was AUD\$568, while people in other occupations received an average of AUD\$921 (ABS, 2012). In 2011, around 50% of farmers worked 49 hours or more per week, while 17% of people in other occupations worked comparable hours (ABS, 2012). Farmer households' average equivalised net worth (assets and liabilities) (AUD\$1.3 million in 2009/10) was higher than that of other households (AUD\$393,000) (ABS, 2012), as farms were usually inherited from the previous generation. However, this net worth has often lured farmers to sell up and leave agriculture (Lockie, 2015). From 1981 to 2011, the number of farmers declined by 40%. Major droughts especially contributed to that, evidenced by the single-year 15% decline in 2002/03 in the



early years of the Millennium Drought (ABS, 2012). Despite much available statistical data that reveals the general, overarching financial situation of farmers, how they have perceived and experienced the financial difficulties is an area that requires further empirical research.

Although there is a strong need to improve farm productivity and return through research and development (R&D) investment, the proportion of such investment in the gross value of Australia's agricultural production declined from 5% in the 1970s to 3% in 2007 (PMSEIC, 2010). Since 1990, global investment in agricultural R&D has declined. Agriculture has increasingly relied on private institutions for research funding. Such a funding structure has typically adopted 1 to 3-year funding cycles, which marginalised research areas needing longer-term investment, and has been criticised as ineffective (Bell et al., 2014; Lawrence et al., 2013). The number of agricultural scientists has declined, for example, the number of pasture researchers fell by 75-95% from 1980s levels (Bell et al., 2014). This process inevitably restricts the progress of agricultural science and technologies, and farmers' capacity to enhance productivity through applying new technologies. It is valuable to examine how such issue is reflected in specific farming operations.

The lack of long-term investment is also reflected in the shrinking funding for natural resource management. Government assistance to landholders in natural resource management has been mainly channelled through the National Landcare Program (Dibden et al., 2009). In 2014, Landcare experienced the first major funding cut in its history (Lockie, 2015). A nationwide reduction in state government funding for natural resource management has removed 40-50% of what regional bodies in NSW and Victoria used to receive, which might contribute to landholders' neglect of environmental management and strategies to cope with environmental challenges, e.g. climate change (Curtis et al., 2014). This policy environment underscores the shift to market-based instruments, measurable results, and centralised control (Curtis et al., 2014; Mercer et al., 2007). Landcare has failed to achieve demonstrable improvement in environmental conditions (Hamblin, 2009), and has found it difficult to compete for funding with other projects (Tennent & Lockie, 2013).

Overall, social capital and support has been pulled away from agricultural communities. This issue begs the question of how farmers have responded to agricultural restructuring with decreasing resources seemingly available to draw on.

### ***2.3.4.3 Family farming***

The socio-economic decline of agriculture has influenced traditional family farming culture. Family farms where capital and labour are mainly drawn from the family dominate Australian agriculture and have done so for generations (Lockie, 2015). They are ‘an icon of the Western countryside’ and embody disaggregated agricultural production (Woods, 2014, p.31). With policies promoting agri-industrialisation and entrepreneurship, one relevant question concerning the structure of the agricultural sector is why numerous family farms have not been replaced by large farming corporations. Three factors in particular help answer this question (Weller et al., 2013). First, the seasonality of labour needs and the uncertainty of annual harvests often impede corporatisation. Second, capital often infiltrates the farm sector indirectly through subordinate social relations including ‘debt, tenancy, contract production and off-farm employment’ which enable profit to be reaped efficiently compared with overseeing the operation of farms (Mooney, 1982, p.289). Third, farming by familial groups often engenders a strong sense of identity and emotional attachment to the lifestyle. Despite the persistence of family farms, global agri-food markets increasingly favour large-scale production and create competition for farmers at a transnational scale (Woods, 2014). The number of family farms in western countries has plummeted (Johnsen, 2004). This trend is reflected in significant financial pressures on numerous Australian family farmers.

Nevertheless, many farmers still feel strongly about farming and their farm (Woods, 2014). Most commercial farmers in Australia recognise three career objectives: ‘work full-time as a farmer’, ‘earn sufficient to provide for an acceptable standard of living for one's family’ and ‘leave a business with the capacity to provide a viable career choice for the next generation’ (Barr, 2014, p.10). One crucial factor in maintaining family farming is the ownership of the farm itself. As Silvasti (2003, p.143) argued: ‘Ownership weaves strong emotional ties between the family and the land. Possession reinforces and justifies family strategies for maintaining continuity of the farm.’ For many Australian farmers, their farm is an inheritance and a record of family history, which can be traced to the mid-19<sup>th</sup> century (Riley & Harvey, 2007). It generates the tradition of ‘family ownership, family labour, a past family connection to farming and usually inherited or partly inherited property from father to usually eldest son, the male head of the household as farmer with farming skills past (sic) from father to son’ (Bryant, 1999, p.257). Moreover, the farm is a workplace and a home invested with social and cultural meanings. Farmers’ work and life intertwines under perceptions of greater autonomy. Farmers’ children can grow up on the farm, get ‘saturated with the farming culture

from parents and friends from an early age’, and have ‘little choice but to continue the farming tradition’ (Kuehne, 2013, p.204). According to Vanclay (2004, p.213), ‘farming becomes a way of life, a way of making a living, that acquires a meaning far deeper than almost any other occupational identity.’ Partly due to this deep meaning, many farmers find the enchanting qualities (e.g. joy and wonder) of everyday agricultural practices (Herman, 2015).

Although many Australian farmers have given up their original family farm for various reasons (e.g. to seek better opportunities) (Woods, 2014), they often remain attached to their new farm and continue the family farming culture (Quinn & Halfacre, 2014). Cultivating the same land for generations or a long period of time means farmers usually have abundant knowledge of their land and how to conserve it for future generations (Herman, 2015). In western countries, many farmers position themselves as ‘stewards’ of the rural landscape and have a unique notion of ‘good farming’ practice (Gill, 2014). However, farmers’ views often differ from those of conservationists. Many farmers contest the opinions and advice of conservationists (Ahnström et al., 2009). Farmers’ experiential knowledge can also constrain innovation (Riley, 2008). Many farmers do not seek business advice and may not seize opportunities for growth or diversification when they arise (Morris et al., 2017). It is valuable to examine how such socio-cultural factors influence how farmers cope with agricultural restructuring.

Giving up farming due to various challenges means losing identity and the cultural values in farming (Carrington et al., 2013). Selling the farm is usually the last resort for farmers with financial or succession difficulties (Kuehne, 2013). To remain viable, Australian farmers tend to persevere, and work harder and longer (Bryant & Garnham, 2014). There is a cultural vision of rural masculinity cultivated in the harsh natural environment. Traditional discourses associate rural masculinity with ‘hard work, honesty, forthrightness, longevity in the community and generational knowledge of agriculture’ (Bryant & Garnham, 2014, p.68). Economic trends, driving numerous farmers out of their business, have threatened farmers’ masculine identities and caused widespread depression and anxiety (Kennedy et al., 2014). To survive, farmers tend to become more entrepreneurial and sacrifice some traditional values, including, for example, strong commitment to the family farm (Woods, 2014).

Overall, socio-cultural research has emphasised how the cultural values ingrained in farming contribute to the persistence of family farms. Nonetheless, Herman (2015) has called for more research at the farm level to better understand how farmers engage with their land and negotiate the demands of agricultural production on an everyday and emotional basis. This research gap provides an impetus for this project. The next section introduces how farmers transform their business.

## **2.4 Multifunctional agriculture**

### **2.4.1 Introduction**

This section firstly reviews the discussion on post-productivism and multifunctional agriculture in recent decades, as these concepts are relevant for understanding on-farm changes. I then introduce details of continued productivism and rising alternative agri-food networks in Australia. Productivism and alternative agriculture both relate to farmers' adaptation strategies.

### **2.4.2 Research agenda**

From the 1980s, agricultural change in developed countries was conceptualised in terms of a post-productivist transition (Wilson, 2001). The dominant productivist agriculture characterised by globalisation and profit-maximisation was troubled by budgetary and environmental problems (Morris & Evans, 1999). Boyle & Halfacree (1998, p.9) argued that the 'migration of people to the more rural areas of the developed world... forms perhaps the central dynamic in the creation of any post-productivist countryside'. With the in-moving middle-class groups demanding rural products and services, some farmers have found income sources other than conventional commodity production (Ilbery, 2014). Initially, analyses through the lens of post-productivism characterised agricultural adjustment as survival or accumulation strategies (Morris & Evans, 1999).

In the 1990s and early 2000s, agricultural researchers summarised the characteristics of post-productivism as follows (Wilson, 2001). First, was the loss of a central position for agriculture within society. Second, there was a 'widening of the agricultural community to include formerly marginal actors at the core of the policy-making process' (Wilson, 2007,

p.3). The third characteristic identified was a shift from agricultural production to the wider commodification of rural space (Boyle & Halfacree, 1998). Fourth, some agricultural producers came to emphasise quality rather than quantity in food (Marsden & Morley, 2014). Fifth, was the growth of alternative agriculture and so-called pluriactivity (Ilbery, 2014). Sixth, some farming practices manifested as extensification rather than intensification, dispersion rather than concentration, and diversification rather than specialisation (Bowler, 2014). A seventh characteristic has been declining government intervention in agricultural production (Wilson, 2007). And the final theme concerns the rising environmentalism coinciding with some farmers' reduced use of agrochemicals. Post-productivism thus reflected a process of comprehensive social change in rural regions, especially for those close to urban centres and with natural amenities. In such regions, in-migrants have influenced agriculture from multiple angles. However, the conceptualisation of post-productivism has failed to provide a clear understanding of agricultural change. As Morris and Evans (1999) concluded, there has been a lack of actor-oriented studies that were directly related to the post-productivist transition.

Despite evidence of post-productivism such as that above, most farmers in the 1990s remained productivist (Wilson, 2001). In Australia, most farmers and key policy-makers still held the productivist ideals, which rendered the concept of post-productivism not applicable to Australian conditions (Argent, 2002). Morris & Evans (1999, p.353) questioned 'whether an emphasis on these conditions [diversification and agri-environmental policy] is sufficient to represent a "transition"'. Despite continued productivism, in the 2000s, the post-productivist transition was 'the only overarching conceptualization of the rural transition' (Holmes, 2006, p.143). Although criticised, the post-productivism literature can still provide insights for understanding Australian agricultural change, and has contributed to the conceptualisation of multifunctional agriculture, which has greater relevance in Australia.

To advance agricultural research, Holmes (2006) developed the concept of multifunctionality, which describes the rural transition as a reordering in the three conventional functions of rural space, namely production, consumption (mainly by urban residents for residence and amenity) and protection (of biodiversity and indigenous land rights). Holmes along with other Australian geographers has continued this research trajectory. Argent et al. (2007) indicated that in the Australian context, the emergence of a multifunctional countryside was especially correlated with the amenity (the attractiveness, qualities or facilities of a locale) of local

physical, social and economic environments. Compared with the European context, agricultural multifunctionality in Australia has been arguably more market-driven, considering that the policy background remained broadly productivist (Wilson, 2009). Wilson (2009, p.379) indicated that compared to the post-productivist transition model, multifunctionality was 'bounded by the two extreme agricultural transition pathways of productivism and non-productivism', and better encapsulated 'the temporal non-linearity, spatial heterogeneity, global complexity, and structure-agency inconsistency that characterises agricultural and rural decision making'. The notion of multifunctionality has thereby been preferred by British geographers (Roche & Argent, 2015). Although the term post-productivism has still been frequently used, there has been a growing consensus among researchers and policymakers to recognise the multifunctionality of agricultural spaces (Marsden & Sonnino, 2008).

At the same time, multifunctional agriculture was not clearly conceptualised either. Marsden & Sonnino (2008) identified three competing interpretations. Firstly, there was an agro-industrial paradigm that pegged multifunctionality to pluriactivity or survival strategies intending to help uncompetitive farmers to remain viable. A key diversification strategy was conversion to organic farming. Thus, empirical research has explored farmers turning to or reverting from organic production especially based on financial factors (Sahm et al., 2013). Secondly, there was a contested post-productivist paradigm perceiving rural areas as consumption spaces to be exploited by the growing in-migrants from cities. Empirical research in Australia has revealed the motivations of urban residents to seek rural lifestyles which were often related to affordable housing, a slow pace of life, and natural amenities (Gosnell & Abrams, 2011). Thirdly, there was an emerging sustainable rural development paradigm reasserting the socio-environmental role of agriculture and its contribution to rural economies and cultures. Empirical research in this vein has explored more sustainable forms of agriculture such as permaculture (Suh, 2014). Due to these multiple meanings, it was difficult to apply the concept of multifunctionality to solving management challenges in rural regions, and answer 'who the beneficiaries should be and how it [multifunctional agriculture] ought to be put into practice' (Wilson, 2007, p.1). More research is needed to explore the role of governments and farmers in approaching rural development through multifunctional agriculture (Marsden & Sonnino, 2008). Despite those limitations, the debate over the frameworks of productivism/post-productivism and multifunctionality has advanced rural

geography and understandings of the multi-layered changes in rural spaces (Roche & Argent, 2015).

Another research gap is that previous studies on peri-urban agriculture, usually characterised by multifunctionality, were mostly conducted by urban planners and landscape architects from an urban-centric perspective with a focus on notions of the highest and best use of rural land (Wästfelt & Zhang, 2016). There is a lack of relevant studies at the farm level or from the perspective of agricultural geography (Smith, 2015). Such approaches are necessary because they can help better explore how farmers have been influenced by urbanisation, expressed their aspirations and driven innovations based on location-specific knowledge (cf. Rivera et al., 2018). In agricultural geography, location-based understandings of peri-urban agricultural change and farm development is valuable in supplementing the structural deterministic view of the global agri-food system by studying local experiences of globalisation (Bafarasat, 2016; Wästfelt & Zhang, 2016; Woods, 2014).

Although in agricultural geography, much attention has shifted away from productivism, productivism itself continues to evolve, with the term receiving enduring acceptance from rural geographers. In developed countries, most farmers are still committed to productivism, and many agricultural policies emphasise competitiveness and output (Robinson, 2017; Roche & Argent, 2015). The new forms or dimensions of productivism have been investigated and termed as, for example, hyper-productivism and neo-productivism (Roche & Argent, 2015). Much work on productivism highlights the increasingly intensive and corporate nature of agriculture (Mitchell & De Waal, 2009). However, existing conceptualisations of productivism generally have limitations. For example, as Wilson & Burton (2015, p.52) have argued, ‘conceptualizations of neo-productivism have so far largely failed to provide a robust analytical framework for understanding the propelling forces, processes and characteristics of complex modern agricultural pathways’. I have identified two specific research gaps. Firstly, there is little understanding of the mechanisms through which the sector context (e.g. Australian dairying) shapes productivism and farmers’ entrepreneurship (Fitz-Koch et al., 2018). Farmers interact in various ways with their peers, competitors, supply chain partners and other stakeholders that constitute the dairy industry. How farmers identify opportunities, formulate ideas and shape their operation within their industry needs more research (Shane, 2007). Secondly, productivism has further consequences in terms of farmers’ environmental performance and long-term resilience and

capacity. It is uncertain to what extent Australian dairy farmers utilise available resources to counter the negative consequences of intensive agriculture (Bell et al., 2014). The continued evolution of productivist agriculture, and its complex impacts on farming businesses require further conceptual advancement and explanation.

Overall, I argue that existing conceptualisations of agricultural change have major shortcomings and warrant more investigation. This thesis aims to make a contribution by providing empirical evidence concerning on-farm changes and farmers' motivations, fully considering the local and industrial contexts of these changes. I clarify farmers' interactions with other major players in rural space, which helps explore farmers' role in rural development. I also explore the potential consequences of the new developments of local agriculture, and how its future capacity may be influenced. To jump out of the complexity of rural space, I highlight the common logics behind the multiple farm development pathways. For example, productivist farmers and farmers committed to alternative agriculture are both driven to become economically competitive and entrepreneurial.

### **2.4.3 Consolidated productivism**

#### ***2.4.3.1 Introduction***

To illustrate Australian farmers' adaptation strategies, subsections 2.4.3 and 2.4.4 introduce on-farm changes respectively from the perspectives of productivism and alternative agriculture. 'Productivism' is committed to improving productivity through increasing output and employing new factors of production (e.g. machinery and inputs) (Burton, 2004). Productivism has become an indispensable approach for numerous farmers to cope with agricultural restructuring, and is usually embedded in farmers' 'good farming' ideals or the cultural image of farming. These farmers tended to expand their business and develop their farming systems into more intensive and sophisticated forms. However, mainstream production modes have been facing difficulties (e.g. environmental and resource constraints) in achieving further productivity gain.

#### ***2.4.3.2 Expansion***

Under restructuring pressures, farmers have to keep improving efficiency or expanding their business. New technologies also contribute to farm expansion, as many technologies only realise their full advantage in large-scale operations (RIRDC, 2007). As most farms in



Australia are too small to make a return fulfilling both an acceptable level of personal consumption and the needed investment for farm upgrading or expansion, many farms change hands (Barr, 2014). In productive regions, landscape change has been characterised by farm amalgamation. In amenity regions with scenic views and convenient transport to cities, landscape change has been dominated by farm subdivision for other land uses (Williams & Schirmer, 2012). In the Illawarra, farm amalgamation and subdivision have both been common features of the dairy farming landscape (chapter 5).

To achieve business expansion, farmers usually borrow money from banks. From 1980 to 2013 in Australia, the ratio of the value of total agricultural output to total farm debt declined from around 3 to 0.75 (Rees, 2014). As the rate of farm debt outpaced agricultural output, banks' lending has been increasingly secured on farm assets (Rees, 2014). In recent years appreciation of the value of farmland in Australia has become an important opportunity for investment (Sippel et al., 2017). Around 70% of farm debt has been concentrated within 12% of farms, mainly large operations and generating a disproportionately large share of Australia's agricultural production (McGovern, 2014). The borrowed money not only went to constructive farm capital, but to fund cash flow shortfalls (ABARES, 2014b). Farmers' need for debt can be strong. In 2010/11, the proportion of all agricultural businesses carrying debt (around 33%) was nearly twice the average figure of other Australian industries (DPS, 2013). This may reflect many farmers' need for investment.

Besides the indebtedness, farmers' business expansion is often coupled with a comprehensive change in business structure. Farmers who actively pursue business growth usually adopt corporate-like business practices and become entrepreneurial (Pritchard et al., 2007). They increasingly depend on legal and financial consultants to optimise their use of farm assets, and shift attention from traditional farming values to short-term profitability (Weller et al., 2013). They can draw capital from investors other than banks and are involved in business partnerships not restricted within the family (Woods, 2014). This business model leads to corporate farming which generally involves a diverse group of shareholders/owners, requires more capital than co-operative farming, and usually involves diverse business areas (e.g. food processing and distribution) rather than focusing solely on farming (Muenstermann, 2009). Besides the diversified ownership, corporate farms in Australia are usually still dominated by the farming family (Clark, 2008), reflecting a continuation of family-based farming culture. Although those family-owned farms are on average smaller than foreign-owned or other

corporate farms, they can be equally productive (Lockie, 2015). Entrepreneurial farmers are more likely to see neoliberal policy reform and globalisation as opportunities for business growth regardless of the increased market competition (Woods, 2014). Their production capacity allows them to target a broader market and have greater bargaining power in agri-food markets. More research is needed to clarify how such a change in business structure is coupled with farmers' changing production models and cultures.

#### ***2.4.3.3 Intensification***

Another global trend in agriculture is intensification (producing more out of existing capital and labour). Since the 1980s, most of the increase in Australia's food production has been achieved through intensified use of capital and industrially produced agricultural inputs (Maron & Fitzsimons, 2007). Given Australia's low soil fertility by world standards, it would be uneconomic to produce the amount of agri-food products that meet modern needs without elements of intensification, for example high consumption of agri-chemicals (Hamblin, 2009). Considering the competition for land from urbanisation and other industries (Mok et al., 2014), farmers often have to use their land more intensively (Dorrough et al., 2007). Another factor driving intensification is farmers' contracts with food manufacturers, which often specify certain farming practices must be adopted to meet food standards and volume/supply agreements (Vanclay, 2003).

Australian farmers have adopted agri-chemicals (fertilisers, veterinary pharmaceuticals etc.), mechanised equipment, new seed varieties and animal breeds, and new approaches to farm management (Dibden et al., 2009). In the past four decades, for instance, fertiliser use has increased by sevenfold in Australia (Lawrence et al., 2013). At the same time, farming has become increasingly specialised and complex, demanding more of farmers' knowledge and skills (McKenzie, 2014). Farm tasks have been increasingly contracted out or assigned to professionals (e.g. veterinarian), so that farmers can harness their expertise and do not have to own certain professional equipment (Woods, 2014). Generally, the benefits of intensification are most effectively achieved on large-scale operations, as they can better specialise capital and labour use (Woods, 2014). This thesis explores specific characteristics of the expansion and intensification of Illawarra dairy farms.

#### ***2.4.3.4 Technology adoption***

Intensification is usually coupled with the adoption of certain new technologies. To improve

efficiency, farmers increasingly adopt technologies related to precision agriculture. These technologies encompass global positioning systems and digital sensors to manage crops and animals according to site-specific conditions and individualised information (Tey & Brindal, 2012). At the current stage, the application of precision agricultural technologies (PATs) in some American and Australian cases, however, has shown mixed financial results (Tey & Brindal, 2012). Investment in PATs usually requires large initial expense and is riskier than investment in mature technologies. PATs require farmers to transition from experiential decision-making to data-driven processes, which can generate financial uncertainty both in the on-farm use, alongside ongoing costs of maintenance (Eastwood et al., 2017; Kutter et al., 2011).

The development and application of PATs are influenced by multiple factors. Firstly, the public sector is crucial for developing new agricultural technologies, as private companies tend to avoid the initial stages of innovation (Eastwood et al., 2017). From the beginning, public research and development (R&D) selects appropriate technologies for investment based on farmers' needs and the performance of new innovations (Hekkert et al., 2007). Public R&D then facilitates adaptation of new technologies to existing farming practices (Higgins et al., 2017). After new technologies become marketable, there is a need for public R&D to diffuse knowledge and create protected niche markets (Kutter et al., 2011). After a sufficient market size is created, private 'knowledge entrepreneurs' can enter the market, improve marketable technologies, develop knowledge and provide relevant services (Eastwood et al., 2017). A lack of public R&D would hinder the initiation of new technologies and engender a lock-in where incremental improvement of existing technologies dominates (Dodgson et al., 2011), as detailed in the next subsection.

Besides institutional environments, material environments, geographical conditions and specific local institutions also influence technology adoption (Massey, 1995). Biophysical heterogeneity has been identified as a key barrier in agricultural industrialisation (Goodman et al., 1987). Water availability and climate variability, which are especially relevant to the context of Australian dairying, can create financial uncertainty and make farmers reluctant to pursue large capital outlays. Policies exacerbating farmers' financial uncertainty can further discourage technology adoption (Higgins et al., 2017). Additionally, farmers of different characteristics have varying propensity to adopt PATs. The research literature attests that farmers who are highly educated (Larson et al., 2008), hire consultants (Larson et al., 2008)

and farm on self-owned land rather than rented land (Isgin et al., 2008) are more likely to adopt certain PATs.

Agricultural researchers have also emphasised socio-cultural factors in influencing technology adoption (Warren et al., 2016). This approach has two foci: farmers' values and motivations, and farmers' tacit knowledge. For the former, existing research has highlighted non-financial factors, for example family well-being and personal values/preferences (Greiner & Gregg, 2011; Higgins et al., 2017). Individual values can be part of the broader farming culture (Sutherland & Darnhofer, 2012). Certain farming practices provide 'symbolic capital and socio-cultural rewards' and are associated with the notion of 'good farming' (Warren et al., 2016, p.179). Whether or not new technologies fit in with this culture strongly influences farmers' adoption (Higgins et al., 2017). As for farmers' tacit or experiential knowledge, it is developed by farmers through their long-term working on their farm, or passed down from previous generations of the farming family. This knowledge is important for farming operations within a given geographic area, but is to a certain extent distinctive from 'scientific' knowledge (Riley, 2008). Failure to consider farmers' tacit knowledge can lead to farmers distrusting scientific institutions (Lash et al., 1996).

The reviewed literature on technology adoption reveals that there is a lack of studies examining how the broader political economic context of agricultural restructuring has influenced farmers' technology choices (Higgins et al., 2017), which provides important impetus for this thesis.

#### ***2.4.3.5 Lock-in***

Another major consideration regarding technology adoption and productivist farming is that it has arguably been locked-in the mainstream production mode (Atkinson et al., 2014). For example, Hogg (2000, p.96) identified that 'much formal agricultural research has evolved within, and helped shape, a breeding-chemical-mechanisation techno-economic mode, in which genetics-based breeding activity is integrated with the development and use of synthetic chemical fertilisers and pesticides, and new machinery'. Such a mode of technical operation has revealed deleterious environmental impacts and vulnerability to disruptions (Bell et al., 2014; Raedts et al., 2017). Alternative farming approaches usually receive inadequate research funding (UCS, 1996; Willer & Lernoud, 2016). Intensification in Australian agriculture has marginalised alternative forms of agriculture (McKenzie, 2014).

In Australia, the mainstream production mode is backed by strong industrial platforms which have considerably shaped agricultural policies especially towards economic growth, national competitiveness and productivism (Hogan & Young, 2013). This policy framework usually provides a favourable institutional environment and research funding to innovations generating short-term returns (Vanloqueren & Baret, 2009). Another factor is the increasing privatisation of research resources. Despite the significant role of public R&D in the development of new technologies, the private sector accounts for over half of food and agricultural R&D in OECD countries and Australia specifically (Fuglie et al., 2012). Since the 1980s, private firms have invested more in mainstream agricultural technologies than in new innovations (Vanloqueren & Baret, 2009). Private incentives for agro-ecological research are limited, as private firms usually cannot fully capture its benefits which can be long-term or for the public good (e.g. environmental performance) (Norton et al., 2009).

Under a system of market-based R&D, formation of a lock-in can also be explained by Arthur's (1994) theory of increasing returns to adoption. It suggests that the more a techno-institutional system is adopted, the more likely it will be further adopted. The initial success of mainstream agricultural technologies would facilitate their further use and exclude possibly superior technologies. Arthur (1994) identified four types of increasing returns: 1. when the scale of production of certain technology/equipment increases, its production costs tend to decline; 2. when certain technology/equipment becomes widely adopted, specialised skills and knowledge tend to accumulate, which facilitates further adoption; 3. broad adoption enhances the confidence of users and manufacturers; 4. when certain technology/equipment becomes popularised, infrastructures are developed based on its attributes, which may hinder the adoption of alternative technologies. For farmers, deviation from the mainstream techno-institutional system implies significant financial risks. In the Australian context characterised by strong restructuring pressures, farmers' financial capacity to try and adopt new technologies is usually restricted (Higgins et al., 2017). The increasing returns encourage incremental changes and resist fundamental replacement of existing techno-institutional systems.

One factor complicating the logics of technology adoption is niche sectors, for example organic sectors supplying small niche markets. Although most farmers stick to the mainstream techno-institutional system, a limited number of farmers deviate from an existing

technological regime and develop radical novelties (Atkinson et al., 2014; Geels, 2004). The formation of these niches can be part of the multifunctional transition of agriculture, which is emphasised in this thesis.

#### ***2.4.3.6 Limited environmental management***

A further issue concerning productivist agriculture relates to environmental management outcomes. The restructuring of global and national agri-food regimes has often sacrificed the resilience of agro-ecological and institutional food systems (Herman, 2015; Lawrence et al., 2013). Although pursuing efficiency can align with the principles of environmentalism, for example by reducing waste and reusing waste materials, the literature indicates that a mainstream production mode, which involves Australian dairying, has tended to simplify agro-ecosystems and exacerbate environmental degradation due to the intensified use of resources (Bell et al., 2014; Maron & Fitzsimons, 2007). Many farmers struggle to transit to more intensive farming, and at the same time abandon some traditional farming methods that have functioned to mitigate extreme environmental events, therefore weakening those farmers' resilience to climate change (Woods, 2012).

In Australia, environmental management has been increasingly devolved to the local and farm scales (Dibden & Cocklin, 2010). However, farmers' heavy workloads and lack of funds can limit their environmental management (Ecker et al., 2012). Conservation-based farm management can potentially sacrifice short-term profitability. For broadacre and dairy farmers in Australia, financial motivations usually prevail over environmental factors in natural resource management, given the economic challenges faced by farmers (Ecker et al., 2012). Farmers may also resist conservation-based farm management due to the social/cultural rewards traditionally conferred through productivist practices (Burton, 2004; Sutherland & Darnhofer, 2012). An Australian study shows that about 30% of rural landholders were 'more committed to short-term economic gain than the long-term health of the land and hold strong views about the rights of private property owners to act as they see fit'; 40% felt reluctant 'to accept a duty of care for biodiversity conservation' (Curtis et al., 2014, p.189). The literature also shows that most farmers focus on short-term economic challenges above longer-term issues (Lawrence et al., 2013). It is important to clarify how agricultural restructuring has pressured farmers to change their operation and influence the long-term capacity of their farming system.

### **2.4.3.7 Reflection**

In summary, productivism involves multiple choices for farmers: acquiring capital (expansion), intensifying production, adopting mature technologies, adopting new technologies, and environmental management. The last two choices can potentially contribute to the long-term resilience and capacity of the industry. Given limited funds, investing more in one field usually leads to less investment for other fields. Under conditions of neoliberalisation, farmers tend to prioritise short-term profitability and usually prefer expansion, intensification and mature technologies. That highlights the importance of the public sector to make long-term investments. However, the neoliberal policy environment underscores short-term measurable results, which often discourage long-term investments by public institutions. This thesis examines how the current industry environment places local farmers in a difficult position from which to invest their capital and labour from a long-term perspective.

## **2.4.4 Alternative agriculture**

### **2.4.4.1 Introduction**

After examining productivism, I now turn to the non-productivist elements of multifunctional agriculture. They are usually reflected in *alternative agri-food networks* (AANs) which have proliferated in OECD countries since the 1970s. AANs to a large extent result from the interaction between agricultural industry restructuring and urban sprawl (Woods, 2012). In Australia, as major supermarkets dominate the retail of groceries, and numerous farmers bear significant financial pressure, some farmers have turned to direct marketing or niche markets to pursue better terms of trade. These efforts contribute to local connections and identities, concerns for food quality, and traditional farming methods (Robinson, 2017). The willingness of some urban consumers to pay premium prices for food creates niche markets for alternative farmers (Woods, 2012). Marsden et al. (2000) recognised the creation and evolution of short or localised food supply chains as a key dimension in the newly emerging patterns of rural development.

AANs may include different production modes (e.g. organic agriculture), supply chains (e.g. local brands, direct sale avenues), regulatory approaches (e.g. organic certification) and policy programs (e.g. urban food strategies) (Andree et al., 2010; Marsden & Morley, 2014). Their key features include localism (employing local resources and supplying local

communities), ecological principles (e.g. low input, recycling materials within the system), bottom-up approaches, small and cooperating communities, and highlighting certain characteristics of food (e.g. local produce) as a marketing point (Andree et al., 2010; Beus & Dunlap, 1990). Australia's policy environment is generally unfavourable for AANs, and pushes alternative farmers to look at mainstream and export markets, given that many alternative farmers are restricted to localised marketing (Ilbery & Maye, 2005). The deviation of AANs from industrial efficiency partly determines that most AANs 'exist in lower level technological niches and have not yet been able to demonstrate scalability' (Marsden & Morley, 2014, p.108). The following section focuses on questions of localism, diversification and organic agriculture, which have been recognised in the literature as key elements to the development of alternative food economies.

#### ***2.4.4.2 Localism and diversification***

Food localisation has been advocated as a more sustainable form of agriculture (Woods, 2012). Local food supply chains can incentivise local producers, strengthen local business coordination, improve local food self-reliance, and reduce transport costs (Morris & Kirwan, 2011). However, local food production, especially by small-scale and lifestyle farmers, can significantly increase greenhouse gas emissions due to a lack of economies of scale, lead to farming in less favourable environments that require greater material inputs, and reduce population density resulting in increased transport (Marsden & Morley, 2014; Mok et al., 2014). With a strong call for resuscitating local agriculture, an increasing number of cities worldwide strive to reconnect consumers and producers (Mason & Knowd, 2010). Such sentiment is also reflected in local councils of the Illawarra, partly due to the demand of urban in-migrants for local food, and the demand of small-scale and lifestyle farmers for sales avenues (John, 2013). However, efforts to promote local produce and build local food infrastructure face strong resistance from mainstream agriculture (Marsden & Morley, 2014).

Local food supply chains usually involve a diversification of local farmers' commercial activities. Besides producing conventional products, farmers can pursue a better return through producing another commodity, adding value to their products by changing farming approaches (e.g. converting to organic farming), branding their products as local specialities, or running on-farm tourism ventures (Woods, 2014). In Australia, the pioneering or tentative nature of diversification determines that it is usually a survival strategy and only attracts a small portion of local farmers. Farmers undertaking new business activities usually rely on



localised marketing, and therefore become confined to their home regions (Hamblin, 2009). Although since the 1990s diversification ventures in Australia improved local employment and skill base, few cases achieved full or large-scale commercialisation (Hamblin, 2009).

In Australia, local food supply chains also involve direct food sale avenues. An example is farmers' markets usually organised by farmers and supported by non-profit community organisations and local governments (Andree et al., 2010). They involve small-scale and lifestyle farmers and trade in locally produced food (Holloway & Kneafsey, 2000). Compared with mainstream markets, farmers' markets are marginal, limited in opening days, and only supplementary to farmers' commercial selling (Andree et al., 2010).

Overall, food localisation provides opportunities for some commercial farmers to survive, but also brings significant challenges. Participants in these short food supply chains usually rely heavily upon their own knowledge and networking abilities that can have limitations (Marsden et al., 2000). This thesis examines food localisation in the context of Illawarra dairying, and its relation with the broader context of agricultural restructuring.

#### ***2.4.4.3 Organic agriculture***

Compared with other AANs, organic agriculture (OA) has a stronger footprint in global agri-food markets (Willer & Lernoud, 2016). The rising demand for organic produce has contributed to the transformation of the ideologies and functions (towards multifunctionality) of modern agriculture (Wilson, 2001). IFOAM-Organics International (2005, n.p.) has defined how OA should be operated, improved and benefiting the environment and society. Firstly, OA should rely on 'ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects'. Ideally, conversion of a general farm into OA involves three steps: substituting environmentally benign inputs for synthetic agrochemicals, increasing the efficiency of input use preferably through ecological cycles, and holistic system redesign to construct a diversified agroecosystem copying natural ecosystems that guarantee ecological functions (e.g. species habitat), productivity and resilience (Lamine & Bellon, 2009; Rosset & Altieri, 1997). Secondly, the improvement of OA should rely on a combination of 'tradition, innovation and science'. Thirdly, OA should 'benefit the shared environment [including ecosystems] and promote fair relationships and a good quality of life for all involved'. The above definition of OA largely represents the normative organic values. In practice, the formal transition to certified OA in the Australian

context is defined through certification schemes stipulating input substitution and a typical conversion period lasting two or three years (Lamine & Bellon, 2009).

Given the emphasis on ecological processes, OA has been recognised for its environmental benefits, although they are not uncontested. Compared with conventional agriculture, OA can better support the diversity of crop species and varieties, build plant resistance to diseases, improve soil life and fertility, and improve water retention capacity (Greene & Kremen, 2003; Marriot & Wander, 2006). These benefits, it is argued, can make the farm more resilient to climate variability (Wright, 2012). OA can also generate lower greenhouse gas emissions due to the avoidance of ammonium nitrate fertilisers, and improved carbon sequestration through cultivating deep-rooting plants (Hamer & Anslow, 2008).

To commercialise OA, there has to be developed regulatory and certification systems. In Australia, the National Standard for Organic and Biodynamic Produce was developed in 1991, driven by major supermarkets requiring certification of their organic suppliers. New consumer laws were introduced in 2010 to allow the Australian Competition and Consumer Commission to prosecute misuse of organic labelling (Paull, 2013; Willer & Lernoud, 2016). With these regulations, from 2009 to 2014, the value of certified organic industry (production and processing) in Australia increased by 15.4% annually (Australian Organic, 2014). However, the number of Australia's organic producers peaked in 2009 (2129) and had declined to 1707 by 2014 (by 19.8%). Many farmers left due to increased production costs and the burden of certification/regulation, including the need for direct membership payments, complex procedures and annual inspections (Sahm et al., 2013; Willer & Lernoud, 2016). The organic sector has thus bifurcated into a dominant commercialised sphere involving large-scale farmers supplying major supermarkets, and a minor market segment involving small-scale farmers supplying high value-added niche markets (Lamine & Bellon, 2009). Overall, organic farming as a strategy for some farmers to cope with agricultural restructuring is generally limited.

This thesis encompasses the experience of organic dairy farming in the Illawarra. Although the potential environmental performance of OA has attracted much academic attention, there is a lack of geographical research on OA, especially organic dairying, in the Australian context. Besides, the commercial forms of organic agriculture, including the structure of

organic supply chains, also need further examination and clarification (Campbell & Rosin, 2011).

#### ***2.4.4.4 Challenges of organic agriculture***

Although OA ostensibly provides an alternative accumulation strategy for some Australian farmers, the extra constraints on OA are significant, as identified in the literature (Sahm et al., 2013). Firstly, without synthetic agrochemicals, organic farmers usually bear extra workload or costs due to, for example, inefficient natural remedies in dealing with animal diseases, lowered yields and product quality (Smith et al., 2015). A further consequence is higher per unit output energy consumption (Pfeiffer, 2006). Secondly, there is a lack of knowledge and experience on, for instance, how to cope with weeds, animal diseases and phytosanitary problems (Ploomi et al., 2006; Sahm et al., 2013). Farmers' own exploration and innovation have been viewed as crucial for improving the economic performance of OA, but the learning process can generate extra costs and time burdens (Vogl et al., 2015). Thirdly, there is a lack of organic inputs (e.g. fodder) which must be produced organically or follow certain standards. As Australia's organic sector is relatively small, it is difficult for organic input providers to achieve economies of scale (Willer & Lernoud, 2016). Finally, marketing can be challenging for organic farmers. As the organic market is relatively small, nearby food manufacturers may not have organic production lines (Willer & Lernoud, 2016). Given these challenges, a wholesale transfer to labour-intensive and high-cost OA would be unable to attract enough labour with competition from better-paid jobs in developed countries (FAO, 2007). In Australia, it would be impossible to achieve the current level of agricultural production in a commercially viable manner without synthetic agrochemicals due to low soil fertility (Hamblin, 2009). As a sign of the challenges facing organic producers in Australia, the Rural Industry Research and Development Corporation cancelled its organic program in 2015 (with annual funding worth around AUD\$300,000). Since then governmental support for OA has remained almost non-existent (Willer & Lernoud, 2016).

Another barrier for OA is existing cultural constructions of 'good farming'. Different types of farmers usually have different 'good farming' ideals (Herman, 2015). For example, Kings & Ilbery (2010, p.437) indicated that 'some organic farmers tend to have small, diverse and untidy farms, ecocentric attitudes and a non-exploitative approach towards farming', which 'often contrasts with the tidy, well-organised conventional farmers with their larger, specialised farms, technocentric attitudes and exploitative view of nature'. Discourses of

‘good farming’ are usually linked to financial success and respect from the farming community (Sutherland & Darnhofer, 2012). The heightened market competition pressure on Australian farmers has tightened the link between economic performance and the ‘good farming’ ideal (Lockie, 2015). Conventional farmers’ productivist view of ‘good farming’ also results from the institutionalised beliefs about the need to maximise production (Sutherland & Darnhofer, 2012). If OA cannot provide a robust financial return, it would continue to be a choice for the minority who have different values. Recognising the importance of ‘good farming’ ideals, Kings & Ilbery (2010) called for more comparative work on the belief systems of conventional and organic farmers.

To achieve commercial success, organic supply chains increasingly resemble productivist ideology and practice, which researchers have referred to as ‘conventionalisation’ (Lockie & Halpin, 2005). Corporate food governance has exerted political pressure to lower organic standards, and sidelined normative organic values unfavourable to industrial production (Fouilleux & Loconto, 2017; Guthman, 2014). Organic standards for certified OA have largely been reduced to a guide of substitution of allowable inputs for prohibited inputs (Lamine & Bellon, 2009). Simplified standards also facilitate speedier inspection procedures (usually undertaken by certifying bodies annually) (Lamine & Bellon, 2009). In developed countries farmers generally convert to OA for financial reasons (Marsden & Morley, 2014). In Australia, the evidence suggests that few organic producers follow the agro-ecological ideal seeking to balance food production in a sustainable relationship with local ecologies (Lamine & Bellon, 2009). Existing OA largely relies on energy-intensive inputs and machinery (Lockie & Halpin, 2005). Overall, conventionalisation is linked to finding ‘conventional’ solutions to economic challenges. Major indicators include prioritising economic profitability as a dominating decision criterion, not seeking systemic solutions to problems (which are solved without considering impacts on other parts of the farm), not mimicking ecological processes by only having few animal types on the farm, and not ensuring closed nutrient cycles by heavily relying on external inputs (Darnhofer et al., 2010). The organic sector overall arguably has failed to mitigate wider environmental impacts of agriculture (Marsden & Morley, 2014). The linkage between conventionalisation and the broader background of agricultural restructuring warrants more research, with this thesis identifying how organic farmers’ operating environments have potentially entrenched the process of conventionalisation rather than challenging such approaches.

#### **2.4.4.5 Reflection**

After examining some major alternatives, it is important to recognise two types of involved actors especially in the complex environment of urban-rural interface: small-scale, lifestyle farmers and commercial farmers (Marsden & Morley, 2014; Mok et al., 2014). Political discourses on local alternative agri-food networks usually do not distinguish them. Small-scale, lifestyle farmers are usually seen as being unable to effectively utilise and manage their land, and contributing little to agricultural production (Marsden & Morley, 2014; Mok et al., 2014). Commercial farmers committed to localism, diversification or OA are few in number and usually have limited capital to achieve economies of scale and go beyond localised marketing (Hamblin, 2009). With little support from public R&D, they have to improve the usually underdeveloped alternative farming techniques by their own resources. To maintain viability, they also emphasise financial performance and remain essentially productivist. Nevertheless, alternative farmers can help develop diverse farming techniques and enhance the resilience of local agriculture. It is necessary to more closely examine the contribution of alternative agriculture, however, in Australia there is a lack of qualitative and farm-level studies on OA. This project contributes to addressing this gap in knowledge.

### **2.5 Summary**

This literature review firstly indicates that since the 1970s the agricultural sector in major capitalist countries has experienced persistent economic difficulties. At a broad level, it is against this backdrop that the restructuring of Australian agriculture must be understood. Rural geography has largely approached the issue from two theoretical perspectives. From a political economy perspective, Australian farmers have been pressured by adverse market conditions and a retreat of direct government support. In some regions, agriculture has also been squeezed by urban sprawl and related processes. Research from a socio-cultural perspective has shown that Australian farmers have formed a strong tradition of family farming characterised by strong attachments to farming, both in terms of emotional and personal identity. Yet, this culture has also been threatened by various forms of agricultural decline. This picture of agricultural restructuring raises questions of how it has happened (from top-level forces or bottom-level needs), under what logics, and what the consequences would be. To bridge various factors, I conduct an in-depth, contextualised study on farmers.

The notion of multifunctionality has been put forward to conceptualise the transition of farming and rural spaces. Firstly, numerous farmers are pressured to improve productivity through productivist practices (e.g. expansion and intensification). However, productivity growth has seemingly been achieved with limited attention to the long-term capacity and resilience of agriculture in terms of environmental management and promotion of certain new technologies. Secondly, the rise of alternative agri-food networks (AANs) contributes to non-productivist values of agriculture, but seemingly provides no answer to achieving sustainability goals. Although alternative farmers individually can be more sustainable, AANs overall are still not able to produce at a scale to make a major societal difference. The multifunctional transition of agriculture needs further conceptualisation. This project explores the competing forces in the formation of multifunctional agriculture, and farmers' various adaptation strategies.

## **2.6 The present study**

The reviewed literature and conceptualisations demonstrate factors that have influenced/conditioned Australian agriculture, farmers' responses to such factors, and potential consequences. From a political economy perspective, those influencing factors reflect the two dimensions of agricultural restructuring. The first is that, driven by neoliberal policy reform, agri-food value chains are increasingly integrated and dominated by corporate entities wielding substantial market power. The second dimension is that at least some rural areas are increasingly repopulated by urban middle-class groups with a range of consequences for access to land and farming practice (Dibden et al., 2009; Ilbery, 2014). From a socio-cultural perspective, Australian and Illawarra dairying has been conditioned by a locally and historically developed family farming culture. Farmers' responses to the restructuring pressure involves both further entrenchment of productivist farming and also alternative approaches to agriculture, indicating the multifunctional agricultural transition (Andree et al., 2010; Lawrence et al., 2013). The potential consequences of these processes include a loss of agricultural capital (e.g. land and labour), deficient environmental management, and limited investment in alternative approaches (Atkinson et al. 2014; Lockie, 2015). This thesis suggests a model explaining agricultural change especially in the context of Illawarra dairying. This model has five sections, as shown in Figure 2.1. The first section or the beginning of the model involves broad influencing factors, usually at global or national scales. The second section involves elements of agricultural restructuring in the last several

decades. They are related to the Illawarra and many other Australian dairy regions. Section three involves direct impacts of agricultural restructuring on numerous Australian dairy farmers including those in the Illawarra. Section four relates to Illawarra dairy farmers' specific responses. The last section relates to potential consequences which will further influence the development of Illawarra dairying and beyond.

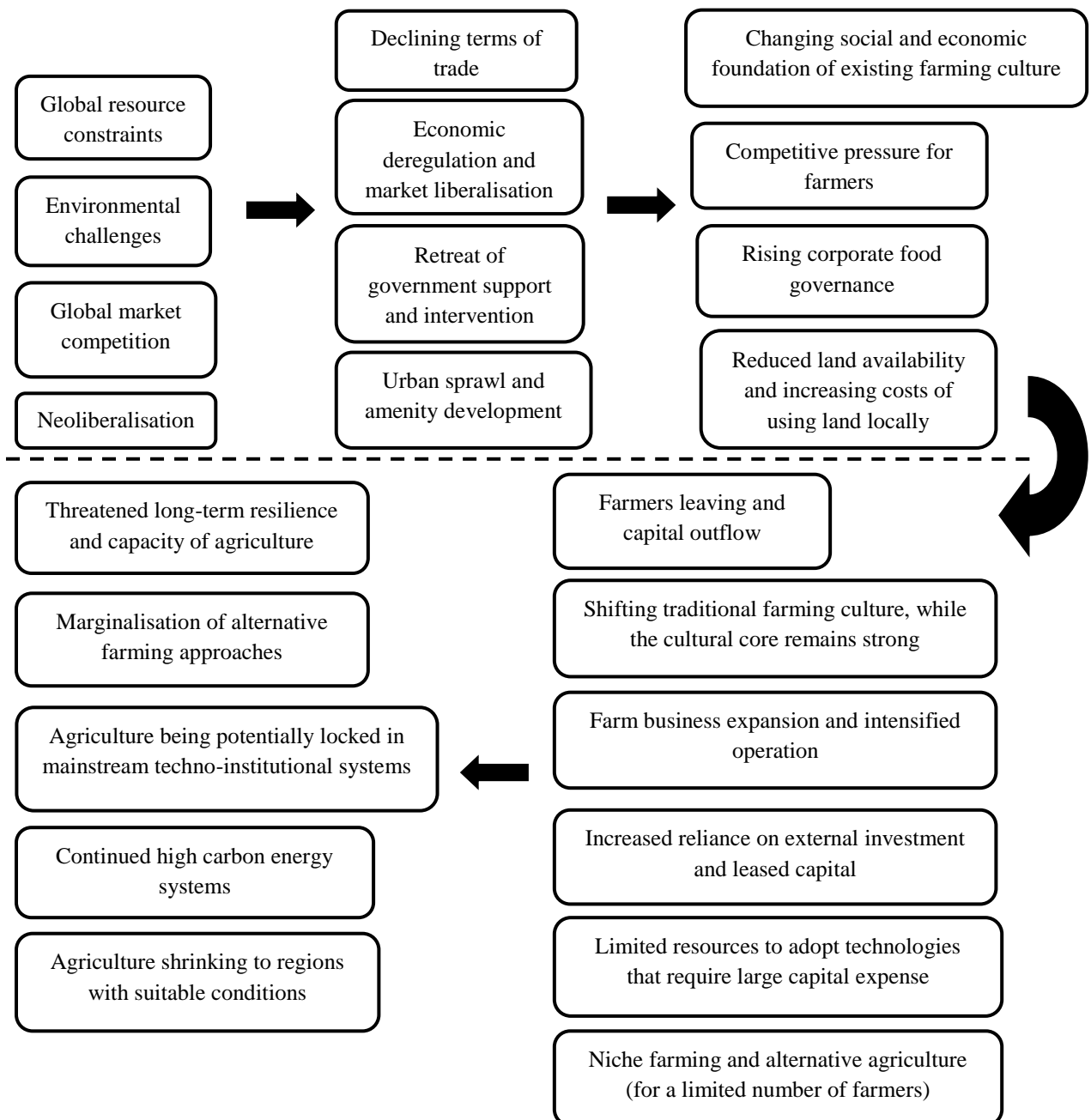


Figure 2.1. Hypothesised model for industry changes and farmers' responses (arrows represent contributing to; the dotted line is the border between the upper and lower parts of this model).

In accordance with this model, the thesis posed three research questions which respectively relate to change-driving factors, farmers' responses, and further consequences. To address these questions within the context of Illawarra dairying, I conducted semi-structured interviews, participant observation and a media survey. To explore research question one inquiring into factors driving agricultural change, and farmers' experiences, I examine several elements. Firstly, I look into the process of national and global neoliberalisation through reviewing relevant literature.

Secondly, I examine the historical development of the Illawarra since European colonisation, especially focusing on the formation of local dairy farming culture, through reviewing relevant literature, public data and news articles, participating in farm work, and interviewing farmers (research results are presented in chapter 5). In interviews with farmers, I inquire about how and why they became a farmer, and how they view the necessity to maintain some traditional values or make a change. Local dairying is characterised by a culture of family farming. Farmers can hold on to farming for non-economic values. To maintain family farming, farmers have to make their business robust through means which may contradict traditional values.

Thirdly, I explore Australian agricultural restructuring through reviewing relevant literature, public data and news articles, interviewing farmers and relevant stakeholders, and participant observation. My analysis follows Ilbery's (2014) two dimensions of agricultural restructuring as mentioned earlier. To explore the first dimension (research results are presented in chapter 6), I asked interview participants their experiences of dairy policy reform and industry restructuring, how they made sense of these changes, and how these changes influenced farmers' viability. I focus on the agri-food supply chain and especially the political economic interactions involving government agencies, farmers, food processors and retailers. These interactions form a key part of local farmers' operating environment. To explore the second dimension (research results are presented in chapter 7), I asked interview participants their experiences and perception of the encroachment of urban and related development into traditionally agricultural regions. I adopt the concept of the multifunctional transition of rural space, and focus on the various forms of commercial development farmers have pursued. Overall, agricultural restructuring brought Illawarra dairy farmers more external competition from farmers in other regions, other supply chain players, and urban land buyers/investors.



To explore research question two, which examines farmers' responses and on-farm changes, I review relevant literature, public data and news articles, participated in farm work, and asked farming participants how they transformed their business in response to economic challenges, how they viewed different choices for investment, and what the patterns of those on-farm changes were (research results are presented in chapters 8). The on-farm changes reflected both productivism and non-productivism (Wilson, 2009). Farmers usually chose to improve their own business, rely on external investment and leased capital, expand their business, and intensify their operation. Although farmers generally followed the mainstream production mode, a small number of farmers explored alternative or novel approaches. I specifically examined robotic milking system (RMS) and certified organic dairy farming approach (CODFA) (background information is presented in sections 4.8 and 4.9; research results are presented in chapter 9). This was because they have been increasingly promoted by the industry or in the academic literature as potential strategies to enhance profitability or cope with challenges like climate change and global resource constraints (Bouttes et al., 2018; Britt et al., 2018). Although the two approaches have potential to improve farm efficiency and resilience, there is an absence of qualitative studies on both approaches in the Australian context. I asked for farmers' views on them and relevant experiences, and interviewed several relevant stakeholders. Most farmer participants expressed negative comments on both approaches, reflecting the challenges faced by them.

I explore research question three, inquiring into likely pathways for the future of agriculture, based on the information revealed by academic literature and interview participants regarding major trends in agriculture (research results are presented in chapters 8 and 9). It has become difficult for farmers to invest in their existing capital from a long-term perspective. Farmers would continue to face challenges from other interest groups, climate change and global resource constraints (Lockie, 2015). As for RMS and CODFA in the Illawarra, in the foreseeable future, they would continue to exist within small niche sectors and have limited influence on the dairy industry.

## **Chapter 3 Methodologies and Analysis**

### **3.1 Introduction**

With chapter 2 presenting the conceptual framework, this chapter firstly introduces my study area, the Illawarra region, and then presents my two approaches to collect and analyse empirical data. They are qualitative observational research combined with an analysis of local media. The former involves semi-structured interviews and participant observation. The latter involves reviewing local newspapers.

### **3.2 Study area**

The Illawarra region is located in the southeast of New South Wales (NSW), Australia, along the coast, bordering the Greater Sydney region to the North, and on the eastern side of the Great Dividing Range. The Illawarra is within the South Coast region of NSW. The geographic extent of the Illawarra has various definitions. In this thesis, the Illawarra refers to the Illawarra Statistical Division (Illawarra SD). SD is one level of the Australian Standard Geographical Classification (ASGC). The Illawarra SD mainly covers the local government areas (LGAs) of Wollongong, Shellharbour, Kiama, Shoalhaven and Wingecarribee (Figure 3.1). More details on local economy and agriculture are presented in chapter 5. The LGAs of Wollongong, Shellharbour and Kiama are in the northeast of the Illawarra, and together are similar to the area of the Illawarra Statistical Area 4 (Illawarra SA4), a lower level of the ASGC. The LGAs of Shoalhaven and Wingecarribee are in the southwest, and together are similar to the area of the Southern Highlands and Shoalhaven SA4 (ABARES, 2018a, 2018b; ABS, 2010).

More specifically, this study focuses on the geographically consistent modified pasture area from Shellharbour (south of Wollongong) to the north of the Shoalhaven LGA (surrounding Berry and Nowra) (mainly marked by orange colour in Figure 3.1). It is roughly within the areas of Albion Park-Macquarie Pass, Shellharbour-Flinders, Kiama, Kiama Hinterland-Gerringong, Berry-Kangaroo Valley, North Nowra-Bomaderry, and Nowra. All farmer participants in the research are situated in these communities.

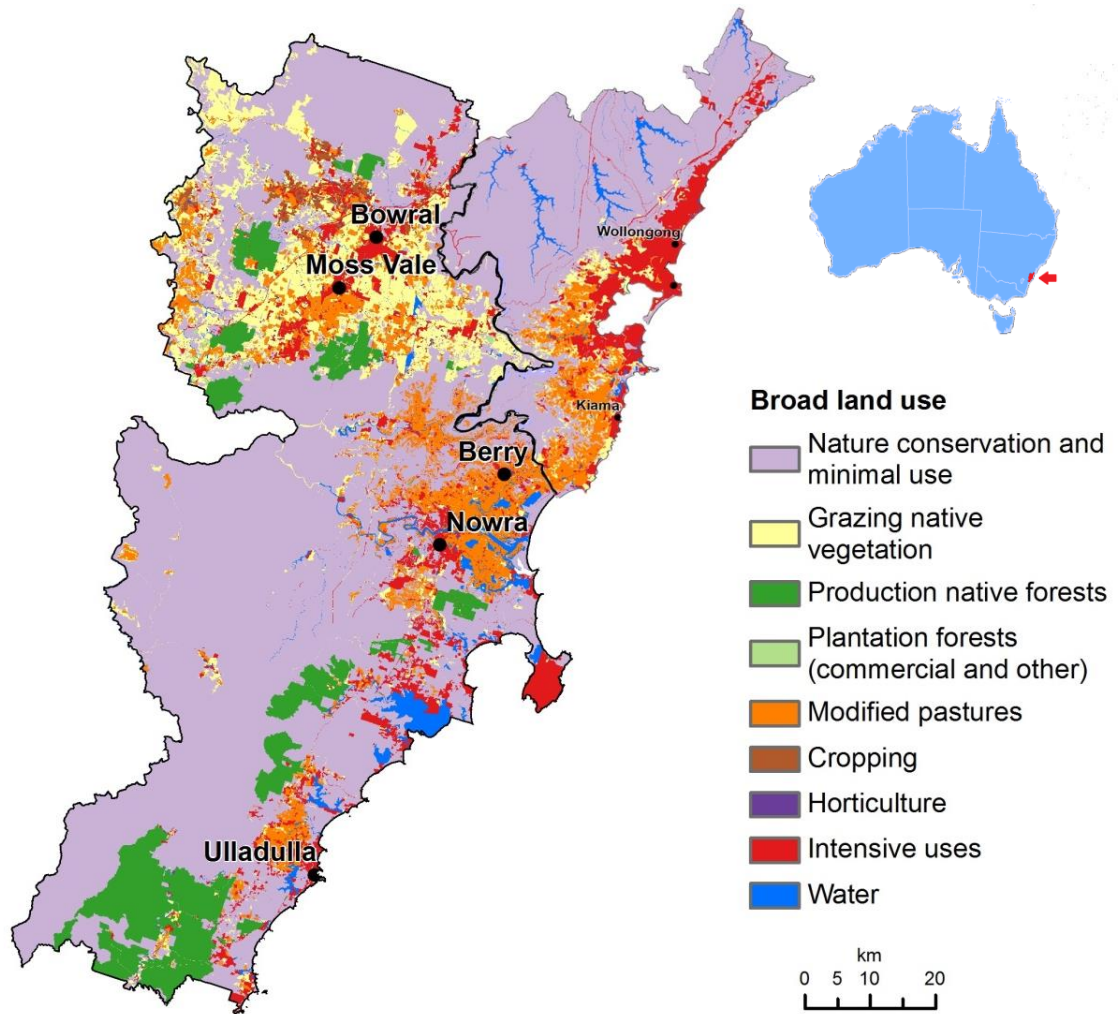


Figure 3.1. Location and land use of the Illawarra SD (ABARES, 2018a, 2018b).

This region is appropriate for the research which inquires into agricultural change and farm development. Firstly, the Illawarra accounts for around 82% of dairy farms in the South East Local Land Service Region, producing around 33% of milk in NSW (NSWDPI, 2015). The high output ensures the professional nature of numerous local dairy farmers. Secondly, its spatial heterogeneity determines that local agriculture has been influenced by the double trends of an urban-to-rural shift in population, and agri-food supply chain restructuring (Ilbery, 2014). The northern part of the Illawarra is characterised by the pressure of urban sprawl from Sydney, and farm subdivision. Local agriculture has been increasingly concentrated into areas which are further away from Sydney, and thereby characterised by intensified production and farm amalgamation. This geographical pattern enables the study of how farmers have shaped their business in response to the double trends.

## **3.3 Qualitative observational research**

### **3.3.1 Introduction**

This section introduces my procedures of semi-structured interviews (with dairy farmers and relevant stakeholders) and participant observation (mainly through taking part in farm work and farmers' gatherings). Data from both methods is analysed based on the broad frameworks of Merriam (1998) and Patton (2002).

There are several reasons for using a qualitative methodology to explore agricultural change. First, the structure of the Australian dairy industry is complex. Quantitative data, such as milk production, can help gauge industry change, but there are numerous change-driving factors, and it is not always easy to establish causality. This study is explorative and inquires into the impacts and interrelations of those factors. Second, farmers' motivation and economic behaviour is complex and cannot be captured in statistical analysis of production volumes, income or investment. It is necessary to investigate farmers' lives and lived experiences more deeply, in order to better understand decision-making and approaches to coping with restructuring. Third, there are risks in using quantitative methods, such as a mail survey. Farmers lead a notoriously busy life, which can influence their willingness to respond to mail surveys (Pennings et al., 2002). The number of Illawarra dairy farmers is limited and it was more effective for me to actively contact farmers for qualitative data collection. Such a justification for the methodology is not intended to downplay the role of quantitative methods. Rather, in-line with the research aims, statistics from public institutions were also intergrated into the project and complemented my primary empirical data.

Through qualitative observational research, I aim to identify and interpret complex social structures within the researched community. I provide a rich and in-depth description of the participants or their social circumstances to make the unfamiliar familiar (Merriam, 1998). According to Patton (2002), qualitative observational research commonly shares 10 characteristics: naturalistic (studying a group in its natural state), inductive (to reason from the specific to more general terms), holistic (the relation between the whole and its parts), personal (it allows researchers to be immersed in a group and acquire in-depth knowledge), no straightforward right or wrong answers (researchers have to examine different perspectives of a study group), unique case orientation (every case is special and deserves in-

depth study), context sensitivity, neutral stance of researcher (researchers should not be judgmental), design flexibility (researchers can shift attention to new questions arising from the initial research) and qualitative data (it is to describe the culture). These characteristics are well suited to this project aiming to present farmers' cultures, and social and working lives.

### **3.3.2 Maintaining ethical research**

Before I introduce detailed research methods, it is important to clarify the Human Ethics Clearance protocols this study followed. This project has been reviewed and approved by the University of Wollongong/Illawarra Shoalhaven Local Health District Social Sciences HREC which is constituted and functions in accordance with the NHMRC National Statement on Ethical Conduct in Human Research. The approval number for this project is HE16/196.

Specific ethical considerations include: i) informed consent, ii) harm minimisation, iii) exploitation, iv) privacy, and v) sensitivity to cultural difference and gender (Hammersley & Atkinson, 1995). Informed, freely and knowingly provided consent is a central ethical consideration of this project. An information sheet was provided to each research participant, outlining the details of the project to assure that potential participants learnt about the aims, focus, purpose and organisation of the research. All potential participants had to freely and knowingly give their informed consent to participate in the project. Participants were asked to complete an authorised consent form. This form outlines the terms and conditions of how the materials collected will be used by this project, how the materials collected will be stored and how a participant has the right to withdraw their material at any stage of the project. The contact details of both the organiser of the research project and the Ethics Officer were provided on both the information sheet and the consent form.

As for harm minimisation and exploitation, I aimed to minimise risk of distress and ensure that participants did not feel as though the researcher was exploiting their time, knowledge or feelings. Participants were fully informed of the research method. I also informed people on the Participant Information Sheet that the interview will include questions about economic trends influencing agriculture and their impacts on farmers. In this regard, participants were aware of the topics to be covered in the interview before it commenced. A person might choose not to participate, based on this information. Participants were able to withdraw from

the interview at any time, with no ramifications. This was explained clearly on the Participant Information Sheet, and again at the beginning of the interview. I did not specifically target people whose businesses had been negatively influenced by the past economic changes. I made clear that participants were not required to answer any questions that they did not wish to answer. I provided contact details for a counselling service, in case participants did feel burdened by participating in this research.

To protect the privacy of research participants, I ensured that participants could never be linked to the data they provided and which was used publicly, such as in publications or presentations. Information such as names and addresses of participants might be included in the field notes, but was coded and eliminated upon entry of the field notes into the computer, with the code list kept in a separate, secure computer file with limited access. I did not disclose personal characteristics that could allow others to guess the identities of participants. Participant confidentiality was also respected during eventual presentation of the data in conferences, thesis, final report and printed publications.

### **3.3.3 Semi-structured interviews**

With these ethical considerations in mind, I conducted semi-structured interviews with a group of Illawarra dairy farmers and relevant stakeholders. Interviews form the main part of my empirical data. The interview approach focuses on dairy farmers from the Shellharbour-to-Shoalhaven pasture area as specified in section 3.2. Farmers include both farm owners/operators and managers who oversee or undertake farming operations in an agricultural establishment (ABS, 2012). In 2016/17, the Illawarra SD had 110 dairy farms (Australian Bureau of Statistics (ABS), catalogue no. 7120.0). In 2010/11, the Shellharbour-to-Shoalhaven farming community (or the areas of Albion Park-Macquarie Pass, Shellharbour-Flinders, Kiama, Kiama Hinterland-Gerringong, Berry-Kangaroo Valley, North Nowra-Bomaderry, and Nowra) had around 69 dairy farms (ABS, catalogue no. 7120.0; this is the most recent official data available).

I recruited participants by sending invitations to potential participants through text message, email and phone calls. Thus, collecting contacts of potential participants was crucial. Some potential participants posted their contacts on public websites or social media. My supervisors provided their personal contacts with some farmers. I acquired some farmers'

contacts while attending local farmers' social gatherings. Initial participants were also invited to provide other farmers' contact details. Some participants helped in inviting other farmers from among their friends. Most participants were recruited through this snowball sampling (Biernacki & Waldorf, 1981). Some participants felt reluctant to provide contacts for privacy issues. It was important to build a harmonious relationship with existing participants. To achieve that, I tried to fully explain the nature and aim of this research, respect participants' choice in arranging interviews, meet with them more than once not just in formal interviews but in other activities (when possible), and provide them with their interview transcripts (when appropriate) which might inspire their interest.

In total, I sent invitations to 52 potential participants. My procedure for inviting people was that: firstly I sent invitations; if they answered and accepted my invitation, I then tried not to push them but offered a time to choose a proper date for an interview; if they did not answer, I waited for one or two weeks and sent invitations again; if they still did not answer, I would wait for another month to re-send the invitation, but I had to give up at certain point so that I did not bother people. Finally, 20 people answered, which brought the 21 participants (one participant brought another participant to their interview). It could take up to four months from sending the first invitation to finally securing an interview. The difficulty encountered in arranging interviews was determined by several factors. First, dairy farmers are renowned for leading busy working lives. People could refuse the invitation for personal issues. Second, dairy farmers may have felt suspicious of an outsider's invitation. To overcome this problem, I actively participated in local activities, especially farmers' events (e.g. cow/agricultural shows).

This sampling strategy has potential biases: possibly, those who answered my invitation very actively were more socialable, open, or appeared to view this study as an opportunity to express their concerns; farmers whose contacts were more accessible to me were more likely to be invited (they may have a profile through active involvement in local politics or industry affairs); farmers who were more accessible to me during the sampling period were more likely to participate (others could be busy with personal affairs during this period). Considering the limited resources of this study, and the voluntary nature of the interview approach, it was difficult to avoid these biases. Despite these limitations, this study was still able to cover the heterogeneity among local dairy farmers, with participants having various business scales and farming approaches. The final decision to cease sampling and data

collection was based on exhausted sources, limited time and resources, saturation of participant categories, and emergence of regularities in data (Lincoln & Guba, 1985).

I formally interviewed 21 participants, and conducted 30 interviews (from 13/05/2016 to 23/02/2017). Participants included 12 active dairy farmers (with existing farming operations), one former dairy farmer who had farming experience and belonged to a dairy farming family, one officer from Dairy Australia (the national services body for the dairy industry), one local farm machinery dealer, one researcher from the Future Dairy project (an R&D program aimed at helping dairy farmers manage future challenges), one researcher from NSW Department of Primary Industries (NSWDPI), two officers from Local Land Services (a governmental organisation providing farmers with services on farming and natural resource management), one officer from Wollongong City Council, and one officer from Food Fairness Illawarra (a non-profit community network). One Local Land Services Officer and one Wollongong City Council officer were interviewed together. I gave each participant a serial number (

Table 3.1) to protect anonymity when I refer to them in the text.

Table 3.1. Participant serial numbers.

Participant	Serial number	Number of interviews
Conventional dairy farmers	#1-9	18
Dairy farmer using robotic milking system	#10	1
Dairy farmer prepared to convert to certified organic dairy farming	#11	1
Certified organic dairy farmer	#12	1
Former dairy farmer	#13	2
Dairy Australia officer	#14	1
Farm machinery dealer	#15	1
Future Dairy researcher	#16	1
NSWDPI researcher	#17	1
Local Land Services officers	#18-19	2
Wollongong City Council officer	#20	1
Food Fairness Illawarra officer	#21	1



For the thirteen participants with dairy farming experience (#1-13), those who clearly revealed their ancestry information all had British or Irish ancestry. Six participants (#1-4, 11, 12) are small-scale farmers with 110-170 milking cows, five (#5-8, 10) are medium-scale with 220-300 milking cows, and two (#13, 9) are respectively involved in businesses of around 400 and 1150 milking cows. Excluding the largest business (participant #9), the average herd size of the 12 participants is 210. Only participant #13 is female. Five participants (#2, 3, 10-12) are from 34 to 44 years old. The others are aged over 50.

I interviewed each participant one to three times. I tried to interview those who had farming experience at least twice. Each interview lasted from 50 minutes to two hours. Interview questions are attached in appendix 2. I asked the two farmers committed to organic farming (participants #11, 12) not only questions for general farmers but questions specifically for them. Questions asked in interviews did not always follow the interview schedule. Occasionally, time limits led me to exclude certain questions, which I then attempted to cover at a follow-up interview. I also invited those who had farming experience to finish a questionnaire (see appendix 3) to record details of their business. Interviews were undertaken in participants' office, computer room, home or around their milking shed. During the interviews, occasionally some other people (e.g. the participant's family member) joined us and made comments. Those comments were also treated as data. Most interviews were audio recorded. I also made extensive constant field notes during each interview. Before and after an interview, I usually received a farm tour (if the participant was a farmer) which enabled me to ask questions in situ and observe aspects of farm setup and operation. Most content of interview records was transcribed. Transcription focused on the textual content of the interviews, or what people said and clearly expressed. That was largely determined by my research questions which directed me to inquire participants on details of agricultural change. Other linguistic features, including pause, stress, laugh, hesitation, could also be recorded. According to Bamberg (2011), there is no right or wrong approach to transcription, and not all dialogic information needs to be captured.

### **3.3.4 Participant observation**

According to Crang (2005), interviews are usually divorced from participants' natural flow of life. This disconnection restricts researchers' ability to understand how people perceive the world and organise their work and life. Besides, textual information derived from interviews

cannot fully illustrate what a farmer’s working life is like and how a farm is operated. Considering these limits, I undertook participant observation in which the researcher observes, experiences, records, describes, analyses people, their interactions and related events, and inquires more deeply into the world of research participants (Bryman, 2004), aiming to obtain a systematic account of behaviour and idea systems of a specific community (Goulding, 2005). In the present study, participant observation could happen at any time when I interacted with participants. I also observed farmers at their events and worked with some participants on their farm. In farmers’ gatherings, my role was similar to a ‘complete observer’ who does not take part in action and does not reveal their role, but occasionally I introduced my role to farmers there and asked them questions. In the farm work, my role was a ‘participant as observer’, and I worked with farmers (with my role revealed) and experienced directly what farmers were experiencing, which was useful for understanding job roles (Goulding, 2005). The data were mainly recorded in the form of field notes and photographs.

I attended four major dairy industry-related events (Table 3.2). These events allowed me to observe how farmers interacted, and talk with farmers, helping me understand how a dairy farm is operated; how a milk processing plant is operated; how a farmers’ cooperative (South Coast Dairy) is managed; what the motivation to establish a locally owned milk-processing plant is; how cows are judged; why farmers show their cows; what the differences between dairy farmers and other farmers are; and how local dairy farmers perceive recent industry changes.

Table 3.2. Local farmers’ gathering events.

Gathering event	Date	Description
A fieldtrip to one dairy farm and the milk processing plant of South Coast Dairy (SCD)*	29/08/2015	Two farmers introduced how the farm and processing plant were operated to a group of students from the University of Wollongong.
The official opening of the processing plant of SCD	26/06/2016	The opening of the plant attended by numerous local farmers and their families.
Deep Winter Conference	30-31/07/2016	Various small and medium-scale farmers gathered at Gerringong, Kiama, to discuss their concerns.
Nowra Holstein Show	27/08/2016	A cow show event in Nowra, Shoalhaven, mainly for local dairy farmers.

\*SCD is a local enterprise owned by the Berry Rural Cooperative and run by seven local farmers.

The farm work I carried out helped me understand farmers' working life. I visited four dairy farms, three small-scale (below 200 cows in milk) and one medium-scale (200-250 cows in milk). One small-scale farm had adopted an organic farming approach. For three farms, I spent one working day (roughly from 9am to 4pm) on each of them. I spent two working days on the other farm (small scale). The four farms milked their cows twice a day. The first milking started in early morning (around 4am), and the second started in early afternoon (around 2pm). When I came to the farm, the first daily milking had just been completed. When I left the farm, the second milking had been underway and I had been able to participate in farm activities outside of, and during, milking. When I was on the farm, I followed the farmer and tried to help them in their work. I asked questions as particular tasks were performed. This experience helped me understand what the structure of a dairy farm is, what farmers' routine working day is like, how farmers' personal life and work intertwine on the farm, what equipment and techniques farmers use, how farmers connect with their milk processors and input providers, how farmers interact with their family and staff, how various human relations influence farmers' decision-making. Overall, participant observation helped to contextualise other data in the study.

### **3.3.5 Qualitative data analysis**

According to Patton (2002), no prescribed processes of qualitative data analysis, no matter how eloquently named and described, can substitute for the knowledge and experience of the analyst. Given the potential limitation of any single method of analysis, I consider mixed and comprehensive analysis frameworks. Overall, analysis involves organising data, reducing raw information through summarisation and categorisation (there are no rules for determining significance), and identifying and linking patterns and themes (Patton, 2002). According to Merriam (1998), analysis has five main stages: *narrative* (using narrative approaches to derive meaning from data), *coding* (organising data into categories that bring together similar themes), *interpretation* (making meaning from the narratives and coded materials), *confirmation* (ensuring the validity and reliability of the analysis), and *presentation* (presenting findings to a specific audience).

The narrative stage involves thick description and ordering quotations of participants (Patton, 2002). There are three typical options for this initial data organisation: *chronology*

*approaches* (e.g. describe critical events chronologically), *case study approaches* (describe the role of participants, functions/structures of this group, various settings or locations etc.), and *analytical framework approaches* (e.g. describe important social processes and organise interviews by research question) (LeCompte & Schensul, 1999; Patton, 2002, p.439). It is also useful to summarise the data, make a list of important facts, and connect data to the researchers' own experience gleaned from participant observation (Wolcott, 1994). For the present study, the three options of data organisation were all considered. In terms of chronology approaches, a major event in this study is the 2000 deregulation, and the timeline stretches from the immediate impacts of deregulation and what farmers did initially in response of deregulation to how they have coped and planned for the longer term. In terms of case study approaches, there are three groups of participants in this study, namely conventional farmers and general stakeholders, participants related to robotic milking (see section 9.3), and farmers committed to organic farming (see section 9.4). The three groups can have different views towards dairying. In terms of analytical framework approaches, the data was categorised based on the two research questions respectively inquiring into factors driving agricultural change, and farmers' responses.

Coding is then intended to systemically categorise data based on concepts or themes (Merriam, 1998). This stage involves noting patterns and themes, applying codes to textual data, organising meanings from the data into themes, and creating a conceptual framework (LeCompte & Schensul, 1999). Themes reflect the overall experience of participants, the function, structure and nature of the experience, and the variability or recurrence of different manifestations of the experience (DeSantis & Ugarriza, 2000). Preliminary theme construction is usually conducted in parallel with data collection. This preliminary process can be used to direct further data collection (DeSantis & Ugarriza, 2000). I firstly coded my data according to various broad topics, for example industry restructuring and urban sprawl (descriptive coding), and specific research questions, for example what technologies farmers have adopted (structural coding) (Saldaña, 2009). I also developed sub-codes to designate the characteristics of farmer participants (attribute or context coding), what farmers were doing specifically (process coding), farmers' feelings and experiences (emotion coding), farmers' values and attitudes (value coding), participants' evaluation of agricultural policies and programs (evaluation coding), participants' negative or positive views towards industry changes (magnitude coding), conflicts and power relations in the dairy market (versus

coding), and narrative lines of farmers' experience (narrative coding) (Guest & MacQueen, 2008; Saldaña, 2009).

The interpretation stage involves a shift of focus from individuals to groups. I identified variables influencing the researched community, checked relations between variables, and examined reasons for outliers. Researchers should remove spurious relations and build a logic chain of evidence (Miles & Huberman, 1994). By reviewing relevant theories or the initial theoretical framework, researchers can determine whether data fits the assumptions, position findings in a broader theoretical framework, build theoretical coherence and derive inferences through inductive reasoning (LeCompte & Schensul, 1999; Wolcott, 1994). Conclusions should be evaluated against participants' interpretation. Researchers can then restate questions to fit data and evaluate the shortcomings of the research (LeCompte & Schensul, 1999).

Besides this interpretation procedure, this study involves narrative analysis. When people discuss their experiences, they tend to give it a narrative form. Narratives are descriptions of characters' actions (Bamberg, 2011). Narrative analysis focuses on how people experience the world and make sense of their experiences (Connelly & Clandinin, 1990). As narrative analysis usually examines experiences of multiple participants, it attempts to discover the shared characteristics of people's stories (Bernard, 2012). It also aims to connect people's meaning-making efforts with the broader socio-cultural background of the story (Mishler, 1986). I adopted thematic approaches to narrative analysis. They focus on the topical or thematic structures of the story's content (Riessman, 2008). For example, when farmers told of their experiences of deregulation, this narrative was usually informed by the impacts of deregulation on farmers. Considering that farmer participants might expect researcher(s) to inform the public of farmers' concerns, I viewed story-telling as an interaction (with me as an audience) or performance, and asked why the story was told to me (Bamberg, 2011).

The confirmation stage involves techniques enhancing the validity and reliability of the research. During the analysis, I checked for researcher effects and rival explanations (Miles & Huberman, 1994). First, I collected referential materials, for example industry reports and previous research findings, to gain as much background knowledge as possible. Second, I employed triangulation by using various data sources, for example newspapers, interviews, participant observation and public database. Cross-checking data from different sources helps

examine the researched group from different aspects. Third, I conducted member checks through inviting some participants to comment on their own interview transcripts, and compiling a research report for participants to provide feedback. Last, I engaged in consultation with other researchers on data analysis and interpretation (Merriam, 1998).

Finally, I presented findings in the form of reports, journal articles, oral presentations and thesis to academic audience and general community members. The presentation stage serves to invite feedbacks, stimulate discussion and inspire further analysis (Wolcott, 1994).

### **3.4 Media survey**

#### **3.4.1 Introduction**

To supplement the qualitative observational research and enhance the validity of the research, I surveyed local news articles on Illawarra agriculture, especially, but not only, the dairy industry, over the periods from 30th June 2000 to 30th June 2002, and from 1st January 2008 to 30th June 2016 (in total 10 years and 6 months). Local news was considered an appropriate resource because it could reveal the transformation of the local dairy industry at a finer scale. News articles usually provide detailed narratives on how farmers experienced industry changes. I did not just focus on the dairy industry for two reasons: 1. reviewing details on the broader political economic context related to local agriculture can help understand the economic trends influencing local dairying; 2. some dairy land has been transformed to other types of farms, such as vineyards. I chose these periods (30/06/2000-30/06/2002 and 01/01/2008-30/06/2016), because they cover major events related to local dairying, including the nationwide deregulation of the dairy industry in 2000, repercussions of the Global Financial Crisis, the sale of Dairy Farmers Milk Cooperative (which used to be a local Illawarra brand) to National Foods (a Japanese-owned corporation) in 2008, the retail 'milk price war' between Coles and Woolwoths (two major supermarkets in Australia) in 2011, global milk price decline over 2014-16, and significant reduction in milk payments to farmers by some processors in 2016. I excluded media coverage from 2002 to 2008, because I had limited time and resources to analyse those news articles, and focusing analysis around key periods and events was an effective way to address my research aims.

In the following part of this chapter, I firstly introduce my news searching procedure. To facilitate media analysis, I briefly review academic literature on news reporting. I then introduce major characteristics of local news media. Analysis of media data is not only based on the framework described in subsection 3.3.4, but based on critical discourse analysis. Media data is mainly analysed in chapters 6-8.

### 3.4.2 News searching procedure

I retrieved news articles mainly from the database of Proquest ANZ Newsstand, which provided access to all registered newspapers in the Illawarra. I occasionally collected news articles directly from the websites of selected newspapers. I used the following search terms to identify relevant articles: ‘Illawarra agriculture’, ‘Illawarra dairy’ and ‘Illawarra farm’ (including lexical variants of ‘agriculture’, ‘dairy’ and ‘farm’). By searching these terms, I could pinpoint articles with the word ‘Illawarra’ in their content or location information (the region where the news was published). To ensure that relevant articles were identified, I also searched ‘agriculture’, ‘dairy’ and ‘farm’ (without the word ‘Illawarra’) in some major local newspapers. They included Illawarra Mercury, South Coast Register, Kiama Independent and ABC Illawarra. Relevant newspapers and the number of collected articles are listed in Table 3.3. A list of collected articles and their serial numbers are provided in appendix 1. When news articles are referenced in this thesis, only their serial number is referenced.

Table 3.3. Relevant newspapers and the number of collected articles.

Newspaper title	Number of articles	Percentage of total
Illawarra Mercury	220	78.3%
Australian Broadcasting Corporation (ABC) (especially ABC Illawarra)	34	12.1%
South Coast Register	16	5.7%
Kiama Independent	9	3.2%
Canberra Times	1	0.4%
Southern Highland News	1	0.4%
Total:	281	

The distribution of articles over the searching period is shown in Table 3.4. A large proportion of articles are concentrated in the first and third two years (30/06/2000-30/06/2002

and 02/01/2010-01/01/2012). That is due to two major events in these periods, the dairy deregulation (1st July, 2000) and retail ‘milk price war’ (since 26th January, 2011), which attracted much media attention.

Table 3.4. Distribution of news articles over the study period.

	Period	Number of articles				Percentage of total
		Illawarra Mercury	ABC	Other	Total	
1st	30/06/2000-30/06/2002	96	0	1	97	34.5%
2nd	01/01/2008-01/01/2010	26	0	0	26	9.3%
3rd	02/01/2010-01/01/2012	38	12	3	53	18.9%
4th	02/01/2012-01/01/2014	20	15	4	39	13.9%
5th	02/01/2014-01/01/2016	31	5	19	55	19.6%
6th	02/01/2016-30/06/2016	9	2	0	11	3.9%

As most articles are from Illawarra Mercury, I recognise its importance in local people’s economic and political lives. The Illawarra Mercury, founded in 1855, plays a major role in presenting local people’s lives and advocating economic development (Burns, 2014; FM, 2017). It is also important to notice that most newspapers (including Illawarra Mercury) involved in this study are divisions of Fairfax Media, one of the largest media companies in Australasia (Flew & Goldsmith, 2013). The following two subsections present a brief literature review on the features of news reporting and values, which is helpful in data analysis.

### 3.4.3 General news reporting

Since 2000 in developed countries, journalists have two general formulae to structure stories: the inverted pyramid formula and the six-question formula (‘who’ does ‘what’, ‘when’, ‘where’, ‘why’ and ‘how’) (Louw, 2005, p.83). The former puts the conclusion at the beginning of the story to grab the attention of readers. Journalists tend to fill the news with soft or sensationalised stories viewed as more attractive to a popular audience (Earley, 2010). The six-question formula prioritises event-based stories. Newsrooms tend to report social issues as one-off bits of information rather than uncover the underlying social trends



(Hannigan, 2014). In addition to these formulae, journalists tend to prioritise stories that ‘can be presented as easy-to-understand linear narratives’, include ‘binary oppositions (“good guys”/“bad guys”)', are ‘correct’, ‘can preferably be “personalised”’, and have ‘interesting or unusual dimensions which can be used as a “hook”’ (Louw, 2005, p.185).

The framing of news stories follows neoliberal logics due to the policy and business environment (McChesney, 2012). Phelan (2014, pp.61-62) identified five such logics: first, media practices ‘must be justified in market terms’; second, ‘media and social identities’ were increasingly commodified; third, news media privileged ‘individual, rather than collective, identities’ and normalised ‘self-expressive modes of public discourse’ (Stanyer, 2007); fourth, news media increasingly normalised ‘competitive idioms and rationalities’ in public communication; fifth, news media tended to ‘explain publicly visible behaviour and action in narrow self-interested terms’.

The above-mentioned features of news reporting are reflected in news articles surveyed for this thesis. For these articles, news title usually summarises news content and reflects the author’s stance. For example, ‘Reduce speed sign spells it out on milk’ reflects the view that deregulation went too far (#M53). Catchy words are occasionally used in news titles, for example, ‘Dairy regions turn sour on deregulation’ (#M52). News reporting is usually based on events. That makes local newspapers ‘local chronicles’ (Bowd, 2003). News narratives are usually framed around quotations from individual informants. Most articles are shorter than 500 words. This space limit conditions news reporting. For example, coverage on industry events is usually simplified and dispersed in multiple articles; there is almost always no clear explanation why certain events happened; the number of informants or news sources is usually fewer than five; it is usually clear which/who is good or which/who is bad, which conveys a simplified understanding of industry change.

#### **3.4.4 Local news media**

Besides those general features of news reporting, local news media show specific characteristics. Local news media include newspapers issued in suburbs, country towns and small cities (Alysen et al., 2003). Local media have two key functions. As advertising media and business enterprises, local media pursue profits and contribute to local economy. Local

media also archives the history of local communities, and allow local residents to express their views (Franklin, 2006).

Local media primarily serve local areas or regions. Local news is prioritised and is pitched at local audiences (Bowd, 2003). Many local newspapers work with their local government to confront a challenge or embrace an opportunity for their community (Richards et al., 2011). Local media are also a window for outsiders to look in and influence people's perception of this region (Neveu, 2002). Local media usually act for the benefit and advancement of their region through fiercely advocating it (Bowd, 2012) and highlighting the success of local enterprises (Alysen et al., 2003). Economic expansion is usually emphasised in news reporting. Items related to contraction are largely absent (Vine, 2012). If local media's circulation region covers country towns, journalists tend to highlight the country idyll (Bowd, 2003). Country towns have been marketed as 'an imaginative refuge for urban sprawl'; country life has been associated with 'health, morality, safety, friendliness and pace of life' (Prows, 2012, p.91). Loo (1994) criticised this developmentalist journalism as subjective and propagandistic. Although local journalists are viewed as advocating for their community, it is unclear which local groups (e.g. middle-class groups or farmers) they mainly speak for, and what kind of economy (e.g. based on services or agriculture) they advocate. This study sheds more light on these issues.

Despite the subjectivity, local media have served as a research source for investigating social issues (Dibden & Cocklin, 2010; Prows, 2012). The real-time reporting of farmers' experiences of industry events can reflect farmers' attitude towards those events at that time.

### **3.4.5 Media analysis**

The reviewed literature demonstrates salient features of news reporting. Based on this knowledge, I not only analysed media data based on the same framework for analysing interview data, but employed critical discourse analysis (CDA). Media data was analysed with interview data, as news articles involve a large amount of quotations from local farmers and relevant stakeholders. CDA aims to understand what structures or strategies of discourses assist in the reproduction of social dominance and inequality (van Dijk, 1993). CDA was considered in this study, as local news is usually not impartial. Local media, as natural allies with local farmers, can help them convey their predicament to the public and gain public

support. Traditionally, news media have functioned to steer public opinion and legitimate social arrangements (Hannigan, 2014).

To analyse media data, I firstly organised news articles based on chronology approaches (arranging major events in chronological order) and analytical framework approaches (categorising news articles according to research questions) (Patton, 2002). I then coded news materials according to different topics, for example industry restructuring and urban sprawl (descriptive coding), and specific research questions, for example how farmers shaped their operation in response to economic trends (structural coding) (Saldaña, 2009). I also developed sub-codes to designate what farmers were doing specifically (process coding), farmers' feelings and experiences (emotion coding), farmers' values and attitudes (value coding), conflicts and power relations in the dairy market (versus coding), various industry players' evaluation of agricultural policies or programs (evaluation coding), and narrative lines of industry changes and farmers' lives (narrative coding) (Guest & MacQueen, 2008; Saldaña, 2009). A model for industry changes and farmers' responses (see section 2.6) was then established mainly based on interview data and media data.

Besides this procedure, I also noted the influence of discourses in news articles. Cox (2006) depicted discourse as the pattern of meaning communicated through written texts, other symbols or interactive events. Hannigan (2014) described discourse analysis as the analysis of intertwined narrative frames which explain the world and become embedded in socio-political institutions, agenda setting and legitimate claims. CDA is a framework for understanding how discourses shape individual viewpoints, and understanding the nature of social power consolidated through discourses (Bax, 2011). Social power is linked to privileged access to resources, and is founded on privileged access to discourse and communication. Dominant social discourses function to manufacture consent and legitimacy of dominance (Herman & Chomsky, 1958). CDA is especially motivated by urgent social issues, which makes it relevant to this study. Dairy farmers have long suffered industry restructuring. Discourses supporting farmers and discourses legitimating industry restructuring both exist in local news.

CDA can be started with asking the following questions:

1. What does the text aim to do?
2. How does the text influence readers?
3. What patterns are there in the text?
4. How does the text reflect on or construct a social problem?
5. What ideologies or viewpoints are revealed in the text?
6. How does the text reinforce its ideologies?
7. How does the text service social relations of power?

(Bax, 2011, pp.143-145)

For question one, I explored what journalists aimed to achieve by presenting news related to local farmers, and whether they tended to support farmers by reporting farmers' concerns. For question two, I explored how journalists selectively presented certain groups' comments on industry changes. I applied question three to the whole media data. For question four, I explored how journalists presented industry changes as problematic for local farmers. For question five, I explored what viewpoints existed in the discussion of industry changes. For question six, I explored which viewpoints were made dominant in news reporting. For question seven, I explored how news content was made to support certain groups, such as local farmers, and oppose others, such as major supermarkets.

Some persuasive strategies of discourses, which can facilitate analysis, are listed in the following:

1. Semantic content: statements that negatively evaluate 'them' (e.g. major supermarkets) or positively comment ones of 'us' (e.g. local farmers);
2. Argumentation: facts based statements (e.g. farmers receiving lower milk payments);
3. Rhetorical device: hyperbolic presentation of 'their' negativenss (e.g. major supermarkets threatened local businesses) and 'our' positiveness (e.g. local farmers contributed to local community); euphemisms or understatements of 'our' negative actions;
4. Lexical style: choices of words and phrases that imply negative or positive meanings;
5. Story telling: telling about negative or positive events as personally experienced with plausible details (e.g. farmers were pressured to sell their farm);

6. Quoting credible witnesses or authoritative sources (e.g. quoting relevant researchers);
7. Structural emphasis, for example in headlines, summaries, or other properties of text schemata.

(van Dijk, 1993, p.264)

Overall, my general framework for analysing qualitative data helped organise data and build an overall model, and CDA helped to gain further insights into the views of dairy farmers, and into how farming and industry change were understood and presented in the print media in the Illawarra.

### **3.5 Summary**

This study firstly inquired into Illawarra dairy farmers' way of life, experience of agricultural restructuring, choices to cope with restructuring pressures, and potential opportunities and challenges. I also surveyed local media coverage on agricultural change. The commercial pressure on media companies can influence news reporting on complex social issues, such as agricultural restructuring. Local journalists can have a specific approach towards local economic development. The empirical data was organised and analysed to establish a model of change-driving factors for local agriculture, farmers' experiences and responses, potential consequences and future trends. To provide context for the empirical chapters, the next two chapters provide history and background for dairying in Australia and the Illawarra.

## **Chapter 4 Australian Dairy Industry**

### **4.1 Introduction**

To facilitate analysis on Illawarra dairying and to underpin my analysis of interviews and media, chapter 4 presents the restructuring of the Australian dairy industry, as analysed using public data. Dairy restructuring in the Illawarra is connected to national processes of agricultural change and neoliberalisation. I introduce dairy policy reform and depict transformations of the domestic dairy supply chain after the 2000 deregulation. Farmers' coping strategies involve three identifiable themes: expansion, intensification and conversion to alternatives. They reflect both productivism and non-productivism. Intensification involves increased input uses, adoption of new technologies/equipment, and breeding cows for better performance. Apart from innovation within conventional dairying, the most salient alternative is organic dairy which has grown rapidly in market value. In recent years, farmers' major challenges include low milk prices, labour shortages and environmental degradation.

### **4.2 Overview**

Judged on the farmgate value of production, dairying is the third largest rural industry in Australia (ADIC & DA, 2014). In 2016/17, 5,804 dairy farming businesses produced around 9.1 billion litres of milk (ABARES, 2017). Three main farm business models exist in Australia: owner operators (farm owners manage their business), sharefarming/co-investment (the farm owner and sharefarmer(s) owning part of the business operate the business together), and leasing (landowners lease out the farm) (ADIC & DA, 2014). The most popular cow breeds include Holstein Friesian (70%), Jersey and Jersey-Holstien (Khan et al., 2010). The main source of home-grown feed is grazed perennial pastures (Pembleton et al., 2015). Farmers supply two main markets, as shown in Table 4.1. As a large proportion of dairy products are exported, international commodity prices strongly influence farmgate pricing for most dairy farmers in NSW and Victoria (ADIC & DA, 2014).

Table 4.1. Two main milk markets in Australia.

	The manufacturing milk market	The liquid milk market
Product processing	Milk will be processed into products such as milk powder and cheese.	Milk will be bottled/packed.
Proportion of products exported	Nearly 60% of manufactured products in milk-equivalent terms.	Around 5% of liquid milk.
Major suppliers	Victorian farmers, who produced around 65% of Australia's milk for most of the last decade, mainly supply this market.	Farmers in NSW and Queensland mainly supply this market.
Required production mode	This market allows farmers to batch calve and take advantage of peak feed supply.	This market normally requires farmers to supply on a year-round basis, with nearly even production throughout the year. Year-round production can be more costly due to the need for high-quality feed all year round.

Source: NSW DPI, 2014, 2015.

### 4.3 General trends

From around 1985, global milk production increased by over half (NSW DPI, 2015). Many industrial countries experienced an oversupply of milk. The USA and European Union (EU) have long been committed to price supports and subsidies to protect their farmers (Lockie, 2015; Paul, 2012). However, Australia progressively opened its market to international competition, and Australian farmers experienced continuous market competition pressure (Table 4.2).

Table 4.2. Australian dairy farmers' changing economic and policy environment.

Period	Economic situation	Policy
1970s	Australian dairy farmers' terms of trade declined rapidly partly due to the formation of the European Common Market (Barr, 2014).	State statutory marketing authorities regulated milk production through quota systems, and controlled farmgate and retail milk prices. Trading of liquid milk across Australian state borders was restricted. Farmers received government support payments for exporting dairy products. Despite the strong protectionism, adjustment schemes incentivising unviable farmers to leave the industry commenced (Gray et al., 2014; Sinclair et al., 2015).
1980s	Farmers' terms of trade steadily declined. Farm amalgamation through absorbing neighbouring farm(s) was widespread (Barr, 2014).	Reforms in tariff, farm support and statutory marketing authorities escalated (Sinclair et al., 2015).
1990s	The number of dairy farms stabilised (Barr, 2014).	Support payments for exporting dairy products were progressively reduced (Gray et al., 2014).
2000s	Farmers' terms of trade stabilised. However, farmers experienced the millennium drought and Global Financial Crisis. In 2003, the drought was recognised as the worst on record. In 2006, annual rainfall was 40-60% below average for most of temperate Australia (Ummenhofer et al., 2009). Before 2006, easy credit engendered escalating land values. The 2007/08 crisis restrained debt financing. Farmland for sale was less likely to be acquired by dairy farmers (Barr, 2014).	Dairy policy reform culminated in nationwide deregulation of the dairy industry in 2000 (Gray et al., 2014). The Australian dairy industry also faced reduced government funding for extension services (education, vocational training and technical services for farmers) with inadequate contribution from the private sector to fill this gap (ADIC & DA, 2014).

Given the significance of the 2000 deregulation, it is important to clarify its details. The idea for deregulating the Australian dairy industry had its genesis in the 1995 National Competition Policy, which asked all Australian states to reform anti-competitive regulations (Gray et al., 2014). The Victorian dairy industry, with large production volumes and



comparatively low production costs, viewed deregulation as a market opportunity and strongly advocated for it (Cocklin & Dibden, 2002). A nationwide process of deregulation was then conducted in July, 2000 (Sinclair et al., 2015). Its measures included: the dismantling of state statutory marketing authorities who had controlled the prices of liquid milk; the cancellation of the Commonwealth Domestic Market Support Scheme that provided payments to farmers for manufacturing milk; allowing the trade of liquid milk across Australian state borders (NSWDPI, 2015). The federal government established a nine-year adjustment package to provide assistance payments to farmers (Gray et al., 2014). Total payment per farm was around AUD\$100,000 in Victoria and AUD\$230,000 in NSW (NSWDPI, 2015). The Victorian dairy industry benefited most from national market liberalisation and quickly began to expand their market share. After deregulation, the only major government involvement was administration of food standards and safety assurance schemes (ADIC & DA, 2014).

The economic and policy changes have created significant pressure on Australian dairy farmers. For example, from 1978/79 to 2012/13, dairy farmers' terms of trade declined by nearly 80%; the number of dairy farms declined by 64.3% (the highest compared with other major agricultural industries); the number of dairy farmers below 35 years old also declined by around 77%; Australia's total dairy area fell by 48.5%, and Australia's milk production was increasingly concentrated in Victoria (from 58% to 65%), shifting from NSW (from 16% to 12%) (Ashton et al., 2014; Barr, 2014). Behind these statistics was a process of comprehensive structural adjustment in terms of business models, physical operations and the socio-cultural dynamics of dairying. The next three sections present more details on how deregulation has influenced the domestic dairy supply chain.

#### **4.4 The farm sector**

Before discussing the impacts, I clarify how the farm, processing and retail sectors are connected, as shown in Figure 4.1. When deregulation allowed the interstate trading of liquid milk, processors' marketing strategies were rescaled to the national level (NSWDPI, 2015). In the north, the supply region of NSW dairy industry spread from Sydney to the growth corridor from the Central Coast to Brisbane. Victorian milk was also supplied to Sydney and Brisbane (NSWDPI, 2015).

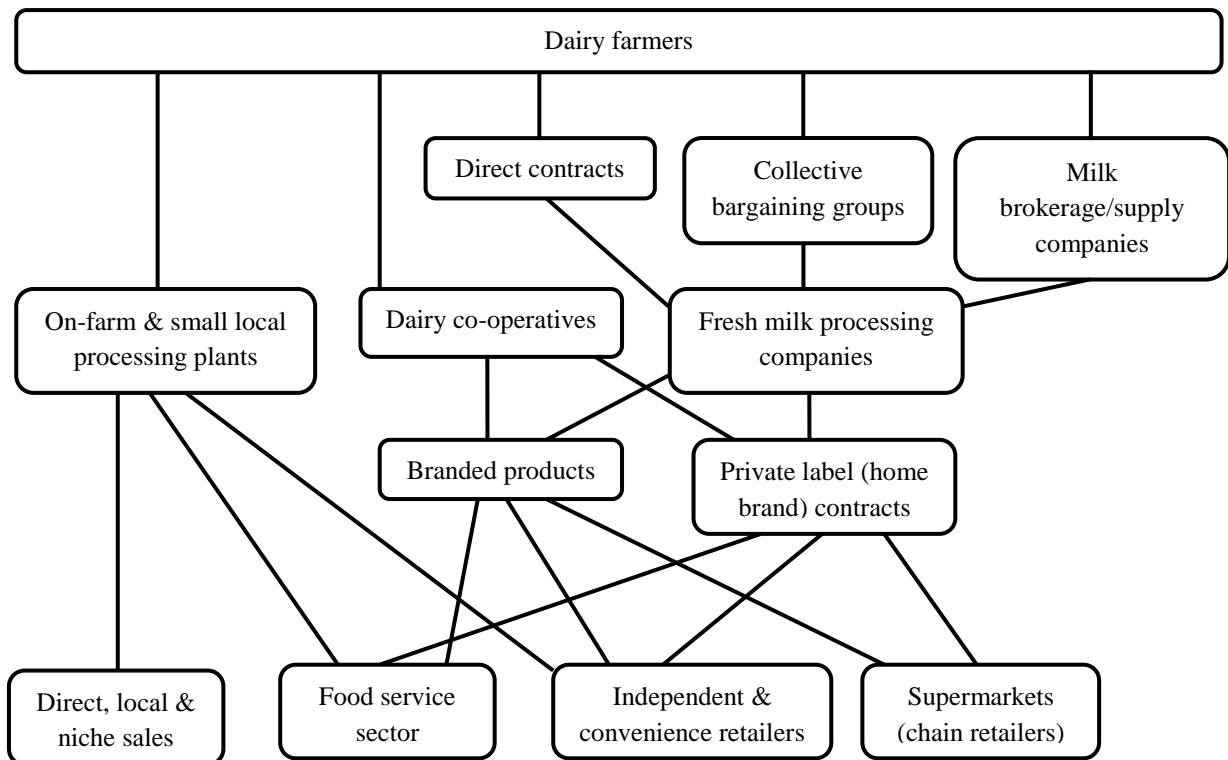


Figure 4.1. The structure of Australia's domestic dairy supply chain (adapted from Dibden & Cocklin, 2010).

Due to increased competition in the liquid milk market and the decline of government supports, in the period immediately after deregulation, the average farmgate milk price declined by 26% in NSW and Queensland, and by 3% in Victoria where only a small proportion of milk supplied the liquid milk market (ABARE, 2001). Since then, farm income has remained volatile (Ashton, 2014). Another blow was the Global Financial Crisis which slashed Australian dairy farmers' average rate of capital return from 7% (supported by a strong demand for land in most dairy regions) to below 1%. The low return lasted to 2013 (Ashton, 2014). With these challenges, from 1999/2000 to 2013/14, nearly every year over 40% of small farms (below 200 cows in milk) had negative farm business profit (incurring a loss), with around 20% of medium farms (200-350 cows in milk) and 15% of large farms (over 350 cows in milk) having negative profit (Ashton, 2014). With negative profit, a farm cannot cover the costs of unpaid family labour or set aside funds to compensate depreciating farm assets.

Market competition drove many farmers to leave the industry, especially small-scale operators. In Australia and NSW, the number of dairy farms, and milk production both

declined (Table 4.3). Nevertheless, those farmers remaining in business could be more capable and innovative. The question is have farmers compromised the long-term development of their farming systems for immediate survival?

Table 4.3. Dairy statistics of Australia and NSW from 1999/2000 to 2016/17.

	Australia	NSW
The number of dairy farms	Declined by 53% with the number of small dairy farms declining by more than 66%.	Declined by 62% with around 880 farmers left.
Milk production	From 1999/2000, it peaked in 2001/02, and declined by 19.9% to 2016/17.	Declined by 23.9%.

Source: adapted from ABS, catalogue no. 7503.0 and 7120.0; Dairy Australia, 2019; NSW DPI, 2014.

#### 4.5 Processing sector

Driven by deregulation, the processing sector underwent considerable consolidation, resulting in a small number of dominant processors and a decline in farmer-owned cooperatives. Globally, milk processing is dominated by multinational corporations (Britt et al., 2018). Australia's milk processing has been controlled by four large corporate firms. These include the Murray Goulburn Cooperative (MGC) (with considerable foreign investment; processing around 33% of Australia's milk), Japanese-owned Lion Dairy & Drinks (LDD), New-Zealander-owned Fonterra, and Italian-owned Parmalat (NSW DPI, 2014). Farmers-owned cooperatives only process around 2% of Australia's milk (Neales, 2015). Another factor contributing to this situation is the global dairy market. In the previous decade, the increase in exports of both liquid milk and milk powder from Australia especially into China has attracted foreign investment into Australia's milk processing sector (NSW DPI, 2015).

NSW underwent a similar trend of consolidation to that observed at the national scale. Its processing landscape was significantly changed when MGC entered the east coast liquid milk market in 2013 through an unprecedented ten-year contract with Coles (NSW DPI, 2014). MGC built a processing plant in western Sydney, which takes a significant amount of milk from the Illawarra. In 2015, major processors' shares of the NSW milk market were as follows: MGC 30%, Parmalat 17%, Norco (a farmers-owned cooperative) 15% and Dairy

Farmers Milk Cooperative (owned by LDD) 12% (NSWDPI, 2015). Competition between processors for milk supply to win supermarket contracts can strengthen farmgate milk prices. However, since 2011, major supermarkets significantly discounted their home-brand milk, and in 2012, NSW suffered a 9% drop in dairy exports. Over the medium-term, farmgate pricing has been driven downward (NSWDPI, 2014).

The domination of corporate actors has changed commercial relations between processors and farmers. That can be exemplified by the subtropical dairy industry in southeast Queensland and northern NSW (Sinclair et al., 2015). Before deregulation, farmers' cooperatives owned milk-processing plants in this region, and took all milk that farmers supplied. Farmers had a strong say in milk pricing. Processors funded government dairy advisors to provide their suppliers with free counselling, and close relationships existed between government agencies, processors and suppliers. After deregulation, two private processors (Parmalat and LDD) came to dominate milk processing, and set standards for their suppliers. Processors introduced individual supply contracts to manage volume and quality of milk supply with various penalties and incentives. The processor-imposed standards resulted in greater processor control and functioned to drive out inefficient farmers (Dibden & Cocklin, 2010). Previous advisory services were replaced by fee-based services run by processors' field officers. Without processors' funding, the government withdrew extension support to farmers. In turn, the two processors were dominated by two retailers (Woolworths and Coles) requiring large quantities for their home-brand milk. Processors strove to expand and win a home-brand milk contract. Due to the fierce competition, processors restricted information sharing (Sinclair et al., 2015). While these changes in certain dairy regions have been well documented, more research is needed to clarify how deregulation has transformed political economic relations in the Australian dairy industry, and has intertwined with other key trends e.g. urban sprawl.

#### **4.6 Retail sector**

Deregulation allowed retailers to set retail milk prices. With this advantage, major supermarkets began to exert control over the liquid milk market through setting private standards and other requirements (Sinclair et al., 2015). With the domination of major supermarkets, farmers have little direct influence over milk pricing (Pellett, 2013). From 1998 to 2003, while the retail price for packaged milk remained similar, the farmgate price

declined by around 40% (Dibden & Cocklin, 2010). A major event which raised considerable public concern is the 2011 ‘milk price war’ between Coles and Woolworths (Richards et al., 2012). Initially, Coles cut the per litre price of its home-brand milk to AUD\$1, cheaper than bottled water. Woolworths, despite acknowledging that such a price would negatively impact farmers, immediately announced a price cut to match that of Coles. Supermarkets could sell milk as a ‘loss-leader’ (with prices lower than costs) by cross-subsidising through profits from other products (Lawrence et al., 2013). The retail competition coupled with disruptions from changes in private label supply contracts created uncertainty and weakened confidence in the future of the dairy industry, reinforcing trends towards fewer and larger farms (ADIC & DA, 2014; Lawrence et al., 2013).

#### **4.7 Farmers’ general coping strategies**

Under fierce market competition and new supply chain relations, remaining farmers have needed to review their competitive strategies. The following case of subtropical dairy industry shows that deregulation engendered a competitive, individualised culture. Sinclair et al. (2015, p.123) quoted producers’ and relevant stakeholders’ comments: ‘Everyone is looking for a bit of a competitive edge over their neighbour’; ‘There is no unity... we are all individual businesses and it’s like we are all against each other’; ‘I’ve always said that since deregulation the more farmers that go out, the better it is for the ones who stay in.’ Sinclair et al. (2015, p.124) also indicated that before deregulation, state and national industry organisations would ‘all lock together and help each other’; however, after deregulation such cooperation has diminished, for example, ‘[Queensland Dairy Organisation] do not see themselves as part of the Australian dairy industry rather they see themselves as part of the Queensland dairy industry’.

Increased competition did help to drive productivity (the ratio of outputs to inputs) growth. From 1979 to 2000 (before deregulation), annual productivity growth by average farm was 1.7%. From 2001 to 2011, productivity growth was 2% (Gray et al., 2014). In NSW, from 1979/80 to 2013/14, annual production per cow increased from 2,870 to 5,274 litres (NSWDPI, 2014).

Productivity growth reflects an increase in farm output. From 1978/79 to 2012/13, the average value of milk production per farm increased from AUD\$120,000 to AUD\$500,000

(Ashton et al., 2014). That was supported by increased capital investment. From 1999/2000 to 2013/14, average farm capital increased from AUD\$1.9 million to AUD\$3.7 million (Ashton, 2014); in NSW, the average number of cows in milk per farm increased from 155 to 268 (by 73%) (NSWDPI, 2014). The increased capital was based on debt financing. From 1999/2000 to 2013/14, average farm business debt for large farms increased from AUD\$1,100,000 to AUD\$1,750,000. For medium farms, debt doubled from AUD\$500,000 to AUD\$1,000,000, while for small farms debt levels remained stable (AUD\$250,000) (Ashton, 2014). In 2013/14, interest payments represented 9% of average farm cash receipts and was the second largest cost item, only behind fodder (ABARES, 2014a). In NSW, average debt per farm was AUD\$1,027,680 in 2015/16, around 25.6% of farm capital (ABARES, 2018a).

The increase in capital since deregulation was not supported by commensurate changes in larger farm area. Since 2000, the average farm area has been stagnant (Ashton et al., 2014). Productivity growth was underpinned by increased input use. From 1979/80 to 2009/10 in Australia's dairy farm sector, total material inputs doubled, while total land, capital and labour were all halved (Ashton et al., 2014). Intensified use of inputs has two directions: increased consumption of commodity feed, and intensified pasture-based feeding through increased fertiliser uses (Ho et al., 2013). Farmers usually consider both directions, as neither of them can guarantee a high capital return (Fariña et al., 2013).

For the first direction, from 1991/92 to 2012/13, the proportion of farmers using commodity feed increased from 81% to 92% (Ashton, 2014); the quantity of concentrates, grains and by-products fed per cow annually increased from 0.7 to 1.7 tonnes (NSWDPI, 2014). In 2012/13, fodder was the largest component (29%) of farm operational costs (ABARES, 2014a). This use of commodity feed boosted milk production among Australian dairy farms (Ashton, 2014). In 2012/13, herds fed over 2.5 tonnes of fodder per cow annually produced an average of 8,388 litres per cow, compared with 4,605 litres of herds fed solely on pasture; and 38% of dairy farms in Australia fed each cow over 1.5 tonnes of grains annually and produced 53% of Australia's milk (NSWDPI, 2014). Although farms using more commodity feed generally have a higher cow productivity, they are more vulnerable to fluctuations in input and milk prices (Bell et al., 2014; Shadbolt, 2012).

Farmers have also increased fertiliser use. In 2012, 76% and 74% of dairy farms respectively used urea (produced from natural gas) and superphosphate (produced from non-renewable phosphate rock with no synthetic alternative) (Ashley et al., 2011; Cordell et al., 2009; Watson & Watson, 2012). In 2012/13, fertiliser represented 6.8% of average farm costs (NSWDPI, 2014). In 2010/11, better-performing farms (measured by productivity) on average used over twice the amount of fertiliser per hectare than lower-performing farms; 63% of farmers conducted soil tests to optimise fertiliser use; among better-performing farms, a higher proportion conducted soil tests (Ashton et al., 2014). In addition, around 70% of farms used ponding systems to recycle effluent nutrients back to the farm (NSWDPI, 2014). With higher pasture production, farmers have increased stocking rates.

Besides intensification, new technologies and equipment, including milking machinery and herd genetics, have also boosted productivity. Since 1990, milking equipment was improved constantly to reduce milking time, improve labour efficiency and cater for larger operations (Ashton et al., 2014). From 1991/92 to 2012/13, utilisation of old-style walkthrough milking sheds declined from 23% to just 6% of farms; the proportion of herringbone milking sheds (with improved layouts for higher cow production) increased from 73% to 81%; and the proportion of rotary milking sheds (suited large herds) increased from 4% to 13% (Ashton, 2014). Noticeably, the use of capital-intensive rotary sheds peaked in 2008/09 (Ashton, 2014). In NSW, milking equipment also kept improving, with herringbone sheds the most popular (NSWDPI, 2014). Additionally, farmers have tried to improve cow performance through breeding and genetics (Ashton et al., 2014). Greatly improved accuracy of genomic selection for yield and health traits would keep boosting production if used more (Britt et al., 2018).

Besides expansion, intensification and technology adoption, some farmers chose diversification strategies, for example converting to organic farming, building milk-processing facilities, and running on-farm tourism (Sinclair et al., 2015). From 2011/12 to 2014/15, around 74% of dairy farmers had off-farm income (Ashton et al., 2016).

Overall, farmers have largely chosen a path where ‘genetics-based breeding activity is integrated with the development and use of synthetic chemical fertilisers... and new machinery’ (Hogg, 2000, p.96). Farmers are hitting some limits on what more they can do without costs being incurred somewhere in the production system. Firstly, intensified pasture use places greater stress on physical resources (Sinclair et al., 2015). Research indicates that

many farms are reaching their economically optimal level of pasture consumption (Pembleton et al., 2015). Secondly, intensified use of inputs means increased greenhouse gas emissions and a larger environmental footprint of Australian dairy industry (Bell et al., 2014; Gollnow et al., 2014). For example, from 1990 to 2012, nitrogen use efficiency declined from 40 to 26% for the average Australian dairy farm, and there have been more serious nitrogen losses to the environment (Stott & Gourley, 2016). Most milk processors have been lukewarm in efforts to drive farmers to improve their environmental management (Dibden & Cocklin, 2010). Thirdly, increasing consumption of external inputs often engenders substantial infrastructure costs and exposes farmers to greater financial risk (Sinclair et al., 2015). Market prices for key inputs (e.g. feed and energy) have shown increased volatility (Raedts et al., 2017). Moreover, most agricultural machinery and the production of most farm inputs (e.g. feed and synthetic fertiliser) depend on fossil fuels (Beilin et al., 2012). A key issue is peak global oil production and constrained energy supply for agriculture (Palmer, 2014). Finally, an overemphasis on high production has negatively influenced cow fertility (Oltenucu & Broom, 2010). In the year-round calving herds of NSW, cows have shown a tendency towards taking longer to conceive (NSWDPI, 2015). Given these limits, total factor productivity for Australian dairy farming remained relatively stagnant from 2009/10 to 2017/18 (Boult et al., 2018). It is important to clarify how farmers have tried to identify new opportunities (e.g. alternative farming approaches) for improving business performance.

#### **4.8 Automation and precision dairying**

Automation technologies have been emphasised as opportunities for further productivity growth (Ashton, 2014). Lyons et al. (2016) surveyed 301 farmers and found that the most commonly installed milking-related technologies included automatic cup removers (71% of farmers), herd management software/computers (60%), automatic milk plant wash systems (43%), automatic in-parlour feeding (37%) and electronic identification (35%). Improving milking efficiency is crucial for productivity growth, as it takes around half of farm labour (Ashton et al., 2014). Adoption of automation technologies is more common among medium and large farms which usually have more financial resources for technology adoption (Mackinnon et al., 2010).

Automation technologies usually have fine-level data collectors enabling precision dairy (PD). PD technologies measure physiological, behavioural and production indicators on individual



animals to optimise animal performance (Borchers & Bewley, 2015). They also track indicators of physical and other resources to maximise economic, social, and environmental farm performance (Eastwood & Jago, 2012). PD involves various technologies such as electronic identification, milk meters, individual feeding systems, and variable rate fertiliser application (Bramley, 2009). An example, observed at several farms visited for research on this thesis, is collar-based cow health and fertility monitoring systems. The device is attached to the cow by a collar, and monitors the cow's heat, rumination pattern and level of activity (Harty et al., 2015). Another example is herd management software such as Easy Dairy, which allows farmers to import cow information such as mating records, calving dates and herd test data (EDAS, 2017). It has also been widely used among my research participants.

An extreme form of automation and PD is robotic milking systems (RMSs) which generally require no human intervention in harvesting milk. Globally, over 35,000 RMS units are operational (Salfer et al., 2017). Adoption has increased rapidly (LeBlanc, 2016), especially in northwestern Europe and North America (Steenefeld et al., 2012). Robotics are usually viewed with great prospect by researchers (Britt et al., 2018). This emerging field of technology-driven agricultural production raises many questions (e.g. how have farmers' working routine and lifestyle been influenced) for social scientists (Butler et al., 2012).

RMSs generally consist of milking stalls, a teat detection system, mechanical arms with teat cups, teat cleaning and disinfecting systems, and a milking machine (Hansen, 2015). Cows each wear a collar with radio tags enabling the RMS to identify them. When a cow walks in the milking machine, a robotic arm pinpoints the cow's teats and attaches a teat cup to each teat for milking (Pellet, 2013). The cow's milking parameters will be recorded and used to decide the amount of feed for each cow (Sitkowska et al., 2015). The RMS can sample milk and test for infections (Holloway et al., 2014). Unlike other technologies, usually attached to the conventional milking system, RMSs require a holistic system redesign in terms of herd management, paddock and shed layout, and feeding approach (Ashton et al., 2014). RMSs have been adapted to pasture-based systems in Australasia by utilising voluntary cow movement to milking stalls (Pellet, 2013). Instead of being herded to the milking shed twice or three times per day, cows are free to visit the RMS as many times as they wish throughout the day (Holloway et al., 2014). Voluntary cow movement can be facilitated by redesigning paddock layout to keep cows close to the RMS and providing feed at the RMS (Ashton et al., 2014).

In the Illawarra, a relevant choice is the Lely Astronaut A4 milking robot, which is a box-style machine large enough for one cow to walk through. There is a trough at one end of the cubicle where cows are provided with feed. Under normal conditions a single robot can milk 55 to 70 cows per day (Lely, 2017). Lely (a Dutch-based company) has manufactured a large proportion of the milking robots installed globally (Butler et al., 2012). Box-based RMSs are the most popular in Australia (Pellet, 2013).

RMSs have been available in Australia for over 15 years, but the proportion of dairy farms using RMS is only around 0.5% (Pellet, 2013). According to a survey of European farmers, the proportion of cows milked automatically was also just 9% (Holloway et al., 2014). The low adoption rate in Australia is primarily determined by the prevalence of pasture-based grazing systems. Advantages and disadvantages of RMSs for Australian farmers are presented in Table 4.4. Overall, academic literature presents no clear evidence of advantages for farm productivity and cow health and welfare (Holloway et al., 2014; LeBlanc, 2016).

Table 4.4. The proposed advantages and disadvantages of RMSs.

	Proposed advantages	Proposed disadvantages
1.	If properly installed and operated, RMS theoretically can significantly reduce labour use (Holloway et al., 2014)	Most RMSs on the market derive from Europe where indoor feeding and milking arrangements (shedding systems) dominate. Under pasture-based systems, there is uncertainty over the best management practice and the ability to succeed. Significant changes to existing farming systems are needed to establish RMS. That creates uncertainty over post-installation performance (Eastwood & Kenny, 2012).
2.	RMS takes over the drudgery of milking and reduces repetitive strain injuries. Conventional milking usually requires operators to start working in the early morning, occupies over four hours per day for repetitive physical work, and requires other tasks to be planned around strict milking times (Hansen, 2015).	The capital expenditure of building a box-based RMS, including machinery and infrastructure, is significantly higher than that of building a conventional milking system with the same capacity (Butler et al., 2012).

3.	RMS reduces human-animal interactions and the risk of certain zoonotic diseases (Moyes, et al., 2014).	Reliable maintenance services may not exist. The Australian market for RMSs is too small and too broadly spread geographically to enable a viable business proposition for specialised service providers (Eastwood & Kenny, 2012).
4.	Farmers can have a normal workday lifestyle. With more flexibility, farmers can use their time more productively, prolong their working life, and have more time for socialising. RMS can make dairying more attractive for young people thus assisting with succession planning (Butler et al., 2012).	The need for knowledge and skills to master RMS can be challenging for farmers who are usually relatively old and busy. RMS retailers and industry service providers have not sufficiently facilitated the needed knowledge transfer networks (Eastwood & Kenny, 2012).
5.	RMSs can improve animal welfare. In conventional milking, cows are herded to the milking shed and stay crowded for hours. Cows usually develop a hierarchy with low-ranking cows undergoing maltreatment by high-ranking ones. Through voluntary and individual milking, RMSs can free cows from such stress and allow cows to be milked more frequently (Holloway et al., 2014).	RMSs can restructure farmers' working routine in an unpleasant way. Farmers to a certain extent have to respond to what the data tells them about herd management needs. Farmers can be contacted by robots 24 hours a day when problems occur (Butler et al., 2012).
6.	RMSs generate abundant physiological data about individual cows, which can enable better cow health and activity management (Tse et al., 2017).	Selection of valid health indicators remains challenging. Detection of diseases still need farmers' skills and experience. How to treat mastitis with RMS-based detection requires more research (LeBlanc, 2016).
7.	Milking robots can be more easily unbolted and moved than conventional milking equipment (Butler et al., 2012).	Expanding the milking capacity of the RMS can be more costly than expansion in conventional milking. Expansion not only means introducing a new robot, but requires adjusting the structure of existing buildings (Butler et al., 2012).

Although existing research focuses on technical and institutional factors which enable RMSs, adoption of RMS is also related to farmers' economic environment. RMS like many PD technologies, as a large and long-term investment, can be discouraged in the economic environment characterised by volatile milk prices and low profitability (Higgins et al., 2017).

Despite the potential of PD, only around 10-20% of dairy farmers in Australia are actively engaged with PD technologies (Jago et al., 2013; Mackinnon et al., 2010). In 2016/17, the replacement value of information and communications technology assets (e.g. computers, phones, radios, GPS, devices and software) held per Australian dairy farm was below AUD\$10,000 (Dufty & Jackson, 2018). Ho et al. (2013) studied two Victorian dairy farms with consistently good capital returns. Both farms tightly controlled costs but did not show a high level of technical optimisation. Low technology adoption can discourage further improvement and adaptation of new technologies to local farming environments. Many PD technologies are originally designed for European and North American systems (Yule & Eastwood, 2012). A study on Australian PD farmers identified steep learning curves and associated costs usually not expected by farmers (Eastwood & Jago, 2012). An unresolved tension is how political economic trends, such as deregulation, have influenced farmers' technology adoption?

#### **4.9 Organic dairy**

Apart from innovation within conventional dairying, converting to organic farming provides a survival strategy for some farms. Organic principles propose removing some practices of conventional farming which push cows to production levels beyond their natural capacity (AOFD, 2013). In certified organic dairy (OD) farming, there is restricted use of antibiotics, growth promotants, fertility hormones, artificial fertilisers, insecticides and herbicides on grazing pastures. All agricultural origin feed should be sourced from certified organic sources and feedlotting of livestock without free access to pastures is prohibited (Australian Organic, 2016; AOFD, 2013). As a range of different inputs have to be used, an OD farming system can be significantly different from its conventional counterpart.

OD can have animal welfare and environmental benefits, although they are highly contested (Sundrum, 2001). A Brazilian study showed that OD farms had lower incidences of mastitis, spontaneous abortions and calf mortality compared with conventional farms (Silva et al., 2014). OD can minimise greenhouse gas emissions and nutrient loss (Halberg et al., 1995; Refsgaard et al., 1998). OD can also be more energy efficient due to the production of forage in grass-clover leys (Smith et al., 2015).

As for economic performance, a Finnish study indicated that OD farmers could produce 5.3% more if they used conventional technologies, and that OD farms were, on average, 5% less efficient than conventional farms (Kumbhakar et al., 2009). Another Finnish study indicated lower technical efficiency of OD farms (Lansink et al., 2002), while research in the US context indicated that OD technology was 13% less productive than conventional dairy technologies (Mayen et al., 2010).

In Australia, OD farms are mostly family owned and on average smaller than conventional dairy farms (Australian Organic, 2014). OD can potentially increase farmers' adaptive capacity to the current policy and market environments due to more stable milk prices (Bouttes et al., 2018). The value of Australia's certified organic dairy industry grew by 18% annually from 2012 to 2014. In its domestic market, 12% of consumers bought OD products from market/farmers' markets. These niche markets provided farmers with premium milk prices (Australian Organic, 2014). In 2014, the export value of OD products was AUD\$53 million (16% of total organic exports), compared with AUD\$3 billion of conventional dairy exports (8% of total agricultural exports) (Australian Organic, 2014). As OD is a relatively small segment of the overall dairy industry, there is an absence of studies on its social aspects and political economic risks/benefits in Australia. It is valuable to examine the potential contribution of OD to local agriculture (e.g. offering alternative farming techniques) and the viability of dairy farms.

#### **4.10 Recent challenges**

Despite those opportunities, a 2013 national survey showed that the proportion of dairy farmers positive about the future of the industry was 43%, the lowest since inception of the survey in 2004 (NSWDPI, 2014). A 2013/14 survey on NSW farms found that major issues included milk prices, labour shortages, succession planning and seasonal conditions (climate change) (NSWDPI, 2015).

Milk prices are at the center of farmers' challenges, as milk prices to a large extent determine farmers' financial performance and ability to cope with environmental challenges, and therefore the attractiveness of farming as a career. From January 2014 to July 2015, Global Dairy Trade, the international platform for trading processed products, witnessed a halving of average auction prices (NSWDPI, 2015). This reflected a potential long-term global milk

oversupply (Lockhart et al., 2016a). The oversupply was largely unforeseen, as global prices have increased strongly since 2005 (Lockhart et al., 2016b). That stimulated continued investment by farmers and processors in Australasia (Ashton et al., 2016). The oversupply came when producers in the EU and USA revealed ambitions to capture greater shares of the global dairy market. In 2015, the EU (the world's largest milk producer) removed milk production quotas for member states (Lockhart et al., 2016a). Farmers in central and Eastern Europe were free to expand (NSWDPI, 2015). The USA (the world's third largest milk producer) also increased dairy production (Lockhart et al., 2016a). Declining milk prices drove major processors in Australia (especially MGC and Fonterra) to significantly cut payments to farmers in export-oriented regions. Processors also reduced payments to domestic-oriented farmers to cover losses in export business (Ashton et al., 2016). From 2013/14 to 2015/16, for Australian dairy farms, average farm business profit was estimated to have declined from AUD\$64,330 to AUD\$-14,000 (Ashton et al., 2016). From 2014/15 to 2016/17 in NSW, farm profit was estimated to decline from AUD\$78,660 to AUD\$4,000 (ABARES, 2017). The impact of global price fluctuations on Australian dairy farmers has been amplified by deregulation. As Dibden & Cocklin (2010, p.417) have indicated: 'To a greater extent than in the past, deregulation exposed the industry as a whole to global forces, but the impacts have been experienced most severely by dairy farmers and dairy-dependent local communities.' It is valuable to examine how farmers have experienced the price decline.

Dairying is also limited by environmental constraints (Pembleton et al., 2015). A major issue is water stress. The dairy industry has the highest water use among agricultural industries (Hochman et al., 2013). Since 1970, the eastern half of Australia, covering most of the nation's dairy production, has experienced a drying trend. Dairying, especially in NSW and Queensland, is likely to be negatively influenced by future climate change (Hanslow et al., 2014). In the words of Khan et al. (2010, p.6), 'climate change and the severe water crisis are crippling south-east Australia's agriculture and environment'. Although climate variability requires farmers to enhance resilience, their pursuit for efficiency driven by financial pressure has caused the narrowing genetic base of cattle. In Australia, around 70% of dairy cows belong to Holsteins breed (Khan et al., 2010). This potentially reduces options for rearing breeds for uncertain future environments (Stoll-Kleemann & O'Riordan, 2015). Overall, Australian dairy farmers seemingly have less room to move with political economic challenges and environmental constraints.

## **4.11 Summary**

Adverse market conditions and neoliberal policy reform have placed considerable pressure on the Australian dairy industry. The farm sector has experienced continuous capital outflow, while the processing and retail sectors have been characterised by increased dominance by a relatively small number of big firms. Pressure on farmers has been transferred onto their farming systems, with intensified use of inputs and capital. Technologies are viewed by agricultural researchers and industry bodies as opportunities for farmers. However, farmers' adoption of robotics and precision technologies is conservative. Organic farming provides an alternative for some struggling farmers. Yet currently, this sector remains very small. Although farmers are motivated to change, with declining government support and public funded R&D, farmers are hitting some limits on what more they can do to further boost productivity. This thesis explores how farmers have tried to open new pathways for future growth.

## **Chapter 5 Dairying in the Illawarra**

### **5.1 Introduction**

Chapters 5-9 present and analyse my empirical data. For my qualitative observational research (based on interviews and participant observation), I focus on participants with dairy farming experience (#1-13). For my media survey, I focus on quotations from farmers and relevant stakeholders.

Chapter 5 presents the historical development and current characteristics of Illawarra dairying. Analyses in the following chapters should be seen in light of the background presented by chapter 5. My research question one inquires into factors driving agricultural change. One factor is traditional farming culture which formed in the colonial history of the Illawarra and continues to shape farmers' decision-making. This culture has had to adjust to economic change. My exploration of the cultural change responds to research question two inquiring into how farmers shaped their business. With those aims, chapter 5 firstly examines the economic history of the Illawarra since European settlement. This examination is informed by the works of Eklund (2002) and Hagan & Wells (1997), who are economic/industrial historians. This history presents a continuous process of new industries replacing previously dominant ones, with dairy farming consistently in a state of retreat. Afterwards, I review the recent state and geographical distribution of local dairying. Based on empirical data, I then zoom into several characteristics of the Illawarra dairy farming system. Physical farming is operated under the framework of family farming as a tradition, a business model and a way of life. Farmer participants in this study mostly had a long history of family farming. However, with increased market competition and financial difficulties, farmers usually compromised some elements of this tradition.

### **5.2 A brief economic history of the Illawarra**

Previous chapters highlighted some major themes of agricultural change. It is also important to understand how local farming culture has formed historically and evolved to its current profile. The settlement of the Illawarra by European immigrants started from the early 19<sup>th</sup> century. From the 1820s, land was granted to settlers by the governor of NSW with many



grantees being absentee landholders who recruited tenant farmers. Recruitment of farmers from convict populations and British immigrants continued through the 1860s. Many of them were ancestors of today's dairy farming families. This long-term family involvement in agriculture contributes to further continuation of family farming.

From the 1840s to the 1870s, agriculture, dominated by a small dairy industry, employed around half of Wollongong's workforce (Wollongong currently is the main urban area in the Illawarra). Most of the Illawarra has long been viewed as an area well suited to dairying due to favourable environmental conditions. In 1882, new railway infrastructure transformed the northern areas of Wollongong from a dairy region to a mining one. By 1907, Wollongong's coal mining employed 39% of Wollongong's male adults (Hagan & Wells, 1997).

From 1900 to 1950, dairying continued to dominate Illawarra agriculture, but the centre of activity became more entrenched in the central and southern parts of the region. This pattern persists today. From 1921 to 1947, the share of agriculture in Wollongong's workforce declined from 8% to 3%. Dairy farming remained largely small-scale and highly dependent on family labour. During the Second World War (1939 to 1945), the Dairy Farmers Milk Cooperative distributed milk for nearly all farms and factories in the Illawarra (Hagan & Wells, 1997). This represents the tradition of farmers' collective involvement in milk distribution and processing. Although this cooperative was sold to the Kirin Group in 2008, a Japan-based multinational, various cooperatives (e.g. South Coast Dairy) still persist locally.

From around 1950, the regional economy experienced the further retreat of agriculture and became dominated by heavy manufacturing industry. By 1947, manufacturing employed nearly half of Wollongong's workforce. Partly due to the slowdown of global economic growth, from 1980/81 to 1986/87, manufacturing employment in the Illawarra declined by 27%. Due to attractive job opportunities but high real estate prices in Sydney, more and more people came to work in Sydney but live in the Illawarra. This trend, alongside growing healthcare and education sectors, helped to shape the Illawarra into a service and lifestyle-oriented centre, further boosting the local real estate market. Tourism, retailing and education were viewed as answers to industrial decline (Warren, 2019). Rural residential and tourism facilities (e.g. farmstay operations) have become major land uses (Sinclair, 2006), which squeezed the living space of intensive agriculture.

In 2016, the Illawarra had a population of about 454,377 (ABS, 2016). Its economy was centred on health care and social assistance (employing around 26,684 people), retail trade (employing 18,992), education and training (employing 18,659), and construction (employing 18,128). Agriculture continued to employ some 2,059 people (ABS, 2016). The limited agricultural employment implies limited job opportunities for those with farming skills/knowledge, which can discourage the development of such skillsets and constrain local agriculture. As set out in the 2013 Illawarra Regional Food Strategy, the three local councils that comprise the northern part of the Illawarra made a commitment to achieving ‘a vibrant, sustainable local food system that is resilient, prosperous, fair and secure’ (John, 2013, p.15). Instead of providing farmers with direct financial assistance, the food strategy has been mainly conducted through organising social services and local support for farmers, and incubating a process of cultural change towards local food networks. This strategy encourages the diversification of farming businesses, and reflects the needs of some farmers for new commercial opportunities, and the demand of an increasing number of consumers for local food (Klepeis & Gill, 2016). However, dairy farmers, who contribute most of the Illawarra’s agricultural production, generally cannot benefit from this development of local niche markets, as they need access to larger markets.

Overall, Illawarra dairying has come to display a set of common characteristics: most dairy farms are family owned and operated as small or medium-sized enterprises, most dairy farmers have European ancestry, and there is a strong sense of farming tradition among farmers. These themes are analysed in more depth in section 5.5. The economic circumstances of the Illawarra determine that local dairying has been giving way to other industries; and dairy farming and dairy products are less valued by the community. This situation implies some possible characteristics of those who hold on to dairying: they may be more committed to the farming tradition, the identity as ‘farmer’, or have a farm with superior conditions (e.g. a better natural resource base).

### **5.3 Dairy farm sector**

As indicated in section 5.2, local dairying experienced shrinkage in the number of farmers, and was pushed to the south (further away from Sydney) by urbanisation and related land-use developments. This section presents the profile of local dairying in recent decades. The northern and southern parts of the Illawarra (the Illawarra SA4 and the Southern Highlands

and Shoalhaven SA4, see Figures 5.1 and 5.2 as shown in the following) are presented separately to show the geographical distribution of milk production. I also present relevant statistics of the Shellharbour-to-Shoalhaven area which this study specifically focuses on (see chapter 3; this area is also shown in Figures 5.1 and 5.2).

For the recent decades of the Illawarra, there is more detailed data on dairying. Broadly speaking, Illawarra dairying followed the national trajectory of capital outflow and amalgamation. From 1978 to 2016/17, the number of dairy farms in the Illawarra declined from around 1080 to 110 (by 89.8%); while the average herd size (cows and heifers) per farm increased 293.5% from around 62 to 244 (Australian Bureau of Statistics (ABS), catalogue no. 7120.0; Dayal, 1980). The Illawarra still significantly contributes to the milk production of NSW. The Illawarra is within the South East Local Land Service Region, and in 2014/15, this region produced around 33% of NSW milk; out of the 183 dairy farms in this region, 150 were Illawarra-based (NSWDPI, 2015).

For the Illawarra SA4 (Figure 5.1), milk production contributed 60% to the total value of agricultural production in 2016/17 (Table 5.1). From 2011/12 to 2016/17, the number of dairy farms and the value of milk production respectively declined by around 55.4% and 38%; the contribution of milk production to total value of agricultural production fluctuated but remained relatively stable. From 2014/15, average herd size significantly increased.

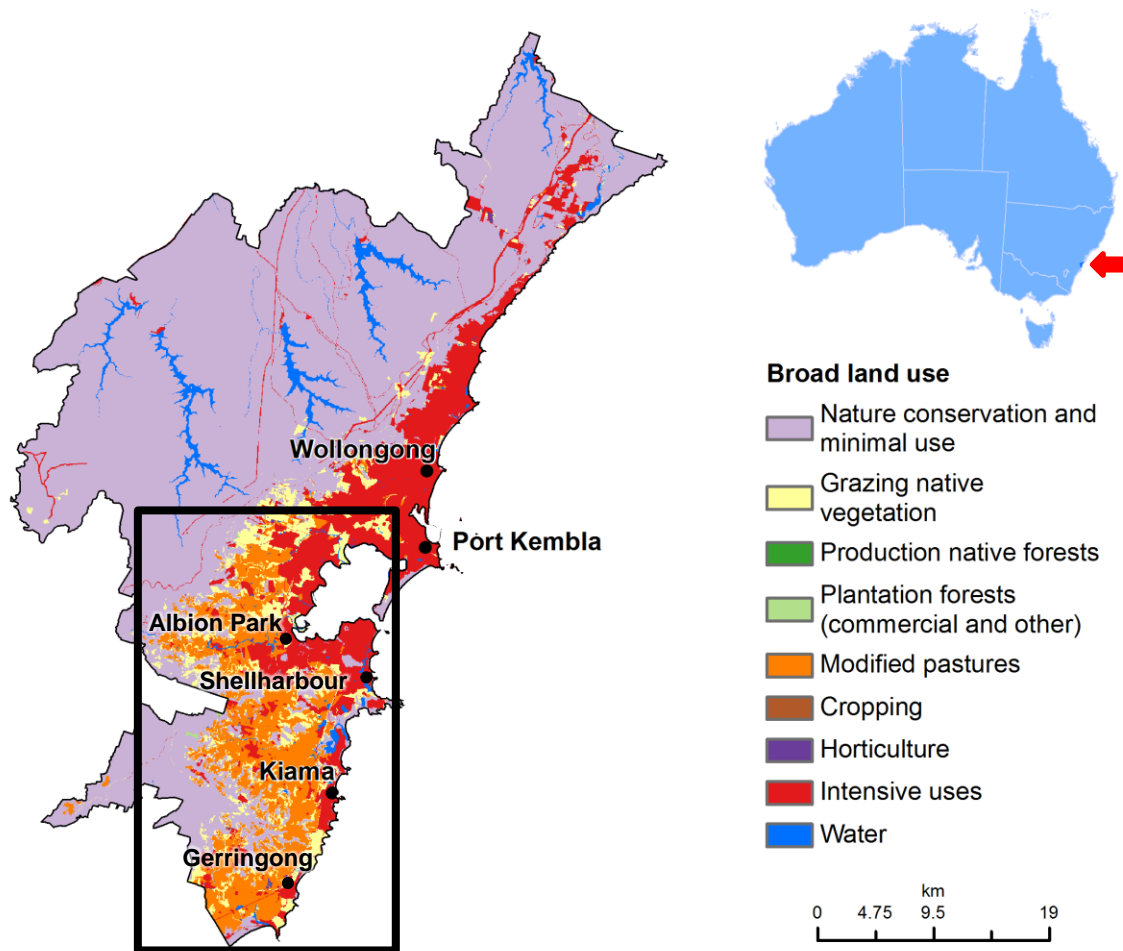


Figure 5.1. Location and land use of the Illawarra SA4 (ABARES, 2018a).

Note: specific study area and key locations are in the black rectangle; I especially focus on modified pastures as marked by orange colour.

Table 5.1. Recent dairy statistics of the Illawarra SA4.

Financial year	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Value of milk production (million AUDs)	28.7	19.48	19.53	18.89	16.96	17.79
Proportion of total value of agricultural production	63%	70%	69%	73%	71%	60%
Number of farms with cows in milk and dry	65	49	47	47	32	29
Average number of cows in milk and dry per farm	165	168	143	116	162	183

Source: adapted from ABS, catalogue nos. 7503.0 and 7120.0.

Compared with the Illawarra SA4, the Southern Highlands and Shoalhaven region SA4 (Figure 5.2) had a larger agricultural sector which depended less on milk production (

Table 5.2). There were also more dairy farms with a larger average herd size. A clear trend was the significant increase in the total value of milk production since 2011/12. Considering the decline in milk production in the Illawarra SA4, probably some farmers in the Illawarra SA4 were pushed by urban sprawl to move their business to the south, or sold their cattle or farm capital to farmers in the south and therefore boosted milk production in the Southern Highlands and Shoalhaven region SA4.

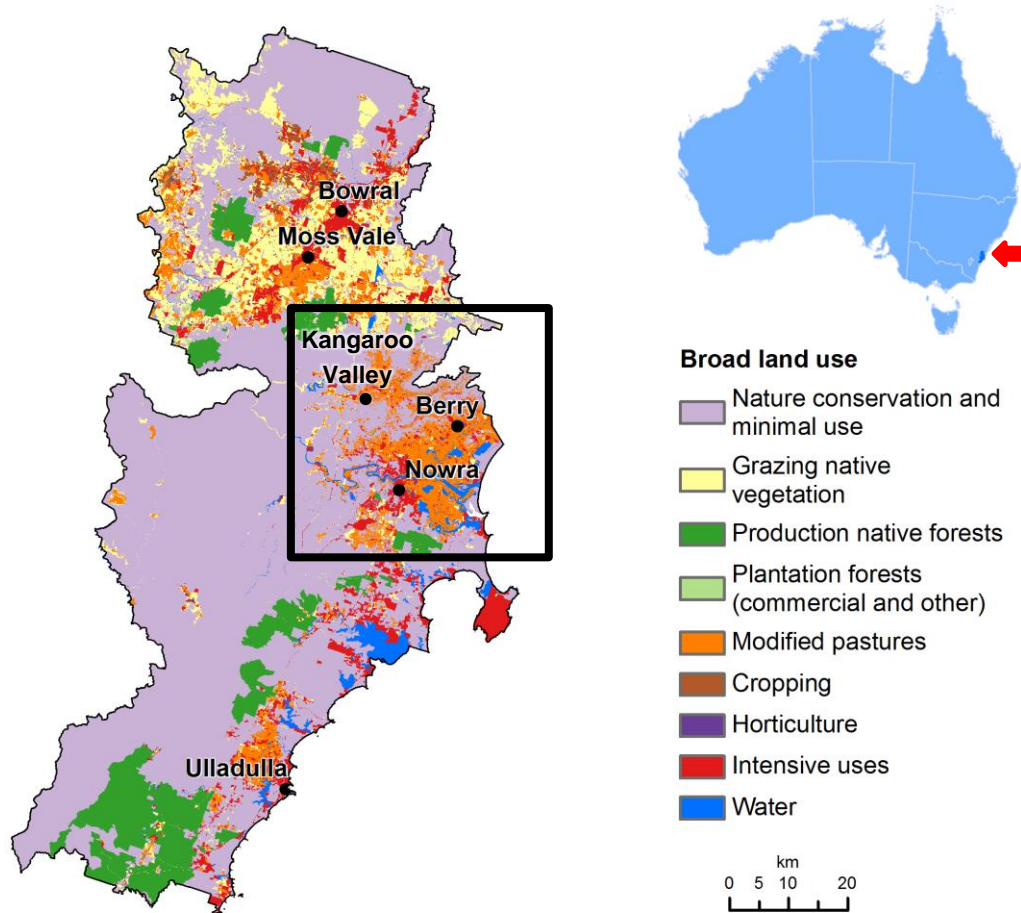


Figure 5.2. Location and land use of the Southern Highlands and Shoalhaven SA4 (ABARES, 2018b).

Note: specific study area and key locations are in the black rectangle; I especially focus on modified pastures as marked by orange colour.

Table 5.2. Recent dairy statistics of the Southern Highlands and Shoalhaven SA4.

Financial year	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Value of milk production (million AUDs)	39.4	42.33	52.04	63.23	62.46	71.92
Proportion of total value of agricultural production	46%	48%	62%	55%	52%	52%
Number of farms with cows in milk and dry	74	71	72	103	65	81
Average number of cows in milk and dry per farm	210	256	248	178	294	266

Source: adapted from ABS, catalogue nos. 7503.0 and 7120.0.

Overall, from 2011/12 to 2016/17 the value of milk production in the whole Illawarra increased by 31.7%, while the value of Australia's milk production declined by 7.3% in the same period (ABS, catalogue no. 7503.0). Considering the significant decline in business profit for NSW dairy farmers (by around 95% from 2014/15 to 2016/17) (ABARES, 2017), it is uncertain how Illawarra dairy farmers' profit is related to their increased value of production. Interviewees of this study usually reported expanded milk production but low profitability. The decline in the number of Illawarra dairy farms from 139 in 2011/12 to 110 in 2016/17 implies that farmers have been leaving the industry in the recent past.

For the Shellharbour-to-Shoalhaven area (shown in Figures 5.1 and 5.2), dairy statistics of its sub-areas are presented in

Table 5.3 (based on the most recent data available). Dairy farms and milk production were concentrated in southern Kiama (covering the Gerringong area) and the northern Shoalhaven (covering Bomaderry and Nowra). Most farms were small (below 200 cows in milk) with the larger farms concentrated around Nowra (situated on the valley floodplain of the Shoalhaven River).



Table 5.3. Dairy statistics of the specific study area in 2010/11.

Region with dairy farms	Value of milk production (million AUDs)	Number of farms with cows in milk and dry	Number of cows in milk and dry	Average number of cows per farm
Albion Park-Macquarie Pass	3.6	8	1392	174
Shellharbour-Flinders	0.2	1	79	79
Kiama	0.1	1	44	44
Kiama Hinterland-Gerringong	13.3	29	5146	177
Berry-Kangaroo Valley	6.7	16	2564	160
North Nowra-Bomaderry	3.8	6	985	164
Nowra	10.8	8	4157	520
Total	38.5	69	14385	208

Source: adapted from ABS, catalogue no. 7120.0.

## 5.4 Farming system

This section focuses on the dairy farming system observed in operation locally. This knowledge facilitates a closer understanding of farmers' working life and decision-making.

The form of local dairying is influenced by the geography of the Illawarra, which has favourable environmental conditions and is close to the Sydney mass-market (NSWDPI, 2015). Local milk production is based on a coastal grazing system and relies on natural rainfall supplemented by irrigation in dry periods. Farmers depend on temperate pasture species (e.g. perennial ryegrass, prairie grass and clovers) with cereals (e.g. oats) used for winter-feeding. In recent years, extreme weather conditions have restricted pasture growth throughout south-eastern NSW causing an increasing use of externally purchased feed (NSWDPI, 2014).

A dairy farming system consists of human capital, cattle, a grazing or feeding approach, milk-harvesting, and equipment and infrastructure. Farmers' work is highly physical,

involving, for example, sowing grass seeds, spreading fertilisers, cutting grass, making silage, mixing grain with other ingredients (e.g. salts), bringing feed to cows, slashing weeds, mating cows, herding cows, harvesting milk, watering the yard covered with manure, fencing, and bringing external inputs into the farm. The key tools and technologies (e.g. tractors, motor vehicles, feed mixers, milking machinery) used to perform this work are fed by carbon-based energy.

Local dairy farmers generally tune their system for year-round production. Farmers produce milk consistently throughout the year regardless of seasonal conditions, representing an approach encouraged by the previous quota system. As participant #7 (male, over 50 yr, medium-scale farmer) recalled:

When it [the quota system] first started, you were allocated a quota, and it started in [the] 1930s or 40s, because Sydney ran out of milk in winter. People didn't want to milk cows in winter. So to guarantee Sydney had a milk supply all year round, they paid a premium but you had to guarantee to produce milk all year round.

Although the quota system was abolished, year-round production is still encouraged by processors. As participant #8 (male, over 50 yr, medium-scale farmer) explained: 'I'm very much a farmer [who] would prefer to be [a] boom-bust farmer. When it's really good, you produce heaps of milk... when it's bad you just pull back... but the dairy factory [processors] don't want that... all their advisors and consultants encourage flat-line production.' Compared with the more seasonal approach to production in colder climate areas such as Victoria, the year-round production engenders higher production costs. Because of such costs and the lack of alternative avenues for sale (e.g. milk powder), Illawarra farmers are more or less locked into the liquid milk market. As participant #4 (male, over 50 yr, small-scale farmer) acknowledged: 'There's no [milk] powder plant in New South Wales, because...the milk price has to be some of the cheapest in the country, because you need more milk to make a small amount of powder milk... back here [milk powder] is not so expensive.' In short, the production costs of NSW milk are usually too high for producing milk powder.

Year-round production also determines everyday milking and cow reproduction cycles. Generally, farmer participants milk their cows twice per day. One labour unit (i.e. one full-time employee) handles 150 to 200 cows based on the use of a herringbone milking system

(explained in chapter 4), the most popular milking system used among research participants. During each milking, cows are herded to the yard of a milking shed. To avoid damage, farmers can manually dehorn the cows or breed for polled cows. To meet production demands, farmers must regularly reproduce the herd (using newborn calves to replace non-productive cows). Each milking cow undergoes a one-year cycle of reproduction. As participant #6 (male, over 50 yr, medium-scale farmer) explained: '[Firstly] they [cows] calve; two to three months after they calve, they are joined again; when they [are] seven months in calf, you dry the cows off and put them into a paddock, maternity paddock; and then within 12 months they calve again. That's the ideal [scenario].' Participant #8 added: 'a cow only milks for 300 days, so you got [to] carry those extra cows [to] make those other two months and other cows are having a holiday.' Thus, cows are separated into batches. Cows of the same batch are mated around the same time of the year. To achieve that, farmers conduct hormonal control of cow estrus. Farmers often employ nutritionists and veterinarians to ensure cow pregnancy. As participant #7 explained:

I also use the University of Sydney vets... they came once a month and they ultrasound every cow... they check each cow is in calf, and we follow a pretty regimental system of getting the cow in calf early, so more than 50% of the herd calve all the time... if they [cows] not in calf, they will be given PG, Prostaglandin [hormonal control], and we check if they don't, we inseminate as soon as they come on.

Thus, cows are adjusted to produce offspring in a routinised manner. The timing of the calving process is critical to ensure efficient milk production.

Year-round production also contributes to a feeding system that depends most substantially on grazing interspersed with supplementary commodity feed, as home-grown feed may not be enough year round. Participant #5 (male, over 50 yr, medium-scale farmer) explained: 'Grazing is a reasonable part of a cow's diet, but a third of my cows' diet comes from grain.' Grain is usually purchased from regions (like Young) on the west of the Great Dividing Range (participant #4). Large farms (e.g. with 800-1000 milking cows) generally rely more heavily on commodity feed. This is because if farmers with large herds rely more on grazing, the land area needed will be too large, forcing cows to walk a long distance to the milking shed and be milked (participant #5). With more external feed, more cows can be introduced on the same area of land, indicating a trend to intensified capital use.

Overall, the form of existing dairy farming system is determined by several factors. Firstly, dairying follows the natural laws of animal and pasture growth based on local conditions. Secondly, farmers are under market competition pressure to improve the efficiency of their operation (Barr, 2014). Thirdly, as farming is within the agri-food supply chain (Bowler, 2014), farmers are subject to other supply chain players (e.g. major processors), and have to consider their requirements, which can put farmers in a certain production mode (e.g. year-round production) and a certain market type (e.g. domestic liquid milk market). Fourthly, farmers respond to what is available on the market. Market availability of external inputs underpins intensified farming systems. Finally, the choice of intensification implies that there are no better technologies or management methods which allow farming to be profitable but less intensive.

Due to these factors, farmers do not necessarily follow the most productive or sustainable way of production, nor necessarily pursue technological optimisation. If this system belongs to productivism (Lawrence et al., 2013), its logic is not necessarily to maximise production, but to accommodate various restrictions and improve profitability. The existing dairy farming system reflects an efficient or pressure-bearing state maintained by a complex arrangement and adjustment of farm elements, and requiring a high level of knowledge, material input, and effort (physical and emotional). Animal and pasture growth has been modified or adjusted to suit other factors. To ensure that each element functions in a desirable way, various types of inputs (e.g. fertility hormones and commodity feed) are needed, usually intensively. If any of the inputs cannot be supplied sufficiently, the entire system is affected. This production system also requires a high level of technical skills and intensive labour input; farmers have to be highly committed to maintaining the business. As the normal operation of a farm depends on so many elements, it appears to be vulnerable to any change of underlying conditions. This vulnerability is probably linked to the constant exit of dairy farmers from the industry (ABS, catalogue no. 7503.0 and 7120.0), and underscores how important it is to think about the production process over time and space.

## 5.5 Family farming

### 5.5.1 Characteristics

Farming is not just a productive activity but has deep cultural meanings. This section firstly discusses characteristics of general local farming culture before exploring reasons for its persistence. Illawarra dairying is dominated by family farms which are viewed as being iconic elements of the western countryside (Woods, 2014). The analysis below shows several core elements of Illawarra family farming culture (Table 5.4), which largely concur with those portrayed in the academic literature (including, for example, strong family commitment to farming) (Lockie, 2015).

Table 5.4. Elements of Illawarra family farming culture.

Elements	Evidence from interviews
Family ownership	<p>For the 13 participants who have direct dairy farming experience (#1-13), excluding participant #11 (male, around 35 yr, small-scale farmer), all others have family ownership of the core part of their farming business.</p> <p>e.g. ‘All farms in this area [Jamberoo Valley] are family farms (participant #6).’</p>
Family labour	<p>‘For continuous dairy farming you need the family to keep being involved (participant #6).’</p> <p>‘The family is the most important thing, because they are the centre piece of the business. That’s been the biggest advantage for me, because they bring new ideas, because they are the next generation (participant #8).’</p> <p>‘My father helped me; my brother helps me... and my wife helps me greatly... family is far more reliable than [hired labour] (participant #7).’</p> <p>Family members do not just provide labour, but are crucial in maintaining the business.</p>

Patriarchal inheritance	<p>Farmer participants in this study are generally involved in a father-son model of farm operation and succession. The younger generation usually works with their father or brother(s). Female(s) in a farming family (e.g. the ‘farmer’s wife’) often have an off-farm job or undertake some non-physical work (e.g. paperwork) on the farm.</p> <p>Participant #5 (male, around 50 yr, medium-scale farmer) said: ‘My wife obviously helps me sometimes. She has a full-time [off-farm] job. She has also got a passion for showing cows, so we are showing cows together.’</p>
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These elements reflect a business model participants depended upon. Firstly, an idealised mode of dairy farming is seemingly to have a farm, work for the family, take care of farm capital, grow the business, and prepare it for the next generation. Ideally, farmers are not to work for others (at least not for the long term), and should have full family control of the business. Silvasti (2003) highlighted the importance of ownership in maintaining the emotional ties between the family and the land. Participant #12 (male, around 40 yr, small-scale farmer) articulated the family-based organisation of dairying: ‘I grew up on a farm, and I worked on a farm as a job. Then when I left school, I just wanted a dairy farm.’ Secondly, the family commitment facilitates concentrated and long-term investment over generational inheritance. Most of farmers’ investment usually flow into their farming business. Capital can deposit in the business for a long time. Most farmer participants had spent over 15 years working in their farming business. Due to logistic and familial reasons, it is difficult for farmers to frequently shift the bulk of their capital or sell their farm. Thirdly, farmers’ working relations beyond the farm (e.g. supplying a certain processor and sourcing inputs from certain companies) are also stable. Farmers usually run their farm in a region for a long time, and are familiar with agribusinesses, and their staff, servicing the region. Overall these characteristics largely concur with the business aims for most commercial farmers in Australia (Barr, 2014, p.10).

As for gender relations, family farming in Australia is traditionally characterised by patriarchal relations (Bryant, 1999). With agricultural restructuring, the underlying masculinity remains dominant in Illawarra dairying but is emerging in new forms to suit the new business model or economic environment. With farms expanding in output, male farmers have increasingly played a farmer-manager role. For relatively small farms (such as participants #1 and #4), female family members often work off-farm. For relatively large

farms (such as participants #6 and #7), female family members often play a critical helper role (often unpaid labour to help sustain and reproduce the farm) in supporting their farmer-manager partner. For farmer participants who discussed the topic of gender, all of them recognised the importance of the support from female family members. Although dairy farming superficially appears to be male dominant, it is enabled by both men and women. This study highlights women's contribution in dairying. Limited industry and government awareness of such contribution has occasionally led to poorly developed supporting strategies for all family members undergoing agricultural restructuring (Alston et al., 2017).

The overall business model as discussed in above paragraphs provides advantages, but has drawbacks under certain conditions. Firstly, due to the lack of capital mobility, farmers may not be able to always keep up with market changes and seize fleeting opportunities that arise. For example, when milk prices paid by processors became unfavourable, it was difficult for Illawarra farmers to withdraw their capital and switch to an alternative supplier or market type (Britt et al., 2018). Secondly, farmers' financing can be restricted. Farmer participants' external investment in their farm mainly came from bank loans and sharefarmers (sharefarmers owning part of the business operate the business together with the farm owner). It can be difficult to accept investors beyond those groups due to the need to maintain family control. Thirdly, the lack of influential shareholders implies that farm operations can be restricted by the knowledge and preference of the farm owner (Riley, 2008; Suess-Reyes & Fuetsch, 2016). Participants #1, 3 and 11 indicated that they could not make some innovative changes due to the rejection of such change by the older generation. Participant #3 (male, around 35 yr, small-scale farmer) discussed on-farm planning: 'There are lots of things we like to do but... [the] current situation makes difficult future plan for us... my father still controls like that sort of things.' However, the conservativeness of the older generation was not absolute. If they cannot make adjustments and leave an attractive business for the next generation, their business may not be sustainable. Fourthly, farmers' stable working relations and difficulty in shifting their capital (e.g. to another region) imply that they usually do not take advantage of competition between their supply chain partners through, for example, chasing better terms provided by different milk processors. Overall, these drawbacks can contribute to the decline of family farming (Woods, 2014).

The above-mentioned model of family farming (Table 5.4) is partly determined by the small or medium size (below 350 cows in milk) of numerous local farms. The literature has long

identified the family as the ‘natural’ unit for running a small business (Weller et al., 2013). Compared with external investors and labour, the business owner often trusts family members more deeply and facilitates the inheritance of the business by family members. Due to the relatively small size, it may be difficult to attract or convince external actors beyond banks to invest in the business. Limited financial resources mean it can be more reasonable to make a concentrated investment, such as into a farm, than diversify investment into multiple projects. When the business becomes larger, it would have more non-family personnel and potentially freer investment choices (Woods, 2014). A local economic transition and geographical setting have been unfavourable for farmers to expand. In the Illawarra, large farms are concentrated in areas where urban/suburban development is unsuitable (e.g. too far away from urban centres) and geographically consistent dairy land (e.g. not separated by hills) exists. More analysis on farm expansion is provided in chapter 8.

### **5.5.2 Adaptability**

Despite the drawbacks, family farming has persisted in the Illawarra for close to two centuries. For participants with direct dairy farming experience (#1-13), all of them have a family farming background. Seven participants have over 150 years of family involvement in agriculture, three have over 50 years, and three did not reveal this information.

One contributing factor to the persistence of family farming is that farmers receive regular payments (e.g. monthly) from milk processors, because milk is harvested everyday. Participant #6 (male, over 50 yr, medium-scale farmer) said: ‘I like dairying. It’s one form of agriculture where you know how much money you are going to make every month... you can budget on that, and plan much better than some of the other rural industries [which] seem to be much more of a gamble than dairy farming.’ Participant #9 (male, over 50 yr, large-scale farmer) claimed that dairy farming provided ‘a perfect cash flow’ and was a ‘gold mine’. The regular payments dairy farmers received can reduce financial risk and provide financial mobility.

It is also important to note that since the 1970s the majority of dairy farmers in the Illawarra have left the industry mainly due to the financial difficulties during the 1980s and the post-deregulation era (since 2000). The land they released has been especially transformed into urban, residential and lifestyle landuses (Dayal, 1980; Sinclair, 2006). Those who have



managed to stay may be more committed to family farming, or have developed it into a more self-sustaining enterprise. Family farming has seemingly evolved into a form which can easily cultivate a love of farming. When family farming cannot convince farmers for economic reasons, farmers may still be encouraged for emotional reasons (Carrington et al., 2013). The academic literature has indicated that family farms can be less sensitive to economic trends compared with other businesses (Riley & Harvey, 2007).

Several factors contribute to farmers' emotional links with farming. Firstly, as farmer participants generally have a long history of family farming, many participants feel thankful for what they have inherited and be willing to continue farming. For example, participant #7 (male, over 50 yr, medium-scale farmer) outlined their deep connection to dairying: 'Some people say you can sell your farm for a lot of money, which I could do, but I'd rather like to think I could pass down to the next generation, coz that's what previous generation did for me... that's why we are still here, emotional links.' Secondly, the farm itself cultivates a range of emotions (Vanclay, 2004). The farm not only welcomes business personnel, but welcomes family members. Participants' homes are usually on their farm. Participants often had lunch at home and it was convenient for farmers to bring their family to the paddock. As participant #6 said: 'The family is the farm, and the farm's the family. Basically it's also my extended family that still come here [and] call it home.' Thirdly, the young generation can get involved in farming at an early age and form emotional links with farming (Kuehne, 2013). For example, on a visit to participant #3's farm I observed the farmer (male, around 35 yr, small-scale farmer) taking his young son on a quad bike to check cows in a paddock. Participant #7 also explained how they 'enjoy being able to work on the farm and have my grandkids with me and help me'. Participant #4 (male, over 50 yr, small-scale farmer) mentioned his own experience: 'I always like agriculture... and enjoy the farm life as a young boy growing up. I've always [been] involved around the farm.' Finally, the mutual help between farmers and their family can create a sense of belonging. As participant #7 noted: 'My father helped me; my brother helps me... and my wife helps me greatly.' Participant #8 (male, over 50 yr, medium-scale farmer) reiterated: 'The family is the most important thing, because they are the centre piece of the business'. Overall, the aforementioned factors relate to family bonds, the opening nature of the family farm, and farmers' long-term involvement in farming as a livelihood. From the perspective of evolutionary economic geography, these factors are clearly path-dependent (Tonts et al., 2014), or dependent on and reinforced through existing capital (e.g. the farm) and ways of making a living (e.g. family farming).

The social effects of the emotional links can be understood from both collectivist and individualist perspectives. From a collectivist perspective, farming was not just an individual behaviour, but represented a form of social organisation where family members supported each other and strengthened this form of organisation. Farmers' efforts to continue farming were also to maintain the family in a farming form. Moreover, the farm had also become part of the current, past and future understanding of *family*. Participant #1 (male, over 50 yr, small-scale farmer) said: 'It [the farm] meant everything... family farmers have a strong tradition in keeping the farm. I don't feel obligated. I wanted.' Participant #5 (male, over 50 yr, medium-scale farmer) acknowledged the deep connection between their family and the farm: 'It's a very significant part of our family... it's not like a house you buy and sell. You don't buy and sell farms.' In an economic sense, the emotional links contributed to the continuous family investment (e.g. time and financial resources) in the farm.

From an individualist perspective, farming is not just a career or family endeavour, but a choice from the heart, an enjoyment and an achievement (Table 5.5). The emotional links transform the farming culture from a structural factor, which is imposed on farmers through their family background, to a personal choice, which farmers usually made voluntarily. Herman (2015) recognised some enchanting qualities (e.g. joy and wonder) of farming for commercial farmers. These qualities of a farming life (Table 5.5) can also drive farmers to continuously improve their operation (Herman, 2015). Participant #3 (male, around 35 yr, small-scale farmer), for example, indicated that to increase operational efficiency of their farm 'was a goal like I wanted to get to, want to beat, keep getting better'. Those farmers that viewed dairying partly as an individual challenge and achievement reflected that they had successfully coped with restructuring pressures.

Table 5.5. Dimensions of farmers' emotional links with farming.

Perspective	Evidence from interviews
A choice from the heart	<p>'They do it, because there's something deep in their heart (participant #13).'</p> <p>Participants #2, 3 and 11 indicated that farming was in their 'blood'.</p>
An enjoyment	<p>'We don't live the high life, but we are happy (participant #5).'</p> <p>'I have lots of freedom. I am my own boss (participant #1).'</p> <p>Participant #1 enjoyed breeding cows; #2 enjoyed working with nature: 'It's like a big puzzle... I like to handle each part of it'; #4 liked 'the fact dairy cows are such efficient converters of raw materials into a product we can use as a food straight away in milk'; #5 enjoyed 'breeding and showing cows' ('We show at Sydney royal, and local shows'); #6 bred cows for better performance: 'That's one of the most exciting part of farming'; #7 enjoyed growing grass and producing food; #12 and 13 loved cows.</p>
An achievement	<p>'The enjoyment's that we've actually been able to stay here this long, and grow the business like we have (participant #8).'</p> <p>Participants #5 and 9 believed dairying was what they were good at or did best.</p> <p>'People say dairy is a hard job, but you know going on university is just hard... for me dairy is easy (participant #11).'</p>

It is noticeable that many participants had a chance to leave farming and try other occupations. Participant #2 (male, around 35 yr, small-scale farmer) spoke about how his father did not mind if he wanted to walk away and would support him regardless. Participant #6 (male, over 60 yr, medium-scale farmer) commented: 'If your son doesn't like dairying, just do not make them do it, because it's a disaster waiting to happen.' Many farmer participants had other working experiences beyond the farm gates. These jobs included working in a bank, the army, for a medical electronics company, as a butcher, and tree lopper. Some of these jobs provided a better income, but participants still chose farming as their main career path. Agricultural researchers have consistently highlighted farming as a cultural or family obligation (Bryant & Garnham, 2014), but have paid less attention to farmers' voluntary and strategic choices to forge and sustain professional farming careers. Participants in this study emphasised both the lifestyle value of farming to them, and their efforts to improve their operation and make farming a financially attractive/justifiable career choice.

Those emotional factors, especially personal enjoyment and satisfaction, can partly explain farmers' acceptance of seemingly unfavourable working conditions, and contribute to the conservativeness of local dairying (e.g. some of the older generation resisting business improvement and changes in farm management) (Morris et al., 2017). Dairy farming is a demanding occupation with hard work and complex skills. Traditional rural masculinity characterised by 'hard work, honesty, forthrightness, longevity in the community and generational knowledge of agriculture' (Bryant & Garnham, 2014, p.68) may apply to the lived experiences of many participants.

Overall, the family farming model appears to be crucial and effective in cultivating farmers' land attachment and identity as a family farmer. Although the emotional links may have made family farming more resistant to external pressure, family farming still evolves over time. When the economic and physical environment favours continuous and concentrated investment, family farmers may focus their investment on their farm and family (e.g. cultivating family labour). When more flexible investment is favoured, family farmers may adjust their business. That does not mean when the environment changes, the elements of family farming will be totally abandoned, as evidenced by the large proportion of family farms in Australian agriculture (Barr, 2014). In real practice, this adjustment can be slow and, at times, unpleasant. For today's farming families who have survived through various pressures and crises, they may be more open to adjustment. Although participants highlighted the importance of family farming to their sense of self and place, their current farm was usually not their original family farm. Ten participants' families had worked on their current farm for three generations or less. Facing various pressures farmers may sell their farm and relocate to another. Participant #8 (male, around 60 yr, medium-scale farmer) commented: 'It [his farm] would always be special to us, but that doesn't mean in the future we won't sell it. We will sell it because we will look at it totally from a business perspective to do that.' Such a pragmatic attitude is not surprising. The academic literature has widely reported that family farmers sold their farm or part of their land due to, for example, urban sprawl (Mason & Knowd, 2010), financial difficulties (Kuehne, 2013), and the need to seek better opportunities in other regions (Woods, 2014). Overall, there is constant conflict between traditional values and enterprise profitability.

## 5.6 Conclusion

The Illawarra's history since European colonisation shows that dairying has shrunk from a dominant economic sector to a minor one. Historical development and geographical features of the Illawarra have shaped local dairying into today's form. Firstly, local dairying has been increasingly concentrated in the central or southern areas of the region partly due to the pressure of urban sprawl from the north. Secondly, milk production has been tuned towards year-round production and for the domestic liquid milk market. Thirdly, today's farming families as survivors through the history of family farming have seemingly developed family farming into a self-sustaining business and lifestyle model characterised by emotional factors and adaptive adjustment. This research can supplement existing research by highlighting farmers' personal and voluntary choice in conducting farming in a certain manner. Despite the importance of the family farm, a common practice to ensure survival is to sell the farm and relocate to another. While that does not by itself represent a move away from family farming, it does represent a willingness to at least sever ties with land the family has connections to by virtue of long ownership – such ties can be a significant part of the practice and narratives of family farming. The cultural core of local dairying has remained dominant within the local context despite continued industry restructuring. I argue that the endurance and galvanising of a family farming model represents one type of on-farm response to increasing market competition. Paradoxically, in an economic environment favouring expansion in size and where non-family relationships (e.g. external investors and specialist labour) are usually assumed to be most significant (Woods, 2014), family social relations become increasingly valuable.

## **Chapter 6 Industry Change**

### **6.1 Introduction**

Drawing on empirical material, chapters 6 and 7 cover local dairy farmers' changing institutional, political and economic environments. Chapter 6, in response to research question one (inquiring into factors driving agricultural change, and farmers' experiences), covers major trends in the dairy industry. I firstly examine trends that have directly influenced Illawarra farmers based on participants' experiences. These trends include farmers' declining terms of trade, the 2000 deregulation, retreat of government intervention, and climate challenges. I then examine trends shaping Illawarra farmers' supply chain environment (the structure of the dairy supply chain is provided in section 4.4). These trends include a competitive industry environment and rising corporate power.

### **6.2 Deregulation and related trends**

#### **6.2.1 Introduction**

This section examines what deregulation meant for farmers, where it originated, how it has directly influenced farmers, and how it has intertwined with some related trends. Deregulation was recognised by all interview participants as representing a significant change to the dairy industry in Australia. After deregulation, many Illawarra dairy farmers had to change the direction of their business and become more competitive. Across the news articles examined for the research, deregulation was also the most important event covered, with 60 articles (21.4% of total) mentioning it. Most articles on deregulation came from the Illawarra Mercury. For my analysis, this ensures consistent reporting styles and news values. Although relevant literature (for example see Sinclair et al., 2015) generally views deregulation as a significant change-driving factor, as this analysis shows, the effect of deregulation should not be viewed as separate from that of other factors or pressures, such as extreme weathers, declining government support and adverse market conditions. No matter what actions farmers took, they were out of the combined effects of a changing industry environment.

My analysis in this section adopts a political economy perspective and emphasises structural factors which can be conditioned by and also drive local factors. I position Australia's dairy farm sector within the market environment of declining terms of trade, and position the Illawarra dairy industry within national and local dairy politics. Different from many political economy studies highlighting power relations between farmers and other interest groups (Ilbery, 2014), I aim to make a contribution through exploring specific market and structural pressures exerted on Illawarra dairy farmers. While examining macro-economic factors, I also consider the context of Illawarra dairying and recognise that political economic activities are embedded in place (Wills & Lee, 1997). As such, Illawarra dairying must be recognised as anchored to the Sydney liquid milk market, previously protected by a quota and regulated pricing system.

### **6.2.2 Market determinism**

For farmer participants, deregulation was primarily equated to the removal of a previous quota system that supported and stabilised farmgate milk prices (NSWDPI, 2015). According to participants, before deregulation farmers had to buy quota to produce milk. The quota milk was to guarantee that the Sydney market was supplied year round. With quota, farmers were paid premium milk prices (around 54 cents per litre in 2000, higher than the 2016/17 level for most Illawarra dairy farmers). Farmers received very low prices for milk produced over their quota and it went to the manufacturing milk market. The government used the quota system to encourage farming in remote areas and to protect small-scale operators. Participant #9 (male, over 50 yr, large-scale farmer) indicated that there used to be many small farms and small processors in the Illawarra and beyond. Local farms usually supplied local/regional processors and were sheltered from inter-regional competition. From a broad sense, NSW farmers did not compete with Victorian or Queensland farmers in the domestic liquid milk market within their state. Overall, government agencies used to play a key role in determining farmers' profitability through the quota system.

However, this system restricted market entry and expansion. As outlined by participant #14 (Dairy Australia officer): 'If I decided to open a dairy farm under regulation I would have to buy quota which could cost me 100,000 or even millions of dollars to buy the rights to produce milk, let alone the cost to buy the land, the cows, the fixed assets.' As participant #3 (male, around 35 yr, small-scale farmer) also argued: 'We couldn't grow without having to

buy more quota, which [was] gonna cost more capital to buy that.’ Hence under a regulated quota system farmers received guaranteed prices for a capped volume of milk they produced, but there were significant regulatory barriers to enterprise expansion and new entrants to dairying.

After deregulation, milk prices became solely determined by market forces prefaced on the relationship between supply and demand. Illawarra farmers’ milk payments reacted more to the global market (participant #4, male, over 50 yr, small-scale farmer). Although farmers lost benefits from the quota system, several participants viewed deregulation positively. Firstly, farmers were ‘fully compensated’ by a government assistance package (participant #9). With this money, some farmers updated their milking equipment (Participants #1, 3, 8). In the Victorian context, Dibden & Cocklin (2010) found a range of approaches in terms of how assistance funds were used by farmers, including for clearing debts, financing expansion and intensification. Secondly, farmers could more freely expand their operations and more easily choose processors to supply (participant #10, male, around 40 yr, medium-scale farmer). Participant #1 (male, around 50 yr, small-scale farmer) explained: ‘I know some farmers. One particularly [in] Nowra, a big farm, milks a thousand cows now. He thought deregulation was the best thing that ever happened, [as] he was able to expand his business.’ Participant #3 also recalled that after deregulation they were ‘able to then produce as much milk as we were probably trying to produce... deregulation probably, I suppose, open[ed] it up for farmers to produce more milk... I actually thought it was good.’ Finally, deregulation spurred a range of new investments and market strategies (Woods, 2014). In support of deregulation, participant #13 (female, former dairy farmer) commented: ‘People get lazy when you’ve got a regulated market... [as] there’s no need to get better.’ Participant #8 (male, over 50 yr, medium-scale farmer) affirmed the change in attitude deregulation helped to precipitate: ‘It made us actually think more about our businesses and grow our business if we want to survive. I would say there are more positive points about [it] than negatives.’ The negative points about deregulation mentioned by participants were related to increased market and supply chain competition (discussed later in this chapter).

Overall, deregulation was not just an imposed program, but reflected economic necessities, for example to improve efficiency and to explore new commercial opportunities. Woods (2014) reported that entrepreneurial farmers are more likely to see deregulation programs and



globalisation as opportunities regardless of the increased market uncertainty. That many Illawarra farmers supported deregulation was a factor in facilitating its introduction.

### **6.2.3 Driving forces among dairy farmers**

The occurrence of deregulation was driven by multiple factors. Farmer participants and news articles indicated that deregulation to a large extent originated from within Australia's dairy farm sector; a view that has found support in other analyses (see Cocklin & Dibden, 2002). Article #M31 stated: 'Dairy farmers in Victoria led the charge towards deregulation on July 1, despite opposition from other states.' Victoria, as 'the largest and cheapest milk producing state, threatened to send milk into neighbouring states' (#M34). Participant #1 (male, around 50 yr, small-scale farmer) said: 'They [Victorian dairy farmers] pushed deregulation pretty hard to happen, because they want to spread the market.' Participant #5 (male, around 50 yr, medium-scale farmer) indicated that Victorian dairy farmers did not benefit as much from previous regulation as NSW farmers:

For the Victorian farmer, 93% of his milk was going export, so they're already on that cheap 36 cents per litre price [cheaper than the price Illawarra farmers received for their quota milk]. When deregulation happened, they only lost 7% [milk prices for 7% of Victorian milk were reduced], so didn't affect them much, one or two cents a litre across all of the milk.

Given this advantage, after deregulation Victorian farmers overall have managed to increase their share of national milk output, while NSW farmers have lost market share and reduced milk production (Ashton et al., 2014). This process of capturing market share from others inevitably faced resistance at the time.

In news articles, the strongest voice against deregulation was from the Australian Milk Producers Association (AMPA). They criticised deregulation as 'the most uncaring and short-sighted act of any government' (#M34), and condemned politicians for being out of touch with rural communities and looking after 'the big end of town' ('the true beneficiaries of deregulation') (#M50). The AMPA, with a membership of over 1,600 farmers, decided to fight deregulation in the High Court (#M4). These farmers sought support from all political parties and were determined to show that farmers were angry through actions like blocking

milk factories and dumping milk (#M40). Although deregulation continued, it represented a compromise between different farmers' groups. Victorian farmers were influenced less by deregulation, so they received lower assistance payments of around AUD\$100,000 per farm, while NSW farmers received around AUD\$230,000 per farm (NSWDPI, 2015). However, deregulation seemingly still exacerbated the contradictions between farmers from different states, and between some farmers and the government (Sinclair et al., 2015).

One factor driving deregulation and industry conflict was worsening market conditions. In general, from 1970 to 2000 Australian dairy farmers experienced an overall decline in their terms of trade (Barr, 2014). It was increasingly difficult for farmers to feel satisfied with the existing system that limited their market opportunities. Some saw opportunities to expand their markets in other regions or states where, as they saw it, regulation was sheltering inefficient producers from reasonable competition. Therefore, there was a perceived need to remove restrictions on market competition. Deregulation triggered a profit reconfiguration among Australian dairy farmers with powerful, advantaged or capable farmers outcompeting others. After 2000, Australia's milk production and the number of dairy farmers both declined, while farmers' terms of trade stabilised.

#### **6.2.4 Direct impact**

Analysis of interviews suggests that deregulation changed the nature of Illawarra dairy farmers' economic environment in three main ways: farmers' milk prices overall became lower; more productive capital and market opportunities became available to farmers (meanwhile farmers were given more freedom to expand); and the liquid milk market became more volatile. The first point was especially emphasised by farmers and relevant stakeholders. As the premium price for quota milk ended, and NSW farmers began to compete with Victorian farmers, 'at the farmgate, milk prices fell from 54 [cents] a litre to between 27 and 37' (#M2). Farmers who relied more on quota were most significantly impacted. Participant #5 (male, around 50 yr, medium-scale farmer) elaborated:

There were farmers sitting right on the edge. Their quota milk, which was 54 [cents per litre], so they dropped 20 to 25 cents a litre, nearly kicked them out of the back... well in Sydney, typical farmers weighed 90% drinking milk [90% of their milk was quota milk],

and only 10% on commodity milk [which did not receive a premium price], so they got really burned.

Before deregulation, farmers were strongly incentivised to produce within their quota, which reduced the necessity for improving operational efficiency and entrepreneurial expansion.

At the time of deregulation, the lower prices created an outpouring of negative sentiments. Farmers commented: ‘It is like we are being expected to do more and more for less return (#M2 on 04/07/2000)’; ‘I expect we will take an 18 to 20% cut in [annual] income’; ‘The compensation package is not going to touch the sides of that [this farmer’s debt] (#M13 on 27/07/2000)’; ‘When deregulation became a reality for us, we actually sold some land to reduce debt (participant #4).’ The negative outlooks were shown in the headlines of news coverage at the time, for example ‘Milk price to fall, but farmers will be creamed’ (#M1), ‘Howard’s [the prime minister] milking dairy farmers, says Kiama MP’ (#M62). Some politicians recognised the issue of low milk pricing. The agriculture Minister acknowledged NSW farmers’ income reduction, and called for investigations into the impacts of deregulation (#M31 on 13/11/2000). The Deputy Prime Minister John Anderson admitted that deregulation might have gone wrong (#M67 on 27/03/2001). This situation implies that the results of deregulation were not fully expected by the industry and government, and many farmers were not fully prepared for deregulation, highlighting the importance of clarifying the impacts of agricultural change.

The price issue led numerous farmers to leave the industry (NSWDPI, 2015). Article #M47 (31/01/2001) indicated that within six months of deregulation, ‘310 dairy farms in Queensland and NSW had disappeared’. Farm closures were a regular feature of news reporting at the time and shown in some headlines, for example ‘NSW dairy industry turns sour; coast farmers among 50 to quit’ (#M2). In the Illawarra, some farmers told of being ‘forced out’: ‘Things are going bad and I’m sure now they would get worse if I stayed... we have got that many obstacles in our way and a government which doesn't help much (#M43)’; ‘In one sense you’re glad to be getting out, but there’s still an uneasy feeling in your stomach (#M5).’ One reason why the price issue was highlighted was that it was a trigger for numerous farmers to quit. Those farmers’ negative comments could be easily captured by journalists.

In other reporting, it was not necessarily financial pressure that drove farmers out. Participant #1 (male, around 50 yr, small-scale farmer) indicated: ‘Some of those farmers were probably looking to go out anyway, so used deregulation as a bit of an excuse.’ The compensation system of deregulation facilitated farmers to quit. Participant #4 (male, over 50 yr, small-scale farmer) explained:

When deregulation happened there’s a payout figure [assistance package and compensation payment from the government] for quota and things. So, I think farmers who were a bit smaller or didn't have family coming on, OK this is my exit strategy. So they took the package, so I [this refers to the farmers who were to exit] never got be in a better position to exit the industry with dignity and with some money behind me, so they have their value of their land plus the exit strategy... it worked out pretty well for a lot of farmers.

Farmers who were not confident in the new environment did not have to invest the assistance money in their farm. Instead, some used the money to fund retirement or alternative business interests (e.g. transforming the farm into a tourism-oriented winery) (Sinclair, 2006). Some farmers who left dairying released capital or resources (e.g. cattle and land) on the market, which could also facilitate the development of other industries (e.g. housing and tourism). Local politics and planning have favoured the transition of local economies towards services and lifestyle (NSW Government, 2015). This transition marked the flow of labour and capital towards more promising businesses or sectors.

The productive capital released on the market also became opportunities for existing farmers to grow their business (participant #9, male, over 50 yr, large-scale farmer). Participant #6 (male, over 50 yr, medium-scale farmer) recalled: ‘The farm I leased over here, [I] was able to lease that, because... they [previous farmers of that farm] had a very high input operation and they couldn’t continue milking on that deregulated market price.’ Local media also reported on the depreciation of dairying-related capital: ‘Dairy farmers had lost up to \$1 billion in devaluation on their properties, herds and equipment holdings because of deregulation (#M46 on 30/01/2001).’ Depreciation pressured many farmers, but it also became easier for some existing farmers to expand. The opportunities brought by deregulation were not restricted to the Illawarra and might have facilitated Illawarra farmers expanding their business and market share nationwide. From 2010 to 2017, Illawarra farmers’

share of national milk output increased continuously (ABS, catalogue no. 7503.0 and 7120.0). Overall, deregulation opened more space for farmers/landholders to try new economic activities or business models. This was a process of creative destruction, which has been identified as a recurring element of economic restructuring and neoliberalisation (Harvey, 2007). It is also important to note that those opportunities were with competition (farmers competed for productive capital on the market and the share of milk market), and did not necessarily lead to an increase in the profitability of existing farmers (Ashton, 2014).

Despite the aforementioned opportunities, the dairy market since deregulation has become much more volatile in terms of farmgate milk prices. Participant #5 (male, around 50 yr, medium-scale farmer) indicated: ‘Up until 2000 the milk price never varied... because it was government controlled, so the milk price stayed fairly stagnant. If you can guarantee your income, if you set a budget, you can do everything.’ Participant #10 (male, around 40 yr, medium-scale farmer) indicated: ‘Basically the price goes up and down like a yo-yo... because of deregulation.’ Participant #1 (male, around 50 yr, small-scale farmer) concurred: ‘Two years can be as long as a cycle for the dairy industry.’ One reason for this volatility is the decline in government intervention to prevent market failure. Dairy farmers increase production quickly when demand increases but can only reduce production slowly when supply exceeds demand (Britt et al., 2018). When milk prices are good, farmers tend to invest, which can engender milk oversupply; when milk is over-supplied, farmers become conservative, which can cause an undersupply of milk (participant #6, male, over 50 yr, medium-scale farmer).

To summarise, the three aspects (lower milk prices, increased commercial opportunities and market volatility) of the new economic environment could be equally important for existing farmers. Although deregulation brought opportunities as well as challenges, overall it was viewed as a major source of pressure by farmers. Participant #6 recalled:

When I started on the farm, [it] was a great lifestyle... there wasn't the pressure that's around us now... it was 1969... we were in a regulated market where you knew how much you gonna to produce, how much we are going to be paid for [milk]... when we were deregulated in 2000, that was when the pressure really got great.

Farmers' negative experiences of deregulation were emphasised in news articles and usually presented in the form of sensationalised comments or stories. Journalists might highlight farmers' suffering to attract public sympathy or support. The evidence is that journalists revealed a strong pro-farmer attitude in the surveyed articles. There was frequent reporting of dairy farmers' stories, honours (e.g. in cow shows) and social contributions (36 news articles or 12.8% of total). The coverage on dairy farmers revealed the ongoing existence of a strong rural link in the Illawarra. Thus, revealing industry pessimism was not to discourage dairying. This extends existing media research which suggests that local media tend to highlight local successes and ignore cases of economic contraction (Alysen et al., 2003; Vine, 2012).

However, the pressure farmers spoke of was not solely due to financial difficulties. Change itself generated uncertainties. A new environment required new business strategies. Some participants agreed that farmers were often reluctant to change their old, trusted way of running businesses. It was often easier for farmers to see the disappearance of their old interests (e.g. premium milk price) than to identify new opportunities (e.g. increased capital availability). Long ago, Toynbee (1947) indicated that due to this reluctance for change, it is the failure of old systems that drives the trial and exploration of new economic models. Although the gate for innovation has been opened, the following subsections show that Illawarra dairy farmers had limited resources to embrace this opportunity.

### **6.2.5 Government support**

Deregulation was a single event, but belonged to a continuous trend of declining government intervention, which contributed to farmers' financial pressure. When asked about whether there was any help from governments, participant #8 (male, over 50 yr, medium-scale farmer) said: 'Especially in the last five years [since 2011], the government support is non-existent.' With decreasing funding, government support has become increasingly based on the provision of services, which usually aim to facilitate farmers to seek opportunities in a deregulated industry environment, but cannot directly help farmers in their challenges (Cheshire & Lawrence, 2005). Currently, Illawarra farmers are provided with extension services by Dairy Australia (industry organisation) and Local Land Services (state government agency). They organise workshops for farmers to improve their farming and business skills, and design relevant programs and smartphone apps. One program, called Fert-smart, trains farmers in efficient fertiliser usage. Another program, called DairyBase,

allows farmers to analyse their farm performance and identify areas for improvements (ADIC & DA, 2014). Participant #4 (male, over 50 yr, small-scale farmer) commented on these services: 'I think the industry is better serviced for information.' This information guides more rational decision-making, but it is farmers' role to take real actions. Overall in the post-deregulation era, Illawarra farmers have experienced a decline in direct government support or financial assistance.

Despite those services, farmer participants highlighted the limited nature of government support. Firstly, some participants felt that governments might have lost touch with farmers (Sinclair et al., 2015). Participant #3 (male, around 35, small-scale farmer) indicated that farmers 'don't hear from them [the government]', and 'you have to yell and scream at them to make things happen'. Secondly, existing extension services might not be enough. One farmer (male, around 40 yr, medium-scale farmer) critiqued the services provided by Dairy Australia and Local Land Services: 'It's marginal... they are just talking, but funds, hahaha... you tend to learn more off neighbours than the [government] departments.' Thirdly, the government has seemingly provided limited incentive for farmers' technology adoption (Higgins et al., 2017). Participant #15 (a farm machinery dealer and service provider) said: 'Our industry is that the farmers can be encouraged to adopt new technologies, but from our side of the industry, we don't get really any incentive or help in supporting with new technology.' Finally, the government provided limited assistance for farmers under economic challenges. When asked about whether the government did anything to help farmers cope with the low milk prices in 2016, participant #6 (male, over 50 yr, medium-scale farmer) answered: 'No, no, no, they talk a lot.' Participant #8 indicated farmers' difficulty in managing the issue of prolonged low milk prices: 'We got no support mechanism underneath us at all.' The overall situation reflects the neoliberal policy environment stressing market-based mechanisms in coping with economic challenges (Hogan & Young, 2013).

Despite this situation, government support may decrease even further in the future. Participants #14 (Dairy Australia officer) and #18 (Local Land Services officer) agreed that state and federal governments were pulling back from intervention in dairying. Participant #14 said:

States-governed organisation Local Land Service, which they have an office in town, they are currently restructuring, reducing the level of physical services and especially

extension [services]. The state government is backing away from extension services. Up until four years ago they would have dairy offices in each of the major dairy regions. They made them redundant, and closed down the whole service provision to farmers.

Participant #18 added: ‘At this moment [funding] is down. I used to run multiple projects worth up to some millions of dollars per project. Last year I had 30,000 dollars.’ If the government viewed numerous farmers as inefficient or destined to leave the industry, there was little reason to support them. With this logic, agricultural support, including funding for research and natural resource management, is more targeted at supporting the competitiveness of remaining farms (Lockie, 2015). Although neoliberal policy frameworks highlight the role of private contributions (e.g. milk processors providing counselling for their suppliers, and supermarket initiatives for helping farmers undergoing drought) to replacing government investment into the farm sector (Hogan & Young, 2013), this seemingly has not occurred substantively in this case. No matter whether the support mechanisms are sufficient or not, they have become increasingly economic in nature, namely helping farmers improve their economic performance rather than strengthen their political status (e.g. helping farmers gain better terms in face of corporate processors).

### **6.2.6 Climate challenges**

Since deregulation, a series of climate challenges have become a major source of farmers’ financial pressure (Harrison et al., 2017). From 2002, when the millennium drought (see section 4.3) first hit the Illawarra, the financial pressure felt by local farmers was exacerbated. The drought reduced pasture production and increased farmers’ feed costs. Some farmers commented in media reports: ‘Most of us have seen worse droughts than this, but this is the worst in terms of impact because of deregulation (#M99)’; ‘On top of the price cuts imposed on farmers with deregulation, we didn’t have a great winter to prepare silage (#M100).’ Participant #6 (male, over 50 yr, medium-scale farmer) recalled this drought: ‘I have borrowed money to expand the business, and I had a plan to pay off all that money in 5 years. It took me 10... it was delayed by a bloody drought... we have no feed, so we have to buy extra feed.’ He thought that this drought was more serious than deregulation. Dibden & Cocklin (2010) indicated that the millennium drought profoundly undermined the economic basis of Australian dairying. The impacts of the millennium drought were seemingly



worsened by changing policy frameworks, which thus threatened the resilience of local agri-food systems (cf. Smith & Lawrence, 2018).

Another commonly mentioned challenge was climate change. Participant #6 said: ‘Certainly there has been a change in the climate, [it’s] more variable... we just get events now like it will stop raining, and then three months later it’ll rain. So the weather is coming in events rather.’ Participant #7 concurred: ‘We get wetter times and drier times, more extreme [variations]. Longer drought spells and longer wet spells as we experienced lately.’ Just like drought, flood could also be challenging for many farmers. Participant #5 said: ‘Like climate change, climate variability, I suppose is the most tough bit. This is a wet farm [his farm]. Could 80% of the farm goes under floods... a lot of coastal farms are [situated on a] flood plain.’ The challenge of climate change for Australian dairy farmers has been widely recognised in the academic literature (Bell et al., 2014; Hanslow et al., 2014). With declining government support, environmental considerations were having an increasing influence on dairying in the Illawarra region

### **6.2.7 Potential change**

Deregulation and related processes to a certain extent have changed how Illawarra dairying has been organised. Before deregulation, each dairy farming family was artificially protected from other farming families in the sense that it was relatively difficult for farmers to expand in size and market share, and compete with others. It was relatively easy for farmers to form a strong attachment to their land, as they usually worked on the same piece of land for the long term with steady profitability. It was also relatively easy for farmers to form a harmonious relationship, as they usually did not have much conflict of interest (Sinclair et al., 2015). Overall, this previous era of regulation contributed to farmers’ attachment or commitment to farming, their family farm and farming community (Kuehne, 2013).

After deregulation, with suddenly increased market competition and financial pressure, farmers usually had to explore a fast and reliable way to improve their profitability. Most Illawarra dairy farmers did not substantially change the technological base of their farming systems, as this was generally a long-term investment and risky (Higgins et al., 2017). Farmers more likely chose to adopt incremental changes, including updating equipment and using more inputs (intensification), and seek to acquire the capital released by those farmers

leaving the industry (Wästfelt & Zhang, 2016). As market volatility also increased, many Illawarra dairy farmers also considered diversification strategies to spread risks, for example, running some other businesses (e.g. providing some farming services and producing their own fodder). Illawarra farmers' exploration of various commercial opportunities contributed to the multifunctional transition of agriculture, which has been much discussed in the context of Australian agriculture (Wilson, 2009).

As for cultural impacts, deregulation inevitably undermined traditional farming culture. That numerous farmers left the industry or sold some of their land reflected that farmers did not have to maintain their attachment or commitment to farming and their family farm. The government no longer functioned to guarantee farmers' profitability, and became a target for numerous farmers to criticise. As farmers were no longer protected from other farmers, market competition (e.g. for land and market share) became more direct and seemingly exacerbated the conflicts between different groups of farmers (e.g. NSW farmers and Victorian farmers). It inevitably became difficult for farmers to form a cohesive political force (Sinclair et al., 2015). As farmers could more freely expand their business, they had more freedom to embrace new capital (e.g. land in other regions), new people (e.g. employees and consultants), and new ideas (e.g. new management approaches). Farmers did not have to be highly attached to what they already had (e.g. their family farm) (Woods, 2014). The above analysis suggests that potential physical and cultural changes in Illawarra dairying were not just responses to financial pressure and market competition (Woods, 2014), but a result of changing structure or organisation of dairy operation. This project also highlights the comprehensive nature of the impacts of deregulation.

### **6.2.8 Summary**

This section explored how some farmers have been driven to push deregulation, and how deregulation and related trends have further driven farmers to change their farming practices and business structure. With the narrowing of market opportunities internationally, Australian dairy farmers have experienced declining terms of trade (Barr, 2014). Farmers who benefited less from pre-2000 regulation (e.g. farmers producing high milk volumes and with a high proportion of milk above quota levels) could be more influenced by that. As long as this pressure was building, they were driven to promote deregulation and shift their pressure onto those who were protected by the previous regulation. Thus, deregulation caused a profit

reconfiguration among Australian dairy farmers and inevitably provoked conflict. Compensation and assistance payments were provided to relieve the conflict and direct numerous farmers to leave. For farmers who were deprived of regulatory protection, they faced lower milk prices, more market opportunities and increased market volatility. Declining government support and environmental challenges also exacerbated farmers' financial pressure.

Superficially, deregulation gave Illawarra dairy farmers more freedom for business expansion and entrepreneurial ventures, which helped some farmers achieve economies of scale. However, Australia's dairy farm sector as a whole has been losing scale and political influence (Ashton et al., 2014; Barr, 2014); deregulation in the Illawarra had induced the loss of numerous farmers and their skills, reduced investor confidence in dairying, potentially damaged farmers' attachment to farming and their farming communities, and reduced farmers' capacity to harness the collective potential of the farm sector partly due to increased competition or division among farmers. It is important to notice that the main reason for Illawarra dairy farmers' inability to challenge deregulation was not farmers having little agency to affect policy reforms or defend their interests (Dibden & Cocklin, 2010), but the challenging market conditions rendering Australian dairy farmers' groups difficult to find solutions to satisfy all sides (Sinclair et al., 2015). Industry bodies (such as Dairy Australia) and local agency (such as local councils) could facilitate farmers to embrace the opportunities brought by deregulation, but they could hardly change the situation that farmers from different states competed for supply contracts. Such competition contributed to farmers' relatively weak strength in influencing supply chain affairs, as analysed in the next section.

## **6.3 Changing supply chain relations**

### **6.3.1 Introduction**

With section 6.2 discussing the dynamics within Australian dairy farmers, to understand dairy restructuring we also need to consider the broader policy and economic environment. Deregulation belonged to the national process of dismantling commonwealth and state statutory marketing authorities, which had monopoly power to regulate trade of agri-food commodities (Gray et al., 2014). Such process reflected the national policy framework 'based on the deregulation of the economy, the privatisation of the common wealth and the

commodification of everything' (Paul, 2012, p.1). The dairy deregulation involved the retreat of public authorities and allowed private entities to have more freedom in influencing industry affairs. Besides the efforts to use deregulation and economic freedom to attract private investment, according to traditional views on neoliberalisation, the deregulation of economic activities has also been actively pushed by corporate interests. Australia's neoliberalisation was initially driven by large corporations, which facilitated multinational capital to increase their influence over the national economy (Paul, 2014). The dairy deregulation also reflected the endeavour of some private entities to increase their political influence over the dairy supply chain (Dibden & Cocklin, 2010).

This section explores deregulation-induced industry change from a systems point of view. The analysis adopts a political economy perspective and follows the concept of the agri-food supply chain. This chain involves the farm sector, processing sector, distribution and retail sector and consumer demand (Bowler, 2014). Agricultural research has increasingly placed farming in the context of this network (see subsection 2.3.2). Alongside such a focus, I also consider the context of Illawarra dairying. Illawarra farmers mainly supply three milk processors (Murray Goulburn Cooperative, Parmalat, and Lion Dairy & Drinks) and two retailers (Woolworths and Coles). This set of corporate actors constitutes the key structure of local farmers' supply chain environment. Bowler (2014) indicated that in developed countries large agribusinesses have dominated one or more sectors of agri-food supply chains. That concurs with Harvey's (2014) view that private power concentration has occurred in major economic sectors under neoliberal regimes. This section emphasises the shift towards private agricultural governance (Wilson, 2001).

### **6.3.2 Dismantling the old system**

Dairy restructuring involved the replacement of the previous government-based, collectively managed system of producing and selling milk with a privately managed version. The first step was direct dissolution of government agencies (e.g. statutory marketing authorities and local services) through deregulation. Next, farmers' milk cooperatives, including farmers-owned milk factories, were to be affected. Cooperatives were an avenue for farmers in the same region to work together, strengthen bonds, make collective decisions and exert control on milk processing, pricing and marketing (Hagan & Wells, 1997). Cooperatives in the Illawarra generally had a long history, represented farmers' commitment to their farming

community, and were part of traditional farming culture (Hagan & Wells, 1997). Cooperatives in the Illawarra were protected by previous regulation from market competition (ADIC & DA, 2014). After deregulation, cooperative processors began to face competition from larger and better capitalised processors, and often failed. Article #M7 (13/07/2000) reflected: ‘The Gerringong Co-op [in the south of Kiama LGA], the hub of the region’s thriving dairy industry for the past 112 years, will quietly close its doors next month - its income plundered by deregulation.’ Deregulation also engendered a 97% plunge in annual profit for the Dairy Farmers Milk Cooperative (DFMC), which was founded in the Illawarra in 1900 (#M90 on 11/10/2001). The Berry Rural Cooperative (in Shoalhaven LGA) had supplied DFMC since 1911, but stopped supply in 2008, and turned to another processor for commercial reasons (#M119). In the same year DFMC was sold to National Foods [owned by the Kirin Group, a Japan-based multinational].

The failure of traditional commercial relations facilitated the formation of new relationships. In the case of DFMC, farmer shareholders initially favoured a foreign takeover, as they needed investment. As indicated by interview participants, under restructuring pressures, farmers usually had to forgo some traditional values and act pragmatically. Article #M131 reported: ‘The Dairy Farmers [DFMC] board has unanimously endorsed the \$910 million National Foods offer.’ One farmer indicated: ‘A lot of farmers have had money tied up in Dairy Farmers for a long time. This gives them a chance to get some capital behind them and reinvest in the area (#M131).’ Another farmer viewed this sale as an opportunity for many old farmers to ‘get out of the industry with a bit of dignity’ (#M133). From this sense, external investment functioned the same as the government assistance package in deregulation, allowing uncompetitive and weary farmers to leave. The entry of private players reflected a transfer in market power. Article #M133 commented: ‘The takeover by National Foods, which also owns Pura and Yoplait, will bring with it the troubles of a less competitive market.’ Due to the relatively small domestic market in Australia, it has been relatively easy for multinational corporations to monopolise the processing of agri-food products (Vanclay, 2003). This power transfer could be irreversible, as Australian farmers usually needed investors more than investors needed them (Williams et al., 2014). The rise of corporate processors marked a turning point for the industry with farmers retreating from collective decision-making on milk processing and specialised in dairy farming.

With the restructuring of government agencies and cooperatives, Illawarra dairy farmers appeared unable to rebuild authority to manage the farm sector and harness its collective potential (e.g. coordinating farmers' production according to market signals). Participant #9 (male, over 50 yr, large-scale farmer) pointed out that farmers were in 'perfect competition' with each other, and 'none of the farmers can influence the market'. Farmers also had less power and influence over supply chain affairs. Dibden & Cocklin (2010) indicated farmers' weak bargaining power and limited collective bargaining when facing processors and retailers. Farmers have faced economic challenges on their own, in greater isolation.

### **6.3.3 Supermarkets**

A new system of supply chain management was to be established by private entities with enough market power. After deregulation, processing and retail sectors of the dairy supply chain experienced the same phenomenon of certain entities accumulating capital and power to an extent that they had significant influence over the sector or supply chain as a whole. Supply chain players were driven by the same competitive pressure to expand, fight for a larger share of supply chain profit, and maintain investor confidence (Richards et al., 2012).

In particular, major supermarkets became more prominent after deregulation than other actors because of their specific position in the supply chain and their market size. Participant #8 (male, over 50 yr, medium-scale farmer) commented on deregulation: 'I still don't think it's been good for the industry. It's taken power from the farmer or the regulator or the government, and just totally given it to the corporates, the Woolworths and Coles [major supermarkets in Australia], and the buyers like that of the world.' Interviewees perceived that major supermarkets' power came from their freedom to manipulate retail prices and shelf space. Before deregulation, 'supermarkets couldn't have a strangle hold on it [retail milk prices]. They couldn't sell it [milk] cheaper, [because] they weren't allowed to' (participant #7, male, over 50 yr, medium-scale farmer). After deregulation, 'supermarkets have to be the biggest power... because there is nobody that governs what supermarkets can do, what price they charge, and how they display milk on the shelf' (participant #4, male, over 50 yr, small-scale farmer). The control on shelf space has been recognised as a major instrument for supermarkets to pass operating costs down to producers (Konefal et al., 2007).

Major supermarkets ‘basically control the retail dairy market’ (participant #6, male, over 50 yr, medium-scale farmer) and ‘dictate what they want to pay’ (participant #10, male, around 40 yr, medium-scale farmer). Participant #9 (male, over 50 yr, large-scale farmer) indicated that farmers could grow their business nationally, but major supermarkets still decided their survival; major supermarkets also prevailed over milk processors and used ‘the xenophobic sentiment of the public to go against processors’ (major processors are largely multinational corporations). The dominance of corporate retailers corresponds with the view that buyer-driven value chains have gained increasing prominence in the global economy partly due to buyers’ (e.g. the retail sector) control over market access (Neilson et al., 2014). The power of supermarkets was also reflected in interviewees’ view on their political leverage. Participant #6 said: ‘The supermarkets contribute to each of the political parties too. You know, the political parties are not going to go against the supermarket lobby because they might lose their donations for the next election.’ Participant #8 indicated: ‘The Woolworths or Coles could ring up and get a meeting with the prime minister within two days... if Australian dairy farmers want to ring up and get a meeting with the prime minister, [they’ll say] we will have to get back to you.’ In article #M187 (28/07/2011), one Illawarra dairy farmer summarised: ‘The Government doesn’t really look at Australia’s food security.’ These comments support the view that state sovereignty in food governance to a certain extent has been subsumed to private or multinational capital (Richards et al., 2012), and global value chains or the organisation of global economy has been increasingly governed by lead firms (Gereffi et al., 2005).

With considerable market power, major supermarkets could harness the collective capacity of the dairy supply chain. There were economic needs to integrate different sectors of the supply chain, convey market information to suppliers, enhance the utilisation of resources, and pressure suppliers to operate efficiently. In agricultural research, retailers have been identified as major drivers of agricultural restructuring (Burch et al., 2013). However, major supermarkets tried to increase their own competitiveness through sourcing milk of the prices and standards they demanded (Burch et al., 2013), without sufficient consideration that whether the farm sector received enough investment to ensure farmers’ sustainable development. One farmer said: ‘Coles and Woolworths are purely companies looking after their shareholders with no regard to the viability of farms that are supplying them (#M212).’ Major supermarkets exerted pressure on other supply chain players (Richards et al., 2013), but, based on the view of participants, took little responsibility for supporting farmers in

issues like stabilising farmgate milk prices, coping with environmental challenges and facilitating technology adoption.

Supermarkets' intervention in supply chain affairs was reflected in their control on retail milk prices. Immediately after deregulation, Woolworths and Coles cut prices of their home-brand milk by 30 cents per litre as a practice of their newly obtained freedom to influence milk pricing (#M18). From October 2000 to April 2001, milk bought from supermarkets increased from 47% to 50% of total sales of liquid milk (#M69). Another price cut happened in the 'milk price war' between Coles and Woolworths beginning in 2011. This was a major event with 22 news articles (12.2% of total) reporting on it. The price of home-brand milk was reduced by around 23 cents per litre to one dollar per litre. The background was a global milk oversupply (#A20). In 2012, NSW suffered a 9% drop in dairy exports (NSWDPI, 2014). The overall impact of the one-dollar milk on the domestic dairy supply chain was recognised as a significant market-based pressure. The National Foods (a milk processor) general manager said: 'The one-dollar milk, right throughout the supply chain, is making the dairy industry a very tough industry to work in (#A10).' Quotations from news articles showed that 'everyone's crying poor' (#A10) and conveyed strong criticism of the two major Australian supermarkets.

With rising sales of milk from the major supermarkets, the market share of other retailers (e.g. corner stores, milk vendors and other supermarkets) declined. For example, the South Coast Milk Vendors Association used to have 130 members in the 1970s, but had just 12 by 2014 (#M243).

Milk processors were also squeezed (#A10, #M170). Every two years major processors had to compete for supply contracts for the one-dollar milk, which put 'extreme' pressure on them (#M213, #M215). One farmer indicated: 'While there is very little or no money to be made supplying home-brand milk to supermarkets, these contracts determine how much shelf space they [processors] get for their brands and if they don't sell their brands they can't afford to pay their farmers a fair price (#M213).' However, there was fierce competition for shelf space. Participant #9 (male, over 50 yr, large-scale farmer) indicated that 'retail shelf space is crazy', and 'many [milk] brands were ruined'. Article #A22 stated: 'Cheap milk is stealing the market away from more expensive brand milk.' In news articles, farmers encouraged consumers not to buy supermarket home-brand milk (#M212, #A20, #A37).



The milk price war has driven corporate processors to pass the pressure onto farmers. One farmer believed: ‘The processor was not able to absorb any of this loss in price, and 100% of the supermarket price drop has been passed onto farmers like myself (#A11).’ Due to the one-dollar milk, ‘up to one in five NSW dairy farms faced financial ruin’ (#M203). One farming family reported an income fall of AUD\$77,000 over the fourteen months since the price war in 2011 (#A22). A further concern was that the one-dollar milk would last for ten years or more. In 2014, Woolworths began to offer longer contracts (up to ten years) to its home-brand milk suppliers to match Coles, and restrict inter-state milk transport (#O23 on 14/04/2014). These measures could reduce market volatility, but participant #4 (male, over 50 yr, small-scale farmer) expressed concerns: ‘We are locked in for 10 years... it’s diabolical really. [It] just means there can be no real incremental growth of the milk value over that period of time.’ Dairy farmers usually believed they were unfairly treated. Participant #13 (female, former dairy farmer) indicated: ‘They [Farmers] don’t get a fair return for the work they put in. In this country, they’ve been told, everybody’s been told that you all deserve food at rock bottom prices. We have supermarkets who promote that model. We have a government who promote that model.’ This also reflected the limited influence of domestic-oriented dairy farmers on the wider value chain.

Arguments defending supermarkets also existed in news articles, but had little coverage. Major supermarkets claimed that they had a good relationship with farmers (#A10). The Woolworths store in Kiama indicated that they stocked South Coast milk (a farmers-owned cooperative brand) to support local farmers (#M212). Two years after the price war, a Coles managing director denied that one-dollar milk threatened farmers’ livelihood, and indicated that average farmgate milk prices remained close to peaks of the last five years (#M213). Some Illawarra dairy farmers expressed that it was time that Coles stopped ‘spin-doctoring’ (#M213); ‘Despite what Coles and Woolworths are saying, they are not helping the farmer stay in business (#M212).’ If the one-dollar milk did not reduce milk payments to farmers, it at least created a negative expectation towards the future of dairying (Lockie, 2015).

Overall, after deregulation, the dairy supply chain entered into a state of freer competition characterised by the powerful squeezing others, or mutually applying pressure. Existing research usually differentiates corporate interests from farmers, highlighting the pressure exerted from the former on the latter (Richards et al., 2012). However, the present study

shows that all supply chain players, large or small, corporate or non-corporate, were under the same competition for share of supply chain profit. Although supermarkets dominated the supply chain, they also competed with each other, and faced public pressure regarding farmers being squeezed by them. Although major processors might have passed their pressure onto farmers, they faced pressure from supermarkets. Although farmers, who supplied the domestic liquid milk market, bore the pressure from corporate interests, they constantly sought public support (e.g. through news media). Although farmers seemingly should unite and confront the challenge together, the Illawarra case also shows that farmers usually tried to enhance their own competitiveness and outcompete others. The competition has driven the exit of small or uncompetitive players in all major sectors of the supply chain. It became difficult for supply chain players to consider the collective and long-term capacity of the industry, a phenomenon widely recognised under neoliberal regimes (Harvey, 2014). Singh-Peterson & Lawrence (2017) also indicated that the withdrawal of previous supply chain arrangements (e.g. cooperatives and central market) where farmers had more control has had devastating effects on Australian agriculture. The new system observed in this thesis has seemingly failed to create new space for economic growth, but witnessed the stagnation of Australia's milk production.

#### **6.3.4 Processor politics**

To understand farmers' situation, we should also examine the relationship with processors. Illawarra dairy farmers were closely tied to processors. If farmers wanted to promote their milk, they could only promote it under the brand of their processor. Participant #3 (male, around 35 yr, small-scale farmer) said: 'Our factory [Parmalat] makes Paul's milk, so we can say: hey, go buy Paul's milk... they all help the company [Parmalat]. So the more profit the company can get, hopefully the more money we can get back.' Participant #13 (female, former dairy farmer) said: 'Farmers need to see all of the people in the supply chain as their partners of their business.' If processors planned to expand, they usually encouraged farmers to produce more. When market conditions became unfavourable, processors and farmers could both face contraction. Processors occasionally provided farmers protection. For example, Parmalat, as the winner of Woolworths NSW and Queensland contracts for home-brand milk, agreed to offer farmers a rise-and-fall clause (#O23 on 14/04/2014) which allowed farmers to share fluctuating input costs with Parmalat. One farmer commented: 'It's probably the most exciting thing that has happened in the dairy industry for 15 years (#O23).'

A potential issue was that like supermarkets, major processors established political advantage over farmers after deregulation (Sinclair et al., 2015). After deregulation Australia's milk production declined (NSWDPI, 2015). Under fierce competition, major processors managed to enhance their competitiveness through expansion or mergers. For example, in 2013/14, Murray Goulburn Cooperative (MGC, the largest milk processor in Australia), Bega Cheese, and Canadian dairy giant Saputo competed for the takeover of Warrnambool Cheese and Butter Factory worth over AUD500 million (McCran, 2014). Major processors usually allied themselves with multinational capital (NSWDPI, 2015), and had more capacity to expand. Compared with farmers, major processors' one advantage was the relative ease in forming a national oligopoly. The Illawarra's milk was largely processed by three processors (see subsection 6.3.1), but there were over 100 farmers. The oligopoly allowed major processors to have more influence over the market and be able to set product standards and farmgate milk prices (Dibden & Cocklin, 2010). This advantage determined that when market conditions became unfavourable, processors could shift their cost pressures onto farmers.

This power imbalance was shown in the 2014-16 global milk price decline. Before this issue was felt by Illawarra farmers, processors had been impacted. One managing director of MGC said: 'There is not enough money to be made by all players [processors] in the Australian dairy market so many players will either have to consolidate [merge with others] or venture internationally (#M241 on 28/08/2014).' Before the price issue became serious in Australia, it was seemingly understated. One analyst of Dairy Australia believed that Australia's dairy industry was strong enough to absorb the price fall (#M254 on 15/01/2015). One managing director of MGC said: 'We think they [milk prices] have bottomed [in September, 2015] (#M252).' Underestimating this issue probably engendered improper responses. When the price falls became more serious, some major processors cut milk payments to farmers. Article #A38 (24/06/2016) indicated: 'The cooperative [MGC] shocked its suppliers by cutting prices, plunging much of the industry into crisis.' Among the 13 interview participants with direct dairy farming experience, six families supplied MGC. Participant #4 (male, over 50 yr, small-scale farmer) indicated: 'Most of the farms around Berry supply Murray Goulburn [MGC]. They've been good up to this last hiccup. I think most of us dropped out five cents a litre [in farmgate milk price].' Processor Parmalat also offered a lowered milk price. Three participants supplied Parmalat. Participant #10 (male, around 40 yr, medium-scale farmer) explained: 'For the next six months [from January 2017], we're gonna lose about two cents a

litre.’ Participant #7 (male, over 50 yr, medium-scale farmer) also indicated that if one processor lowered their milk price, other processors tended to do the same, thus financial pressure was distributed across all farmers. Overall, lower farmgate milk prices were a widespread issue among Illawarra dairy farmers.

Three participants supplied Dairy Farmers Milk Cooperative (DFMC) which offered good milk prices. Participant #6 (male, over 50 yr, medium-scale farmer) explained:

It’s better than the other companies. They [DFMC] just have a different business model to the other dairy processors... Lion [the company owning DFMC] have a market, say have a market for 200 million litres a year. They will go out and take contracts from farmers for 160 million litres, so there’s always 40 million litres short, but they can buy that milk cheaper from the Murray Goulburn [MGC] or Parmalat. What happens in a really good season, when we produce 20% more milk than usual... they can still use that milk and don’t have to sell it cheaply elsewhere.

When asked about why farmers did not switch from MGC to Parmalat or DFMC for better conditions, participant #1 (male, around 50 yr, small-scale farmer) indicated that Parmalat or DFMC did not want more farmers, because they could buy milk cheaply from MGC. Participant #4 confirmed that MGC traded their excess milk to other processors. Thus many farmers’ milk had to go through MGC to reach other processors. MGC, supplied by numerous Illawarra farmers, to a certain extent locked farmers into their system (e.g. the terms they set). This model of selling excess milk probably also made MGC vulnerable in market contraction.

Rather than domestic issues, some farmers recognised that the cause of the price problem was unfair international competition (Lockhart et al., 2016a). Although farmer participants supplied the domestic market, the competitive pressure on their processors, which usually supplied to the international market was transferred to them. Participant #6 said: ‘The challenge for the Australian dairy industry is the international dairy industry. Foreign companies, dumping product into Australian export markets, they influence the price.’ Participant #8 (male, over 50 yr, medium-scale farmer) added: ‘They [the US and European farmers] are subsidised. They go out on the world market. We are only paid world market price... do you think they have a level playing field? No... that just hurts us unbelievably.’

Under the background of adverse market conditions, deregulation that expected farmers to be self-reliant and compete with each other will probably continue to drive farmers out (also see Lockie, 2015).

Although the problem was in the global market, farmers expressed dissatisfaction towards their processors, especially MGC who draw investment from both farmers and multinational capital. Article #A37 indicated ‘They [MGC] are trying to appease investors by smashing their own farmers.’ A Victorian farmer commented: ‘It’s not fair on the farmers because we’ve worked within our budgets on the advice [for business expansion] we’ve been given from the board of [MGC] directors (#A38).’ Participant #4 indicated a change in the relationship between farmers and processors due to the price issue:

The processor of our milk used to be our friend, you know, used to have a contract between us. That was mutually beneficial... we are finding that the processors aren’t so much our friend as we thought, mainly because it’s not always Australian-owned processors we are dealing with... they will maximise their profit and do it as cheaper as they can... so we run a risk being screwed, and that’s effectively what has happened in the case of Murray Goulburn [MGC] and a few others.

Some participants felt that processors did not share enough profit with farmers. One Illawarra farmer commented: ‘We accept that there’s ups and downs and market volatility... but the supermarkets and the processors don’t, and they don’t want to bear any of the risk (#M264).’ Participant #13 (female, former dairy farmers) said: ‘Murray Goulburn [MGC]... are paying the worst possible price at the present moment.’ Some participants expressed that they no longer trust their processors. Participant #4 used the home-brand milk contract between MGC and Coles as an example to show that MGC withheld the truth from farmers. He said: ‘They [MGC] are all right to argue how they can make money on that or probably good business for us, coz it was excess milk at the time in the state, but what they didn’t tell us then was we are locked in for ten years.’ That farmers had to continue to work in the industry with negative sentiment reflected their lack of effective strategies to counter the oligopoly of larger supply chain players. Previous cases show that farmers’ actions, like milk dumps, have been easily marginalised due to the competition among rural communities for contracts (Woods, 2014).

Overall, the competitive pressure released by deregulation drove processors to expand business by all means, usually relying on private or multinational investment. Major processors managed to establish political prominence over farmers. However, adventurous expansion plans lessened some processors' resistance to market fluctuations. With increasing international competition, some processors tried to maintain investor confidence and utilised their political advantage to shift their pressure onto farmers with limited consideration of farmers' viability and long-term capacity. In this regard, major processors behaved similarly to major supermarkets. Traditional views on multinational capital highlight its competitive and exploitative nature (Screpanti, 2014). The present study indicates that, according to some interviewees, multinational corporations or processors have previously formed a mutually beneficial relation with farmers when the competitive pressure had not become enormous. It was not foreign investors or corporations that tended to squeeze others, but the need to maintain their position in the freer competitive environment and amid the vagaries of global market. Clearly, corporate food governance has failed to improve farmers' overall market conditions.

### **6.3.5 Farmers' weak position**

To clarify why the dairy supply chain has taken its current form, I further discuss why Illawarra dairy farmers and their cooperatives did not become a strong political force to override other industry players. Firstly, it was comparably difficult for farming businesses, comprised of many family-owned and small enterprises, to form a national oligopoly or expand to a level where their business went beyond the range of NSW (only one farmer participant achieved that). For Illawarra farmers to expand, they usually had to wait for their neighbour(s) to release some land to them, or acquire land disconnected to their farm (participant #12).

Secondly, it is difficult for dairy farmers to store their product. The materiality of liquid milk demanded that it be processed, refrigerated and consumed within a short time period. Participant #8 (male, over 50 yr, medium-scale farmer) explained:

We have a product that's got to go every day, or every second day... with the grain farm, if the prices are really low, I can say well I just dump the wheat out on the ground and leave it there for three or four months... we [dairy farmers] are totally at the hands of,

you know, the demand. We [the processors] are gonna give you [farmers] this price for it [milk], because we know you can't keep it.

Dibden & Cocklin (2010) also recognised that the bulkiness and perishability of milk constrained farmers' actions in bargaining for higher prices. Perishability has also been recognised as a key factor causing the asymmetry in farm to retail price transmission, and limiting the increase in farmgate prices. For perishable agri-food products, declining retail prices can be quickly translated into declining farmgate prices, possibly due to the motivation of mid-level actors to quickly sell perishable products (Aguiar & Santana, 2002). However, increasing retail prices may not quickly induce a need for higher supply, and may not quickly drive up farmgate prices, due to a lack of, for example, refrigerated trucks (Aramyan & Kuiper, 2009).

Thirdly, dairy farmers were a small proportion in the national population and often did not have enough resources to organise effective lobbying. Participant #6 (male, over 50 yr, medium-scale farmer) said: 'We are just a small number of people, and we don't have any political clout, and we really are not a strong lobbying body, and it's very hard to get the dairy farmer off his farm to go and talk to someone.' If dairy farmers had more economic resources, it would likely be easier for them to successfully broadcast their concerns to consumers. It seems that compared with the pre-deregulation time, dairy supply chain players' political or public influence became more closely correlated with how much capital or economic resources they had.

Illawarra dairy farmers' weak position relative to major processors and supermarkets determined the usually limited performance of farmers-owned cooperative processors. If cooperatives looked after their suppliers' profits, the financial performance of these cooperatives would be dragged down. For processors to succeed in a highly competitive market, they usually had to be self-serving, otherwise they sacrificed their own capacity.

Besides analysing the nature of dairy farming and farmers' groups, we should also consider that one possible reason for many farmers' limited political strength was their overall inability to generate a comparably high short-term profit. High profitability can bring many advantages. Firstly, it will become easier for farmers to attract young farmers and external investment. Labour shortages and the declining number of farmers have long been recognised

as a major issue (Barr, 2014). In the Illawarra dairy supply chain, the farm sector was the only major sector without direct injection of multinational investment. Corporate processors and supermarkets took a share of profits from milk sales, but did not take direct responsibility for helping farmers develop their businesses. Participant #6 said: ‘The processors don’t own dairy farms. They don’t have to make money off a dairy farm, just take money.’ If farms could generate high returns, they would be more valued by investors. Secondly, farmers would have more economic resources to increase their political influence (e.g. through forming a strong lobbying body) and persuade consumers to support them. Thirdly, there are also more economic resources to establish protective mechanisms (e.g. coalitions of producers) to protect farmers (e.g. from market fluctuations), to be invested into existing farms (e.g. in new technologies), and to ensure the long-term capacity of farm capital. Given the above discussion, a key reason for farmers’ predicament is the adverse market conditions (e.g. the global milk price decline) that constrain farmers’ profitability. In agricultural research, much attention has been paid to corporate players considered as major factors restricting farmers’ profitability and market influence (for example see Pulker et al., 2018).

### **6.3.6 Potential change**

The new political relations involved in the supply chain contributed to a different industry culture. Previous government agencies and cooperatives allowed Illawarra dairy farmers to work together and functioned as social and economic adhesives (Sinclair et al., 2015). Removing or restructuring such adhesives and loosening restrictions on competition inevitably strengthened competitive relations. Participant #12 (male, around 40 yr, small-scale farmer) explained how some farmers expected others to fail and took over their capital: ‘It’s a very competitive environment... the big farm always look to next door to see how they going, so [if] they fall off the perch, they [the big farm] can buy that farm, and get bigger.’ It became easier for farmers to take an individualistic approach in business development. Participant #8 (male, over 50 yr, medium-scale farmer) said: ‘It [deregulation] divided the [dairy] farmers and conquered them. When it was a regulated system, farmers were much more together... [currently] they [farmers] work on their own, do their own things, and are very individualistic.’ It has been difficult for farmers to form a cohesive political force. Participant #8 said: ‘They [dairy farmers] don’t see the value of what some things can be done [for example forming a lobbying body collectively].’ Participant #13 (female, former dairy farmer) said: ‘It’s not a collaborative model. Everybody says we need to cooperate, but



nobody quite works out how to do it yet.’ Phelan (2014) indicated that neoliberalisation normalises a world of ‘narcissistic individualism’. This thesis reveals how a specific neoliberal project (the dairy deregulation), in effect, unleashed a new level of intra-industry competition to the detriment of an industry culture that enjoyed a more collaborative, unified and supportive dynamic, and as a result contributed to an individualistic farming culture.

Deregulation also divided the domestic dairy supply with many Illawarra dairy farmers viewing other supply chain players negatively. This was clearly shown in local media. Based on Illawarra farmers’ quotations, local journalists tended to single out farmers’ ‘enemies’. Intentionally or inadvertently, journalists created targets for public criticism. The government that pushed deregulation was criticised as being out of touch with rural communities (#M50). Major supermarkets have been viewed as ‘bad’ guys squeezing other industry players. Major processors have been attached with the label ‘foreign’. When Dairy Farmers Milk Cooperative was sold to a Japanese company, article #M133 lamented: ‘Breakfast has become a decidedly un-Australian affair because of the foreign takeover of our food companies.’ Major supermarkets and processors together have been viewed as ‘big companies’ and thus ‘selfish’ by association. One farmer, who helped establish a farmers-owned milk factory, said: ‘We’ve always believed the big companies take too much away from the local regions and we’re just trying to do our little bit to bring it back into a local regional business and look after local people (#A29).’ Farmers’ expression of discontent could be their strategy to attract public support. Besides discussing industry conflicts, it is also important to notice several characteristics of the media inquiry: 1. for journalists, the underlying causes for industry conflicts were seemingly unimportant; 2. journalists tended to privilege individual identities and self-expressive modes of public discourse, and ignore other opinions (e.g. not all farmers criticised deregulation) (Stanyer, 2007); 3. journalists tended to favour news stories which included binary oppositions (‘good guys’/‘bad guys’) (Louw, 2005); 4. local journalists tended to support local businesses or farmers (Vine, 2012).

The new supply chain arrangement determined several aspects of potential on-farm changes. Firstly, Illawarra dairy farmers generally had to focus on improving their own business. Business expansion was usually a main direction of farmers’ planning, as with a larger output farmers could increase their bargaining power in the supply chain. Secondly, with insufficient investment or financial resources at hand, farmers usually had to push the potential of their capital through intensification, and might compromise other elements of on-farm

management (e.g. environmental management and measures against extreme weathers) (Riley et al., 2018). Finally, the failure of existing business models to cope with financial pressure drove Illawarra farmers to explore new farming approaches or commercial opportunities (e.g. searching off-farm income, running other businesses, and relocating to other regions) (Woods, 2014). As suggested by interviewees, numerous individuals each with a small amount of resources were searching new opportunities from various directions (details are presented in following chapters).

### 6.3.7 Summary

Deregulation has represented a systemic change of the domestic dairy supply chain. Table 6.1 summarises supply chain arrangements before and after deregulation. Although deregulation triggered a fundamental restructuring, the development of pressure for change was a gradual and continuous process, and partly originated from deteriorating market conditions before the moment of deregulation (July, 2000).

Table 6.1. Supply chain arrangements before and after deregulation.

	Before deregulation	After deregulation
Economic foundation	Milk sales could generate a relatively high and stable return.	Milk sales could not generate a satisfactory return for all players involved in the domestic dairy supply chain (Barr, 2014).
Social regulation	There was strict protection on farmers to avoid too much pressure on them.	With lesser economic importance of the farm sector, there was less resources and necessity to provide institutional protection for farmers, and to keep investing in the sector, e.g. in the form of subsidies (Lockie, 2015).
Social relations	Government agencies, farmers and processors had close relations, which could facilitate trust and coordination.	The supply chain has been privatised with declining government intervention, and farmers retreating from decision-making on milk processing. As there was insufficient profit, supply chain players tended to exert pressure on others. As farmers usually could not accumulate capital as fast as major processors and retailers

		did due to structural reasons, many farmers were disadvantaged. Farmers themselves competed with each other and could not form a cohesive political force to override other supply chain players.
Consequences	Australia's milk production kept increasing, which created downward pressure on milk prices (NSWDPI, 2015).	As deregulation failed to improve Australian dairy farmers' overall market conditions, farmers were driven to adjust and improve their business, but the number of Australian dairy farmers has kept decreasing (Ashton et al., 2014).

Overall, the two systems responded to different economic environments and reflected different accumulation strategies. When the existing system could not satisfy internal players, they tended to exert pressure on others. The pressure drove industry players to explore new business models and commercial opportunities.

## 6.4 Conclusion

The analysis of dairy industry change reveals an unhappy picture where farmers presented negative comments on other industry players. One overarching factor has been a continuous trend of economic deterioration within Australian dairying since the 1970s. This trend has engendered pressure on farm income, and driven farmers, especially those who were more influenced by this trend, to push policy reform, demolish existing regulation systems and pursue new accumulation strategies. This process resulted in deregulation and reduced direct government support to dairy farmers (Dibden & Cocklin, 2010). As this case shows, neoliberalisation was not only wanted by corporate power, but favoured by those farmers who had the ambition to outcompete others. After deregulation of the domestic liquid milk market, competitive pressure increased, market stability declined, but the failure of numerous market players opened up opportunities for others. The competitive pressure and more freedom in market activities have challenged a traditional farming model based on the family. This section of analysis firstly extends existing research by presenting a detailed analysis on how neoliberalisation in the dairy industry attracted a broad social basis (e.g. many dairy

farmers) that helped to legitimise and mobilise the process, considering that traditional views on neoliberalisation usually emphasise the contribution of corporate power and political actors (Paul, 2014). This project also elaborates on how neoliberalisation has unfolded in a specific industry over time and in place, as Van Caenegem & Cleary (2017) indicated that detailed understandings of the trajectories and consequences of neoliberal policies within agriculture is scant.

With less government intervention in market activities, and the decline of previous mechanisms (e.g. cooperatives) managing the dairy supply chain, powerful private entities came to fill this gap and face the challenge of improving the efficiency of the supply chain. Driven by competitive pressure, dairy supply chain players tended to accumulate capital and power to fight for a larger share of supply chain profit (Richards et al., 2012). This process negatively influenced social solidarity and seemingly failed to establish effective mechanisms to invest in the long-term capacity of dairy farms. Compared with major processors and supermarkets, Illawarra dairy farmers have yet to form a powerful political and economic force. Facing significant pressure from other supply chain players, farmers usually have had to explore new farming approaches and new commercial opportunities. This section of analysis makes a contribution by providing a detailed account of how different players and layers of forces over the past decades intersected to influence farmers, considering that theoretical and empirical knowledge on those interactions are limited (Wästfelt & Zhang, 2016).

As analysis in section 6.3 was framed around the notion of agri-food supply chains (Bowler, 2014), I provide several relevant insights on its explanatory usefulness. It proves to be useful in understanding industry change, as the behaviour of players from the same sector (e.g. the farm sector) of the domestic dairy supply chain usually has similar patterns. Firstly, each sector of the supply chain appears to be a naturally formed interest group. For example, farmers have a common interest to push up milk prices. Secondly, different sectors have different functions in the supply chain. For example, major supermarkets function to organise the supply chain (Burch et al., 2013). However, analysis should not be limited by the boundaries of commodity-based sectors, but should consider the general logics of supply chain players, including their market behaviour. Players within the same sector can have conflict of interest. Small agribusinesses may prefer a highly regulated market. Large ones

may prefer the opposite (Woods, 2014). As all sectors face capital and power concentration to a small number of players, inequality within all sectors has become salient (NSWDPI, 2015).

## **Chapter 7 Urban Sprawl and Related Processes**

### **7.1 Introduction**

One way to characterise agricultural restructuring is in terms of two dimensions, industry and supply chain restructuring on the one hand, and the urban-to-rural shift in people and non-agricultural services on the other (Ilbery, 2014). With chapter 6 discussing the first dimension, this chapter, in response to research question one (inquiring into factors driving agricultural change, and farmers' experiences), covers how urban sprawl and related processes have unfolded in the Illawarra and come to shape local dairying.

Urbanisation and economic transition based on lifestyle/amenity factors have been persistent in the Illawarra, underpinned by supportive planning processes of governments (NSW Government, 2015; Sinclair, 2006). Specific processes include land rezoning, farm subdivision, infrastructure construction, residential development, amenity migration, tourism/amenity development, and the rise of sub-commercial/hobby farming and alternative agri-food networks (Gill et al., 2010). Based on empirical data, local dairy farmers have been influenced from multiple angles. Farmers enjoy land asset appreciation and can harness the commercial opportunities brought by urban migrants/tourists. However, farmers are also pressured by new social values related to environmental externalities and animal welfare, and bear increasing costs of using land locally.

The analysis firstly follows the conceptual framework of the urban-to-rural shift in people and non-agricultural services (Ilbery, 2014). Because Illawarra farmers are located close to Sydney, they have been directly influenced by the sprawl associated with Sydney's urbanisation. Rural areas have been repopulated, especially by urban middle-class groups (Klepeis & Gill, 2016). From a political economy perspective, I explore how the new land buyers/investors have reorganised the local economy and conflicted with dairy farmers (Abrams & Bliss, 2013). I also adopt the concept of multifunctional agriculture involving productivist farming elements, farmers' pluriactivity, sub-commercial/hobby farming, and alternative agri-food networks (Marsden & Sonnino, 2008).

As news articles form an important part of the empirical data, I clarify their main features. In news articles, urban sprawl and related processes were not presented as a holistic or consistent picture, but reflected in separate cases (usually stories of local businesses). This pattern concurs with Phelan's (2014) view that news media tend to privilege individual identities. Local journalists tended to present objections towards development plans promoted by the state government, but portray the rural lifestyle of urban migrants positively, and highlight the new economic opportunities for farmers. Local journalists also left an impression that social problems (e.g. unpopular development plans and subsequent farm subdivision) only originated from the outside community (e.g. the state government), rather than from within.

## **7.2 Urban sprawl and related processes**

### **7.2.1 Development plans**

The Illawarra has undergone persistent development in recent decades. One reason is its proximity to Sydney which is Australia's largest city and has been experiencing a long-term loss of farmland (James & O'Neill, 2016). New housing development is a strategic priority for urban planners across the Sydney Basin, and farmland subdivision in certain regions has been unconstrained (Ruoso & Plant, 2018). Participant #4 (living in the Shellharbour LGA) said: 'It's just two hours [driving to Sydney] so a lot of people like to come down for the weekend...a lot of people actually commute from here up to Sydney or Wollongong.' We should also recognise the neoliberal nature of urban sprawl and related processes around Sydney, a factor usually ignored in previous studies (for example see Ruoso & Plant, 2018). Under the background of neoliberalisation, such development processes reflect several interrelated elements, for example commodification, financialisation and market determinism (Harvey, 2005; Paul, 2012). In local media, development was often viewed negatively in terms of causing loss of farmland and amenity.

In recent years, development in the Illawarra was framed around development plans and implemented through land rezoning and the injection of external investment. To a large extent, development was promoted by external forces (e.g. the construction and real estate industries) and the state government, but was often criticised locally. In 2009, a 5000-lot subdivision in Calderwood Valley was proposed by Lend Lease Corporation,

a multinational construction and infrastructure company. Calderwood contained 700 hectares of land ideal for dairy farming. The Illawarra Greens convenor maintained: ‘We should not be putting food-producing land under concrete’ (#M141 on 10/08/2009). The Shellharbour City Council of the Illawarra sued the state government over the approval of this proposal (#O6 on 05/04/2011). Clearly, development planning for rural land has been accompanied by constant conflicts and disagreements over the nature and scale of development projects.

In 2014, the Draft Illawarra Regional Growth and Infrastructure Plan was released by the state government. This document included plans for housing and infrastructure to supply 45,000 new dwellings by 2031 (NSW Government, 2014). A spokesman for a petition opposing development said: ‘This will... allow residential subdivision and speculative development of productive prime agricultural farmland (#O33 on 09/03/2015).’ Participant #20 (Wollongong City Council officer) also voiced concern over rezoning farmland for residential development: ‘Kiama council in particular is very concerned to retain agricultural zoning and minimum lot sizes... to protect the future of agricultural industries.’

The development of the Illawarra is currently guided by the Illawarra-Shoalhaven Regional Plan, which is formulated by the state government. This plan contends that the Local Government Areas of Wollongong, Kiama, Shellharbour and Shoalhaven (covering the study area) will need at least 35,400 new homes between 2016 and 2036 (NSW Government, 2015). Participant #18, a Local Land Services officer, criticised the focus of local development: ‘[You] just see a lot of houses going to be built... they [the government] are zoning differently so the landholders can sell off and develop.’ Crucially, rather than a focus on consolidation and medium density housing, the approach taken in the Illawarra has leaned towards new development in greenfield sites.

The exogenous origin of development concurs with Ilbery’s (2014) view that major land development processes are more likely related to a national or global network of actors. The occurrence of large-scale development plans reflects the absence of planning policies to protect agricultural lands around Sydney (James & O’Neill, 2016). From this perspective, farmers were under pressure to be forced out by new development processes outcompeting agriculture for land. In Australia, there has been a prevailing view that farming in and around urban regions is a transitional activity, or does not necessarily represent the ‘highest and best use’ of land (James & O’Neill, 2016). Those plans implied that a large amount of investment



would be introduced, and local residents could benefit economically (NSW Government, 2015). However, peri-urban regions are especially characterised by contestations from different interests, and land-use conflicts where local residents may resist development due to, for example, noise pollution, visual blight, nature conservation, and changes to the neighbourhood (James, 2014; von der Dunk et al., 2011). Local resistance to development due to the perceived damage to rural scenery has been reported in other regions around Sydney (Ruoso & Plant, 2018). In the Illawarra, resistance against development might also reflect the interests of local dairy industry which would suffer the competition for local land by developers.

Noticeably, development could also be promoted locally. Although the Kiama council seemingly opposed the aforementioned 2014 plan, it raised a much smaller development proposal - for 52 dwellings in the town of Jamberoo - in 2014, seemingly as a compromise position. Even so, among the 65 community submissions on the development, 54 objected (#M227 on 14/02/2014). However, article #M227 highlighted supporting arguments. As one Kiama councillor said: ‘Jamberoo [in Kiama], like many country towns, is dying because it lacks population... there are businesses looking for a lifeline and this project could save them.’ This need for investment implies that there is a need for some agricultural land to give way to more promising economic activities.

Overall, local media mainly presented objections towards large-scale development plans supported by the state government, but revealed a sympathetic attitude towards the Kiama development proposal that was considered more closely reflective of local needs. This revealed the ambivalence of local people who needed external investment to stimulate economic growth, but resisted some negative impacts of development. Thus, residential development was not just a result of the population growth of nearby urban centres. Despite the conflicts, urbanisation has proceeded. In western countries, urban-rural fringes often experience retreat of agriculture (Curran-Cournane et al., 2016), which also applies to the Illawarra context.

### **7.2.2 A lifestyle region**

With continuous development, the Illawarra’s rural landscapes were ‘increasingly populated by people fleeing the city’ (#M168 on 15/01/2011), especially previous Sydney residents

(Klepeis & Gill, 2016). Ilbery (2014) indicated the continuous inflow of wealthy middle-class groups into certain rural areas in developed nations. Interview participants experienced such a population inflow. As participant #8 (male, over 50 yr, medium-scale farmer) said:

All our neighbours [come from Sydney]. One guy's a merchant banker, has an investment portfolio in Japan. Another guy is... an investor. He [is] in the wind energy power under the sea things like that... another guy sort of retired. He was a big importer into Australia... these guys come spend millions of dollars [purchasing rural properties].

According to Walford et al. (1999), the middle-class lifestyle space was underlain by the rural idyll related to hedonism. Amenity migrants or second-home owners usually have a desire for privacy, escape and scenery (Race et al., 2010; Kondo et al., 2012). Article #M126 (05/04/2008) quoted a photographer: 'Growing up on a farm is the most marvellous life... for me the city is just like a giant vacuum cleaner... city people go on holidays to places like Gerroa [in Kiama] and they see that it's a paradise and they buy up the land.' Article #M134 (01/10/2008) mentioned some urban migrants: 'Life on the [rural] land is a complete lifestyle change for the former Sydneysiders who left the big smoke [of Sydney]... for a relaxed rural lifestyle in which their two young children had room to breathe on.' Some tree changers hoped that the rural region could be transformed into 'a sought-after retreat for cashed-up Sydneysiders' (#M218 on 23/05/2013). Kondo et al. (2012) reported that second-home owners seek to support regulations which support their version of a rural idyll emphasising the aesthetic value of rural space. Because of this demand for land and services, consumption-focused development has become a prominent feature of the rural Illawarra (Klepeis & Gill, 2016), and has driven the transition of local economy.

Sub-commercial/hobby farming belonged to the rural idyll of urban middle-class groups. Local media presented various forms of sub-commercial/hobby farming: raising beef cattle (#M168), growing raspberries (#M134), raising chickens (#M210), and growing coffee (#M224). My participant observation confirmed the widespread prevalence of small, non-dairy farms. Journalists portrayed these operations positively in terms of lifestyle values. One hobby farmer said: 'There's a great satisfaction in growing things and harvesting. I love seeing people's pleasure in tasting fresh vegetables (#M168 on 15/01/2011).' Another hobby farmer said: 'All of a sudden on a small piece of land you have this lovely, sustainable, mixed farm where you are growing all this really great food (#M224 on 07/01/2014). Butt (2013)

recognised the sustained growth in small farms for lifestyle and conservation purposes in Australia's peri-urban regions. Since the late 1990s, 'lifestyle living' became a more common land use of acreage blocks than commercial farming in Sydney (Mason & Knowd, 2010). In the Illawarra, the subdivision of dairy farms has created opportunities for small-scale farming to proliferate (Participants #19, 20).

Sub-commercial/hobby farming is often part of alternative agri-food networks (AANs) (Marsden & Morley, 2014; Mok et al., 2014). Local media showed that AANs in the Illawarra involved organic farming (non-dairy and small scale), community gardens/farms, farmers' markets, direct sale avenues, etc. Sub-commercial/hobby farmers generally supplied local niche markets, such as farmers' markets (participants #6-8). The inflow of urban migrants into some rural areas creates demand for local food which is usually more expensive than food products in supermarkets (Woods, 2012). AANs which can reconnect consumers and producers have often been encouraged by local councils around Sydney (Mason & Knowd, 2010). Article #M127 (07/04/2008) explained: 'Wollongong's successful farmers' markets were the best symbol of local food production, as growers and buyers could cut the supermarkets out of the price equation.' According to news articles, the AANs seemingly attracted noticeable community support, as shown in some news titles: 'Illawarra leaders plan to help us eat greens' (#M124 on 13/02/2008); 'Response to farmers' market overwhelms' (#O39 on 13/08/2015). These articles gave the impression that AANs can be an important element in local agriculture. However, the elements making AANs attractive (small scale, localised, ethical/fair trade, short supply chains, community involvement, etc.) arguably also make them uncompetitive and marginal (Marsden & Morley, 2014). To support AANs, to a certain extent, was also to support the middle-class lifestyle represented by sub-commercial/hobby farming. Local councils in the Illawarra appeared to be cooperative in providing the needed facilities for the middle-class groups, making the area more attractive for urban migrants. For example, the 2013 Illawarra Regional Food Strategy revealed a supportive attitude towards local AANs including sub-commercial/hobby farmers (John, 2013).

Overall, local media highlighted the relaxation of rural life, the satisfaction of sub-commercial/hobby farming, and the potential social contributions of AANs. According to Franklin (2006), in the neoliberal age local media have increasingly functioned as an advertisement channel (emphasising how good a commodity is). In the present study, rural

lifestyle and landscapes were seemingly being advertised for sale. In the reporting on the rural lifestyle, journalists largely ignored associated social problems. One problem was the loss of numerous dairy farms for the amenity/lifestyle development. Noticeably the value of dairy farms was highlighted in those articles on major development plans perceived by many local residents as threatening dairy farms (see the previous subsection). That local journalists presented negative comments on the development plans, but favoured some of their results (e.g. the amenity/lifestyle development) once again reveals the ambivalence of local people who needed development but were concerned about its negative impacts. Journalists' support for urban newcomers' rural lifestyle and some local councils' cooperative attitude reflect the inevitability of the amenity/lifestyle transition of local economy.

This economic transition of rural areas has been recognised in academic literature (Ilbery, 2014). The new landholders contributed to one economic model based on the consumption of rural land and the injection of external wealth and capital (Klepeis & Gill, 2016). Urban residents came to rural areas to spend vacations, settle, or perform farming as a hobby or retirement venture. To facilitate this process, the local economy should have or develop construction capacity (to build houses and infrastructure), community services (e.g. health care), tourism projects, and niche supply chains for hobby farmers. According to previous studies, some local councils in Australia were active in driving projects to realise those needs (Gibson et al., 2005). The economy of the Illawarra has been anchored on health care, social assistance, retail trade, education/training and construction (ABS, 2016). The significant influence of urban land buyers/investors and tourists on local economy corresponds with the view that the economic arrangement of rural areas is biased towards those who have wealth and power, and are influential in national policy-making (Curran-Cournane et al., 2016).

## **7.3 Influence on dairy farmers**

### **7.3.1 Opportunities**

Illawarra residents' ambivalence about urban sprawl and related processes was reflected in farmer participants, as those processes brought economic opportunities as well as challenges to farmers. As for opportunities, the external wealth and capital directed into the rural areas could flow to farmers in several ways. Firstly, farmers benefited from their proximity to urban milk markets. Secondly, the expectation of urbanisation usually inflated the value of

their land assets. It was also convenient for farmers to invest in local real estate markets. Thirdly, as the urban in-migrants have invigorated local tourism market and niche food markets, farmers could transform their business to harness these opportunities. Finally, the new landholders brought opportunities for farmers to lease land.

One direct benefit for Illawarra dairy farmers was their ‘proximity to the [milk] factories supplying [the major urban markets of] Sydney and Canberra’ (participant #12, male, around 40 yr, small-scale farmer). Participant #13 (female, former dairy farmer) said: ‘We are paid extra money because we are close to Sydney.’ Many economic geographers have highlighted the influence of transportation costs on agriculture (for example see Goffette-Nagot & Schmitt, 1999). Thus, Illawarra farmers were incentivised to stay close to the urban markets.

Farmer participants have also generally gained high returns from asset appreciation. Wästfelt & Zhang (2016) have argued that with urban sprawl in developed countries, rising land values, including the expectation of appreciation, have become the determining factor of agricultural land use patterns. Participant #4 (male, over 50 yr, small-scale farmer) said: ‘It’s probably about every ten years, the [land] price doubles. Even though the land values are high, they’re still gonna keep growing.’ According to the CoreLogic property data, from 2014 to the end of 2018, median house prices in Kiama and Berry where many participants farmed respectively increased by 52% and 77%. Participant #13 (female, former dairy farmer) recognised the potential windfall for land-owning farmers: ‘They [dairy farmers] should be grateful. They got two businesses. They got their real estate business, which is the value of their land, and they got their milk business.’ Participant #8 (male, over 50 yr, medium-scale farmer) concurred: ‘We actually farmed the capital asset here.’ Land asset appreciation has become a significant part of many farmer participants’ businesses and future planning.

Farmers were therefore encouraged to acquire land locally. Klepeis & Gill (2016) reported that some peri-urban farmers seek opportunities for new real estate markets. Participant #5 (male, around 50 yr, medium-scale farmer) said: ‘One thing me and my wife like to do is to buy another house, or something, using the asset we own, and that house will be rented out. So the rent will pay most of the house.’ Participant #18 (Local Land Services officer) mentioned a dairy farming family that had ‘bought a house property every three years as an investment in the region’. Sippel et al. (2017) also emphasised the increased importance of farmland for financial investment in recent years. Although farmers were encouraged to

continue farming for asset appreciation, their two businesses (farming and real estate) could compete for their investment. For example, instead of adopting farming technologies, participant #12 (male, around 40 yr, small-scale organic farmer) would spend his money on ‘either lowering debt, or acquiring more land’. Thus, it was not just that external land buyers/investors competed land with agriculture, but that the opportunities they brought mitigated against investment in certain aspects of farming. This phenomenon coincides with the general background that an increasing proportion of global investment has gone to non-productive financial activities (Harman, 2009).

Another opportunity for farmers was the tourism potential of the Illawarra. Farmers have been encouraged by local councils to run tourism businesses (e.g. farm-stays or farming tours) or produce agri-food products for boutique markets strongly supported by tourist visitation (#M37, #M73). However, some dairy farmers were not keen on such ventures, perceived as more for those who were leaving the industry (#M54). In this study, no farmer participants had ventured into on-farm tourism; only two participants decided to change farming mode and supply niche markets (details are presented in chapter 8). As Participant #8 (male, over 50 yr, medium-scale farmer) explained: ‘I, as a farmer, don’t have the time to run a full-size-scale farming operation, and do that as well.’ Recent studies suggest that in developed countries most farmers remain committed to conventional productivist farming (Robinson, 2017).

For dairy farmers who decided to embrace the tourism opportunity, they usually had to fundamentally transform their farm. For example, local media reported that some Illawarra dairy farmers turned their farms into tourism-oriented wineries or vineyards (#M84). Sinclair (2006) recognised the growth potential of vineyards in the Illawarra. Wästfelt & Zhang (2016) reported the increasing recreational farms (e.g. horse farms) in some peri-urban areas. Local journalists overall viewed the urban in-migrants as an economic opportunity for farmers, and emphasised the success of local businesses harnessing the tourism potential. The promoting nature of those articles was shown in their titles, for example ‘Coast’s wine industry expands’ (#M76 on 29/05/2001); ‘Vintners of vision’ (#M234 on 31/05/2014). Participant #8 (male, over 50 yr, medium-scale farmer) also recognised this trend: ‘If you ask me what do I see the future of this farm [his farm], I see a golf course down the front, and a big reception centre something up here, because that’s what it all about. It’s all about tourism and people.’ Just like investing in a real estate business as aforementioned, investing in a tourism business

could be an opportunity for farmers/landholders but would direct investment, time and energy out of farming.

Another opportunity was that local farmers could lease land from the new landholders who did not necessarily develop their acquired land. As participant #6 (male, over 50 yr, medium-scale farmer) explained:

The people who bought that farmland as hobby farmers have found out they can't make money out of it, and it costs them money to fix up fences, fix up water troughs. So what they've done is said to dairy farmers would you like to look after my farm for me and run your cows on it.

Participant #7 (male, over 50 yr, medium-scale farmer) also said: 'There used to be lots of small farms in Gerringong... now there are 5 farms. Generally it's bought by people from Sydney with money. They don't wanna farm them, but they leased them to farmers.' Wästfelt & Zhang (2016) highlighted the importance of leasing land for maintaining farms in peri-urban areas. However, leasing also had the potential to negatively influence farmers' emotional attachment to the land they farm. Silvasti (2003) highlighted the importance of ownership in maintaining the emotional ties between the family and the land. Thus, leasing as an increasing rural social relation co-constructed by farmers and external land buyers/investors (Klepeis & Gill, 2016) can potentially reshape local farming cultures.

In summary, the above-mentioned opportunities could be a bonanza for farmers/landholders, but equally could discourage commercial farming through directing farmers' investment out of their farming business. Illawarra dairy farmers usually shaped their business towards certain directions. Firstly, farmers diversified their investment into multiple avenues (e.g. the farming business and the real estate business). From 2011/12 to 2014/15, around 74% of Australian dairy farmers had off-farm income, usually with dairying as their main career choice (Ashton et al., 2016). Secondly, farmers explored how to harness those opportunities through individual efforts. Farmer participants' investment in general had become more individualistic and reactive to the market rather than government intervention. This finding is consistent with relevant literature (cf. Cheshire & Lawrence, 2005). Finally, the ownership of farm capital had become more diverse. Farmers could lease their property to others, borrow from banks, form a joint-capital enterprise when investing in the tourism industry, or lease

land from others. Overall, farmers had to a certain extent deviated from the traditional family farming model that had a higher level of devotion to farming, collectivism, and family ownership (Lockie, 2015).

### **7.3.2 Conflicts**

Despite opportunities, Illawarra dairy farmers also faced challenges from urban in-migrants. According to interviewees, farmers' neighbourhood used to be dominated by dairy farmers. In recent decades, farmers had more and more neighbours with urban backgrounds. In my participant observation, it was common that participants' farms were adjacent or close to residential areas. Participant #4 (male, over 50 yr, small-scale farmer) spoke about how they now had 'a different neighbour to what I ever knew when I was younger'. Farmers and the newcomers might not get along. As participant #15 (a farm machinery dealer) indicated, urban in-migrants 'come in and want [to] change the use of land in that area, and they put pressure on those [dairy] farmers, don't like what they [farmers] do'. Specifically, the in-migrants showed different views of farm externalities and animal welfare.

One point of conflict was that urban migrants made amenity complaints about dairying. Participant #7 (male, over 50 yr, medium-scale farmer) said: 'People don't like living next door to dairies... too noisy, too early starts... if the cow gets out through the fence, they don't like it, [the cow] treads on their gardens. They complain to the council.' Participant #3 (male, around 35 yr, small-scale farmer) said: 'We had complaints before about with spraying organic fertiliser, that's chook manure, and the chook manure smells until... it rains... there was one certain person [complaining to me] about it one time. I told him to go back to Sydney where he came from.' Amenity complaints about intensive agriculture in peri-urban areas have been widely reported in Australia (Taylor et al., 2017). Conflicts occurred partly due to the in-migrants' different lifestyle expectations e.g. expecting a quiet and enjoyable environment for a slow-paced life. Although such conflict is predictable to a certain extent, it can be difficult to restrict development around existing farms due to the strong demand for new housing (Henderson, 2005). Some amenity migrants were attracted to rural areas based on their imagined rural idyll, and tended to promote, or at least indirectly encourage, regulations to make the image become a reality.



Another source of tension was that ‘community are becoming increasingly aware of animal health and welfare issues’ (participant #4). As urban residents lived closer to farms, participant #4 discussed how, ‘the public have a far greater input into what happens on farms now, and that can be backed up by greater surveillance drones or, you know, iphones... our customer could be driving past our gate way at any time’. Participants #3 and #8 concurred that ‘this pressure starts to build’. Community concerns were reflected in consumer choice. Participant #4 said: ‘The consumer out there traditionally has always been financially conscious, but I think now they are becoming much more food quality conscious and also animal welfare conscious.’ Lockie (2015) has reported Australian consumers’ increasing resistance towards agricultural products perceived as cruel. Considering this trend, milk processors required their suppliers to follow certain practices. Participant #8 (male, over 50 yr, medium-scale farmer) commented: ‘[There] has been lots of changes in the last 20 years, [which] is the animal welfare standard on farms. Farmers now would never dream doing some of the things they used to do.’ It seemed that farmers could only passively accept the new requirements from consumers and urban in-migrants, and had limited influence over agenda setting.

Despite stricter regulations, problems occurred with new residents considered by farmers to be poorly informed about dairying practices. As participant #4 (male, over 50 yr, small-scale farmer) recalled: ‘We had an instance... a person from the road viewed there was a cow down in the paddock, and they ring RSPCA straight away, like the animal activist group for rights of animals, instead of coming in and seeing us. We could explain to them.’ Participant #8 recalled: ‘We also have lots of people saying well those cows [heifers] are tied on chains down there - that’s really cruel. But we tie them on chains to keep them contained, so they’ll go in their little hatches, and be warm... at that young age they are so susceptible to disease.’ One contributing factor to the misunderstanding is the decline in knowledge of commercial agriculture among the increasingly urbanised population (PMSEIC, 2010). Dufty-Jones & Connell (2016, p.83) observed that some tree change migrants in Australia ‘have no concept of what a farm is’. Singh-Peterson & Lawrence (2017) presented similar views and also indicated the devaluation of food and farmers among consumers. Participant #8 further indicated that conflicts could occur when so-called outsiders tried to dictate on-farm practices:

A lot of people come in telling us what to do, and these are the same people that shop at Woolies [Woolworths], at Coles, at ALDI, and buy the dollar-a-litre milk. That’s really

cheap, but they expect us to have the best farming system, and cows all living inside the house with you.

In the aforementioned issues, some urban in-migrants seemingly tended to promote their version of ideal farming practices without considering the extra financial burden from following stricter regulations on farmers.

Participants #4 and 13 highlighted the importance of getting connected with the public. As one farmer said: ‘We’ve got to get out there and share our stories about modern farming practices and we’ve got to convince consumers that agriculture in this country is a responsible and legitimate user of our natural resources... the disconnect between rural communities and the rest of Australia is the biggest problem (#M176).’ The contradiction was that ‘it’s very hard to get the dairy farmer off his farm to go and talk to someone’ because of their long working days and the fact that most are time-poor (participant #6, male, over 50 yr, medium-scale farmer). This reflects Australian dairy farmers’ limited public and political influence (Dibden & Cocklin, 2010). Many farmers who do not have the capacity to defend themselves can easily become the scapegoat of real or imagined social ills (e.g. animal cruelty).

Overall, with increasing urban in-migrants, farmer participants increasingly faced two types of restrictions. Firstly, as they got closer to urban or residential areas, they faced increasing economic rents (Sinclair, 1967), which included regulation costs related to legal restrictions on farming practices. Secondly, they also had limited resources to persuade the public to support them, or legitimise their practices (Hogan & Young, 2013). Illawarra dairy farmers usually bore the social requirements of those who have gained influence over their industry and landscapes. This view echoed other analyses of agricultural change (for example see Ilbery, 2014). From the perspective of power imbalance, those social requirements are similar to the private product standards imposed by powerful dairy supply chain players on farmers after the 2000 deregulation (Richards et al., 2012). Many Australian dairy farmers seemingly have less political influence in shaping the social arrangements that influence their business.

### 7.3.3 Competition for land

Another challenge posed by the in-migrants for Illawarra farmers was competition for land. More and more farmland in the Illawarra was being transformed into non-agricultural land uses (Australian Bureau of Statistics (ABS), catalogue no. 7120.0; Dayal, 1980). Farmland loss from subdivisions and housing has become a common experience along Australia's fertile east coast (James, 2014).

Farmland in the Illawarra was lost for several reasons. Firstly, some farmland had been compulsorily acquired for infrastructure construction. News articles reported that after 2012 a proposed Berry highway bypass would cut through three dairy farms (#M197 on 28/02/2012; #M260 on 11/04/2016). Secondly, the encroachment of residential areas often pressured farmers to relocate. News articles introduced one dairy farmer whose previous farm (closer to urban centres) was transformed into a golf course. His current farm became surrounded by a residential area (#M126, #M202). Article #M126 indicated: 'It [urbanisation] puts enormous pressure on dairy farmers.' The aforementioned cases showed that farmers could lose their land unwillingly. Holding onto land was not just a personal choice, but was subject to a collective pressure from an urban-oriented society. Thirdly, in normal operations farmers could sell some land due to financial difficulty or succession planning, but it was hard for farmers to purchase land back (participants #1, 3, 4, 7, 8, 12). As participant #4 (male, over 50 yr, small-scale farmer) recalled: 'Years ago I was young, we owned all the land through to the next road east of us, where there is now five small rural blocks in that area... when deregulation became a reality for us, we actually sold some land to reduce debt.' Finally, as land became increasingly expensive, farmers were tempted to sell land and cash-in on appreciating prices, a trend widely reported in the literature (Mason & Knowd, 2010). Some Illawarra farmers had been approached directly by developers to sell their land (#M126 on 05/04/2008; #M187 on 28/07/2011). The above analysis further supports the view that farmers were under the pressure to be forced out by urban sprawl and related processes.

Under competing land-use pressures, research shows that Australian farmers are often driven on to lower-quality land with higher production costs (James, 2014). Participant #4 indicated: 'Most of the [local] agriculture now is confined to the flood plain where there is flood water activity, so it's difficult for people to build in those areas... about half of our farm is in the flood plain area. It is subject to water damage sort of thing.' Participants generally

underscored the agricultural value of the Illawarra, as a place well suited to dairy farming, and viewed farmland loss to urban sprawl and related processes as ‘a waste of good land’. The high value of peri-urban agriculture around Sydney has been recognised in academic literature (Butt, 2013; Wilkinson, 2011). Participant #15 (a farm machinery dealer) said: ‘It’s an area naturally suited to dairy farming, good climate... pretty reliable rainfall... good soil.’ Participant #12 (male, around 40 yr, small-scale farmer) argued: ‘This is some of the best country [for farming] in Australia down here, but all up the east coast there is a pressure oh well from non-farming... building houses on some of the best country... that’s ridiculous.’ Participant #8 (male, over 50 yr, medium-scale farmer) highlighted the wasteful use of land: ‘They [some urban in-migrants] will buy a hundred acres for their kids to ride motorbikes on.’ Some participants also viewed the land management of new landholders as problematic. Participant #9 (male, over 50 yr, large-scale farmer) said: ‘They [hobby farmers] don't have enough care for land and don't have enough knowledge of managing land.’ Participant #6 (male, over 50 yr, medium-scale farmer) concurred: ‘I could sell the farm and I know the next person to come on to it would be a very wealthy person who will not look after the land the way a farmer does.’ In another study on the peri-urban region around Sydney, researchers found that many farmers viewed themselves as good carers of the land, and considered the urban in-migrants’ use of the land as inappropriate (Ruoso & Plant, 2018). For example, poor management could give rise to invasive species. Despite the validity of farmers’ statements, the waste of productive capital under suburban development has been recognised in academic literature (Harvey, 2014, p.253). The changing criterion in valuing rural land contributed to the multifunctional transition of rural spaces.

Overall, due to the competition from urban land buyers/investors, many Illawarra farmers were deprived of the opportunity to acquire quality assets (e.g. farmland) for farming locally, or faced high costs of using land (e.g. for purchasing land or paying rents). Although peri-urban agriculture has social and environmental benefits, for example reducing food miles (Merson et al., 2010), these benefits can hardly be captured by individual farmers in a neoliberal policy environment (James & O'Neill, 2016). Agricultural land has been increasingly used for non-productive or less productive activities, and for attracting wealth brought by urban in-migrants. The commodification of rural landscapes has been perceived by governments as important for economic activity and by planning agencies for accommodating demand for both rural land and urban development.

## 7.4 Conclusion

Urban sprawl and related processes under the background of neoliberalisation reflect several interrelated elements, including commodification, financialisation and market determinism (Harvey, 2005; Paul, 2012). The development plans influencing the Illawarra contributed to the commodification of rural landscapes (allowing land to be sold for housing or rural lifestyle land development). Although those plans were resisted by many Illawarra residents, development still proceeded partly due to the need for capital accumulation and economic growth by external investors, local communities and governments. The continued introduction of external capital pushed up the value of local assets and led to the financialisation of some rural landscapes (land was traded through financing and to gain financial returns). Illawarra farmers, benefiting from the increasing value of their land, also invested into local real estate markets.

Local councils and agencies overall have chosen to meet the demands and values of the in-moving land buyers/investors and urban middle-class groups, or to cater to the market demand. This had multifaceted impacts. Firstly, the in-migrants created new space for economic growth and alternative approaches to commercial business. They needed local farmers to lease their land, demanded various services (e.g. tourism and entertainment), and pushed the establishment of certain infrastructure (e.g. sales avenues for hobby farmers). Secondly, the in-migrants redefined rural landscapes and drove the transformation of some existing economic activities. New social values were informed by the rural idyll and associated lifestyle ideals. Under this pressure, dairy farmers often adjusted their practices in terms of environmental externalities and animal welfare, and bore relevant costs. Thirdly, the external land buyers/investors competed with local businesses for local land/properties and other resources. Overall, external land buyers/investors, who brought a large amount of wealth and capital, have significantly influenced local economic development. In areas under such influence, Illawarra dairying faced political and economic challenges. Under the planning regimes examined in this study the political and economic influence of market players in the rural space seemingly became more correlated with how much capital or economic resources they had. The clash between different forms of local economies (e.g. services and agriculture) contributed to the multifunctional transition of rural space (Wilson, 2001), and the capital outflow from commercial farming. With the sprawling middle-class

lifestyle space, Illawarra agriculture was oriented towards production, services, lifestyle and investment.

Under the background of neoliberalisation, the urban-to-rural shift in people and non-agricultural services, and dairy industry restructuring especially after the 2000 deregulation, as two independent trends, follow similar logics (Table 7.1). They have significant impacts on Illawarra dairying simultaneously. Local farmers' adjustment strategies reflect the combined effects of these trends.

Table 7.1. Logics of dairy industry restructuring and urban sprawl related processes.

	Dairy industry restructuring	Urban sprawl and related processes
<b>Origins</b> (both reflecting economic needs)	Adverse market conditions, insufficient resources to maintain protectionism, and advocacy from powerful industry players (Cocklin & Dibden, 2002).	The population growth of nearby urban centres, local need for external investment, and support for urbanisation from the state government.
<b>Direct results</b> (both involving freer competition)	Farmers were allowed to freely expand, processors were allowed to source milk nationwide, and retailers were allowed to influence retail milk prices (NSWDPI, 2015).	External land buyers/investors were allowed to purchase rural land for residential or suburban development, which usually involved farm subdivision or breakup, facilitated by planning regimes.
<b>Opportunities</b> for farmers (both involving freer investment)	Farmers could absorb or lease their neighbouring land or expand into other regions (Barr, 2014).	Farmers could invest in the real estate markets, take advantage of the commercial opportunities brought by in-migrants or tourists, and utilise capital from their lenders, lessors or business partners.
<b>Market competition</b> (both reflecting the domination of certain groups)	Formation of oligopoly in the processing and retail sectors (NSWDPI, 2015).	External land buyers/investors increased demand for local land and thus prices.
<b>Politics</b> (both reflecting powerful players/groups exerting pressure and imposing requirements on others)	A few powerful industry players set milk prices and private standards, and tended to shift their operational costs on to other players (Burch et al., 2013).	Urban middle-class groups deprived many Illawarra farmers of the opportunity to acquire quality assets locally, and created new social requirements on farming practices usually without any mechanism to compensate farmers. The numerous land buyers/investors, who might compete with each other

		but had a common interest in land market deregulation (e.g. allowing freer development), exerted pressure on local councils and agencies to create landscapes that embody their values and ideology.
<b>Economic challenges</b> for farmers	Low and instable milk prices (Ashton, 2014).	Increased operational costs (e.g. the economic rent) and land costs.

Urban sprawl and related processes had specific effects on Illawarra farmers' business decision-making. Firstly, commercial opportunities beyond farming drove some farmers to diversify or transfer their investment into those fields (e.g. real estate, niche food markets) (Klepeis & Gill, 2016). Secondly, due to reduced land availability, leased land or capital became an important foundation for farmers' business expansion. Farmers could also seek expansion opportunities in regions further from urban centres. Finally, increased costs of using land locally drove farmers to increase the intensity of production (Wästfelt & Zhang, 2016). Details of on-farm changes are presented in chapter 8.

Analysis of this chapter contributes to existing research by examining how different forces over recent decades have intersected to influence farmers, considering that theoretical and empirical knowledge on those interactions are limited (Wästfelt & Zhang, 2016). The present study calls for improvements to existing regulations, including more consideration for protecting quality agricultural soils and how the process of farm relocation out of major amenity/lifestyle regions can be encouraged. The conceptual frameworks of the urban-to-rural shift in people and non-agricultural services (Ilbery, 2014), and multifunctional agriculture (Wilson, 2009) are useful in examining peri-urban agricultural change. Future research can help clarify several points. Firstly, existing theoretical frameworks highlight the role of middle-class groups in driving rural development, but do not sufficiently clarify the functions of corporate players, for example bank financing behind the middle-class groups, and the tourism, housing and construction industries. Secondly, existing theoretical frameworks highlight the bottom-up nature of some processes such as tree change migration and alternative agri-food programs, but do not sufficiently recognise the systemic or holistic nature of the economy behind urban sprawl and related processes. Such an economy is now largely governed by private interests, and is promoted and organised with and through planning processes.

## **Chapter 8 Farmers' General Coping Strategies**

### **8.1 Introduction**

Chapters 8 and 9, in response to research question two, examine Illawarra dairy farmers' coping strategies amid agricultural restructuring. Chapter 8 presents a general picture of how farmers have coped with economic challenges through changes in their personal and business outlook and in their approach to farming in the last two decades. In general, farmers in this study tended to deviate from traditional farming culture and become more financially savvy and expansive in business development. Although there was significant heterogeneity in farm business developments among interviewees, some common pathways have emerged. I examine farmers' various expansion choices and on-farm changes. In response to research question three inquiring into likely pathways for the future of agriculture, I discuss how those changes may negatively influence the long-term resilience and capacity of local agriculture.

My analysis adopts and examines the conceptualisation of multifunctional agriculture which involves productivism, localism and diversification. Productivism involves intensified use of inputs and adoption of new technologies. Productivism faces limitations in terms of environmental challenges and global resource constraints (Lawrence et al., 2013; Vanloqueren & Baret, 2009). Localism/diversification involves a small number of farmers changing production mode, supplying niche markets and adopting an ideology favouring local development (Hamblin, 2009; Woods, 2012). These farmers may have limited potential for further growth (Marsden & Morley, 2014). Multifunctional agriculture has been driven in part by the values and demands of urban migrants into rural areas (Boyle & Halfacree, 1998). As the Illawarra is close to Sydney, it has developed niche markets (urban in-migrants demanding certain local food products) and is proximate to metropolitan markets for locally produced food.

### **8.2 Pressure for change**

With agricultural restructuring driving down farmgate milk prices and driving up farmers' operational costs, Illawarra dairy farmers have to develop coping strategies (PMSEIC, 2010). The restructuring pressure was reflected in farmers' perceived decline in their terms of trade



(participants #3-5, 7, 8, 10; Ashton et al., 2014). As participant #5 (male, around 50 yr, medium-scale farmer) recalled, since the 2000 deregulation farmers' milk prices declined (his milk price at the time of this interview was 46.7 cents a litre), but '[the cost of] everything goes up... wages, fuel, oil, whatever doesn't matter'. Most farmer participants reported low profitability. Among the seven farmer participants (small and medium-scale farmers) who revealed their household income, five reported an income below AUD\$64,300 (below the regional median) (ABS, 2016). Participant #8 (male, over 50 yr, medium-scale farmer) elaborated on his low profitability:

For this dairy farm here, the budget runs about 1.45 million dollars. That's [annual] income. I budget it for 17,000 dollars excess [profit]. Do you think there's a lot of money in it? ... In that [budget] we are paying off machinery, but there's no major capital purchases or anything. You would say that oh we gonna spend 350,000 dollars on a tractor, or even 20,000. I might budget for 15,000 dollars on capital purchases [indicating limited fund].

With low profitability, some farmer participants' investment became conservative, which could increase certain risks. For example, during participant observation, I encountered problems with milk vats causing wastage of a large amount of milk; one farmer had experienced a breakdown of their milk cooling system several weeks ago and wasted thousands of litres of milk. These cases resulted from aging capital equipment. Participant #6 (male, over 50 yr, medium-scale farmer) reflected philosophically on the nature of their dairying work: 'Someone asked me what I do for a living. I said I take risks, I'm a risk manager.' Participant #13 (female, former dairy farmer) also discussed the risks involved in dairying: 'I saw how stressed my mother was all of the time with the riskiness of never ever knowing from [what].' Given these risks, Lockie (2015) has argued that Australian farmers are vulnerable to stress, mental illness and suicide.

The financial pressure was also related to some participants' working stress. Participants #1, 2, 6, 7 and 13 mentioned the difficulty of getting up early and working long hours. Participant #16 (Future Dairy researcher) explained: 'Generally conventional dairy farmers will often try to have one of their milkings in the off-peak period [for electricity use], which is why a lot of farmers get up at four o'clock in the morning to milk their cows.' Seven participants indicated that they worked at least 55 hours per week. By comparison, only 17% of

Australians in other occupations work 49 hours or more per week (ABS, 2012). . Some participants indicated the limitation of hired labour. Participant #4 (male, over 50 yr, small-scale farmer) said: ‘You still got to be here to oversee the staff, and you still got to be here to be the common denominator for the most important job [managing the cattle and milking].’ Participant #8 added: ‘We are stuck what we are doing. I don't see many people come to help us milk on Christmas day or anything like that.’ The lack of reliable labour was firstly related to many farmers’ inability to offer a competitive salary. Additionally, the Illawarra has undergone a significant transition towards a services-based economy meaning that competition for labour from other, higher-paying industries, was significant and made it difficult to source qualified agricultural labourers.

Besides the long working hours, in my participant observation, I also witnessed a high level of physical work, with farmers often working alone for long periods of time. They could be injured by machinery and cows. When accidents happened, they might not get immediate help. When asked about the most difficult part of dairying, participant #13 answered: ‘It’s the emotional and physical toll that it brings. We all have nasty accidents on this farm.’ Lockie (2015) concurred that Australian dairy farmers are more prone to accidents and injury compared to other workers.

With the aforementioned difficulties, many Illawarra farmers had left the industry since 2000. It was also difficult to attract a younger generation of aspiring farmers. One Illawarra farmer said: ‘We don’t have the personnel coming into it [dairying] to take over from old blokes like me (#M253 on 22/12/2014).’ Participant #8 explained the lack of young farmers: ‘One of [my] sons wants to be a dairy farmer, and he runs the farm here. He’s a very good farmer, but should he be committing his life to worry about paying his bills every month... I just don't think the value is in farming.’ Overall, participants generally indicated tremendous pressure on them. Some participants gave the impression of being on the brink of being driven out of the industry. Farmers were therefore driven to try new ways of doing business.

### **8.3 Changing tradition**

To a certain extent, farmer participants were increasingly required to deviate from the traditional family farming model involving family ownership, labour, patriarchal inheritance and emotional attachments to farming and farms (Bryant, 1999; Kuehne, 2013). Many

participants expressed a strong tendency to change. Participant #7 (male, over 50 yr, medium-scale farmer) said: 'They [dairy farmers] have to be open-minded about changing their ways. You can't say that's the way we have always done it... if you don't change, you will be forced to change. You should be able to see what's going on before it happens and adapt to that.' Farmers who refused to change were observed to have failed. Participant #5 (male, around 50 yr, medium-scale farmer) used the 2000 deregulation as an example: 'The guys who didn't prepare themselves for deregulation, they couldn't survive.' The analysis of this chapter shows that the pressure-driven agricultural change involves multiple aspects of farming, encompassing farming philosophy, business operation, and social function.

Farmer participants generally focused on improving their own business. After deregulation, government agencies, industry groups and other public organisations became less able to harness the collective capacity of the farm sector. There were collective actions, such as farmers' groups suing the government, protesting outside supermarkets, striving for government assistance funds, and operating milk cooperatives. However, Illawarra dairy farmers usually had limited resources and energy to contribute to collective, direct political actions (participants #6, 8).

The transformation of individual farming operations in the last two decades was firstly directed by the dominant discourses of getting big (business expansion) and becoming more entrepreneurial. Illawarra dairy farmers inevitably had to learn from mainstream coping strategies or the 'proven way' of running a farm in a deregulated industry environment (participant #7). The collective choice of such a productivist path certainly provided 'symbolic capital and socio-cultural rewards' and was associated with the notion of 'good farming' (Burton, 2004; Warren et al., 2016, p.179). Farmers' ongoing adjustment of their business was also opportunistic. Farmer participants generally conducted more individualistic and flexible exploration of new opportunities which had uncertain long-term consequences. Correspondingly, Morris et al. (2017) found that the difficulties of maintaining existing business models stimulate opportunity-seeking behaviour among farmers.

This trend for change was coupled with a new business perspective. To focus more on their financial performance, farmer participants viewed farming more as a business than as a lifestyle. Participant #5 indicated: 'Compared with my grandfather when I was a boy, I am sure it [dairying] does [become more business-like].' Participant #1 (male, around 50 yr,

small-scale farmer) concurred: ‘You have to run it [dairying] as a business, not a way of life, even if it is a way of life... you got to watch your dollars and cents.’ Participants generally emphasised the financial aspects of farming. Participant #13 (female, former dairy farmer) noted: ‘Farming today is a big business... you should not run a big business unless you have strong financial literacy skills.’ Participant #9 (male, over 50 yr, large-scale farmer) also highlighted the importance of having ‘a mind for business’: ‘For a farmer to be successful, it’s not about technical issues, but the financial side... dairying is not about physical farming, not about loving milking cows... but thinking of the business, is about the colour of money.’ Although the entrepreneurial tendency among Australian farmers has been widely reported in rural research (Woods, 2014), participant #9’s view was nearly a total denial of the emotional values farmers have traditionally attached to farming and farms. This reflected the acute contradiction between traditional farming values and enterprise profitability. Participant #8 (male, over 50 yr, medium-scale farmer) also deprioritised their emotional attachments to their farm: ‘It [his family farm] would always be special to us, but... we will sell it because we will look at it totally from a business perspective to do that.’

This thesis suggests that for traditional farming values to survive in the long term, they have to contribute to the business, or be supported by a sustainable business. All farmer participants viewed profitability as a top priority, although it might not be a stand-alone priority. Participant #6 (male, over 50 yr, medium-scale farmer) explained: ‘The reason you are doing the job is to make money, whether you look it long-term or short-term. Sometimes in the long-term, you may [temporarily] have a dip in your income and not be making money.’ My above argument helps explain the following phenomena. Firstly, most Australian farms remain family-owned/controlled, which is a long-standing tradition (Lockie, 2015), partly because family members are usually reliable business partners. Secondly, many Illawarra farmers have sold their original farm, which was against traditional values, partly because new farms had better commercial opportunities. Although participants highlighted the importance of family farming to their sense of self and place, their current farm was usually not their original family farm. Ten participants’ families had worked on their current farm for three generations or less. Clearly, farmers have been involved in a struggle between maintaining traditional farming culture and improving business performance (attachment to the farm as a place or as a business). My argument supplements the dichotomous view between traditional farming culture and enterprise profitability, which is common in research of Australian farmers (for example see Kuehne, 2013).

With a mind for business, many farmer participants were not restricted to family ownership and became open to external investment (e.g. debt) and leasing. Participants usually capitalised on their land asset through borrowing from banks. According to participant #5, 'Debt is healthy. It's a way of sustaining yourself.' Participant #8 was equally forthright on the reality of debt-financing their farming: 'It's very restrictive, but you know I still regard debt as my friend. It drives you to do what you do.' Several participants were even quite enthusiastic about debt and its role in business operations. Participant #11 (male, around 35 yr, small-scale farmer) said: 'The bank gives [me] money, so I can have a crack [at] business. [If] the banks still want to give me money, I'm gonna keep taking it.' Participant #9 recognised how 'successful farmers have a mind for business. None of them [are] scared of debt... debt is an asset, [providing] resources. Debt is the god.' Australian dairy farmers' need for debt can be strong. In 2013/14, interest payments represented the second largest cost item of dairy farm operations (ABARES, 2014a). One reason for the importance of debt-financing is that Illawarra farmers usually do not have other major sources of external investment, but are driven by market competition to look for funding and expand their operation. However, the restrictiveness of borrowing terms determined that, at least for some farmers (for example, participants #5 and #6), debt or loans were to be paid off as soon as possible after the expansion target was achieved.

Farm expansion has driven business restructuring. Although family farming still dominated in the Illawarra, as farms got bigger, farmer participants had more and more non-family personnel including sharefarmers, advisors and hired labour. In 2012, 68% of Australia's dairy farms hired labour, compared with 55% in 2004 (NSWDPI, 2014).

Overall, after deregulation farmer participants had more freedom on business operation to improve profitability by diverse means, and also faced more market competition. The 2000 deregulation should be understood as one prerequisite for the cultural change among Illawarra dairy farmers. Such change towards a more financially based model of commodity production has been common among Australian farmers who usually have experienced similar processes of deregulation and restructuring (Woods, 2014). While farmer participants constituted a family farming model it was different from the typical characteristics of a traditional family farm as identified in much of the academic literature. Table 8.1 compares the two business models.

Table 8.1. The main elements of traditional family farming model and participants' general business model.

	<b>Traditional family farming model</b>	<b>Participants' general business model</b>
Attitude towards change	Maintaining tradition and stability	Being open to change
Attitude towards farming	Farming as a lifestyle	Farming more as a business than as a lifestyle
Focus of farm operation	Technical aspects of farming	More focus on the financial aspects of farming and on financial skills
Business priority	Emotional attachments and drivers towards cows, the farm or farming	Profitability as a top priority
Ownership	Strong family ownership and a low proportion of borrowed, leased or shared capital	A high proportion of borrowed, leased or shared capital
Business scale	Relatively small operation	Relatively large operation
Labour use	Mainly family labour	Having more hired labour, advisors or sharefarmers
Farm/Business inheritance	Mainly patriarchal inheritance	Patriarchal inheritance persisting to a certain extent, or the farm being sold to or influenced by external investors

Note: information is based on interviews and also from Bryant (1999), Bryant & Garnham (2014), Kuehne (2013) and Rees (2014).

## **8.4 Business expansion**

### **8.4.1 Productive capital**

With a different business outlook, farmer participants' coping strategies, to a significant extent, were a matter of where they invested their available resources. A common choice

among participants was business expansion. With reduced government intervention after deregulation, in theory, the choice to expand operations was open to individual farms. Farmers could select various types of productive capital (e.g. land in the Illawarra or in other regions) or venture into new or related industries (e.g. integrate into milk processing). Participant #5 (male, around 50 yr, medium-scale farmer) indicated a common path of expansion based on borrowing and leasing:

In 1998, I only ran 130 or 140 [milking] cows, and the farm next door came for lease, so [I] took on the farm next door. I brought more cows, we went to 180 cows. In the next farm across, it came up for lease again, so I went up again, so I got myself to, I got 300 cows... I lost one of those leases, but I managed to gain [another] one lease down here.

This type of expansion was possible because many Illawarra farmers left the industry and released their land onto the market. From 1978 to 2016/17, the number of dairy farms in the Illawarra declined by 89.8% (ABS, catalogue no. 7120.0; Dayal, 1980).

Expansion has several economic advantages: farmers can achieve economies of scale and better focus the deployment and efficacy of their capital; productive capital can generate returns in the form of value appreciation or generating surplus value from hired labour; high-quality capital is not always available, so when it is released on the market, it is important to seize the opportunity; and many technologies only realise their full potential in large-scale operations (RIRDC, 2007). However, the main driver of participants' expansion was seemingly low milk prices, especially after the 2000 deregulation. Australian farmers' pressure-driven expansion has been recognised in academic literature (Barr, 2014). As participant #5 discussed in relation to farmers' expansion: 'That's not a goal or target. It's forced, because of deregulation.' As deregulation terminated the premium prices that Illawarra farmers received for their quota milk, some participants highlighted the importance of expanding their production above their quota before deregulation. As participant #5 recalled:

We knew deregulation was coming, and I prepared myself before that [through expanding production]. At the point of deregulation half of my milk was going to Sydney milk market [where he received a premium price for quota], half of it was going

to basically the commodity market [where milk price was lower], so... when deregulation hit... I only dropped a few cents a litre.

Participants' expansion reflected the goal of Australian agricultural restructuring to drive farmers to 'get big or get out' (Higgins & Lockie, 2001), largely under the expectation of increasing returns to scale.

Ten years after deregulation, however, pressure for expansion still existed. As an Illawarra dairy farmer said: 'Staying still is not an option, reducing the size of your business is just a disaster (#A10 on 15/08/2011).' Participant #3 (male, around 35 yr, small-scale farmer) explained: 'Milk prices go down, milk production goes up because they [farmers] have to try make more milk to get through the low price... you have capital overhead, loan costs or things like that. They don't change.' Participant #7 (male, over 50 yr, medium-scale farmer) concurred: 'You have to produce lots of milk now to make a profit.' These comments concurred with the result of McDonald et al. (2013) who found dairy farms that remain static will likely experience reduced profitability in the following years due to increased production costs. From 2011/12 to 2016/17, the average number of cows in milk and dry per dairy farm in the Illawarra increased by 29.1%, while the number of dairy farms declined by 20.9% (ABS, catalogue no. 7503.0 and 7120.0).

Expansion was so important that other investment choices were usually deprioritised. Participant #6 (male, over 50 yr, medium-scale farmer) indicated that his biggest on-farm change since deregulation was expansion rather than adopting new technologies. Participant #9 (male, over 50 yr, large-scale farmer) highlighted: '[The] biggest hope [for the dairy industry] is to get scale.' Expansion of individual businesses is not only for economic reasons, but to increase bargaining power over the milk market. The urgent necessity of expansion partly explained why farmers usually relied on borrowing and leasing (which can be achieved quickly and have low initial costs) to expand instead of using saved money to purchase capital. From 1999/2000 to 2013/14, average dairy farm business debt in Australia increased from around AUD\$340,000 to AUD\$750,000 (Ashton, 2014). Debt-driven expansion is also a general development pathway among Australian farmers (Rees, 2014).

Another factor was the competition for rural land from urban land buyers. Thus this analysis contributes to existing literature by presenting the combined effects of multiple trends. The



difficulty and high cost of acquiring land locally also led farmers to rely on borrowing and leasing to expand. Participant #7 indicated: ‘There used to be lots of small farms in Gerringong... now there are 5 farms. Generally it’s bought by people from Sydney with money... they leased them to farmers.’ This competition also led Illawarra farmers to expand into other areas or regions, usually west beyond the Great Dividing Range. Eight participants reported that their family owned or leased land nonadjacent to their home farm. Small pieces of land were usually for raising heifers and growing feed. Participant #15 (a farm machinery dealer) said: ‘We’ve seen lots of farmers actually also send their heifers out west to be grown up... more of their home farm is used for just milk production.’ The other blocks could also be independent farms. Participant #8 (male, over 50 yr, medium-scale farmer) had a cropping farm in the central west of NSW. It provided grain and hay for his dairy farm. Participant #9 had another dairy farm in Victoria with 350 milking cows. Some farmers considered selling their home farm in the Illawarra and moving west, so they could buy a larger property with more opportunity to expand (participant #4, male, over 50 yr, small-scale farmer). This option being viewed as acceptable reflected the reality that farmers could sacrifice, or had sacrificed, their emotional links with family farming because of socio-economic pressures (Kuehne, 2013).

Overall, expansion was usually characterised by reliance on debt financing and leased land, and shifting into other areas or regions. These strategies in general had less initial costs compared with using saved money to purchase land nearby. However, there were also disadvantages which were rarely comprehensively discussed by previous studies (Lockie, 2015). Borrowing and leasing had potential problems. Firstly, farmers had to pay interest or rent. Although many participants were willing to bear the risks involved in debt-financing, participant #5 said: ‘I just don’t wanna be going into too much debt. Debt means you’re gonna work longer.’ Secondly, farmers did not have security over the capital they were utilising. If the external investors or land lessors decided to withdraw their capital or land, farmers’ operation would be disrupted. Participant #3 (male, around 35 yr, small-scale farmer) said: ‘The property that we lease if they want to sell it how we supposed to buy it. We’ll lose land. It’s hard for, like, securing.’ Participant #1 (male, around 50 yr, small-scale farmer) recalled his experience of losing a lease on land meaning they ‘had to downsize, sort of not too sure what the future is’. Due to this insecurity, farmers might be less motivated to manage rented land in a favourable manner, as suggested by Roberts et al. (2004). Finally, farmers might be subject to the external investors or land lessors, for example, in on-farm decision-

making. Weller et al. (2013) indicated that debt and tenancy were subordinate social relations allowing capitalists to reap profit efficiently from farmers.

Expanding into other areas or regions also had potential problems. Firstly, as farmers' new land blocks were disconnected to their home farm, farmers faced transportation costs if transferring cattle or equipment from one land block to another. Secondly, farmers might not be familiar with the region where they acquired new land block(s). The adaptation period would induce extra costs. Participant #3 indicated the need to change farming methods if moving inland: 'There are a number of dairy farmers inland, but it's a different farming compared to [farming] on the coast.' Finally, the new region might lack certain resources, for example water entitlements, proximity to major markets, and potential of land asset appreciation. Participant #4 indicated: 'If say we buy a bigger property inland, and then we have trouble with water, we lose water rights to it.' Participant #8 indicated: 'Our family has been on this farm [their home farm] for a long period of time... the asset growth has been enormous, but when we sell this and move to a natural and normal farming area, that asset growth is not gonna be in that land.' This expansion into more marginal farming regions had significant risks different from those experienced in the coastal dairy industry of the Illawarra.

Overall, borrowing, leasing and expanding into other areas or regions had advantages, which also came with financial risks. After deregulation, Illawarra farmers had to use limited resources to explore new business models with potential risks. As over half of dairy farmers in NSW had left dairying since deregulation (NSWDPI, 2014), numerous farmers either decided such risks were too great or took them and failed.

#### **8.4.2 Value adding**

Another type of expansion was through investment in milk-processing facilities or efforts to add value to the milk and, in the process, not relying on, or at least relying less, on the major processors. In the Illawarra and surrounding regions, a small proportion of dairy farmers (including participants #5 and 12) have chosen this path and supply niche markets (e.g. farmers' markets, cafes and local retail outlets) rather than supplying only to major supermarkets. These farmers are usually small-scale (less than 200 cows in milk). Niche markets provide premium prices for suppliers compared with the mainstream market, as commodities from niche markets are usually more expensive. Several factors determine the

existence of niche markets. Firstly, some community members oppose major supermarkets which, they believe, threaten the livelihood of local farmers. Niche markets are usually supported by local community groups (Woods, 2012). In the present study, niche players usually highlighted their local nature. Secondly, numerous urban residents have migrated to rural areas, and expanded potential markets for local products (Klepeis & Gill, 2016). This further strengthens notions of localism. Some examples of those niche-oriented enterprises in the Illawarra and surrounding regions included South Coast Dairy (owned by the Berry Rural Cooperative Society Limited), Country Valley, Pines Kiama and Highland Organics.

In local news, the progress of South Coast Dairy (SCD) was celebrated. SCD planned to build their own processing plant as early as 2010 (#A5), but the new plant didn't officially open until 2014. Its processing capacity is relatively small, and the bulk of the cooperative's milk is sold to Murray Goulburn Cooperative (a major processor for the Illawarra) (#M250). But this new plant still aroused considerable enthusiasm. The SCD chairman said: 'We've always believed the big companies take too much away from the local regions and we're just trying to do our little bit to bring it back into a local regional business and look after local people (#A29).' Participant #5 (male, around 50 yr, medium-scale farmer) as one shareholder of SCD said: 'I'm trying to sell milk locally... employing local people, keeping all of the businesses local, and it works. People enjoy. I'm lucky I'm part of the coop where there are seven farmers [shareholders]... we intend to grow that [processing capacity] to hopefully use all their milk.' One reason why participant #5 and other farmer shareholders had the opportunity to build a milk factory (an uncommon choice among local farmers) was probably their special position in the Berry Rural Cooperative, or relative ease of finding shareholders, investment and local support to start this venture. Gaining support from local community is a strategy to compete with major processors. However, the local branding suggests that it can be difficult for niche-oriented enterprises to expand beyond their home region (Hamblin, 2009).

Despite the expectation, participants #5, 8, 9 and 12 indicated difficulties in running the milk factory of SCD. Firstly, the factory was worth around AUD\$2.5 million including AUD\$1 million spent on the equipment (participant #5). Such expenses were a burden for farmer shareholders who were usually conservative with introducing external investment, hoping to maintain full control. Secondly, running the enterprise involved considerable processing of government paper work, tuning and maintaining machinery, and developing new expertise,

which were not only challenging but distracting shareholders from their ‘core’ farming business. Finally, it was usually difficult for seven shareholders to agree to something or reach consensus, as farmers were strongly identified as ‘independent people’ (participant #12, male, around 40 yr, small-scale farmer).

Local media also mentioned other local brands. Article #M199 (08/03/2012) commented on Country Valley: ‘Milk, the way it used to taste... a hollow motto printed on the sides of countless milk bottles to turn a quick buck – but for [Country Valley]... it is the benchmark for producing quality milk.’ The business owner, a dairy farmer who built an on-farm processing factory, explained: ‘Whatever comes out of the cow in the morning we put into our whole milk and into our bottles. We just don’t muck around with it the way other guys do (#M199).’ He also said: ‘I’ve always thought: employ local, buy local and try to sell local and support the local community (#M199).’ Another brand, Pines Kiama, produces non-homogenised milk, yoghurt, and gelato. Article #M231 (06/03/2014) described that as ‘a passionate creation’. The business owner said: ‘There has definitely been more positive feedback from the community than I thought (#M231).’ In these cases, local journalists, who usually support local businesses (Bowd, 2012), advocated for the niche-oriented enterprises which not just adopted localism, but usually claimed superiority (e.g. in quality) of their products over products from mainstream milk processors.

Overall, support from local community and premium milk prices appeared to be the main reasons to supply niche markets. Nonetheless this choice also had financial risks. Firstly, given the small number of niche farmers, there was limited experience of harnessing the potential of niche markets, such as how to operate a milk factory, how to cooperate with shareholders, how to expand supply chains and market products. Secondly, niche markets did not necessarily have a complete supply chain including retailers, processors, producers and distributors. Niche farmers usually had to establish and develop a supply chain by investing in a milk-processing facility and looking for distributors. Compared with the mainstream market, supply chains lacked economies of scale. Thirdly, investing in this supply chain could further distract farmers’ energy and resources from their main farming operation. Participant #8 (male, over 50 yr, medium-scale farmer) said: ‘I, as a farmer, don’t have the time to run a full-size-scale farming operation, and do that [running a milk factory] as well.’ Finally, niche markets have limited potential, paradoxically making this option difficult for medium and large-scale farmers. Other studies (see for example Singh-Peterson & Lawrence,

2017) have also indicated that niche markets generally are only suitable for small-scale farmers and may not provide a consistent base for building a business. Participant #6 (male, over 50 yr, medium-scale farmer) explained:

I'm producing 5500 litres of milk a day [all year round]. Someone said why don't you make cheese? Five thousand and five hundred litres of milk a day would produce 2.5 ton of cheese a day. Where am I gonna sell 2.5 ton of cheese a day? I'm not gonna take them around the markets... with the volume of milk I produce to have a small factory or something like that, that's just not practical, because I could only use a small portion of my milk... so large-scale farmers will never go into [niche markets].

Participant #5 attributed the small size of niche markets to the higher prices of niche products: 'There's only a certain amount of niche there... at the moment there is, I don't know what percentage you put on that, but be only 5 or 8 % of all New South Wales milk... the local milk [on niche markets] is dearer, so you always get 20 to 30% of people can't [buy it].' In summary, the costs of harnessing the niche markets are investments in relevant skillsets and facilities to supply such markets. However, their small size did not always justify the required investments.

Those limits have been recognised in academic literature (Hamblin, 2009). Due to the relatively inefficient supply chain operation, niche production in general can have social and environmental disadvantages (Marsden & Morley, 2014; Mok et al., 2014). However, niche production should not be viewed as inferior; it reflects farmers' response to restructuring pressures by exploring unfamiliar economic fields (Marsden & Sonnino, 2008). Niche farmers have different advantages and contribute differently to local agriculture (see Table 8.2).

Table 8.2. A comparison between mainstream farmers and niche farmers.

	Mainstream farmers	Niche farmers
Economic activity	Specialising in milk production	Diversifying into milk processing, product innovation and marketing
Business direction	Acquiring productive capital and competing in familiar mainstream milk markets	Adding value to the products and exploring unknown niche markets
Ideology	Productivism (gaining economies of scale and improving technical efficiency)	Localism (contributing to local or regional economy, and producing food of certain quality or as local specialty)
Advantage	Being more efficient in milk production	Having premium and stable milk prices
Disadvantage	Lower and unstable farmgate milk prices	The limited potential of niche markets
Potential contribution	Driving productivity growth of local agriculture	Developing alternative farming approaches and contributing to the diversity and resilience of local agriculture (Atkinson et al. 2014)

## 8.5 Diversified income streams

Although farmer participants' main income was generally from milk production, most of them did have income streams. In 2014/15, around 74% of Australian dairy farmers had off-farm income (Ashton et al., 2016). According to some interviewees, this diversification was another response to market realities. To subsidise their income, participant #1 (male, around 50 yr, small-scale farmer) sold heifers. Participant #2 (male, around 35 yr, small-scale farmer) received director's fees from the Dairy Farmers Milk Cooperative board, while participant #3 (male, around 35 yr, small-scale farmer) worked as a sales representative for two days a month. Participant #4 (male, over 50 yr, small-scale farmer) provided artificial insemination services for other farmers, and participant #5 (male, around 50 yr, medium-scale farmer) sold 20-40 milking cows annually. He explained: 'That's another way I help combat deregulation... for a milking cow, you can get 3000 dollars.' He also invested in real estate:

‘One thing me and my wife like to do is to buy another house, or something, using the asset we own, and that house will be rented out.’ Participant #6 (male, over 50 yr, medium-scale farmer) also sold heifers, but not regularly, while film companies used their farm to shoot videos. Participant #7 (male, over 50 yr, medium-scale farmer) made silage and sold silage to neighbours. The family of participant #8 (male, over 50 yr, medium-scale farmer) operated a cropping farm, with participant #11 (male, around 35 yr, small-scale farmer) also owning another business. The family of participant #12 (male, around 40 yr, small-scale farmer) ran a milk-processing business. Overall, relying on their farming and business skills, participants used their extra time and resources to generate extra income. Although additional income helps sustain farming, farmers’ economic resources can be taken away from the farm enterprise (Morris et al., 2017). Existing literature has usually linked diversification strategies to small-scale farmers (Marsden & Sonnino, 2008), but this study shows that diversified commercial activities are common among dairy farms of varying sizes.

## **8.6 Changing modes of operation**

Besides expansion and diversification, farmer participants also transformed their farming systems. Table 8.3 presents approaches/technologies adopted by farmer participants, and their possible future choices. With a larger business participants usually made some lesser adjustments within the parameters of their existing operation. These adjustments included increasing the capacity of their system through introducing more updated equipment, increasing the use of commodity feed to avoid cows walking too much on a larger farm, milking some cows three times a day instead of two times as a result of better batching in a larger herd, using more specialised staff or contractors to carry out more specific tasks. Thus, many major on-farm changes related to shifting management practices. Besides, participants also tended to push the potential of their farming systems to increase efficiency. Strategies included better focusing the deployment and efficacy of farm capital and labour, intensified use of inputs usually of higher quality, breeding cows for productivity traits, and adopting automation/precision technologies. The new practices generally helped boost production. Pushing the existing system was usually more feasible and less risky than transferring to a new production mode (Higgins et al., 2017). With much investment devoted to expansion and intensification, participants had limited resources for other investment choices. Although few participants considered significant mode change requiring a large amount of investment, participants’ decisions still revealed a high level of diversity (e.g. using robotic milking

system, farming organically, or transferring to a freestall barn). The case of participant #10 using robotic milking system is specifically discussed in chapter 9. Participants who deviated from the mainstream were usually compelled by market forces unleashed following the dairy deregulation to explore unfamiliar opportunities. In the following paragraphs, I specifically discuss specialisation, intensification and technology adoption.



Table 8.3. Adopted approaches/technologies and possible future choices reported by participants (participants #1-4, 11, 12 are small-scale farmers with 110-170 milking cows, participants #5-8, 10 are medium-scale with 220-300 milking cows, and participants #13, 9 are respectively involved in businesses of around 400 and 1150 milking cows).

Categories of adopted technologies/approaches	Examples and participants who reported they adopted this category	Participants who considered this category as possible future choices
Updating equipment	New milking equipment (#1, 3, 8, 13). Note: participant #3 increased the capacity of his milking equipment from four cows each time to twenty cows each time, and reduced the duration of each milking from around 4 hours to 1-1.5 hours.	#4.
Adopting automation/precision technologies on herd management and milking	Monthly herd recording (to generate individual milk production data; #1), cow pregnancy testing (#1), electronic cow ID (ear tag; #1, 6), automatic ID reader (#1), heat detection cow collar (which can monitor heat-related activities and rumination information; #3, 10, 13), electronic calf rearer (#7), automatic cup remover (to reduce labour during milking; #1, 3), robotic milking system (#10).	#4, 5, 7 (all of the three participants considered electronic feeding system). Note: participant #4 planned to shed the cows for half a day and use robotics to systemically feed cows.
Adopting automation/precision technologies on pasture management	Soil test (to use fertiliser more precisely; #1, 4, 7), weather data (#1, 4), various fertiliser rates (#4), using GPS for applying fertiliser (#3), using automatic steering (on the tractor) based on satellite when applying fertiliser (#7), using satellite photographs to estimate pasture production (#4).	No data.
Adopting new technologies on data and general management	Computerisation (e.g. for bookwork; #6, 10), the EasyDairy computer program for herd management (#7, 8).	#12 (to adopt computerisation).
Selective breeding for desirable traits	Better cow genetics (#1, 4, 5), breeding for polled cows (without horns; #1), breeding for cows with better feed conversion efficiency (#13), better semen (#5), sexed semen (for artificial insemination to produce offspring of desired sex; #1, 6), using small and tough cows (#2, 9). Note: participant #2 used the Illawarra breed, and Holstein × Jersey crossbreed.	No data.

Categories of adopted technologies/approaches	Examples and participants who reported they adopted this category	Participants who considered this category as possible future choices
Improving task management	Reducing the amount of equipment and using contractors (#4), using veterinary specialists to ensure that cows are in calf (#7), using nutritionists (#7), using agronomists for precise fertilisation (#7), employing a herd manager (#7), specialising the work of staff (#7, 8), concentrating more on staff management (#8).	No data.
Improving feed management	Using more fertiliser (#2), growing more grass (to increase the carrying capacity of the pasture; #2, 13), better quality pasture (#5, 8), better grazing management (#2), using more commodity feed (#2, 8), feed of better quality (#2, 3, 5, 10), using the Manildra feed (dry distilled grain from an ethanol factory of the Manildra Group; #4), more feed for cows (#3), consistency in feed (#5), better feed management (#1, 2, 4, 7, 8), feeding cows according to their production (#4).	#5 (to use the Manildra feed).
Improving herd management	Better cow nutrition (#5, 7, 10), better herd management (#4, 7).	#1 (to further improve cow nutrition).
Other practices	Using recycled sewage water from the Sydney Water for irrigation (#7), better genetics of grass species (#6), trying a new ryegrass annually in one or two paddocks and comparing it with the rest of the farm (#5), milking three times per day (to increase milk production per land area; #9, 13), organic farming (#11, 12).	#5 (to build feed pads which allow cows to be fed in a housed environment: better herd management; that would cost around AUD\$80,000), 8 (to build a freestall barn: pasture is still needed for growing grass, but grass is cut and brought to cows; cows do not go out for grazing).

Many of the new practices could be interpreted as farm specialisation. Participant #1 (male, around 50 yr, small-scale farmer) recalled what farms used to have: ‘My grandfather, they used to have everything... they reared their own beef, they have lambs, they had pigs... but not this scale.’ Participant #5 (male, around 50 yr, medium-scale farmer) did not think permaculture or mixed farming nowadays could generate a higher return than conventional dairy farming: ‘I haven’t seen anybody do it overly successfully yet.’ In Australia, mixed farming systems have declined in recent decades (McKenzie, 2014). Participants’ farms generally had a highly specialised setup. A farm was divided into multiple areas with specific functions, for example raising heifers, grazing, for cows to calve, and milking operation. A farm could have elements not for dairying (e.g. poultry), but its effective land area (area suitable for dairying) was mostly utilised for dairy farming. Specialisation was also reflected in the utilisation of expert professional labour. Participant #4 (male, over 50 yr, small-scale farmer) said: ‘For specialist jobs like making silage and spreading effluent... we use a contractor...we found that more cost-effective. They can own the big tractor and big equipment.’ Participant #7 (male, over 50 yr, medium-scale farmer) said: ‘I also use the University of Sydney vets... they came once a month and they ultrasound every cow...they check each cow is in calf...that’s one thing we do, [but] we never used to.’ Overall, specialisation was to achieve more efficient use of capital.

Participants also intensified the use of capital and inputs. Participant #4 said: ‘Dairying is certainly seen as being one of the most intensive agriculture landuse areas.’ Participant #6 (male, over 50 yr, medium-scale farmer) introduced his farm: ‘We call it a high input farm, fertiliser, feed and probably labour as well... with that high input, we get a higher return.’ One farmer indicated the high output of local dairying: ‘There is probably more milk coming out of the valley [Jamberoo Valley in Kiama LGA] now than there was in the 1970s because of higher stocking rates [based on more fertiliser input] and better production per cow [based on more feed consumption] (#M187 on 28/07/2011).’ Investing in inputs appeared to be a cost-effective way to improve efficiency. However, this option has arguably increased Australian dairy farmers’ environmental impact (Stott & Gourley, 2016), and exposed farmers to greater financial risks (Sinclair et al., 2015).

One important input was fodder, the largest cost item of dairy farm operation in Australia (ABARES, 2014a). With urbanisation and inadequate land, farmer participants tended to increasingly rely on commodity feed (Wästfelt & Zhang, 2016). Participant #8 (male, over 50

yr, medium-scale farmer) explained: ‘The cheapest feed we produce is what we actually grow on the farm here, but we don’t have enough to sustain the number of cows we milk.’ Participant #15 (a farm machinery dealer) indicated: ‘When ground [farmland] is high cost, and you get more affected by the environment, the weather conditions... there are certainly advantages probably in restricting the amount of grazing the cows do.’ Increasing feed use was also intended to improve productivity. Most farmer participants increased their per cow milk production since 2000, and highlighted the contribution of better feeding, for example feed of better quality, more feed for each cow, better feed management. Participant #9 (male, over 50 yr, large-scale farmer) said: ‘Dairy farming is about feed not cows.’ Participant #8 highlighted more feed for each cow: ‘If you can spread more litre [of milk] over your fixed cost, it actually reduces your cost of production, so the demand for that is more feed, to produce more litres.’ Participant #4 emphasised better feed management:

We can get much more out of cows once we understand how much feed we need to make certain amount of milk, and feed them according to their production... the best thing I can do is look after my cow, so the best quality feed that I can put in that four kilograms of feed she eats, the best quality water and the closest water she can access, so she doesn't have to waste energy you know going a long way to drink.

To further increase productivity, participants #4, 5, 7 considered building feed pads or electronic feeding systems where cows would be shedded for a period of time and fed more precisely; participant #8 considered transferring to a freestall barn system where cows are shedded and all of the feed is brought to cows. These systems will potentially further increase cows’ feed consumption and reduce their physical activity. Participant #8 explained: ‘Every time the cow walks, she’s using energy, she walks some production off, so the more comfortable they are, sitting in a shed and [getting] fed, [the more they will produce].’ Australian dairy farmers’ increasing use of externally sourced and home-grown feed is reflected in the academic literature (Bell et al., 2014). Although those practices can potentially increase productivity, cows’ health will likely be negatively influenced (Oltenucu & Broom, 2010).

Better feeding relies on improved management, but dairy farming needs new technologies to open more potential (Pembleton et al., 2015). Participants generally showed an open mind towards new technologies. Participant #4 (male, over 50 yr, small-scale farmer) said: ‘We

need to be more scientifically based.’ Participant #6 (male, over 50 yr, medium-scale farmer) also spoke of the technological change occurring in agriculture: ‘There’s a huge introduction of technology into farming, it has revolutionised things.’ However, there was also a degree of caution about the nature of technological change among Illawarra dairy farmers. Except natural replacement or expansion of equipment, the adopted technologies/equipment in Table 8.3 were generally of relatively low cost (usually below AUD\$100,000), supplementary to existing farming system, or relatively easy to adopt (not requiring a comprehensive mode change). In 2016/17, replacement value of information and communications technology assets (e.g. computers, GPS, sensors, other hardware and software) held per Australian dairy farm was below AUD\$10,000 (Dufty & Jackson, 2018). Participant #3 (male, around 35 yr, small-scale farmer) commented on low-cost technologies/equipment:

All of those little things that can save you a lot more [than high-cost technologies like robotic milking system]... even from my heat detection collars which do health as well as heat detection, you know, like ear tags [which] have got chips in them, you can scan them and tell which cows [are] in a different area.

A main contribution of those low-cost technologies is to improve efficiency of the existing system through generating more information and guiding more precise resource use (Atkinson et al. 2014). Participant #7 (male, over 50 yr, medium-scale farmer) indicated: ‘[New technology] helps manage your resource more precisely more than anything.’

In summary, farmer participants generally prioritised business expansion, operation intensification, and related changes in management and infrastructure. These choices were not without long-term risks, but under financial pressure farmers needed these fast or proven ways to improve profitability. Although participants were generally open to new technologies, their technology adoption overall was conservative and incremental to their existing system. Although some farmers converted to radically different production modes (e.g. organic farming), their small number determined their limited influence on Illawarra dairying. The general directions of participants’ on-farm changes correspond with the essence of Australia’s agricultural policy reform, which is captured under the mantra of ‘get big or get out’ (Higgins & Lockie, 2001). Such results concur with findings of other studies that highlight farm expansion and intensification as common adjustment strategies in Australia and other western countries (Lockie, 2015; Wästfelt & Zhang, 2016).

## 8.7 Consequences

Farmer participants focused on several aspects of their business, but shifted attention away from other aspects. Several factors determined the difficulty for participants to invest in their existing capital from a long-term perspective, and to trial alternative farming approaches/technologies also as an investment in agricultural technology developers. Firstly, mounting financial pressure and a lack of government support potentially reduced participants' resources to be invested in areas that could not bring short-term profit (e.g. environmental management). Secondly, continuous urban/suburban development created an expectation of losing some land or the whole farm to new land uses, and relocating to a place further away from urban centres. It became less practical for farmers to be strongly committed to their existing capital which could be traded away in the future (Wästfelt & Zhang, 2016). Thirdly, expansion and intensification required a large amount of investment and potentially reduced participants' ability to make other investments. For example, participant #12 (male, around 40 yr, small-scale organic farmer) indicated that compared with adopting new technologies, he would 'probably spend [the money] on other areas, either lowering debt, or acquiring more land'. Finally, when participants accumulated more and more capital, they increasingly relied on hired labour for business management. Compared with family labour, the concern was that hired labour might care less about farm capital. Participant #6 (male, over 50 yr, medium-scale farmer) explained: 'Family on dairy farms work for nothing, but for a good lifestyle... I own the animals so I respect them and look after them. Someone who comes on to the farm from outside to milk cows, he doesn't have any relationship with the cattle.' The following paragraphs specifically discuss how participants' long-term capacity has been influenced from the aspects of environmental attitude, farm resilience and technology-related choices.

As for farmers' view on environmental management, one Illawarra dairy farmer, who had won Landcare awards in multiple years, considered that farmers' efforts to improve efficiency contributed to environmental sustainability. The farmer said: 'Our strategy has been to increase milk production using fewer resources and generating less waste and reusing the waste we do generate (#M176 on 02/04/2011).' The farmer also considered that intensified land use could generate less environmental impact: 'These days we have even less impact on the environment than we did 10 years ago, even though we're grazing three times

as many cows per hectare (#M204 on 06/09/2012).’ Some interview participants believed that they already reached environmental sustainability. Participant #1 (male, around 50 yr, small-scale farmer) said: ‘I don’t think it’s worth going spending more money on planting more trees. We won’t change our way of farming, coz we think we are pretty all right now, because... what we’ve been doing for the last 15 years [is] being environmentally sustainable.’ Participant #6 explained this perceived sustainability: ‘There’s always an intention for every farmer when he takes over the family farm to leave it in a better condition.’ It has been reported that many farmers position themselves as ‘stewards’ of the rural landscape and have a unique notion of ‘good farming’ which may contradict the understandings of conservationists (Gill, 2014).

This belief on sustainability along with the persistent financial pressure can lead many farmers to view environmental challenges (e.g. climate change) as manageable and instead focus more strongly on meeting economic challenges. As participant #4 (male, over 50 yr, small-scale farmer) said:

We all used to... dealing with whatever the environment throws at us... there’s always gonna be change... all of a sudden people picked up this climate change. Well there is. We’ve known that for years, and it always gonna keep happening, so whether it becomes more intense or not, or whether we warm up a little bit or not, you know, we tend to adapt to that.

Participant #9 (male, over 50 yr, large-scale farmer) indicated that many dairy farmers in Nowra (part of the Illawarra) only thought about economic sustainability. Curtis et al. (2014, p.189) indicated that about 30% of Australia’s rural landholders were ‘more committed to short-term economic gain than the long-term health of the land’. Farmers neglecting environmental challenges may perform farming practices that can exacerbate environmental issues. Despite participants’ comments, there is evidence that intensified use of industrially produced inputs, characterising the dairy farming system in the Illawarra, means increased nitrate leaching, greenhouse gas emissions and an increased environmental footprint (Bell et al., 2014; Gollnow et al., 2014; Stott & Gourley, 2016); there is also evidence of the negative influence of climate change on Australia’s dairy farming (Harrison et al., 2017).

Besides the potential lack of investment in environmental management, participants' on-farm changes potentially threatened the resilience of their farming system. The increased reliance on external inputs implies a more vulnerable system. Participant #9 indicated that the most popular cow breed (Holstein) in Australia were highly dependent on inputs: 'They are the problem animal for Australia... high cost, need more management, need high energy, high protein to get high production. They are like aristocracy... too delicate... if there's no money, you cannot look after them.' Participant #8 (male, over 50 yr, medium-scale farmer) indicated cows' vulnerability to diseases: 'Cows are bred to produce milk now. You know, the genetic traits of them are high production... they got mastitis, infections and all of [health problems].' It seems that farmers' pursuit for cow productivity growth has sacrificed other functions of the system, e.g. cow health. The increased use of inputs also engenders substantial infrastructure costs and exposes farmers to greater financial risks, such as fluctuations in milk and input prices (Bell et al., 2014; Sinclair et al., 2015). After the 2000 deregulation, Australian farmers' milk prices have remained volatile (Ashton, 2014). Market prices for key inputs (e.g. feed and energy) have also shown increased volatility (Raedts et al., 2017). Besides market volatility, another relevant issue is peak global oil production and constrained energy and oil supply for agriculture (Palmer, 2014), as the operation of most agricultural machinery, and the production of most farm inputs (e.g. feed and synthetic fertiliser) depend on petroleum products (Beilin et al., 2012). Given these issues, Abberton et al. (2016) highlighted the necessity for agriculture to reduce dependence on high external inputs. With those challenges, farmers themselves usually have limited resources and capacity to cope with market fluctuations/risks and seek alternative farm inputs due to, for example, low profitability and a large amount of resources being devoted to business expansion. Participant #8 highlighted dairy farmers' vulnerability: 'Unexpected things certainly just happen [low milk prices in 2016]. That's the whole trouble with the industry, that there's not enough surplus in the industry before those unexpected things.' Nonetheless, Australian governments have reduced financial support for farmers (OECD, 2016). Given this situation, some participants viewed themselves as 'risk managers'.

Limited surplus to cope with financial risks also implies limited investment in future productivity growth. Participant #2 (male, around 35 yr, small-scale farmer) indicated that it was hard to maintain his farm (repairing existing equipment/infrastructure) based on his profitability, let alone updating the equipment. Although participants adopted new technologies and approaches, some participants indicated the minor contribution from new



technologies to Illawarra dairying. Participant #3 (male, around 35 yr, small-scale farmer) thought that not many farmers were interested in new technologies. Participant #1 (male, around 50 yr, small-scale farmer) admitted: ‘I don’t know so much about new technologies... we just concentrate on the way we [already] got.’ Some participants indicated that their machinery has not changed much since 2000. Participant #6 (male, over 50 yr, medium-scale farmer) said: ‘Our machinery has got bigger, but the same style.’ Similarly some participants indicated that they have not invested in cow genetics to a great extent. Participant #8 said: ‘You can throw in better genetics [as a contributing factor to cow productivity]... but the significant impact is for feeding cows... I think the genetics are already there.’ Participants’ conservative technology choice corresponds with the finding of Ho et al. (2013) that two Victorian dairy farms with consistently good capital returns both tightly controlled costs but did not show a high level of technical optimisation. The choice of optimising existing farming system implies the neglect of alternative approaches which may be less productive now but would have more potential in future.

An obstacle for adopting new technologies is their usually high initial costs and longer-term return; a factor reported for farmers elsewhere (Tey & Brindal, 2012). Participant #3 indicated that some new technologies were not cost-effective, making farmers sceptical about new technologies. Participant #12 (male, around 40 yr, small-scale farmer) gave one example: ‘I would need a fairly large cash injection for me to go out start spend the money on computerised systems.’ The learning curve can also induce considerable costs, which has been reported by studies on precision agricultural technologies (Eastwood & Jago, 2012). Participant #4 (male, over 50 yr, small-scale farmer) concurred: ‘There are too many old farmers, haha. A lot of [them] haven’t had tertiary training.’ Some participants highlighted the lag time between introducing new technologies and harvesting their returns. Participant #8 (male, over 50 yr, medium-scale farmer) said: ‘What you do today you won’t get the benefits until at least 9 to 12 months’ time... I think that’s an absolutely pitfall of dairy farming [which] is you can’t make an instant change.’ Participant #3 expressed reluctance in investing in new equipment that cannot bring short-term returns: ‘We wanna make money within 18 months [after introducing the equipment]. We want it to pay for itself.’ The long lag time of some technologies, such as many precision agricultural technologies (Eastwood et al. 2017), makes them uncompetitive.

The unsatisfactory and/or longer-term return of some technologies and approaches does not mean they should not be invested in. Firstly, maintaining a diversity of farming approaches (e.g. breeding cows not just for production traits) in the farm sector can enhance its adaptability to uncertain future environments and help avoid major disruptions (Elmqvist et al., 2003). Secondly, technological advancement requires long-term investments from public and private sectors. At the beginning, it is not always certain which technologies represent the future. To proceed, technology developers have to trial numerous choices and select promising ones. Promising but immature technologies can be commercially uncompetitive because of the lack of scale production and user confidence (Arthur, 1994; Eastwood et al., 2017). Public sector support and the accumulation of initial users can be crucial to drive continuous technological advancement and establish economies of scale and support networks for new technologies (Hekkert et al., 2007). With low government support for alternatives and declining public R&D funding (Bell et al., 2014; Willer & Lernoud, 2016), Illawarra dairying (including organic farmers) as discussed by participants was characterised by being locked into a breeding-chemical-mechanisation techno-economic mode (explained in subsection 2.4.3.5) (Atkinson et al. 2014). Partly reflecting the lack of investment in new technologies, total factor productivity for Australian dairy farming remained relatively stagnant from 2009/10 to 2017/18 (Boult et al., 2018). Essentially, farmers' path dependence (relative inability to undertake major expenditure to take their farms to the next level technology) is related to farmers' place dependence (relative inability to relocate to a region with cheaper land still suitable for dairying), as they both reflect restricted capacity to make substantial changes. Although farmers have been exploring and trying alternative business approaches, their relatively individualistic actions are limited.

Overall, there has seemingly been constrained momentum from Illawarra dairy farm sector to develop long-term capacity. Partly reflecting the lack of long-term investment, Australia's dairy area has shrunk (Ashton et al., 2014). Dairy farming will likely continue to experience the two trends of business expansion and exploration of new opportunities. The former is not just to achieve economies of scale, but for capital owners to harvest surplus value from labour or capital users. Exploration involves several aspects: farmers can reduce investment in dairying and venture into other economic fields; farmers can explore opportunities which have not been sufficiently utilised (e.g. niche markets and land in other regions); farmers may also benefit from the slow progress of new technologies pioneered by some farmers.

## 8.8 Conclusion

With agricultural restructuring, many farmer participants have experienced low and unstable returns, immense working pressure and reduced lifestyles. Participants, to a certain extent, tended to deviate from traditional family farming culture, and accept new business models characterised by individualism, profit maximisation, external investment (e.g. debt), leased capital, and potentially less care (e.g. on cows). Participants usually considered business expansion based on borrowing and leasing, expanding into other areas or regions, or venturing into other sectors (e.g. milk processing and other income sources). These choices usually had short-term advantages but long-term costs. For example, the initial cost of leasing land is lower than purchasing the same area of land, but farmers have to pay rents continuously. Besides expansion, participants generally adjusted their management and pushed the potential of their existing system usually via specialisation and/or intensification. With limited resources, it was difficult for participants to invest in their capital from a long-term perspective (e.g. environmental management and enhancing business resilience), and trial alternative farming approaches/technologies. Australian dairying would continue to be characterised by a shrinking dairy area, expansion of individual farming operations, and the exploration of new opportunities. This study helps address research gaps, especially in terms of the limited theoretical and empirical knowledge on how farm development pathways have been influenced by different layers of political economic and socio-cultural forces (Wästfelt & Zhang, 2016, p.173), and how location and context matters for understanding experiences of agricultural change (Bafarasat, 2016; Woods, 2014).

This study shows how the dairy deregulation and in-migration of urban population into rural areas have intersected to influence on-farm changes and drive the multifunctional transition of agriculture. In this transition, some farmers deviated from conventional agriculture and explored ways to add value to their products. However, there are several comments to be made, which can be clarified by future research. Firstly, underneath the superficial multifunctionality and heterogeneity, different types of farmer participants (e.g. organic or conventional; more details are presented in chapter 9) fell into the same logic of expansion and intensification. Multifunctionality seemingly did not enhance environmentalism but entrenched the profit imperative. As Marsden & Sonnino (2008) have indicated, under a capitalist system multifunctionality must hold the potential of increasing income to

agriculture if farmers are to have financial incentives to commit themselves to alternatives. Secondly, although alternative farmers found new commercial opportunities through multifunctional agriculture, that does not mean they did not compete with other farmers. With the in-migration of urban population and large urban markets nearby, the demand for different types of food led to different markets (niche and mainstream). However, this potentially divided dairy farmers into two competing groups (supplying niche or mainstream markets). Some niche farmers denied the quality of products from mainstream supply chain. Localism, as a core ideology of many niche farmers, has been used to negate non-local players' practices (e.g. viewing multinational processors as shifting wealth away from local community). However, niche farmers are no less capitalist than conventional farmers. In fact their emergence is itself a product of the restructuring of capitalist agriculture under neoliberal modes of governance.

This chapter has discussed farmers' general coping strategies. To build on this, I now focus on two novel farming approaches: robotic milking and organic farming.

## Chapter 9 New Approaches

### 9.1 Introduction

Chapter 9, as an extension of chapter 8, further discusses how Illawarra dairy farmers' adoption of alternative or novel farming approaches, especially robotic milking systems (RMSs) and a certified organic dairy farming approach (CODFA), has been influenced by agricultural restructuring. I also discuss the prospect and potential issues of RMS and CODFA. This chapter responds to research questions two (inquiring into farmers' responses and on-farm changes) and three (inquiring into likely pathways for the future of agriculture). I focus on robotics and organics, as they have been strongly promoted by the industry and some academic researchers as potential strategies to enhance business performance or cope with challenges like global resource constraints (Bouttes et al., 2018; Britt et al., 2018; Migliorini & Wezel, 2017). It is valuable to examine such approaches in the Illawarra context, as local farmers are under the challenge of improving both short-term profitability and long-term resilience. Although Illawarra farmers adopting RMS and CODFA are few in number, these approaches have potential to be further developed and contribute to the vibrancy of local agriculture through, for example, increasing the diversity of farming methods.

Illawarra farmers' adoption of RMS and CODFA was influenced by the same trends that influenced farmers' general coping strategies discussed in chapter 8. These trends include industry restructuring, limited public and private R&D funding in alternative farming approaches, the in-migration of urban population into rural areas, and farmers' limited surplus to adopt alternative or novel approaches and to invest in the long-term capacity of their capital.

As for analysis of results, I not only consider theoretical frameworks (agricultural restructuring and multifunctional agriculture) referenced in chapter 8, but recognise the different roles of actors in R&D of new technologies (Carolan, 2018; Eastwood et al., 2017; Higgins et al., 2017), the theory of increasing returns to adoption (Arthur, 1994), and the notion of the conventionalisation of organic supply chain (Darnhofer et al., 2010; Lockie & Halpin, 2005). These points are respectively introduced in subsections 2.4.3.4, 2.4.3.5 and 2.4.4.4. Hekkert et al. (2007) showed that public R&D can be crucial for initiating the

development of new technologies, facilitating adaptation of them to existing farming practices, and creating protected niche markets for new technologies. The lack of public R&D can hinder the improvement and popularisation of RMS and CODFA. Another factor hindering adoption of alternative or novel approaches is the domination of mainstream farming technologies usually with better financial performance. Although Arthur's (1994) theory of increasing returns to adoption may not well explain the adoption of RMS and CODFA at very low adoption rates, it does help explain how increasing returns to the adoption of mainstream technologies make alternative or novel approaches less competitive. Under competitive pressure, alternative or novel approaches can be oriented towards short-term profitability. Although CODFA deviates from productivist trajectories, organic farmers usually rely on 'conventional' practices or 'conventionalisation' to cope with economic challenges.

## **9.2 Background**

Firstly I recognise that the broader process of agricultural restructuring highly influences adoption and development of robotic milking system (RMS) and certified organic dairy farming approach (CODFA). Australian dairy farmers have been experiencing adverse market conditions, limited government support, dominant corporate power, and competition for capital and labour from other industries (Lawrence et al., 2013). Although organic farmers in the Illawarra are, to a certain degree, sheltered by niche markets, they cannot escape corporate and market competition. They have to accept standards set by certifying organisations which often respond to corporate interests (Paull, 2013); their products face competition from major processors and supermarkets; if they decide to acquire land and expand, they face competition from urban land investors and other farmers. Participant #16 (Future Dairy researcher) summarised Australian dairy farmers' predicament: 'The more profitable dairy farms are, the more likely they are to invest in anything [for example RMS]... right now we got a lot of farmers in Australia that try to survive.' Despite farmers' difficulties, Australian governments generally provide no specific financial assistance for farmers to adopt new technologies (Dibden et al., 2009). There has been nearly no direct financial assistance from the government and industry for the organic sector (Andree et al., 2010; Paull, 2013).

Given the lack of incentives for adopting RMS and CODFA, the Australian markets for RMS and certain organic inputs remain too small and too broadly spread geographically to enable a strong business proposition for specialised input providers, service providers and consultants (Eastwood & Kenny, 2012). Participant #15, as a service provider for RMS, expressed his concern: 'If it [robotics] never takes off, well it could effectively be quite a burden to our business in the long run. If all of the [dairy] industry shrinks further, industry shrinking further is probably one of the greatest risks we have.' Overall, we should expect great challenges for the adoption and development of RMS and CODFA which are relatively new in the Illawarra and need further improvement.

## **9.3 Robotic milking systems**

### **9.3.1 Introduction**

Section 9.3 discusses the advantages and challenges of robotic milking systems (RMSs) as based on interviews of farmer participants who did not use RMS, a participant (#10) who has integrated RMS, and three professionals in field of robotics (participants #15-17). I recognise that all farmer participants had views and informed perspectives on RMSs, so their experiences in not choosing to invest in RMSs also offers important insights. Participant #10 (male, around 45 yr, medium-scale farmer) began to use the Lely Astronaut A4 RMS in 2015, with four robots milking around 220 cows. Participant #15 was an RMS dealer and had over 40 years of experience in the business of farm machinery. His primary agricultural customers were dairy farmers on the NSW South Coast (covering the Illawarra). Participant #16 was a researcher from the Future Dairy project and aiming to 'develop the farm system around robotic milking to make sure that robotic milking could work in pasture-based farming systems'. Participant #17 was a researcher working for the NSW Department of Primary Industries, specifically the intensive livestock units.

RMS is a form of automatic milk-harvesting system that generally requires no human intervention. It can identify cows, milk them and record their individual milking parameters (see section 4.8). In the Illawarra, only two farms were using RMSs. Participant #15 indicated that on the NSW South Coast, four farms they were aware of were using RMSs. Two farms adopted RMSs in 2009 and 2012, and the other two adopted RMSs in 2015. Although the adoption was low, this promising technology is still worth examining to explore its potential

contribution to local dairying. The brand most relevant to the Illawarra was Lely, as this company had developed service backup for local RMS users. Participant #15, as an RMS dealer, indicated that Lely was responsible for training his service technicians, and they had to be accepted by the company. Lely, as a Netherlands-based firm, was a crucial player in establishing the support network for RMS locally.

### **9.3.2 Advantages**

RMSs have to have some advantages to convince farmers to abandon conventional milking systems that have been used in the Illawarra with a high degree of confidence and familiarity. Several participants acknowledged the advantages of labour reduction, higher productivity, suitability to alternative energy sources, and better lifestyle.

RMS first of all has to provide a satisfactory performance. Participants #15-17 (those working in the field or selling RMS) proposed that RMS could suit most farms, large or small, flat or reasonably hilly. Participant #16 (Future Dairy researcher) said: ‘Cows cannot cross roads without people... aside from things like that generally it can work on most farms.’ Participant #10 (male, around 45 yr, medium-scale farmer using RMS) viewed RMS as technically reliable and financially competitive. Participant #16 maintained that RMS was not necessarily better than conventional milking systems, but ‘every farmer in Australia, if they [are] going to buy a new milk-harvesting system, they really should investigate and make a formal decision about whether it’s right or not [to choose RMS]’. For participant #10, RMS was seemingly only an alternative milking system. RMS did not push up the productivity or production of his farm to a level that would change his position in the supply chain. He still had to supply the same market under similar terms with other local farmers. If RMS does not offer obvious advantages, it will be difficult to convince farmers to overcome the substantial costs associated with transiting to an unfamiliar system. Such costs have long been viewed by agricultural researchers as an obstacle for technology adoption (Eastwood & Jago, 2012).

A major advantage of RMS concerned its potential to reduce labour needs on a dairy farm. Participant #16 explained: ‘Farmers just can’t find labour units [i.e. full-time employees]. They can’t find staff [usually due to the competition from better-paid jobs in other industries, and the lack of agricultural skillsets in local job markets]... then replacing employees with technology is another option.’ With four milking robots, participant #10 (farmer using RMS)



had cut one labour unit on his farm with 220 milking cows. Participant #8 (male, over 50 yr, medium-scale farmer) also emphasised the labour reducing effects of RMS: ‘There’s a social cost [in human labour] as well. The robots don’t need holidays. They don’t need compassionate leave... I’m not saying they don’t break down, but they are not watching the clock to go home.’ The advantage of labour reduction can be translated into financial performance. As participant #16 (Future Dairy researcher) noted:

If the average farm size [in Australia is] close to 300 [milking] cows now, the average farm has three labour units, generally the farm owner and two labour units... robotic milking farms are averaging, ranges up to 250 cows per labour unit... that’s 75,000 dollars a year you are saving... it [RMS] is more expensive but not much... the payback is pretty quick.

Generally, it would take more than 10 years of savings from labour reductions to offset the initial expenses of introducing RMS, and other related costs. This lag time can be challenging for farmers. As Participant #3 (male, around 50 yr, small-scale farmer) said: ‘We wanna make money within 18 months [after introducing the equipment]. We want it to pay for itself.’ Eastwood et al. (2017) has indicated some Australian dairy farmers’ reluctance in making long-term investments in new technologies owing to uncertain market conditions. Australian farmers need to cope with short-term economic challenges and usually have limited surplus resources for longer-term investment choices.

Nonetheless RMS was also touted for its potential to improve cow productivity. Firstly, RMS enriches information of the farming system, especially concerning cow productivity, physiology and physical activity. Participant #15 (a farm machinery dealer) explained how robotics ‘can monitor what the cows doing in every milking, every day, and it can show what we recorded, all that data, the whole lactation or life time of the cow.’ Participant #10 (farmer using RMS) also said: ‘If we change the cows’ diet tomorrow, we can see the effect of that.’ Some of the information was valuable for farmers who did not use RMS. They usually acquired this information from other sources. As participant #15 said:

A lot of them [farmers not using RMS] are spending quite a lot of money on an ID system, and that’s all they get, an ID system, so the cow can be identified... but with the robotic system, you get the ID system, you get the automatic drafting system, we get

scales so we can weigh the cow each time they get milked... if they [farmers not using RMS] do herd recording, those sorts of thing, they normally have to send it away and wait for it to come back... a lot of them might do it four times a year, so their data is basically always looking backwards... whereas they can have it from the robots the same day, and they don't have to make any special effort to get it.

RMS is a combination of tools with numerous functions. However, it is still uncertain whether or not all of the information generated by RMS is worth spending time interpreting (LeBlanc, 2016). Butler et al. (2012), for instance, indicated that many early RMS users felt subject to 'information overload', and did not have the skills or time to take full advantage of the data. The operation of RMS may need further streamlining.

Secondly, with more information cows can potentially be better managed through using veterinary medicine and intervening in cow activity. Participant #10 (farmer using RMS) said: 'We can focus more on cows individually.' Participant #15 (a farm machinery dealer) added: 'We can feed them [cows] and match their feed to what they are producing... the feeder [in RMS] is connected to milk production.' Therefore, RMS encouraged cows to produce more milk by providing productive cows with more feed.

Thirdly, RMS could support a better milking regime. Farmer participants usually milked their cows twice per day due to logistical reasons. However, if their cows were milked more than twice, they would produce more milk. Participant #16 (Future Dairy researcher) elaborated: 'That [thing] most limiting production is milking frequency... farmers [who do not use RMS] only milking twice a day. But [with their cows] being fed well enough, they [cows] have a genetic potential to produce more. Then with robotic milking, the cows can bring themselves [to be milked more than twice].' Although increasing milking frequency can potentially increase production, cow productivity on RMS is influenced by many factors, for example teat cup attachment failure and incomplete milking, a situation where the cow leaves the robot before being emptied (Siewert et al., 2018). It is difficult to draw a conclusion based on one parameter.

Finally, RMS can potentially reduce stress on cows. Cows can be milked at any time they choose and do not need to be pushed to the milking shed by the operator (Participant #10, farmer using RMS). Participant #15 (a farm machinery dealer) said: 'Cows like it. They

respond very well to robotic milking.’ However, academic literature presents no clear evidence of improvements to cow health and welfare through the use of RMS technologies (Holloway et al., 2014).

Another advantage of RMS is its better suitability to alternative energy sources (e.g. solar power) compared with conventional milking systems, because the requirement of robots for electricity spreads over 24 hours each day. Participant #16 (Future Dairy researcher) said: ‘We got a farmer in Australia... he generates all of his power [from solar panels]... he would not be able to do that with conventional milking at the same cost, because the battery supply he would require wouldn’t be feasible.’ Participant #10 (farmer using RMS) also had installed solar panels to generate electricity and cover his higher energy costs (around AUD\$10,000 annually) after installing RMS. Participant #17 (NSWDPI researcher) maintained: ‘There’s great potential for solar panels in the [dairy] industry.’ However, we should be cautious about the performance of solar panels compared with other investment choices. As participant #8 (male, over 50 yr, medium-scale farmer) indicated: ‘You most probably looking at 100 to 150,000 dollars to initially invest in that [solar power system]. You know, you gonna get more return out of a new tractor or a new piece of equipment, or upgrading the dairy... so it’s about the cost-benefit to the business.’ Despite the performance of solar panels, their initial costs can be a burden for farmers who already pay the costs of an RMS. Solar panels also represent a new field which needs to establish user confidence among farmers.

Despite business performance, RMS has the potential to afford farmers a better working regime and lifestyle. Participant #15 (a farm machinery dealer) said: ‘They [farmers] don’t have to be there four in the morning [to milk cows]. They can come down eight in the morning... they can turn it more into like a normal [working] day, which you know the majority of people want to work a normal day.’ Participant #10 (farmer using RMS) said: ‘We can finish here by four o’clock in the afternoon, go home, and we don’t get here until seven o’clock in the morning... we can spend more time off farm here and do more paperwork than before.’ Considering that the post-installation performance of RMS was uncertain, participant #10 highlighted the lifestyle change as a major reason for him to introduce RMS.

As cows do not need to be milked in a batch, farmers are also relieved from the pressure to manage large herds (participants #16, 17). Participant #15 added: ‘There are a lot of hygienic issues, occupation and health and safety issues with milking cows, the problem associated with repetitive strain type of injury... you reduce risk by doing this [using RMS].’ Participant #16 (Future Dairy researcher) said: ‘Farmers are getting older, and their bodies are getting worn out. They don’t want to milk cows anymore. They don’t want to retire from the dairy industry. Then it [RMS] can help to keep them in the industry longer.’ Getting rid of early morning milking did not mean participant #10 worked less. He still reported long working hours (over 60 hours per week). More generally, existing research does not provide clear conclusions as to whether or not farmers’ new working routines, enabled by RMS, led to positive outcomes in terms of work-life balance and greater social time (Butler et al., 2012). From this perspective, participant #10 chose RMS as a personal preference, or he preferred to work in a manner enabled by RMS, even if the overall workload might not reduce. Thus RMS should not only be viewed as an investment avenue, but a lifestyle choice which at least gives other farmers another option for farm operation.

With the aforementioned advantages, some participants recognised the use of RMS was a global trend. Participant #15 (a farm machinery dealer) said: ‘When you look at the world, robotics is taking control.’ Participant #16 said: ‘There are probably 20,000 farmers around the world now using robots. Australia is a long way behind.’ Whether or not RMS would become more mainstream in Australia highly depends on its financial performance. At present, the academic literature presents no clear evidence of advantages for farm productivity (Holloway et al., 2014; LeBlanc, 2016). The advantages outlined by participants indicate potential avenues where RMS could outperform conventional milking systems.

### **9.3.3 Challenges**

Despite those potential advantages, most farmer participants did not use RMS and generally made negative comments on it. Challenges identified in adopting RMS included the problems of RMS itself (e.g. high initial costs, logistic issues, costs associated with the learning curve, unsatisfactory performance, and inability to cope well with accidents and maintenance needs), costs and reluctance associated with transiting to a radically different system, and competition from alternative investment choices.

Participants' primary concern was cost. Participant #4 (male, over 50 yr, small-scale farmer) compared the setup costs of RMS and a herringbone milking system (HMS), the most popular milking system used in the Illawarra:

If say you need two or three robots [which can milk around 110-210 cows], you have to be spending a million plus [including costs of infrastructure], you know, anywhere between 1.2 or 3 million something like that... we can probably put one [HMS including infrastructure] in here for maybe half a million to 600,000... about half the cost [of RMS].

Participant #5 (male, around 50 yr, medium-scale farmer) thought the labour-saving capacity of RMS was not enough: 'I will lose one to one and half labour units, which is typically sixty, seventy thousand dollars [annually]. Is that enough to pay one million dollars [for initially installing the RMS] off?' Participant #13 (female, former dairy farmer) summarised: 'The costs are out of most people's reach at the present moment.' The clear implication was the long pay-off times. As Eastwood et al. (2017) found, investment in precision agricultural technologies usually involves large initial expenses and is riskier than investment in already popularised technologies. Considering the high volatility of market prices for milk and key farm inputs (Ashton, 2014; Raedts et al., 2017), it is difficult for Australian dairy farmers to justify such investments.

Special logistic requirements were another concern. Participant #10 (male, around 45 yr, medium-scale farmer using RMS) said: 'Not all farms are designed for robots... the smaller the farm area, the more suitable for robots... having a smaller area, you milk off, the cows come and go more easily.' Considering that RMSs require voluntary cow movement, participant #6 (male, over 50 yr, medium-scale farmer) said: 'This farm [his farm] wouldn't suit robots. Particularly they [cows] gonna walk up hills to get milked? Cows will not walk up hills without a dog behind them.' The prevalence of grazing systems as opposed to shedding systems (where indoor feeding and milking arrangement dominates) has been considered as a major reason for the low adoption of RMS in Australia (Eastwood & Kenny, 2012). As all farmer participants had a pasture-based grazing system, many of them considered RMS 'better for shedding systems'.

After overcoming the above-mentioned challenges, farmers who decide to adopt RMS have to learn how to operate the machinery. Participant #15 (a farm machinery dealer) said: 'We

haven't tried to sell it to anybody who doesn't want it... because they are going to be learning, we are going to be learning at the same time.' Participant #16 (Future Dairy researcher) said: 'If you have the attitude: I'm gonna buy the equipment and I'm gonna pay someone good money for it, and they have to make it work for me, things become very challenging.' Farmers need to have a good relationship with service technicians and be prepared to learn from them (participant #10), so farmers can better cope with general problems and breakdown. Participant #17 (NSWDPI researcher) even considered it necessary for farmers to have 'some technical training to be able to service the robot'. These comments imply that RMS is relatively difficult to learn. Participant #4 (male, over 50 yr, small-scale farmer) reported difficulty for farmers to properly operate RMS:

I'm a bit sceptical of robotics, because... robots are only as good as information that runs them, so they are only as good as whoever designs them, controls them, and the information in them, and then they are only as much value as the amount of time you put into them to get information out of them... if you don't do the setup or the monitoring right, and there's not good information in. Then it's gonna be rubbish out. I see that too many times in robots.

The learning costs can discourage potential users. This issue has probably been exacerbated by the lack of support networks to familiarise farmers with robotics (Eastwood & Kenny, 2012), and farmers' lack of education on robotics, especially their operation and maintenance.

Even if farmers have skills to operate RMS, it usually requires farmers to significantly change their farming system. The new system may not perform as well as expected. As participant #4 (male, over 50 yr, small-scale farmer) explained:

What a lot of people don't realise is that if you are going to have a robotic system for milking, it then becomes a whole-farm-system change. It's a different way of farming, totally different to what way we farm now, because the feed needs to come to the cows rather than the cows necessarily go to the feed. It's a farm change [which] has to be closely looked out.

He indicated the extra work involved in RMS:

If you try to incorporate grazing with robots, you have to make sure the cow movement is happening, otherwise you have to go get them and bring them in... if you bring in the feed to the cows while they are being milked in a robot, then you have to be going cutting that feed or collecting it somewhere and bring it in, you know, silage or hay or grain... there's always extra jobs people don't think about.

He also compared the labour use of HMS and RMS:

In a 200-cow dairy [HMS], you might have two people milking. Well in a robotic dairy you probably get away with one person just monitoring for a while, but then you really need two people at certain times to bring the cows in, monitor what's going on, and doing feeding and this sort of thing. Often it's not as good a labour saver as you think it might be.

Several other participants made similar comments. Participant #3 (male, around 35 yr, small-scale farmer), for instance, indicated that farmers who used RMS did not milk cows in the early morning, but they could work to mid-night with robots when other farmers were already asleep. Overall, participants questioned whether RMS could increase farm productivity to the levels that would justify investment. Such questioning has been expressed in other studies on RMS adoption (for example see Holloway et al., 2014; LeBlanc, 2016). The problem is that robots, at the current level of technological development, can only partly imitate human behaviour. For example, they can milk cows but cannot bring cows to the milking shed. Thus, RMS cannot completely replace human labour and maintain farmers' existing system, but requires farmers to establish a new system and change farm management practices to fit with the needs of robots. If RMS does not improve farm productivity, farmers still have to work hard and push their animals in other ways. It is high, or at least adequate returns, that generally allow farmers and their system to work less and enjoy a less stressful work-life balance.

Even if RMS is operated properly, it may not cope well with accidents. Participant #4 (male, over 50 yr, small-scale farmer) commented on dairying: 'You [are] working with a live animal who's prone to changing and being different a lot of time. They have different behaviour each day. It's not just a standard machine coming in doing the job all the time.' Participant #6 (male, over 50 yr, medium-scale farmer) explained:

You are dealing with animals, you know, 6 [to] 700 kilos. They [are] always going to do damage... there has to be someone on the farm all the time with the robot, because if one of the robots breaks down, you need someone there to repair the robot straight away, or if the gate gets locked, and the cows cannot get into the robot... or something like that.

Participant #11 (male, around 35 yr, small-scale farmer) added: 'The way that robots work is connected to your mobile phone. They always had an alarm going off on their mobile phone saying cows haven't come, there are problems in the dairy. It wouldn't matter if it's one o'clock in the morning, or 3 o'clock whatever.' As Butler et al. (2012) indicated, poor adaptability of some RMS technologies to existing farms can restructure farmers' working routine in unpleasant ways. For example, farmers may have to fix issues during the night.

Overall, farmer participants generally believed the performance of RMS to date was unsatisfactory. Participant #9 (male, over 50 yr, large-scale farmer) maintained that 'robots do not make life any easier', because they added complexity but did not generate enough return. Participant #4 summarised: 'Probably ten years or so since I first saw robotics getting involved with milking. You know, if they are that good, they'd be becoming much more commonplace.' RMS and its support networks clearly need further improvement to enhance adaptability to local farms, streamline the operation (making robots easier to learn and operate), make the working regime more comfortable for farmers, and improve the financial performance.

Despite the economic performance, if farmers decide to buy a new milk-harvesting system, transferring to a different system (compared with the previous system) is usually more costly than installing a similar system due to the need to adjust the farm's established structure, scrapping existing infrastructure that can still be used under the old system, learn new skills, and retrain staff. Participant #15 (a farm machinery dealer) described how RMS worked differently from conventional milking systems:

They [milking robots] need to be reasonably central on the farm, coz the cow has free access to come and back forward [to the pasture]... they work better if you can actually have grazing in three different directions. So what they do, unlike the traditional dairy: they [cows] revolve around [the milking shed]. The cows looking for the next paddock,



so they'll go to this block in the morning, and they'll walk back through the dairy [the milking shed] mid-morning, and they'll go to this [the next] block, and then they'll walk through [the milking shed] in the afternoon... so the cows are continually moving around the farm.

Thus RMS usually requires farmers to change their farm layout. Additionally, participant #4 (male, over 50 yr, small-scale farmer) indicated the need to change the structure of the milking shed and pay for extra costs, because 'there's so much different wiring, and obviously the milking plant, and there's a lot of hydraulics to water the gates and things, a lot of intricacy in the setup, and then you need a computer room, so you can monitor all that, and waste disposal, all of that sort of stuff.' With different infrastructure, RMS required 'a different way of farming, totally different to the way we farm now' (participant #4). To adopt this new farming, 'you got to be going back to school [to learn new skills]' (participant #10, male, around 45 yr, medium-scale farmer using RMS). Clearly, this is a significant challenge for potential RMS users.

The needed transition can be facilitated by existing experiences, knowledge and skillsets, and the support networks of RMS. However, these factors have been limited by the low number of RMS users. Participant #15 as an RMS dealer indicated the difficulty in providing services: 'Probably the greatest challenge we see is we gotta be able to support that 365 days a year ourselves... for us to provide support on-going for a low number of farmers, it's challenging.' Participant #16 (Future Dairy researcher) said: 'The robotic manufacturing companies have invested a lot of money to have technicians in all these regions, [who are] very underutilised at the moment.' The adoption of a techno-institutional system has to reach a certain level to reap increasing returns to further adoption, including economies of scale, and accumulation of specialised skills and knowledge (Arthur, 1994). Thus it needs more investment, adoption and time for RMS to establish stronger user confidence within Australian dairying (Kutter et al., 2011).

For farmers, any deviation from mainstream production mode not only implies financial risks, but requires changing lifestyles and habits (Higgins et al., 2017). Some participants indicated that they enjoyed certain elements of conventional milking and felt reluctant to change. Participant #3 (male, around 35 yr, small-scale farmer) maintained that farmers farming conventionally would be the majority in the foreseeable future, 'coz people want their hands

on, like when you are a dairy farmer you don't want to [use robots], you rather do it yourself... coz that's what you love.' Participant #11 (male, around 35 yr, small-scale farmer) concurred:

All it [RMS] does means instead of being hands on with the cows, seeing how they are, the robots doing that. I got to sit in front of a computer. That's not enjoyable for me. I'd rather be here and see the cows and know how they are working. You got have a relationship. The cows need a relationship too. They want to work with the farmer, as much as the farmer wants to work with the cows.

These comments correspond with the view of Warren et al. (2016, p.179) that certain farming practices provide 'symbolic capital and socio-cultural rewards'. Whether or not new technologies fit in this culture strongly influences farmers' adoption.

Given the above issues, farmer participants generally expressed a strong tendency to adhere to conventional milking which was of lower initial costs, highly streamlined and simplified, and familiar for farmers. Participant #4 (male, over 50 yr, small-scale farmer) commented on HMS: 'It's the simplest. They don't break down very easily.' Participant #9 (male, over 50 yr, large-scale farmer) also favoured the relative simplicity of conventional farming: 'Growing feed, making sure cows healthy, that is all, simple.' This path dependence follows the paradigm of evolutionary economic geography, which identifies the resilience or resistance of economic systems to making substantial changes (Tonts et al., 2014). Despite competition from conventional milking systems, participants tended also to compare RMS with other investment choices. In a neoliberal policy environment, Illawarra farmers had more freedom in making on-farm investment decisions. Farmers are driven to invest in fields that bring short-term returns (Curtis et al., 2014). Participant #3 mentioned other cheaper technologies/equipment: 'There's lots more options [for example, heat detection cow collar]. Like robots are right at the top of the mountain, where all of those little things that can save you a lot more.' Participant #9 said: 'I am always against robots... not investing in depreciating capital, robots [are] very quickly depreciating.' Farmers' adherence to proven approaches and emphasis on short-term returns may have shaped and will likely further shape the development of RMS.

It is less likely for RMS manufacturers to challenge conventional productivist farming and develop RMSs that especially target farmers' long-term challenges (e.g. climate change and global resource constraints). Although RMS usually requires significant farm change, it follows the proven and dominant high-external-input path of dairying, and still belongs to the 'breeding-chemical-mechanisation techno-economic mode' (explained in subsection 2.4.3.5) (Hogg, 2000, p.96). This mode emphasises improving single elements (e.g. yield) of the farming system, but often ignores other aspects such as environmental externalities. Participant #10 (male, around 45 yr, medium-scale farmer using RMS) reported that he pushed the capacity of his farm to increase pasture production, which implied an increasing level of intensification and input use. From this sense, many social and environmental problems related to intensive production or productivism are also relevant to RMS (more discussion is in section 9.5).

### **9.3.4 Summary**

The above-mentioned comments show that generally participants who did not use RMS and might not fully understand its benefits highlighted its disadvantages; the participant who used RMS and those professionals highlighted its advantages, partly because they have made serious decisions to be committed to this technology. Participants' stance certainly shaped their views. Overall, RMS as a novel technology has potential to be further developed and enhance the viability of the dairy industry. However, at the current stage many Illawarra farmers perceive it as having multiple drawbacks and needing further development.

## **9.4 Organic dairy farming**

### **9.4.1 Introduction**

Section 9.4 discusses the characteristics and challenges of the certified organic dairy farming approach (CODFA). CODFA is defined by certification schemes and established organic standards (explained in subsection 2.4.4 and section 4.9). Farmers usually need to get through a three-year conversion period to have their farm qualify as a certified organic farm. Based on the experiences of organic dairy farmers in the Illawarra, CODFA is differentiated from conventional dairy farming mainly in the restriction of certain material inputs, especially non-organic feed, chemical fertilisers and antibiotics. Thus, organic farmers adopt alternative

farming techniques or inputs to substitute for those restricted inputs. In the Illawarra, CODFA is oriented towards niche markets for premium milk prices.

The adoption rate of CODFA in the Illawarra was low. Participant #5 indicated that there were only three certified organic dairy farms in NSW. Two were in the Illawarra and surrounding areas. Besides interviewing farmers performing conventional operation, I also interviewed one organic dairy farmer (participant #12, male, around 40 yr, with 110 milking cows) and one farmer preparing to convert to CODFA (participant #11, male, around 35 yr, with 162 milking cows). The family of participant #12 began to convert their farm to organic production in 2001 and experienced three years of conversion. Unlike conventional farmers emphasising milk production, participant #12's family also processed and distributed their milk, and sought markets for their products. Participant #11 had just leased his farm for about two months at the time of our interview. As he said: '[The farm was] very run-down when I took over it. The fences were all on the ground not working, so there was no grass. So I've taken the farm over and done some drastic changes immediately around organic practices.' It is relatively easy for a newly started business to adopt CODFA, as the farmer can prepare the farm for CODFA from the beginning. Participant #11 supplied his milk as non-organic milk to Dairy Farmers Milk Cooperative, but planned to supply participant #12's family milk factory in the future once certification had been completed.

#### **9.4.2 Why organic**

CODFA was relatively new in the Illawarra, first appearing around 2001. The reasons why some Illawarra farmers had considered this unfamiliar approach were related to the dairy industry restructuring (especially the 2000 deregulation) and the development of niche markets for organic products. Firstly, the market competition pressure brought by deregulation made some farmers unviable and pushed them to try new pathways. Secondly, the inflow of urban middle-class groups into rural and peri-urban areas had created more demand for locally produced organic food. The potential markets in nearby regions had made CODFA a financially viable option.

Some participants highlighted financial factors for some farmers to consider CODFA. Bouttes et al. (2018) suggested that converting to organic dairy farming can potentially enhance farmers' adaptive capacity to economic challenges. Participant #12 (male, around 40

yr, small-scale organic farmer) indicated that initially it was deregulation and financial pressure that drove them to become certified organic:

Our milk price went from... average prices say 48 cents down to 30 cents in six months [since deregulation]... we had a fairly large debt. We needed to get more for our product, so we converted and we get a premium on our organic milk. So it was the only way for a small farm like this carrying debt to survive in the current dairy environment.

Other studies have also reported the impetus generated by this dairy deregulation for a minority of farmers to adopt alternative strategies (for example see Dibden & Cocklin, 2010). Participant #3 (male, around 35 yr, small-scale farmer) indicated that CODFA was a survival strategy for those who were resource poor: 'A lot of people tend to go organic when they tend to not have much money left, so they tend to go how about we don't feed any grain [due to restriction of non-organic feed, organic farmers usually use less feed], then we turn our farm organic.' Participant #11 (male, around 35 yr, small-scale farmer), who just started his farming business and had limited financial resources, expected a higher profitability from CODFA: '[The reason] I will certify is because of the milk price. I can get a lot better milk price [after he gets through the conversion period]... I'll start supplying 90 cents a litre... I'm talking [about] 40% to 50% more profitable [than conventional farming].' While he might be underestimating the difficulty of CODFA (Smith et al., 2015), overall interviewees indicated that CODFA helped those who were small-scale or under financial pressure to remain viable in a deregulated industry environment. Clearly, economic feasibility or the premium prices of organic milk were a prerequisite for some farmers to choose CODFA and consider other benefits it might bring, such as environmental benefits.

Additionally, participant #12 indicated that by farming organically and supplying niche markets he avoided another result of deregulation, namely the domination of major retailers and processors in the mainstream market. These corporate players have imposed private standards on their suppliers and partly led to the overuse of antibiotics, or high dependence on external inputs (Dibden & Cocklin 2010; Vanclay, 2003). This thesis shows that corporate food governance can also drive farmers to escape or avoid its power through, for example, turning to niche supply chains. Participant #12 explained the issue of overusing antibiotics:

It's the big milk companies' [major processors' fault]... what they call a somatic cell count [a standard of raw milk required by processors], so your milk has to be below 200,000 [in somatic cell count]. What it is is the white cells in the milk. All right, you get white cells when you get sub-clinical mastitis in your cows... the only way to do that [avoid high somatic cell count] is to use antibiotics. If it [somatic cell count] goes above 200,000, they [farmers] lose cents per litre of their milk... the processors set their standards. Then they get cheap milk.

That corporate food governance potentially enhances farmers' financial pressure has been widely acknowledged in academic literature (for example see Lawrence et al., 2013). Participant #12 further indicated the subordinate position of conventional farmers in that 'they are governed by processors, especially that antibiotic thing. They are stuck in that system.' Thus the perceived benefits from CODFA, and the challenges involved in conventional farming together drove some farmers to choose CODFA. It is also important to notice that this benefit of escaping corporate food governance might not be foreseen by participant #12. Premium milk prices may be an important attraction for farmers to consider CODFA, but after they start to perform CODFA which is still unfamiliar, they may discover more benefits of it, which may not be easily recognisable for other farmers. This can help explain why organic farmers usually establish a 'good farming' ideal highly different from that of conventional farmers (Kings & Ilbery, 2010).

The above-mentioned advantages might not be regarded as significant by conventional farmers. Many conventional farmer participants considered the financial performance of CODFA as unsatisfactory, and therefore viewed the idea of organic farming as an important reason for some farmers to choose CODFA. Participant #5 (male, over 50 yr, medium-scale conventional farmer) commented on organic farmers: 'They like the idea of doing organic... so these guys got what they want. They [are] happy and contented.' Compared with conventional farmers, advocates for organic farming have different views on how agriculture should be performed (IFOAM-Organics International, 2005). Organic farmers and conventional farmers often have different ideals of 'good farming' (Kings & Ilbery, 2010). This ideal helps farmers justify their farming practices.

Overall, CODFA was able to help some small-scale farmers cope with the negative impacts of deregulation. The importance that participants #11 and 12 placed on financial factors

implied that normative organic values, such as farming on ecological principles, have been potentially neglected in favour of market imperatives (Darnhofer et al., 2010). The next section discusses how the farming systems of participants #11 and 12 reveal a certain level of productivism and conventionalisation.

### **9.4.3 Organic operation**

CODFA brought benefits to farmers, but required a long-term commitment. CODFA was significantly different from conventional farming, and required very different farming methods, as confirmed by my participant observation. With almost no specific government support for CODFA, the burden of exploring and improving organic techniques is largely born by organic farmers (Paull, 2013). Participant #12 (male, around 40 yr, small-scale organic farmer) said: ‘We are still learning.’ Vogl et al. (2015, p.140) highlighted farmers’ experiments as underpinning ‘innovations that keep organic farming locally tuned for sustainability and adaptable to changing economic, social and ecological conditions’. The following paragraphs present how participants #12 and 11 (male, around 35 yr, small-scale farmer) coped with the four major restrictions of CODFA, namely restricted use of non-organic feed, chemical fertilisers and antibiotics, and restricted market access.

Due to the limited supply or high cost of organic feed, participants #12 and 11 produced their own supplement feed (e.g. grain). Participant #12 leased and certified two land blocks for growing silage and grain, and raising heifers. Participant #11’s parents had a 700-acre property in the west of NSW. He was going to convert that property organically and use it to produce feed and raise heifers. Constrained feed supply determined that participants #12 and 11 could not improve cow productivity through using a large amount of fodder like many conventional farmers. Participant #12 said: ‘We don’t feed much grain. We feed three to four kilos of grain per cow per day, because it’s expensive. Some of these bigger [conventional] dairy farms will be feeding six to eight kilo of grain or even further per cow per day.’ From this sense, organic operation was less intensive.

As for pasture management, participants #12 and 11 used organic fertilisers. Participant #11 gave more details on his approach. He used pelletised chicken manure (which was industrially produced and also used in conventional farming), cow manure and compost as fertilisers. He had an effluent pond to which he added liquid leaching from a ‘worm farm’ (a

pile of soil, decayed plants, vegetable waste and other organic materials where worms propagated). Microbes in the pond fermented and decomposed cow manure washed into the pond. Liquid in the pond was to be pumped into a tank and spread over the pasture. He indicated his difference from other farmers in managing cow manure: ‘I’m streamlining it, so mother nature works and uses it [manure] on a daily basis, whereas conventional farms don’t use it daily. They will stock pile their solids... that’s just the amount I’m doing it, and the frequency I’m doing it.’ Additionally, he had a large pile of compost (various types of organic waste) on the paddock, which was also to be used as fertiliser. As organic farmers cannot use chemical fertilisers to simply fertilise their land (Hamblin, 2009), the working routine associated with composting and manure can increase farmers’ workload (cf. Vogl et al., 2015). Although organic operation in the Illawarra required less intensive usage of external inputs, it could be more labour intensive.

Nevertheless, participants #12 and 11 highlighted the benefits of organic fertilisation. Participant #12 said: ‘We probably grow more grass now than we did back then. We are using organic fertilisers, trying to build the biology in the soil.’ He commented on chemical fertilisers: ‘They are basically designed just to break down into a liquid... so soluble for the plant to take up... plant has nothing else to take up but nitrogen. That’s why they look so green, but can be looking so green [but] not having many vitamins or minerals.’ Participant #11 said: ‘I’m not just a dairy farmer, I’m a soil farmer. So I know if I look after my soils, the soils gonna in return look after me... she’s [the cows are] getting more nutrients out of the grass.’ The performance of organic fertilisation seemingly allowed participants #12 and 11 to use their land as intensively as conventional farmers did. Participant #12’s home farm was similar in size to participant #1’s conventional farm, and they had a similar number of milking cows. Organic fertilisation seemingly provides a viable alternative to conventional fertilisation at least at a small scale (participants #12 and 11 were small-scale farmers). Participant #11 also believed organic fertilisation was superior in environmental performance in terms of greenhouse gas emissions. There is evidence that organic pasture management is more energy efficient compared with conventional farming (Smith et al., 2015).

As for herd management without antibiotics, participants #12 and 11 bred cows for health and fertility traits; participant #11 also used natural remedies. Participant #12 tried to breed ‘tougher cows’ (smaller, healthier and resistant to diseases). He relied on ‘natural selection’ to cope with mastitis: ‘Some [cow] families in case they’ll have a predisposition to getting



mastitis... some don't get mastitis their whole life... we try to breed cattle that don't get mastitis... I do a lot of cross-breeding [for hybrids].’ Although his cows could still get mastitis, overall mastitis was not a problem on their farm. He commented on cows in conventional dairying: ‘They only do one thing, that is eat and milk, and all of their health traits just fall off. The only way to keep running is antibiotics...conventional cows, you know, average age... is about 8 years. We’ve got cows in my herd that’s 16 years, 17 years old.’ As his cows were not bred for high production and not fed much grain, they had low and static milk production. He said: ‘A lot of conventional dairies would be averaging anywhere from 26 litres [of milk per] cow per day to 35 litres... I average between 16 litres a cow and 20 litres a cow.’ In the last decade his per cow milk production only increased ‘marginally’.

Participant #11 also used cross-breeding: ‘The best breed is still undecided for organics.’ He bred cows for high fertility and longevity: ‘I’m looking at getting cows to have more calves, more babies, and be there for a longer period of time.’ He highlighted the benefits of not aiming for high milk production: ‘By having a cow producing less milk and more efficiently, she’s gonna be more productive when it comes to reproduction... she’s gonna have less stress on herself... because of the other factor of less stress, she has less mastitis.’ His breeding strategy was seemingly different from that of participant #12 who targeted immunity to mastitis. The different breeding strategies both aimed for economic optimisation. As for natural remedies, participant #11 explained:

On our farm up in Robertson [his previous family farm]... our vet bill for one year cost over 10,000 dollars. So then I looked what we were using the vet for. Ninety per cent of it was for antibiotics. How could I change this? So I start a study and look into things [natural remedies], and within 12 months I saved 7000 dollars.

He indicated that his treatments on cows with mastitis were generally successful. The benefit of natural remedies further highlights the importance of financial factors in driving CODFA.

Overall, CODFA in the Illawarra appears to deviate from the conventional model of high external inputs (e.g. commodity feed, chemical fertilisers and antibiotics) and genetic uniformity (high dependence on Holsteins breed). Therefore, CODFA has potential to increase farmers’ resistance to cow diseases and fluctuations of input prices (due to less dependence on certain external inputs) (Bouttes et al., 2018), and contribute to the resilience

of local agriculture through developing a low-input model (Lamine & Bellon, 2009). Those organic farming techniques can also be valuable for conventional farmers. Participants #11 and 12 both emphasised the benefits of organic operation. Thus it was not just premium milk prices that helped organic farmers to overcome the costs involved in transiting to and performing CODFA.

As for market arrangements, participant #12's family not only ran the farm, but distributed, processed and marketed their products (some of their raw milk was supplied to another farmers-owned milk factory); participant #11 planned to supply participant #12's family milk factory. They did not supply organic milk to major processors, because 'the only major processor that has an organic line is Parmalat... their organic processing factory is down... Bendigo in Victoria, too far away' (participant #11). Participant #12 mentioned his farmgate milk prices: 'Through most time of the year it's 80 cents. In spring that can drop down a bit, coz you get a spike in production, so it can drop down [to] between 60 and 70 cents.' His milk prices had steadily increased over the last decade. That contrasted with the volatile milk prices in mainstream market characterised by fierce competition (Barr, 2014). Participant #12 used a contractor to transport his milk to their milk factory to be processed into cheese or yoghurt. Their final products went to Harris Farm Markets ('small chains around Sydney and Canberra'), local coffee shops and even customers in Western Australia. Thus, in the Illawarra, organic dairying exists within this niche supply chain, which contrasts with the large-scale organic milk production that is dominant in Victoria where farmers' costs of production are usually lower. This difference reflects that Australia's organic sector has bifurcated into a dominant commercialised sphere involving large-scale farmers supplying major supermarkets, and a minor market segment involving small-scale farmers supplying niche markets (Australian Organic, 2014; Lamine & Bellon, 2009).

In summary, CODFA in the Illawarra was different from conventional dairying in the management of feed, pasture, herd and the supply chain. CODFA was characterised by a constrained feed supply. Organic pasture management relied on organic fertilisers from external sources (e.g. chicken manure), and better utilisation of on-farm organic materials (e.g. effluent). At a small scale, organic pasture production was able to be comparable to conventional pasture production. Organic herd management was characterised by breeding cows for health and fertility traits. Farmers also used natural remedies to cope with cow diseases. Organic farming methods were to find substitutes for the restricted conventional

inputs, and improve the performance of other aspects of the farming system to compensate for reduction in milk production. As for supply chain management, farmers went beyond their family farm and established broad business relations with distributors, other processors and customers (Woods 2014). The aforementioned differences contributed to the diversity of farming techniques and cow breeds. Thus, CODFA had different social and environmental functions compared with conventional agriculture, and contributed to the multifunctional transition of agriculture (Marsden & Sonnino 2008).

Despite the potential social and environmental values, the organic approaches performed by participants show many signs of conventionalisation, based on the indicators developed by Darnhofer et al. (2010). Firstly, profitability is a dominating decision criterion in conventionalised farming, and participants #11 and 12 viewed profitability as a top priority. Secondly, as the infrastructure and equipment used in CODFA can be the same as that in conventional farming, participants #11 and 12 remained highly reliant on fossil-fuel-dependent machinery (e.g. tractors). Thirdly, ensuring closed nutrient cycles is a foundation of organic farming, but a high proportion of fertiliser (e.g. chicken manure) and feed used by participants #11 and 12 was produced outside their farm. Fourthly, conventional farming usually seeks to maximise production, and participant #12 managed to achieve pasture production to a level comparable with conventional intensive farming. Fifthly, participants #11 and 12 only kept a few animal types on their farm. Finally, conventionalisation is reflected in practices that try to solve problems separately without considering other parts of the farm, and participants #11 and 12 tried to improve cow performance mainly through breeding rather than consider how to improve cow performance through adjusting other parts of the agro-ecological system. Certified organic farming that fails the expectation of environmental protection has been widely reported (Marsden & Morley, 2014). CODFA in the Illawarra still highly depended on inputs based on fossil fuel, and was limited as an effective response to climate change and global resource constraints.

#### **9.4.4 Challenges**

Even if CODFA in the Illawarra relied on some conventional practices to ensure its viability, its economic performance was still questioned by most conventional farmer participants. CODFA itself was challenging, in terms of regulation costs, the higher costs of production, difficulties in maintaining cow health, lower production, lack of processors, and limited

market potential. Other challenges included the lack of capacity to establish economies of scale and fully develop organic techniques, and conventional farmers' adherence to their production mode.

A major concern was the costs associated with certification schemes. Participants highlighted the three-year conversion period. Participant #12 (male, around 40 yr, small-scale organic farmer) said:

That is a period that stops people doing it [CODFA]... because [during this period] we were getting a conventional price [lower than the price for organic milk], while we had to farm organically. Organically [cows produced] less milk and [we received] less of the price, so we took on a lot of debt through that period.

He believed certification organisations should lower the threshold: 'They make it too hard for people to get in.' Besides the conversion, he had to be audited annually for continued certification: 'I have to show everything on the books to make sure I'm not cheating... we pay them to come here to audit us. It's 1000 dollars.' Willer & Lernoud (2016) recognised the burden of certification/regulation as one main reason for some small-scale organic farmers to leave the industry.

For organic operations, the costs of production per unit output were perceived by some participants as much higher compared with conventional farming. Participant #6 (male, over 50 yr, medium-scale farmer) indicated that under CODFA, with lower milk production, 'you would still have to do as just much work [as that in conventional farming], because you got so much farm[land] to look after'. Participant #1 (male, around 50 yr, small-scale farmer) indicated the difficulty of organic fertilisation: 'If you've got to spread out mulch [organic fertilisation] or whatever, you got to spend more time doing that. But if you just gonna put [chemical] fertiliser [conventional fertilisation], you got to go around three times, you're using less diesel... so it's better for the environment.' Some participants also emphasised the costliness of organic feed. Participant #5 (male, around 50 yr, medium-scale farmer) indicated that if the fodder he used was from organically certified sources, the feeding costs would be doubled, because of the low availability of such feed. Participant #13 (female, former dairy farmer) mentioned an organic dairy farm: 'They have to get their organic grain [feed] from Queensland. Could you imagine the [ecological] footprint that does bring it right

down from Queensland?’ Overall, many participants considered CODFA as ‘a waste of resources’, which was linked to poor environmental performance. Organic standards try to remove certain elements in conventional agriculture. Those elements have been viewed negatively by the community, but contribute to industry efficiency (Mayen et al., 2010). If CODFA were to use less external inputs, its output would be further lowered (Dibden et al., 2009), which would influence its economic viability.

It was also difficult to maintain cow health without antibiotics, especially at a large scale. This difficulty has been recognised in academic literature (Sahm et al., 2013). Participant #8 (male, over 50 yr, medium-scale farmer) indicated the relative convenience of conventional treatment: ‘You got a whole lot of cows you trying to do natural remedies [organic treatment to cope with cow diseases]. So [it is relatively] easy to go to the dairy and get a needle and go bang [conventional treatment], and give the penicillin [antibiotics], that’s done.’ Participant #7 (male, over 50 yr, medium-scale farmer) indicated the low potency of organic approaches to cope with mastitis: ‘I don’t know how you’d manage mastitis [without antibiotics]... in New Zealand a lot of organic farms, dairy farms, have two farms, have an organic farm and a non-organic. If cows get crook with mastitis, they’ll move the cow to the normal [conventional] farm to treat.’ Participant #12 (male, around 40 yr, small-scale organic farmer) summarised: ‘That puts a lot of people off going organic. It’s just too hard to maintain the big herds in good health without antibiotics.’ Clearly, Organic farming techniques need further improvement to increase their applicability.

With multiple difficulties, CODFA was characterised by lower output per unit land area. Conventional farmer participants usually believed that organic farmland carried fewer cows, and organic cows produced less milk. Participants #5 and 8 indicated that if their farms were converted to CODFA, their milk production would be halved. The low production was linked to poor environmental performance. As participant #13 said: ‘There’s no way in this world that organic is lower for the carbon footprint...because you reduce your carbon footprint by improving your efficiency, and efficiency is on how much produce you can produce per hectare.’ Farmers’ productivist view of farming might result from the institutionalised beliefs about the need to maximise production (Sutherland & Darnhofer, 2012). The high costs and low production determine that organic products are more expensive and have a much smaller market compared with conventional products (Australian Organic, 2014).

The limited market partly determined the lack of economies of scale within the organic supply chain. Traditionally, milk from each farm is transported by a truck from the processor, and milk from different farms is mixed together. Participant #3 (male, around 35 yr, small-scale farmer) indicated that separate transport of a small amount of organic milk could be more expensive. Thus major processors usually do not supply the organic milk market. Due to the lack of processors, the family of participant #12 (male, around 40 yr, small-scale organic farmer) had to build their own milk factory and look for distributors, or rely on other farmers' milk factories which usually also had limited capacity. Thus, converting to CODFA for many is not just a change in production mode, but to diversify the farming business into other economic activities. This distracts the farmer's resources and restricts the improvement and expansion of the farming business.

The limited scale of production and processing determined that organic dairy products from the Illawarra have only been supplied to small niche markets rather than major supermarkets which required large quantities. Participant #12 (organic farmer) mentioned the issue of the small size of his production: 'A lot of times markets [domestic or export] we don't take them up, because we just can't supply the milk.' Even if his business was big enough to supply major supermarkets, he would have to face competition from cheaper organic products from Victoria. Thus, if he had the scale, he would consider export markets. He said: 'If the domestic market was there you would take it, but I just can't see.' The limited market was linked to some participants' perception that premium prices for organic milk were not enough to compensate for the extra costs. Participant #4 (male, over 50 yr, small-scale farmer) said: 'There is a premium for organic milk, but there's a lot less of it.' Participant #7 (male, over 50 yr, medium-scale farmer) said: 'I'd like be able to do it [CODFA], but economically I can't, you don't get a fair return.' It was financial performance that strongly determined the attractiveness of a certain farming approach for most farmer participants.

The aforementioned difficulties partly resulted from the lack of investment and time for organic farmers to establish economies of scale, fully develop organic techniques, and accumulate experiences and skills. CODFA in the Illawarra only emerged since 2001, and was practiced and invested in by only a few small-scale farmers. CODFA was perceived as being in a lower-level technological niche (participant #7), and not fully developed for large-scale production (participant #6). There was also limited experience of harnessing the potential of niche markets, for example how to operate a milk factory and how to market the

products. CODFA in the Illawarra was experiencing the usual difficulties experienced by new technologies at their initial stage, for example lack of scale production, specialised skills and knowledge, and user confidence (Arthur, 1994; Kutter et al., 2011). Participant #8 (male, over 50 yr, medium-scale farmer) highlighted the importance of having scale:

If it's a whole-industry approach, even a half-industry approach, you will probably make it successful, because you got the sheer volume of numbers to actually drive it. It would drive the feed to have enough feed... you would have something that was marketable, would go overseas.

Many participants' adherence to conventional farming can also be explained by the economies of scale of conventional supply chains, and accumulated user confidence.

Despite the scale of the organic sector, some conventional farmer participants seemingly revealed a belief in the inferiority of CODFA. Some participants clearly held misunderstandings of CODFA. For example, they supposed that if they turned to CODFA, the carrying capacity of their pasture would be halved, which was not necessarily correct based on the experience of participant #12 (organic farmer); some participants tended to use output (per cow or per unit area) to judge whether farm capital and resources were effectively utilised, but CODFA offered other potential benefits, like cow health. Participant #4 commented on CODFA: 'Sometimes I think organics is a way for lazy farmers... because it does tell them they don't have to do. Oh you shouldn't do this, you shouldn't do that... too many [certified organic] farms... look really run down. You know, there's more weeds there; the cattle don't look particular healthy.' Warren et al. (2016, p.179) indicated that certain farming practices provide 'symbolic capital and socio-cultural rewards' and are associated with the notion of 'good farming'. CODFA clearly did not fit in some participants' ideal of what constituted 'good farming'.

Some participants believed a conventional production mode along with some organic techniques provided satisfactory economic and environmental performance, and there was no need for a wholesale conversion to CODFA. Participant #10 (male, around 45 yr, medium-scale farmer) said: 'All farmers are organic in mind. They only use drugs if have to... we don't want to pollute our dairy land.' Participant #4 said: 'Like in any farming practices we are conscious of working with the environment not against... I think there's a bit of organics

in all farming. I think I like the idea, the principle of organics. It's putting back what you take out and keeping things in balance.' However, there is evidence that the Australian dairy industry has significant negative environmental impacts (Bell et al., 2014; Stott & Gourley, 2016). Participants' adherence to conventional production incorporated with some organic ideas might not be based on real economic and environmental performance, but a 'good farming' ideal and the productivist identity. There is a body of literature suggesting that the productivist identity dominates on-farm decision-making, thereby resisting conversion to alternative agriculture (Burton, 2004; Sutherland & Darnhofer, 2012).

Overall, the Illawarra organic dairy sector, which needed substantial investment to improve organic techniques, develop economies of scale, open new markets and establish other farmers' confidence, have inevitably faced notable constraints (Dibden et al., 2009; Hamblin, 2009). Such constraints resulted in the perceived poor financial performance of CODFA, and continued adherence to the already developed conventional supply chain by other farmers. Those constraints also help explain why existing organic farmers in the Illawarra have prioritised profitability and chosen a relatively conventionalised path to improve performance. Although highly different from conventional dairying, CODFA still revealed an intrinsic path dependence or adherence to the farmer's previous conventional approaches (Tonts et al., 2014).

#### **9.4.5 Summary**

With agricultural restructuring, CODFA has been recognised as an opportunity for some Illawarra farmers. However, CODFA requires from farmers a long-term commitment to exploring how to substitute organic inputs and techniques for the restricted conventional inputs, and harness the potential of niche markets. In practice, CODFA is different from conventional farming in the management of feed, pasture, herd and supply chain, and has potential social and environmental contributions. However, CODFA in the Illawarra reveals clear signals of conventionalisation. Organic farmers have chosen to improve operation efficiency through some conventional farming practices (avoiding some economically inefficient organic practices), for example intensified use of certain externally produced inputs (e.g. fertiliser and fuel), so that they could generate a return at least not significantly lower than that of conventional farmers. The low number of organic farmers in the Illawarra and farmers' limited resources to improve CODFA have determined its underdeveloped



status (e.g. difficult to suit large-scale production), and the lack of economies of scale regarding the local organic supply chain. Most conventional farmer participants thereby perceived CODFA as unviable or impractical.

## 9.5 Prospects

With various difficulties, participants had different views on the future of robotic milking system (RMS) and certified organic dairy farming approach (CODFA). Most participants believed RMS had a bright future. Participant #7 (male, over 50 yr, medium-scale farmer) explained: ‘I think everyone realises robotics is the way for future.’ Participants #16 (Future Dairy researcher) and 17 (NSWDPI researcher) believed RMS would sooner or later become the mainstream method of dairying, including in the Illawarra. Participant #16 said:

It’s a slow uptake, because most farms if their existing dairy works perfectly well, they are not gonna pull that out, put robots on... but if they need a new dairy... then robotic milking is a very viable option... even in Europe some European countries where 60 or 70% of farmers that are buying new milk-harvesting equipment will buy robots, but still only 20 or 30% of the farms have robots.

As part of his job, participant #17 (NSWDPI researcher) surveyed around 300 Australian dairy farmers and service providers: ‘We asked... which technology they think will increase adoption in the next ten years. Sixty per cent of farmers said robots will be more adopted in Australia... fifty per cent of farmers said they would consider robotic milking today if they have to install a new dairy.’ Farmers’ confidence in robotics reflects their belief in the continued dominance of conventional productivist models on which RMSs are based.

As for CODFA, many participants maintained that the local organic dairy sector would not have a big influence on the dairy industry, and would not keep growing. Participant #6 (male, over 50 yr, medium-scale farmer) said: ‘There always may be a niche dairy industry, organic dairy industry, but never be a major part of the industry.’ Participant #3 (male, around 35 yr, small-scale farmer) said: ‘Unless something happened in the dairy industry and everyone needs to go organic.’ Participants’ views were usually based on economic considerations. However, we should not devalue the potential contribution of organic techniques to Illawarra agriculture.

Given the challenges faced by RMS and CODFA, in the foreseeable future they will likely be adopted and developed largely as a diversification strategy for Illawarra dairying rather than become mainstream choices. Adverse market conditions and the difficulty for a mainstream production mode to bring robust financial return drove some farmers to try alternative or novel approaches. Participant #15 as a robot dealer indicated that only around 10% of his business was on RMS, and the remaining was largely on conventional machinery (e.g. tractors). Mackinnon et al. (2010) noted that adoption of automation technologies is more common among medium and large farms. Farmers with more financial resources are more likely to adopt new technologies. The small number of initial RMS users can contribute to the continued development of RMS, its support networks and relevant skillsets (Atkinson et al. 2014; Geels, 2004).

As for CODFA in the Illawarra, it will continue to be confined within the niche sector driven by farmers viewed by others as economically irrational. This niche preserves and develops valuable skillsets, experiences and fixed capital, and may trigger a larger-scale industry change in future (Atkinson et al. 2014; Geels, 2004). However, niche farmers will continue to experience the lack of investment, technology input, efficiency and market opportunities. Hamblin (2009) indicated that it is usually difficult for farmers oriented towards niche markets to fully commercialise their products. Compared with conventional farming with more farmers and investment, CODFA would have a slower rate of productivity growth and is likely to be vulnerable to economic fluctuations.

A potential issue for the development of RMS and CODFA in the Illawarra is that although RMS-based farming and CODFA in this study are significantly different from mainstream farming, they do not change farmers' aim for short-term returns, the high-external-input nature of agriculture, and the vulnerability of agriculture to climate change and global resource constraints. Under a deregulated industry environment where farmers are expected to be self-reliant and are driven to compete for short-term returns, alternative or novel approaches have to generate sufficient returns, often at the expense of any long-term benefits they are supposed to bring. This study echoes the widespread criticism on technocratic prescriptions for meeting sustainability goals (Woods, 2012). RMS and CODFA need long-term development, and their future is linked to the future of the dairy industry. If environmental and resource issues (e.g. extreme weathers, fluctuations in input prices, and

peak global oil production) lead Australian dairy industry to shrink further due to lack of long-term investment (Bell et al., 2014; Hanslow et al., 2014; Beilin et al., 2012), the adoption of RMS and CODFA would be restricted. Thus the future for such approaches is highly uncertain.

## **9.6 Conclusion**

RMS and CODFA respectively have potential to improve the efficiency and resilience of Illawarra dairying. However, they both require farmers to make significant efforts to adapt them to local farming environments, and suffer from the lack of skillsets, experiences, user confidence and investment in their support networks. The deregulated industry environment is also unfavourable for their adoption and development. They will likely continue to be adopted by only a small number of local farmers who will contribute to their further improvement. Although RMS and CODFA need long-term development, they have been largely oriented towards short-term profit and intensive production to help farmers cope with immediate financial pressure. They are equally vulnerable to major challenges (e.g. climate change and global resource constraints) faced by the Australian dairy industry in general. This study contributes to addressing research gaps that relate to a lack of qualitative studies on RMS and CODFA in the Australian context, and more research is needed on specific farm development pathways in the context of agricultural restructuring (Higgins et al., 2017; Van Caenegem & Cleary, 2017; Wästfelt & Zhang, 2016).

The concepts of public and private R&D, and the theory of increasing returns to adoption are useful in analysing farmers' adoption of alternative or novel approaches. However, there are several comments to be made, which can be clarified by future research. Firstly, although public R&D is crucial for the development of new technologies, it is difficult to justify public investment in economic fields undergoing shrinkage (e.g. Australia's dairy farm sector). In a neoliberal age when governments become committed to market determinism, public and private R&D can be subject to the same mentality of aiming for short-term results. Secondly, increasing adoption can potentially increase returns of a techno-institutional system, but the returns can be insignificant at certain stages. When a technology is at its infant stage, initial adoption can result in negligible returns. If a technology is applied to economic fields undergoing economic difficulty, the returns can be irrelevant to adoption rates but determined by the economic environment (whether or not market conditions allow technology users to

profit). Overall, the roles of public and private R&D, and the theory of increasing returns to adoption should be considered together with the political economic contexts of technology users.

The notion of conventionalisation of the organic supply chain appears to be useful in understanding how organic farmers shape their operation. Although conventionalised organic agriculture has been widely criticised (Darnhofer et al., 2010; Lockie & Halpin, 2005), ironically it is also conventionalisation that makes CODFA possible in the Illawarra. Some conventional farming practices help ensure the basic viability of organic operations. When farmers are under significant financial pressure and need to find alternative accumulation strategies, they are more likely to transfer to a system which they can operate based on their existing skillsets (e.g. cow breeding and using existing machinery) than transfer to a system which they have little knowledge and financial incentives to operate (e.g. farming based on normative organic values). Future research can contribute by better situating conventionalisation within the political economic trends that influence agriculture.

## **Chapter 10 Conclusion**

### **10.1 Introduction**

This chapter summarises and re-examines aspects of the overall project. Firstly, I make brief conclusions for this study, situating findings within relevant literatures. This analysis is organised to follow the order of research questions one to three. I then present a summary of the overarching study, discussing how the thesis contributes to the broader themes in rural/agricultural research. Lastly, I discuss the limitations of the study, and make recommendations for future research

### **10.2 What factors are driving agricultural change and how have farmers been affected?**

In response to research question one, this study analyses several influencing factors on Illawarra dairy farmers. Relevant content is particularly in chapters 5-7. Such factors include local historical development, the development of local farming culture, geographical conditions, urban sprawl and related processes, the broader context of neoliberalisation, and dairy industry restructuring. Previous studies on relevant topics have not usually offered such a comprehensive analysis of farmers' operating environment. As Wästfelt & Zhang (2016, p.173) previously acknowledged: 'Our theoretical and empirical knowledge is still very limited regarding the processes of how these different layers of forces generated over the past decades intersect to impact the development pathways of farms.'

This thesis contributes to existing conceptualisations of agricultural change by clarifying the connections and interactions between various factors involved in such change (briefly described in the following), as previous studies usually focused on separate elements of agricultural change rather than in a holistic sense. Australian agricultural restructuring has been driven by changing policies in major food-importing countries, and changing global economic conditions. These external, macro-scale forces potentially created an industry-wide need, for example, to improve efficiency by loosening competition. The dairy deregulation and restructuring in response to such need was usually perceived as a top-down political

economic project, but has inevitably been conditioned by, and will further shape, local institutions, including a culture of family farming.

I firstly consider the historical development of Illawarra dairying. The Illawarra has witnessed dairy farming shrinking from a dominant economic activity in the 19<sup>th</sup> century to a minor one in the present day (Hagan & Wells, 1997). Existing dairy farming families, who have survived through various pressures, are characterised by long-term family involvement in agriculture and a strong family farming culture. This culture involves family ownership, family labour and, still today, to some extent, patriarchal inheritance. This cultural frame reflects a business model which has been increasingly challenged by the market-facing logics of neoliberalisation. The persistence of family farming in the Illawarra depends on farmers' emotional links with farming or their family farm. While previous studies usually highlighted farming as a cultural or family obligation (Bryant & Garnham, 2014), the present study underscores farmers' personal and voluntary choices in conducting farming.

Illawarra dairying is also shaped by the geography of the region, especially its proximity to Sydney. Previous studies regarding peri-urban agriculture have often been conducted by urban planners and landscape architects from an urbancentric perspective (Wästfelt & Zhang, 2016). There is a lack of relevant studies at the farm level and from the perspective of agricultural geography (Smith, 2015), which provided an impetus for this thesis. Illawarra dairy farmers usually supply the Sydney liquid milk market, requiring milk supply on a year-round basis. Farmers are subject to a few major processors who dominate the market. Besides this market arrangement, Illawarra farmers are also influenced by urban sprawl and related processes such as residential development and sub-commercial/hobby farming. Such changes bring farmers new commercial opportunities and contribute to the multifunctional transition of agriculture (Wilson, 2009). However, as this thesis shows, it has been increasingly difficult for farmers to acquire land locally, and rural communities have been experiencing increasing land-use conflicts (Argent, 2011). Despite farmers' predicament, local councils and related agencies have oriented the Illawarra economy towards lifestyle and services to cater for the in-migrants and tourists.

Local agricultural change is also a consequence of national agricultural restructuring which relates to the multiscalar process of neoliberalisation (Gray et al., 2014). The continued importance of neoliberalisation as a broad process of market-oriented transformation has

driven the revival of political economy approaches in agricultural geography. Since the 1970s, the global economic environment has deteriorated, which drove the corporate sector to push neoliberal policy reform to safeguard their interests (Lawrence & McMichael, 2014). Australia's experience of neoliberalisation has been marked by the initial push of large corporations that have facilitated multinational capital to increase their influence over the national economy (Paul, 2014). Rising corporate power inevitably imposed more pressure on other social groups including many farmers (Hamblin, 2009).

Against such a background, dairy industry restructuring occurred. This study focuses on the dynamics of the 2000 deregulation characterised by the retreat of government intervention in market activities. An important driver of deregulation was Australian dairy farmers' declining terms of trade (Barr, 2014). With market liberalisation, advantaged farmers could theoretically gain a larger market share, but with substantial costs, including exit from the industry, for others (NSWDPI, 2015). The present study supplements the traditional view of corporate power enforcing neoliberal policy reform (Screpanti, 2014) by highlighting how farmers' groups themselves supported or acquiesced in neoliberalisation and actively lobbied for greater inter-regional competition. The research also increases understandings of agricultural individualism by highlighting the dismantling of social mechanisms that used to harness the collective capacity of the farm sector, showing instead how competitive pressure drove each individual farmer to improve their own business and seek to outcompete others. While the external drivers and features of agricultural restructuring form the basis of much analysis, this thesis has provided insights into the intra-industry dynamics of change, including a noticeable shift towards more individualistic farming mentalities and strategies for coping with change.

I also consider how the corporate sector contributed to dairy industry restructuring. Previous studies have usually highlighted the negative impacts of corporate governance on agriculture (Lawrence et al., 2013). The present study indicates that it was not the corporate sector per se that pushed neoliberal policy reform and created conditions for social exploitation. Under deteriorating market conditions for milk sales, powerful or advantaged market players within dairying (e.g. major processors) were pressured to squeeze others and ensure their own return. Illawarra farmers have faced fierce competition from other supply chain players for a share of profit in the liquid milk market (Dibden et al., 2009). Most farmers were also subject to the governing power of major supermarkets and processors on supply chain affairs (e.g. milk

pricing) (Richards et al., 2013). This thesis makes a contribution to geographical knowledge by providing a detailed account of how different players over the past decades intersected to influence farmers in a specific local context (Wästfelt & Zhang, 2016).

In summary, in the last two decades Illawarra dairy farmers, who generally followed the family farming model, have experienced adverse market conditions and the liberalisation of the key markets that they depended on. This process not only led to increased external competition (from urban land buyers/investors, farmers in other regions, and other supply chain players), but reduced Illawarra dairy farmers' influence in the managing of those markets. A competitive culture characterised by individualism has thrived among local farmers and potentially undermined the spirit of collaboration. Those political economic trends did not just exert pressure on farmers, but brought the dominant discourse on how farmers should cope with their challenges, namely "get big or get out". Such principle has penetrated deeply into farmers' adjustment strategies (discussed in the next section), which were not just to maintain viability or increase competitiveness, but to increase their weight or influence in the markets. Thus, farmers' adjustment strategies highly corresponded with the market pressures they received.

### **10.3 How do farmers respond to their various pressures and shape their business?**

In response to research question two, this study analysed Illawarra dairy farmers' coping strategies amid agricultural restructuring. Relevant content is predominantly in chapters 8 and 9. Existing conceptualisations of farmers' decision-making and on-farm changes usually have shortcomings. For example, the notion of multifunctional agriculture has not been clearly conceptualised (Marsden & Sonnino, 2008); conceptualisations of neo-productivism have largely failed to provide an effective analytical framework for understanding modern agricultural change (Wilson & Burton, 2015). This thesis makes a contribution by exploring several questions which warrant more research, for example how farmers redefine the socio-cultural meaning of farming in a deregulated economic environment, seek to harness the various opportunities specific to their geographical location, reshape their business and farming system, and drive innovations based on place-specific experimental knowledge.



Until the last two decades, the Illawarra dairy farm sector was characterised by strong public authorities, protectionist policies, high and stable milk prices, low dependence on private debt financing, collectivist decision-making, and developing or preserving the capacity of existing capital. Some regulatory mechanisms and institutions included state statutory marketing authorities, the quota system, state-based extension and research, and farmers' cooperatives. With such mechanisms being gradually dismantled or restructured, the characteristics of the farm sector became individualistic decision-making, low and volatile milk prices, privatised extension, limited resources for each individual to improve their business, high dependence on debt financing and leased capital, exploration of new capital and commercial opportunities, and increasing pressure on existing capital.

For individual farmers, they had to figure out a quick way to cope with the increased financial pressure after deregulation. They tended to rely on resources (e.g. bank loans, leased capital and lower-quality capital) which had relatively low initial costs but potential long-term disadvantages. Such resources were usually for business expansion. Mainstream expansion was to increase output. Financial pressure also drove some farmers to explore non-farming business opportunities (e.g. establishing milk-processing facilities). To complement the usually unstable farm income, farmer participants in this study generally had other income sources. With limited land and a strong need to improve operation efficiency, farmer participants usually used their capital more intensively (e.g. carrying more cattle). Although limited resources restricted farmers' technology adoption and discouraged farmers from converting to alternative or novel farming approaches, a small number of farmers, usually driven by economic reasons, chose to significantly change their farming system. This study helps address research gaps, especially in terms of the limited theoretical and empirical knowledge on how the various aspects of farm development pathways have been influenced by the multiple forces (Bafarasat, 2016; Woods, 2014).

Two examples of alternative or novel approaches are robotic milking system (RMS) and certified organic dairy farming approach (CODFA). By analysing Illawarra farmers' experiences and views on them, this study contributes to addressing research gaps regarding a lack of qualitative studies on RMS and CODFA in the Australian context, and more research is needed on specific farm development pathways including technology adoption and farm diversification (Bafarasat, 2016; Higgins et al., 2017). Both RMS and CODFA appear to offer opportunities for some farmers to cope with agricultural restructuring. RMS as a novel

technology has potential to be further developed and enhance the viability of the dairy industry. CODFA, with a different farming and business model, has potential to improve the environmental performance and resilience of Illawarra dairying. However, at the current stage both approaches in the Illawarra have multiple drawbacks. The overall impacts of new technologies and approaches on local agriculture will likely be limited in the short to medium term.

In summary, in the last two decades, as responding to the factors examined in section 10.2, Illawarra dairy farmers usually had to change their traditional business philosophy and sacrifice some long-term interests to acquire the needed resources for current development. Farmers tended to prioritise business expansion and operation intensification. Those farmers who transited to alternative or novel farming approaches have inevitably faced great technical and financial constraints to improve their farming system. Under the neoliberal policy environment, farmers' business strategies were overall individualistic and opportunistic, which had potential implications. Firstly, there was a lack of coordination between different farmers' business activities. Secondly, any decision-making was limited by the farmer's own knowledge and experience. Finally, farmers might not have enough knowledge and resources to effectively contribute to the long-term and collective interests. Survival pressure, emphasis on the immediate survival and inability to make long-term planning exacerbated such issue. These points are expanded in the next section.

#### **10.4 What are likely pathways for the future of dairying and agriculture?**

In response to research question three, this study examined potential consequences of Illawarra agricultural change, and can be a reference for studies in other regions. Relevant content is largely in chapters 8 and 9. This thesis contributes to addressing the research gap that, given the significant impact of neoliberalisation on Australian agriculture, the outcomes of specific neoliberal projects (e.g. the dairy deregulation) usually cannot be well predicted, and farmers occasionally have little understanding of how they should prepare for the future (Alston et al., 2017; Sinclair et al., 2015). This thesis can enlighten local farmers and relevant stakeholders on future challenges.

As deregulation brought more competitive pressure and reduced government support for dairy farmers, farmer participants in this study turned to more individualistic decision-making. This process of restructuring induced the loss of the skills, experiences and community contributions of numerous farmers who left the industry, and negatively influenced investor confidence in dairying, farmers' attachment to farming and local communities, and farmers' capacity to harness the collective potential of the farm sector. While previous studies usually highlighted how farmers coped with economic challenges through entrepreneurial practices, the cultural change and changing organisation of the farm sector also influenced individual capacities and warrant more research.

Under this background, it became less likely for Illawarra dairy farmers to invest in their existing capital from a long-term perspective. Many farmers had low and unstable profitability, and usually had limited resources to make investments that would not generate considerable short-term returns. Continuous urban and suburban development created an expectation of potentially losing the farm or relocating to another place, and some farmers were remaining less committed to their own land and farm as a primary form of social and economic capital than they likely did in the past. The common choice of business expansion restricted farmers' financial resources to make other investments, and usually brought extra issues including interest or rent payments, the low return from acquired lower-quality assets (e.g. land blocks without the potential of asset appreciation), new staff not highly committed to the business, and the costs associated with learning and exploring unfamiliar capital (e.g. new equipment and land in other regions). With more short-term consideration, many farmers tended to prioritise economic sustainability over environmental sustainability, and exert more pressure on their capital through, for example, increasing fertiliser uses and stocking rates. Illawarra dairy farmers were highly dependent on external inputs and influenced by global market conditions, however, they had limited surplus or backup to cope with fluctuating milk and input prices. While previous studies on farm development usually focused on business strategies (McDonald et al., 2013), this project highlights how farmers' specific strategies often bring further problems that must be managed anew (e.g. reduced business resilience).

Investment from Illawarra dairy farmers into new technologies or alternative farming approaches, especially those requiring large and long-term investments, tended also to be limited. Momentum to further develop technologies for local farmers was thus constrained. In the Illawarra, few farmers had adopted a robotic milking system (RMS) or taken a certified

organic dairy farming approach (CODFA). Existing RMS and CODFA faced difficulties in further improving their performance. With limited financial capacity, Illawarra farmers adopting RMS and CODFA tended also to intensify their production and orient their business towards short-term profitability. Their farms might be equally vulnerable to major challenges (e.g. climate change and global resource constraints) faced by Australian dairy industry in general.

Overall, there has seemingly been limited momentum from the dairy farm sector to develop long-term capacity. Agricultural restructuring has brought challenges and driven farmers to innovate, but investment for farmers to consider both short-term profitability and long-term capacity has seemingly been inadequate. Illawarra dairying was characterised by shrinkage in older, established parts of the region and exploration into new regions (e.g. farmers relocating further to the south). Seeking new opportunities was seemingly more important than developing long-term capacity against climate and resource challenges.

In the foreseeable future, adverse market conditions and environmental challenges for the Illawarra and Australian dairy industry will continue and likely become more serious (Hanslow et al., 2014; Lockhart et al., 2016a, 2016b). It is likely that the Illawarra dairy industry overall will continue to shrink in terms of the number of farms. From this research it appears clear that existing farmers will continue to aim for business expansion, be committed to intensive production (if input costs are low enough to enable it), and explore new commercial opportunities. Alternative or novel farming approaches (e.g. RMS and CODFA) in the Illawarra will continue to exist within small niche sectors and have limited influence on local dairying.

## **10.5 Reflection**

Given mounting challenges of adverse market conditions, climate change, and global resource constraints, research on agricultural change and farmers' adjustment is valuable for exploring how to better support farmers and enhance food security. This study provides an exploratory case for understanding agricultural restructuring. The results are multifaceted and may enlighten the formulation of agricultural policies. Firstly, Illawarra dairy farmers' commercial operation is conditioned by a family farming model that results from local historical development. Secondly, institutional changes have brought Illawarra farmers more

external competition from urban land buyers/investors, farmers in other regions, and other supply chain players. Illawarra farmers generally had to improve their own business through using borrowed or leased capital, and conducting business expansion, operation intensification, and exploration of new commercial opportunities. Thirdly, it is difficult for Illawarra dairy farmers to invest in their existing capital from a long-term perspective, and also difficult to invest in some new technologies or approaches. Australian dairy farmers' operating environment will continue to be challenging.

Essentially, this project explores how existing socio-cultural structures react to external pressures and also internal tendencies to change. The exacerbation of market conditions for Australian dairy farmers since the 1980s to a large extent was uncontrollable, but subsequent institutional changes (especially deregulation) and industry restructuring were driven by both external players and some Illawarra dairy farmers, and viewed by local farmers as having both benefits and disadvantages to local dairying. This contradiction or ambivalence also applies to urban sprawl and related processes where farmers saw both opportunities and challenges. These political economic trends shared the neoliberal nature of allowing market players to have more freedom to be entrepreneurial, but also bringing more competitive pressure usually from wealthier and more powerful players. To cope with these trends, Illawarra dairy farmers inevitably changed their farming practices, but still preserved the core element of traditional family farming culture. The competitive industry environment determined that farmers' adjustment strategies were usually not conducted under conditions of smooth planning and coordination, but amid stress and uncertainty. The mainstream choice of business expansion was not just to improve economic efficiency, but to increase the farmer's bargaining power or political influence in the markets. In a highly uncertain or volatile market environment, farmers usually had to explore or experiment with other commercial opportunities (e.g. new technologies and investment avenues other than agriculture), and it was difficult to make long-term planning or consider long-term interests. Although short-term business consideration and exploration of new opportunities might be gambling to a certain degree, farmers might still discover directions with long-term value, for example better technologies.

The original contribution of this thesis to the international literature on agricultural restructuring lies in its comprehensive analysis of the multiple processes involved in the restructuring, and its indepth explanation of the internal logics of such processes. Firstly, this

thesis uncovers the contradictory nature of agricultural restructuring. Although most farmer participants in this study reported significant pressure on them, they were not simply against or welcoming agricultural restructuring as a whole, involving neoliberal policy reform, industry and supply chain restructuring, and urban sprawl and related processes. Farmer participants could benefit from these processes, but also faced significant challenges. Thus neoliberalisation in agriculture should not be simply viewed as being pushed by the corporate sector (e.g. processors and retailers). Secondly, farmers' mainstream adjustment strategies should not be only viewed as productivist or pursuing economic efficiency, but aiming to achieve economic optimisation with existing resources and opportunities. A complicating factor is market uncertainty or inability to find a proven path for business development. As a result farmer participants were usually open to deviating from existing farming methods and diversifying their business activities. Farmers' multiple choices contribute to agricultural multifunctionality. Thus multifunctionality is not simply a result of the inflow of population with urban backgrounds into rural areas.

Based on the aforementioned results, I examine some key themes in agricultural geography. Some themes have aroused enduring interest among Australasian rural geographers over the last two decades, and they include the changing international demand for local resources, the growing influence of amenity values over rural landscapes, changing demographics in rural regions, how localities and regions respond to various challenges, and food security and sovereignty issues (Argent, 2015; Tonts et al., 2014). I try to systemically analyse some key social processes underlying these themes.

I start from the policy environment of Illawarra dairy farmers before the 2000 deregulation. This environment was characterised by protectionist policies which restricted farmers' business expansion and inter-regional competition for milk markets (Sinclair et al., 2015). These policies to a certain extent protected each farmer from others' expansion, protected farmers within their region, and guaranteed their profit. Farmers were also organised under collectivist mechanisms (e.g. cooperatives) which harnessed the collective capacity of the farm sector (through for example pooling dispersed capital from individual farmers) and exerted control over supply chain arrangements. The internal contradiction of the whole system was that farmers might not have enough pressure and necessity to keep improving their businesses. If farmers were to keep increasing output and profit, there had to be a market that lacked competition and was large enough to sustain those inefficient farmers. Thus, this

system itself involved unsustainable factors (see chapter 6). Evolutionary economic geography, as an emerging historically-sensitive research paradigm, underscores the impacts of external shocks (e.g. economic upheavals) on an economic system (Tonts et al., 2014), however, the status of a system can shift spontaneously. Thus, as some participants pointed out, a certain level of external competition or economic challenges can even help maintain the stability and economic vigor of a local dairying community. However, this view has seemingly been misunderstood to support policies (e.g. deregulation and the following reduction in government support) that have introduced excessive competitive and financial pressures restricting farmers' ability to make long-term investments.

The previous protectionist policies, which to a certain extent restricted the movement of farming population and capital, gave prominence to family, community, and connections between farmers and regional capital elements (e.g. farms and infrastructure). Firstly, family was a natural unit for agricultural production, and each farming family was protected from market competition. Secondly, farmers usually had to join those collective projects (e.g. cooperatives) with other members of the farming community, and interacted with government or public agencies. Thirdly, farmers' business activities to a certain extent were restricted within a certain region for a relatively long period of time, allowing farmers to build strong connections with their farm and local community. Advantages of this culture (see chapter 5) included: the community had relatively strong solidarity and could pool dispersed capital to invest in large projects; community or family members were usually more reliable than externally hired labour; farmers could accumulate abundant knowledge of their farm and region, and could potentially better develop the long-term capacity of their capital. Disadvantages included: the introduction of external ideas and skillsets could be restricted, facilitating conservative thinking; individual farmers might not be able to fulfil their entrepreneurial talents.

This social structure and culture was based on certain policies and economic conditions, and would inevitably change, when this foundation shifted. That does not mean the importance of family, community and connections between farmers and regional capital elements (e.g. farms) will be denied, not only because of path dependence (or people adhering to the old culture and institutions), but because of the intrinsic advantages of collectivist economic organisation, as above-mentioned, which can be not so historically contingent. Even in a neoliberal policy environment, family and community can still have strategic values for

business development. Therefore, this analysis contributes to understandings of how political economic trends and social cultures are mutually influenced (Barnes & Christophers, 2018), and also supplements evolutionary economic geography by indicating that the path dependence (a key evolutionary concept) (Tonts et al., 2014) of a rural economy is not only determined by past events, routines or institutionalised economic behaviours. Rather path dependence is a process that is also shaped by the intrinsic or enduring economic advantages of some previous economic strategies. For example, all farmer participants in this study have maintained the family-based organisation of their business, even if many of them have sold their original family farm.

With the progress of agricultural restructuring, Illawarra dairy farmers faced fierce competition as well as new opportunities in both commodity (e.g. milk) and capital (e.g. real estate) markets. This thesis argues that the restructuring of the dairy industry in the Illawarra reflects strong and broad economic needs which have overcome the objections for restructuring (see chapters 6 and 7). Thus, restructuring is not just imposed as a top-down project, as highlighted in many studies on neoliberalisation (Lawrence et al., 2013). Some Illawarra farmers had a need for business expansion and fulfilling their entrepreneurial potential, many farmers in other regions needed to expand their markets, and some other dairy supply chain players needed to expand their influence over the supply chain. In the Illawarra real estate market, local community had a need to introduce external capital to support economic growth locally, and external land buyers/investors needed to utilise local resources for capital accumulation. As each group jostled in support of their interests, the consequences of agricultural restructuring were complex and unexpected by many market players.

Agricultural restructuring has been criticised by many participants in this study, but also supported by others (see chapters 6 and 7). Although neoliberalisation has different manifestations in different economic fields (e.g. the dairy industry and urban sprawl) which are often researched separately (Wästfelt & Zhang, 2016), these manifestations reveal some common logics in terms of impacts on farmers. Illawarra farmers faced pressure from both dairy supply chain players and external land buyers/investors in terms of competition for profit or quality assets, and competition for political influence over the dairy supply chain or local economic development. This phenomenon should not be only explained as social exploitation or economic class-based conflicts. In a highly competitive market, it is difficult



for any social group to look after the interests of others or in the long term. Another issue is that under neoliberal policy frameworks (e.g. deregulation and regional planning frameworks), economic players' political or public influence has seemingly become more correlated with how much capital or economic resources they had, compared with the period before such policy changes. Illawarra dairy farmers have been subject to those larger capital groups (e.g. multinational agribusinesses) or wealthier social groups (e.g. urban in-migrants). One explanation is lack of government restrictions on major economic power (Richards et al., 2012). Another potential reason is that the ability to make high short-term profits (and thereby bring other social welfare, such as employment) has become an important standard for measuring social contribution. This dilemma has rarely been mentioned in agricultural studies. Many Illawarra farmers cannot meet this expectation and can be easily neglected politically. For the governments, instead of increasing investment in the dairy farm sector, it seems better to drive some farmers into more profitable economic sectors.

New political and economic environments drove the formation of new farming cultures. With the dismantling of previous restrictions on the movement and exchange of capital, farmers did not have to confine their business activities to their family, regional cooperatives, and home region. This weakened the connections between community or family members, and between farmers and regional capital elements (e.g. farms and infrastructure). Farmers focused more on short-term profitability and were more motivated to explore new commercial opportunities (e.g. opportunities in other regions). Traditional farming values did not disappear, but were variously eroded and reformulated. Based on the above analysis, I argue that this cultural change is indirectly driven by a broad need among Australian dairy farmers and related actors for better accumulation strategies, and is not just a result of farmers' financial difficulties as usually underscored by researchers (Woods, 2014).

Illawarra farmers' choices have driven the multifunctional transition of rural space, which has attracted much research attention. The diversification of rural commercial activities signals economic transition, as emerging economic activities co-exist with traditional activities. The diversification of commercial farmers' business activities and geographical locations where their businesses spread (see chapters 8 and 9) reflects their exploration or seeking for more promising business models or more valuable economic resources. If one economic model within a limited geographical range can bring high returns, there is little necessity for diversity. Although the forms of farmers' business activities become more diverse or

multifunctional, the ideology or the embedded values probably converge or more centre around profit maximisation and competitiveness. This view extends existing understandings of multifunctionality which underscores heterogeneity (Ilbery, 2014).

Mainstream farming systems in Australia have usually been described in terms of productivism (Roche & Argent, 2015). This term possibly overemphasises production. In the Illawarra, the aim of a mainstream dairy farming operation is not necessarily to maximise production within the capacity of farm capital, but is conditioned by a range of factors (see chapter 5) originating from farmers' operating environments. For the majority of Illawarra dairy farmers, a better description of the aim of their physical operation may be economic optimisation which has shifted towards short-term financial performance. This view can potentially contribute to the terminology of agricultural change, or extend the meaning of productivism (Roche & Argent, 2015). Overemphasising short-term returns inevitably restricts long-term investments (e.g. in system resilience and new technologies). It is also difficult to pool farmers' capital to make long-term investments collectively, due to the lack of mechanisms harnessing collective resources. One fundamental reason why Illawarra farmers cannot achieve environmental sustainability at the current stage is that if they try to improve efficiency and maintain ongoing production (under conventional or organic systems), they have to use fossil fuels (including inputs and networks based on fossil fuel) in large amounts and bear the consequences (e.g. extreme weathers).

Overall, this thesis makes multiple suggestions which can potentially help better conceptualise agricultural change and bring together separate processes involved in agricultural change. Future research can help quantify and provide more details of trends identified in this study. As for policy implications, this thesis suggests the need for a range of creative policy and institutional developments to target several issues that have not been well addressed by existing policy instruments. The issues include significant financial difficulties experienced by numerous dairy farmers, many farmers' difficulties in making long-term investments in business resilience and environmental performance, loss of quality agricultural soils in some peri-urban regions, and the land use conflicts between commercial farms and amenity/lifestyle/residential developments.

## 10.6 Limitations and future research

Although this thesis presents a nuanced and critical analysis of agricultural restructuring and farmers' coping strategies, there remain some unresolved tensions and potential research threads that warrant future investigation. Firstly, as with all qualitative research, this study only provides a partial explanation and cannot generate a universal account of the Illawarra dairy industry and its diverse actors (Law, 1994). For example, my participant recruitment depended on snowball sampling, which is not a random selection of local dairy farmer population (Biernacki & Waldorf, 1981). My study is also subject to the inaccessibility of many local farmers due to their busy working life. My participants' experience of industry change may differ from those who did not respond to my invitation. Quantitative research is needed to confirm the significance of the trends identified in this study.

Secondly, this study is subject to existing participants' busy working life. Too much research pressure on farmers would reduce their willingness to participate. This limitation made some lines of analysis, such as gendered and farm history analyses, difficult and unfeasible. An ethnographic study which allows researchers to maintain closer contact with farmers may help overcome this issue. Family farms are highly gendered spaces where male farmers and their female family member(s) generally perform different tasks (Bryant & Garnham, 2014). Investigating the gendered dynamics of farming businesses is a worthy topic for future research. The lack of scrutiny of the gendered roles and livelihood strategies has led to a lack of institutional support or acknowledgement for women and men (Alston et al., 2017). From a farm history perspective, possible trajectories for farm development are likely forged at the time of farm establishment. For example, it is relatively easy for newly established farms to convert to organic farming. Application of theoretical developments surrounding the notion of path dependence can make valuable contribution to evolutionary economic geography (Tonts et al., 2014).

Thirdly, this study targeted Illawarra dairying, while Australian dairy industry restructuring is a highly spatialised process. Although this study can provide a reference for other studies, it is still uncertain how farmers in other Australian states and regions have experienced restructuring and expressed future farming aspirations. This provides a prompt for comparative work both within Australia and internationally to extend our knowledge of how

to support family farmers under the increasing market pressures that are a general worldwide experience (Woods, 2014). Hebinck (2018) has highlighted the importance of conducting research on agrarian transformation in various contexts, as it is about the future of family farming, food security and sovereignty. Although family farms have reduced in number and importance (Theron, 2016), they are not inevitably victims of globalisation. It would be valuable to explore how to strengthen a family farm through proactive engagement with the opportunities presented by economic globalisation (Woods, 2014).

Finally, this study is limited by its own scope due to its explorative nature. Future research can contribute by clarifying or providing more details on certain topics. More research can focus on the potential change in the culture of farming which has been viewed by many Illawarra farmers as a personal choice rather than a collective choice, as an economic activity rather than a cultural activity. Future research can also further explore how the farm sector are managed under corporate food governance through mechanisms like private standards. Involvement of private agribusinesses into supply chain arrangement has been perceived as a powerful engine of sustainability (Rueda et al., 2017). However, little is known about the conditions under which sustainability instruments among private agribusinesses will be adopted (Rueda et al., 2017). Additionally, more research can focus on farmers' exploration into previously unfamiliar economic domains, such as new places, markets, and farming methods. More attention should be paid to whether or not such new domains really hold potential. Two specific fields deserve more research (Butler et al., 2012). These are robotic milking systems and organic dairy farming, which are both undergoing new uptake, adjustment and improvement. Although Australia is the fourth largest dairy trader in the world (NSWDPI, 2015), there has been a lack of indepth studies on those new approaches in social sciences. Potential topics include farmers' experiences of those new approaches, their potential contribution to coping with the long-term challenges of climate change and global resource constraints, and their spillover effect on the broader farming community.

Overall, this thesis has identified multiple promising directions for geographical researchers to further explore the questions of how to support family farmers in coping with economic and environmental challenges, how to ensure the viability and ongoing development of rural communities, and how to improve farming systems through updated technologies and working practices.

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# Appendices

## Appendix 1 List of news articles

### 1. News articles from Australian Broadcasting Corporation

Retrieved from <http://www.abc.net.au/>

Article #	Author	Date	Title
A2	Locke, S.	(2010, June 21).	Jamberoo dairy - providing clean milk and water.
A3	Duncan, E.	(2010, September 2).	Bare earth to sustainable paradise.
A4	Gasser, T.	(2010, September 16).	The 'dig ya dinner' organic school garden.
A5		(2010, October 20).	New dairy good news for Berry.
A7		(2011, April 29).	Farmers make highway protest over milk prices.
A8		(2011, August 8).	Illawarra dairy farmers fear carbon tax squeeze.
A9		(2011, August 15).	Dairy Farmers suppliers suffer contract cut.
A10	Locke, S.	(2011, August 15).	Milking the farmer.
A11	Gocher, K.	(2011, September 29).	Milton farmer switches processors, fed up with supermarket milk pricing policies.
A12	Drewitt-Smith, A.	(2011, October 7).	Local dairy farmers lose \$15 million in price wars.
A13	Huntsdale, J.	(2011, December 1).	Taming the weather for wine success.
A14	Huntsdale, J.	(2011, December 15).	Regular rain eases splendour in the grass.
A15	Huntsdale, J.	(2012, March 28).	Using the power of poo to save your farm, no bull.
A16		(2012, April 27).	New Port Kembla bio-diesel plant to impact on crop prices.
A17	Huntsdale, J.	(2012, May 4).	Urban farm growing potential in Wollongong's south.
A18	Mark, D.	(2012, May 17).	If you want quality food, pay for it: the Country Hour goes organic.
A19	Tromp, B.	(2012, May 25).	Experts warn of loss of good farm land.
A20	Huntsdale, J.	(2012, May 29).	Milk price war and oversupply hurting South Coast producers.
A22	Locke, S.	(2012, June 22).	Dairying: less pay for harder work.
A23	Locke, S.	(2012, September 12).	US drought expected to lift milk prices.
A24	Huntsdale, J.	(2012, October 15).	Grape glut end in sight as South Coast industry stays firm.
A25	Huntsdale, J.	(2013, January 23).	Dairy industry thinning as export dollar milks supply.
A26	Huntsdale, J.	(2013, January 23).	Fibreglass cows to help secure farming future.
A27	Swann, J.	(2013, January 31).	Biodynamic farming a potential for fire prevention.



A28	Huntsdale, J.	(2013, March 5).	Rain brings flourishing conditions for South Coast tea producer.
A29	Drewett-Smith, A.	(2013, April 26).	NSW co-op to build local milk processing plant.
A30	Huntsdale, J.	(2013, August 26).	From tourism to dairy - a photographic glimpse of Gilmore.
A31	Huntsdale, J.	(2014, January 31).	Steady warm weather sets the scene for quality Shoalhaven vintage.
A32	Huntsdale, J.	(2014, February 3).	Farm gate to town beach as Kiama growers' market ripe for opening.
A34	Huntsdale, J.	(2014, July 2).	Saving Australia's farming land and revitalising your vegie patch.
A35	Walmsley, H.	(2014, November 14).	Dairy farmer avoids legal loophole with herd-share scheme to distribute raw milk.
A36	Huntsdale, J.	(2015, July 13).	Booming truffle farm puts retirement on hold for Highlands couple.
A37	Savage, D.	(2016, May 18).	Milk crisis: Jamberoo farmer weighs in on the problem.
A38	Lewis, D.	(2016, June 24).	Dairy farmers struggling after Murray Goulburn's China dream turns sour.

## 2. News articles from Illawarra Mercury

Retrieved from <http://www.illawarramercury.com.au/>

Article #	Author	Date	Title
M1		(2000, July 1).	Milk price to fall, but farmers will be creamed.
M2	Allen, J., & Australian Associated Press (AAP)	(2000, July 4).	NSW dairy industry turns sour; coast farmers among 50 to quit.
M4		(2000, July 5).	Dairy lobby wants \$2.5b; farmers prepare to sue.
M5		(2000, July 6).	Valley men milked dry.
M6		(2000, July 8).	Top silk fights for milk compo.
M7	Iliffe, D.	(2000, July 13).	Change milks coop dry; End near after 112 years.
M8		(2000, July 17).	Aid for dairy farmers moves to its second stage.
M10	Woolage, D.	(2000, July 19).	Farmers urged to plant trees.
M11		(2000, July)	Many could miss the dairy dollar share.

		25).	
M12	Woolage, D.	(2000, July 26).	Beyond doom and gloom; some good things in our environment.
M13	Failes, G.	(2000, July 27).	New dairy policy hits hard; deregulation 'driven by Victoria'.
M14	Failes, G.	(2000, July 27).	Farmers to share \$1.7b.
M15		(2000, July 27).	Milk lifeline has sour taste.
M16		(2000, August 4).	Dairy farmers are slow to get a moove on.
M17	Iliffe, D.	(2000, August 11).	'Enough is enough' on city sprawl; call to review development program.
M18		(2000, August 17).	Big supermarkets give milk prices a shake.
M19		(2000, August 18).	Farmers apply for help.
M21		(2000, September 19).	Tax aid to dairymen.
M22		(2000, September 20).	Farmers lose a long-time friend.
M24		(2000, September 26).	Organic appeal; Dapto man calls for Wollongong growers' market Green Fingers.
M25		(2000, September 28).	National foods 'challenge'.
M26		(2000, October 11).	Dairy group wants no-name boycott.
M28		(2000, November 4).	Dairy consolidation talks.
M29	Ellis, G.	(2000, November 7).	Hard work is about to pay off.
M30	Ellis, G.	(2000, November 7).	Tourism, horticulture vision for Shoalhaven.
M31		(2000, November	Dairy hardships prompt inquiry.

		13).	
M32	Turk, L.	(2000, November 28).	Fuel could be cheaper down cooperative road; South Coast hears the good oil.
M33		(2000, December 5).	Deregulation hits dairy farmers hard.
M34		(2000, December 6).	Farmers have protest down pat.
M36		(2000, December 16).	No forms, no money.
M37	Iliffe, D.	(2000, December 22).	Dairy farmers may turn to tourism.
M39	Duffy, J., & AAP	(2001, January 4).	Heat is on dairy farmers to keep their cows cool.
M40		(2001, January 12).	Farmers on the offensive.
M41		(2001, January 13).	Govt must release dairy report now: labour.
M42	Failles, G., & AAP	(2001, January 17).	Most dairy farmers happy with payouts.
M43	Tydd, M.	(2001, January 19).	Fallen powerline kills cows.
M44	Woolage, D.	(2001, January 26).	One of the oldest agricultural shows in the country; 153rd Kiama Show January 26 and 27.
M45		(2001, January 26).	Brothers' experience brings success; ex-presidents, committeeman make keen competitors 153rd Kiama Show January 26 and 27.
M46		(2001, January 30).	Report on state of dairying due.
M47		(2001, January 31).	310 dairy farms milked dry since July.
M48	Treasure, K.	(2001, February 1).	Pelting, praise, pique for PM; Howard on the Hustings.
M49	Iliffe, D.	(2001, February 1).	Shoalhaven farmers get 'drought-proofing'.
M50		(2001, February 2).	Govt's dairy deregulation turning sour.
M51	Woolage, D.	(2001, February 3).	Time changes but show goes on; 113th Berry Show February 2 and 3.

M52	Iliffe, D.	(2001, February 5).	Dairy regions turn sour on deregulation.
M53		(2001, February 5).	Reduce speed sign spells it out on milk.
M54		(2001, February 5).	Tourism hope just a pipe dream: farmers.
M55		(2001, February 5).	Tough times and struggle just started.
M56	Iliffe, D.	(2001, February 7).	Dairy assistance deadline looms.
M57		(2001, February 7).	Assistance for dairy regions.
M58		(2001, February 9).	Dairy response; fast news.
M59	Woolage, D.	(2001, February 17).	Farm life inspires valley artist; Kangaroo Valley Show February 16 and 17.
M62	Iliffe, D.	(2001, March 5).	Howard's milking dairy farmers, says Kiama MP.
M63	Woolage, D.	(2001, March 9).	Driving Limousins to Robertson Show; Part-time breeder takes on the best.
M64	Woolage, D.	(2001, March 10).	Dairy entries unaffected; Mrs Chief Beef in charge 122nd Robertson Show March 9 and 10.
M66		(2001, March 17).	City-slicker's doin' fine; 115th Moss Vale Show March 16, 17, 18.
M67		(2001, March 27).	Dairy competition 'gone wrong'.
M69		(2001, April 10).	Cheap milk no help to farmers, small shops.
M70		(2001, April 10).	High price to get milk costs down; opinion.
M71		(2001, April 14).	NSW dairy farmers struggling to survive.
M72		(2001, April 18).	Get rid of farm chemicals.
M73	Ellis, G.	(2001, April 20).	Funding to ease Kiama dairy community's woes; federal government assistance in business.
M74	Treasure, K.	(2001, May 2).	Keeping the young down on the farm.
M76	Adie, K.	(2001, May 29).	Coast's wine industry expands.

M77	McInerney, P.	(2001, June 2).	Double the cheese: good news for farmers; Howard in Gilmore.
M79		(2001, June 13).	Lessees milking us dry: farmers.
M80	Failles, G.	(2001, June 19).	Call to sell off Dairy Farmers.
M81	Failles, G.	(2001, June 30).	Farmers hail new package.
M82	Pacey, L.	(2001, July 21).	Bega is crying out for milk; exports booming.
M84	Ellis, G.	(2001, August 7).	Coolangatta - going for gold; winery aims to be one of state's top attractions.
M87		(2001, August 25).	Dairy officer to help farmers plan future; in tray out tray.
M88		(2001, September 4).	South coast breeders woo new markets.
M89	Woolage, G.	(2001, September 12).	Shoalhaven taps into liquid gold.
M90		(2001, October 11).	Dairy Farmers profit creamed.
M91	Ellis, G.	(2001, October 24).	No use crying over dairy deregulation: dairy farms in crisis special report.
M92	Ellis, G.	(2001, October 24).	Day 1 life after deregulation: dairy farms in crisis special report.
M93	Ellis, G.	(2001, October 24).	The man who may have the answers: dairy farms in crisis special report.
M94		(2001, October 25).	Deregulation is still a drain on farming families: Illawarra Mercury special report.
M95		(2001, October 26).	Export markets beckon: day 3 exports Illawarra Mercury special report.
M96	Ellis, G.	(2001, December 4).	Dairy product export boost.
M98		(2002, January 12).	Coast not officially in drought: farming family weathers trials of sunburnt country.
M99	Tydd, M.	(2002, January 12).	At 74, Mum still has to help with milking: farming family weathers trials of sunburnt country.
M100	Tydd, M.	(2002, January 12).	Winter stores opened up to fend off farm failures: farming family weathers trials of sunburnt country.

M101	Ellis, G.	(2002, January 21).	Old dairy still producing the cream of the crop: grape expectations.
M102		(2002, January 21).	Crooked river flows with wine: grape expectations.
M103	O'Connor, K.	(2002, January 24).	Regional shows facing big bills: corner stores and community fairs struggle to make ends meet.
M104	Field, A.	(2002, January 25).	Kiama show brings the country to town.
M106	Ellis, G.	(2002, January 28).	Drinking in the atmosphere: grape expectations.
M107	Ellis, G.	(2002, February 1).	First fruit from a new vineyard: grape expectations.
M108	Failes, G.	(2002, February 20).	Holy cow! India joins long list of South Coast cattle buyers.
M111		(2002, May 1).	Organic the way to grow.
M113	Ellis, G.	(2002, June 4).	Hot prospects follow Joadja's cool decision.
M114		(2002, June 14).	National's bucket overflows Dairy Farmers misses out on Woolies deal.
M115		(2002, June 19).	Farmers can reap rewards.
M116	Pacey, L.	(2002, June 22).	Rural land boards watch over.
M117		(2002, June 25).	US bill will hit Aussie farmers.
M119	Arnold, A.	(2008, January 4).	Milk co-op cuts old ties; Berry flicks Dairy Farmers.
M121	Minus, J.	(2008, January 19).	Lack of spirit blasted by Farm Aid organiser.
M122	Arnold, A.	(2008, February 2).	Tree changers make it a champion move; our golden waterfronts.
M123	Webster, M.	(2008, February 12).	Market worry for farmers.
M124	Trenwith, C.	(2008, February 13).	Illawarra leaders' plan to help us eat greens.
M125	Hector, M.	(2008, February 29).	Jamberoo farmer a cover girl.
M126	Duffy, J.	(2008, April 5).	Doing right by dairies.
M127	Allely, S.	(2008, April 5).	Author's food for thought.

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M128	Cunningham, I.	(2008, May 1).	About the drought.
M129	Minus, J.	(2008, July 1).	Dose of reality: search for love is not all milk and honey.
M130	Arnold, A.	(2008, July 26).	\$126m Maria's Farm plan aired.
M131	Minus, J.	(2008, August 27).	Celebrity farmer back up dairy coop's takeover.
M132	Christodoulou, M.	(2008, September 5).	Landed with huge bill.
M133	Cox, B.	(2008, September 6).	Milking the money.
M134	Cunningham, I.	(2008, October 1).	Mittagong farm does berry well.
M135	Cox, B.	(2008, November 14).	Dairy farmers vote 'sell'.
M136	Tydd, M.	(2009, January 5).	Wet is best for a drought-hit bush family.
M137	Adie, K.	(2009, March 18).	Milking the issue.
M138	Harvie, J.	(2009, June 16).	Farmers fighting for us all.
M140	Tydd, M.	(2009, August 4).	Tree change.
M141	Arnold, A.	(2009, August 10).	Greens fear over Calderwood plan.
M143		(2009, September 11).	Award for farmers.
M144	Munro, C.	(2009, October 28).	Unpasteurised cheese ban to stay.
M145	Arnold, A.	(2009, December 9).	Anger at rushed development.
M146		(2009, December 18).	Drought the key issue.
M147	Arnold, A.	(2009, December 19).	The driving force behind tourism.
M148	Ellis, Greg.	(2010, January 21).	Gerringong coffee plantation on show.

M150	Ellis, Greg.	(2010, February 10).	Agribusiness index dips.
M151	Webster, M.	(2010, February 24).	Dairy farmers chew the cud.
M153	Arnold, A.	(2010, March 27).	Family's tie to land honoured.
M154	Ellis, Greg.	(2010, March 30).	Success stories shared.
M155	Ellis, Greg.	(2010, April 9).	Illawarra agribusinesses feeding regional economy.
M156	Verity, W.	(2010, May 1).	Take two.
M159		(2010, June 26).	Adapt or move on, says dairy farmer.
M160	Hasham, N.	(2010, June 30).	More people could make it unlivable.
M161	Tydd, M.	(2010, July 3).	\$60m residential development for milk factory site.
M162		(2010, July 19).	Farms worth preserving.
M163	Langford, B.	(2010, October 23)	Get chewing, Clover: Berry to develop new coop plant.
M164	Arnold, A.	(2010, November 2).	Town picks dairy design for revamp.
M165	Langford, B.	(2010, November 4).	There's a healthy appetite for more Kiama-grown food.
M167	Arnold, A.	(2010, December 20).	Rush for last lots of land.
M168	Verity, W.	(2011, January 15).	Country fare.
M169	Jones, M.	(2011, January 28)	Price war may milk farmers' earnings.
M170		(2011, February 14).	Retail giants milking farmers.
M174	Apap, V.	(2011, March 18).	Consumers urged to support dairy farmers.
M175		(2011, March 22).	Long-term grief assured.
M176	Turk, L.	(2011, April 2).	Jamberoo's dairy queen.
M177		(2011, April	Farmers' futures in wrong hands.



		6).	
M178	Langford, B.	(2011, April 22).	Corner stores 'next casualty' of discounting battle.
M179	Hasham, N.	(2011, May 19).	Calderwood project 'illegal'.
M180		(2011, May 28).	Marina stuck in limbo.
M181		(2011, May 30).	Shell Cove funding.
M182		(2011, May 31).	Sweet tune for plucky farmers.
M183	Paver, C.	(2011, June 10).	Late relief for sodden farmers.
M184		(2011, June 16)	Dairy supply switch has farmers on edge.
M185	Paver, C.	(2011, July 18).	Carbon tax to hit dairy farm costs.
M186	Turk, L.	(2011, July 23).	Going green.
M187	Ellis, G.	(2011, July 28).	Mixed signs ahead.
M188	Ellis, G.	(2011, August 1).	Emma's making moo-ves amid her field of dreams.
M189	Paver, C.	(2011, August 6)	Milk price war sees new middlemen enter market.
M190	Ellis, G.	(2011, August 13)	Milko's friendly home delivery set to return.
M192	Ellis, G.	(2011, October 25).	Agribusiness growing strong.
M193	Verity, W.	(2011, December 19).	Take two.
M194	Paver, C.	(2011, December 13).	Overdevelopment fears put to rest in Kiama plan approval.
M196		(2012, February 5).	Cow family racks up a century.
M197	Langford, B.	(2012, February 28).	Dairy farm in danger.
M199	Fuller, B.	(2012, March 8).	The flavor of yesterday.

M201	Arnold, A.	(2012, June 13).	Meet Tina, queen of the milky way.
M202	Arnold, A.	(2012, June 25).	Dairy land is 'priceless'.
M203	Cropper, M.	(2012, August 1).	Push to keep jobs local.
M204	Humphries, G.	(2012, September 6).	Lynne's strong stance on sustainability wins award.
M208	Fleming, I.	(2012, October 16).	A passion for organics.
M210	Turk, L.	(2012, November 3).	Regrow the future.
M211	Humphries, G., & Kruger, C.	(2013, January 11).	Corner stores milked dry by the big players.
M212	Arnold, A.	(2013, January 22).	War hits dairy farms.
M213	Arnold, A.	(2013, February 1).	Coles denies milk claims.
M214	Crawford, R.	(2013, February 3).	Holstein show attracts strong field.
M215		(2013, February 12)	Your say ... pavilion bins spoil popular area.
M216	Arnold, A.	(2013, February 19).	Fibreglass cows to invade Illawarra.
M217		(2013, March 2)	Take two.
M218	Tydd, M.	(2013, May 23)	Backblocks no longer.
M220	Spillett, E.	(2013, July 22).	Organic community gardens shoot up.
M221	Munro, K.	(2013, August 17).	Small farmers are winners in the milk war.
M223	Walsh, K.	(2013, September 17).	A prize look at farming.
M224		(2014, January 7).	Making a tree change.
M225		(2014, January 11).	Married to the land.

M226	Arnold, A.	(2014, February 1).	Roll up for Kiama's new farmers' market.
M227	Arnold, A.	(2014, February 14).	Rezone could lift town's viability.
M228		(2014, February 15).	As the summer sun rises on the grassy showground.
M229		(2014, February 27).	From chalk to cheese.
M230		(2014, February 28)	Who is next on the hit list?
M231		(2014, March 6).	A passionate creation.
M233	McIlwain, K.	(2014, May 24).	Delegation from China tour region.
M234		(2014, May 31).	Vintners of vision.
M235	Arnold, A.	(2014, May 31).	New lease of life for farmhouse.
M236		(2014, June 6).	Where fate meets river and wine.
M237	Fuller, B.	(2014, June 29).	On the menu at the new farmers' market in Bulli.
M238	Arnold, A.	(2014, July 10).	Development plan tick.
M240		(2014, August 23).	Take two.
M241		(2014, August 28).	Milk market likely to force mergers.
M242		(2014, September 2).	Farmers less confident.
M243	Parkins, B.	(2014, October 3).	Stronger tipple likely for milkos' reunion.
M246		(2014, October 29).	Low prices bite cheese.
M247	Arnold, A.	(2014, November 6).	Input urged on plans.
M248	Pearson, A.	(2014, November 19).	Dairy sector to benefit from trade deal.
M249	Pearson, A.	(2014,	Agreement good news for farmers.

		November 21).	
M250	Arnold, A.	(2014, November 29).	Milk flow increases for coop.
M251		(2014, November 29).	Joyce defends agreement.
M252		(2014, December 12).	Clouds over investment in farming.
M253	Wachsmuth, L.	(2014, December 22).	Call for newcomers.
M254		(2015, January 15).	Milk price falls no threat to Aust farmers.
M2460	Crawford, R.	(2015, April 9)	The cows come home with show glory.
M2470	Arnold, A.	(2015, May 5).	Estuary plan unveiled.
M2520		(2015, September 1).	Dairy prices likely to rebound: milk giant.
M2540	Latifi, A.	(2015, December 3).	Rare birth of three cow girls.
M255	Johnson, L.	(2016, January 16).	Albion Park show a hit with thousands.
M256	Warden, H.	(2016, January 19).	Kiama show an annual family ritual.
M257	Langford, B.	(2016, February 26).	Student farmers headed to the Easter Show.
M258	Thompson, A.	(2016, March 9).	Hidden community farm putting on the blitz in Bulli.
M260	Pearson, A.	(2016, April 11).	'Bypass will take my house'.
M261	Johnson, L.	(2016, April 12).	RFS baled out by hay shed.
M263		(2016, May 17).	Milk tax: Waleed's 'greatest call to arms'.
M264	Savage, D.	(2016, May 18).	Jamberoo farmer says milk crisis will hit home.
M265	Han, E.	(2016, June 3).	New process 'raw milk' now on sale.

### 3. News articles from other newspapers

Article #	Author	Date	Title	Newspaper title	Retrieved from
O1		(2001, September 5).	South coast success.	<i>Canberra Times.</i>	Retrieved from <a href="http://www.canberratimes.com.au">www.canberratimes.com.au</a>
O6	Munro, K.	(2011, April 5).	Anger over site for 4800 houses	<i>Sydney Morning Herald.</i>	Retrieved from <a href="http://www.smh.com.au">www.smh.com.au</a>
O7	Lett, G.	(2011, October 23).	Students get a taste for the art of judging.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O8	Lett, G.	(2011, October 23).	Illawarra breeders have their day in the sun.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O9	Crawford, R.	(2011, November 8).	Pint-sized future farmers steal the show.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O10		(2012, February 5).	Cow family racks up a century.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O13	Crawford, R.	(2013, April 7).	Local dairy farmers show off our home-grown champions.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O15		(2013, July 11).	Field day gets beef producers talking.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O18	Cetinski, D.	(2013, October 14).	Dairy farmers turn their backs on Bega.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O19		(2014, January 19).	Local farmers head south.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O20	Crawford, R.	(2014, January 23).	Locals win at dairy show.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O21	Cetinski, D.	(2014, January)	Fresh from the farm.	<i>Kiama Independent.</i>	Retrieved from <a href="http://www.kiamaindependent.com.au/">www.kiamaindependent.com.au/</a>

		27).			
O23	Crabb, B.	(2014, April 14).	Milk market changes augur well.	<i>Kiama Independent.</i>	Retrieved from <a href="http://www.kiamaindependent.com.au/">www.kiamaindependent.com.au/</a>
O24	Crabb, B.	(2014, May 8).	'Seed' funds vital.	<i>Kiama Independent.</i>	Retrieved from <a href="http://www.kiamaindependent.com.au/">www.kiamaindependent.com.au/</a>
O25		(2014, June 17).	A voice for nature.	<i>Kiama Independent.</i>	Retrieved from <a href="http://www.kiamaindependent.com.au/">www.kiamaindependent.com.au/</a>
O28	Crabb, B.	(2014, Ocotoer 15).	Boundary concerns.	<i>Kiama Independent.</i>	Retrieved from <a href="http://www.kiamaindependent.com.au/">www.kiamaindependent.com.au/</a>
O29	Crawford, R.	(2014, Ocotoer 21).	Cattle come out for the big spring show season.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O30	Arnold, A.	(2014, Ocotoer 23).	Unease grows over Gerringong boundary.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O31		(2014, December 15).	Popular markets in festive season mood.	<i>Kiama Independent.</i>	Retrieved from <a href="http://www.kiamaindependent.com.au/">www.kiamaindependent.com.au/</a>
O32	Crawford, R.	(2015, February 1).	Supreme champion cow makes history.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O33	Crabb, B.	(2015, March 9).	Petition opposes development outside village.	<i>Kiama Independent.</i>	Retrieved from <a href="http://www.kiamaindependent.com.au/">www.kiamaindependent.com.au/</a>
O35	Crawford, R.	(2015, April 9).	The cow comes home with show glory.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O36		(2015, June 14).	Field day with a farm focus.	<i>Southern Highland News.</i>	Retrieved from <a href="http://www.southernhighlandnews.com.au/">www.southernhighlandnews.com.au/</a>
O37	Warden, H.	(2015, July 19).	Record Nowra sale reflects cattle's upward trajectory.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O39	Winkler, E.	(2015, August 13).	Response to farm's market overwhelms.	<i>Kiama Independent.</i>	Retrieved from <a href="http://www.kiamaindependent.com.au/">www.kiamaindependent.com.au/</a>

O40		(2015, August 23).	Dairy gathering connects our young people with Shoalhaven tradition.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O41		(2015, October).	Illawarra cattle on show in Berry.	<i>South Coast Register.</i>	Retrieved from <a href="http://www.southcoastregister.com.au">www.southcoastregister.com.au</a>
O42	Warden, H.	(2015, October 16).	Gerrinong's Geoff Bailey takes out champion pasture title	<i>Kiama Independent.</i>	Retrieved from <a href="http://www.kiamaindependent.com.au/">www.kiamaindependent.com.au/</a>

## **Appendix 2 Interview questions**

### **1. Questions for farmers and former farmers**

#### *Section 1. Farmer and farm*

1. To begin with, could you tell me how you became a farmer?
2. What were your reasons for becoming a farmer?
3. Which part of your career you enjoy most?
4. Could you tell me what this farm means to you and your family?
5. Could you please give a description of your farm? (how large, how many cows, how many milking cows, What has led you to have the herd size that you do)

#### *Section 2. Changes*

6. Could you please tell me about the major changes in the dairy industry you have experienced since 2000? For example are there any big policy changes, market changes or climatic changes.
7. Could you tell me about what major changes you have made (to your farm)?
8. Has your milk production per cow been increasing? What are the main strategies for you to achieve that?
9. Do you think farming today needs to be more business-like, so that running a farm is little different from running a company?
10. Do you think income or profitability should be a top priority for managing a farm?



### *Section 3. Technology and organics*

11. Do you think today's agriculture has increasingly become a high-tech sector?
12. Could you outline the key technologies or techniques that you introduced?
13. What do you think are the major obstacles for farmers to adopt new technologies or equipment?
14. Have you considered milking robots?
15. Organic dairy products have become increasingly popular. To what extent do you think organic dairying could contribute to the viability of dairying in this region?
16. Do you think the trend of being organic will continue? Why is that?
17. Do you have any intention to conduct organic farming or adopt organic techniques?

### *Section 4. Market outlets*

Consumers today seem to expect specific characteristics in what they eat, for example, people may want locally produced food, organic food or food with a better flavour.

18. To what extent does this create any commercial opportunities for your farm?
19. Could you tell me about how you have responded (or might have responded) to this trend?

### *Section 5. Sustainability*

20. To what extent do you have any concern about the sustainability of your farming operation?

For me, sustainability means that things can last and is not necessarily only about environmental issues. For farmers' operation, its sustainability may be threatened by adverse economic, social, financial or weather conditions.

21. Could you tell me about the major challenges you think are facing dairy farmers in the Illawarra?

Prompts (if needed): that can include sustainability issues, low milk prices, limited market access, labour shortage, succession, climate change, bureaucracy, regulation cost, environmental degradation, financial problems etc.

22. To what extent do you think that the challenges faced by dairy industry in recent years mean that farmers have less room to move to maintain viability?

23. What do you think has made some farmers susceptible to leaving farming and others able to stay and even do well?

24. Could you tell me what plans you have for your farm and family for the future?

#### *Section 6. Land*

25. Some think that a lot of good farmland around here has been transformed to land uses other than farmland, such as residential lots. What do you think is causing this change?

26. What vision do you have of the future of agriculture for this region?

27. We are close to the end. Before we finish, I would like to ask you one more question which is if this interview was conducted one or two years ago, do you think some of the answers would be different?

### **2. Questions specifically for organic farmers**

1. Did you do organic farming from the very beginning or did you convert from conventional farming to organic farming? How long or how many years have you been practicing organic farming?

2. Which stage are you in in the process of transforming to organic operation?

3. What are the major differences between organic and conventional dairy farming?
4. What are the requirements for farmers or their farm if they plan to go organic?
5. Which processor do you supply?
6. Do you supply major supermarkets like Coles and Woolworths?
7. If not what are your retail outlets, or where do you sell your products?
8. To what extent do you think organic dairying is something that could contribute to the long-term viability of dairying in this region?
9. Do you suggest other farmers to also turn to organic?
10. Do you think in the future there will be more organic dairy farmers in this region?
11. To what extent are there other non-conventional farming practices that you think might be relevant or useful to you?
12. Are there some governmental or industry support specifically for organic farming?

### **3. Questions for the Future Dairy and NSW DPI researchers**

1. Could you please briefly talk about what you are doing, and your experience in farm robotics?
2. Do you think today's agriculture has increasingly become a high-tech sector?
3. Could you please tell me about the major changes in technologies adopted by dairy farmers, say since 2000?
4. Could you please give a description of the current development of robotics in dairy? Has robotics been widely adopted or is it still at its early stage?

5. Could you tell me about what are the main advantages of using robotic technologies in dairy farming? What is that they offer farmers?

Prompts (if needed): do they increase efficiency, reduce labour use, produce more data, or help farmers to manage their resource more precisely?

6. Could you tell me about what are the main disadvantages of using robotic technologies in dairy farming?

Prompts (if needed): are they too expensive and lead farmers to having more debt, do they add too much complexity to farming, or contribute to the reduction of rural jobs?

7. What do you think are the major obstacles for farmers to adopt new technologies and equipment?

8. To what extent do you think agriculture in general should become more high-tech in future?

#### **4. Questions for relevant stakeholders**

1. Could you please give a brief description of your relationship with agriculture and farmers?

2. Could you also talk about the status quo of Illawarra agriculture?

3. Could you tell me about what changes have occurred to the Illawarra agricultural industries roughly since 2000? For example are there any big changes in the dairy industry, are there any big policy changes, market changes or climatic changes.

4. Could you tell me about some of the major challenges you think farmers are facing in the Illawarra? That can be debt, environmental management, and low prices.

5. What changes in farm or business management or technology have been helping to keep farmers or dairy farmers specifically in business in the Illawarra?

6. What future options for coping with changes and remaining viable do farmers have?

7. Do you know any supports farmers are currently receiving from governmental and non-governmental sources?
8. Do you think these supports are sufficiently useful in supporting farmers?
9. More generally for the region by which I mean the Illawarra, what vision do you have of the future of agriculture for this region?
10. Do you know any opportunities for future development of Illawarra agriculture? That can be demand for organic food, farmers' markets, and overseas markets.
11. Could you also talk about the constraints for future development of Illawarra agriculture?

## Appendix 3 Questionnaire for farmers

### Survey Questionnaire

#### Part 1: Farming

1. How long have you been a farmer?

\_\_\_\_ years \_\_\_\_ months

2. How large is your farm property? (Please tick ✓ the right unit)

Please indicate: \_\_\_\_\_ ( hectares  acres)

3. Please outline your main on-farm income generating activities (e.g. milk, crop or beef production, silage sales, breeding etc.):

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4. Are you a family farmer (i.e. your farm is owned and mainly operated by your family)? (Tick ✓ only one; if no, please go to part 2)

Yes

No

5. How many years have your family (including your ancestors) been involved in agricultural production?

Please indicate: \_\_\_\_years

6. How many years have your family (including your ancestors) held this farm?

Please indicate: \_\_\_\_years

7. How many generations have your family (including your generation) held this farm?

Please indicate: \_\_\_\_generations

#### Part 2: Personal information

8. Please indicate your gender:  Male  Female

9. Please indicate your current age: \_\_\_\_\_

10. What is the highest level of **education** you have completed? (Tick ✓ only one)

- |  |  |
|--|--|
| <input type="checkbox"/> Primary school      | <input type="checkbox"/> High school / secondary school          |
| <input type="checkbox"/> Certificate         | <input type="checkbox"/> Advanced diploma / diploma              |
| <input type="checkbox"/> Bachelor's degree   | <input type="checkbox"/> Graduate diploma / graduate certificate |
| <input type="checkbox"/> Postgraduate degree |  |

11. What is the total of all income/wages/salaries, government benefits, pensions, allowances and other income your **household** received in the last financial year? (Tick ✓ only one)

- \$0 - \$32,000    \$32,001 - \$64,300    \$64,301 - \$118,500    \$118,501 and over

12. Please indicate to what extent your total **household** income is from **off-farm** sources:

\_\_\_\_\_ % of my income is from off-farm sources.

13. If your household receives off-farm income, please indicate what it is from:

\_\_\_\_\_

14. On average, the gross annual value of agricultural production on your land is:

- |  |  |  |  |
|--|--|--|--|
| <input type="checkbox"/> \$0               | <input type="checkbox"/> \$1-\$4999          | <input type="checkbox"/> \$5,000-\$9,999     | <input type="checkbox"/> \$10,000-\$49,999 |
| <input type="checkbox"/> \$50,000-\$99,999 | <input type="checkbox"/> \$100,000-\$199,999 | <input type="checkbox"/> \$200,000-\$499,999 | <input type="checkbox"/> \$500,000+        |

15. How many hours per week do you **work** on-farm and off-farm in the last twelve months except holiday time?

Please indicate: \_\_\_\_\_ hours/week

16. What **ethnicity** do you most strongly associate yourself with? (You may choose more than one)

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> Aboriginal                      | <input type="checkbox"/> Oceanian                     | <input type="checkbox"/> British/Irish          |
| <input type="checkbox"/> African                         | <input type="checkbox"/> Asian                        | <input type="checkbox"/> People of the Americas |
| <input type="checkbox"/> European, please specify: _____ | <input type="checkbox"/> Other, please specify: _____ |   |

*Thank you for your help!*



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