

**Understanding regional agri-food systems and their
supply chains:**

A Socio-Technological Systems approach

This thesis is submitted in fulfilment of the requirements for the degree of
Doctor of Philosophy

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DECLARATION

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Dedicated to the memory of my father

Robert Adams

April 1959 – April 2013

'The dwarf sees farther than the giant, when he has the giant's
shoulders to stand on'

This one is for you old man

Abstract

This thesis investigates the development of regional agri-food systems and their supply chains to understand how they affect the sustainability of rural regions. It argues that the existing dichotomies of alternative-local and conventional-global do not provide a sufficiently nuanced understanding of the dynamic transitions and interactions that occur in regional agri-food systems. Deploying and extending socio-technological systems theory, the thesis explores the interaction between nested levels of sectoral and general agri-food regimes and reconstructs the emerging logics of interaction. Against this background, it analyses how alternative agri-food supply chain innovations evolve and assesses their various degrees of success.

The meat, dairy and horticultural sectors in SW Wales are investigated as case studies, using a mixed methodological approach combining secondary data analysis and interviews with key stakeholders and supply chain actors. The research finds three sub-sectoral systems with highly differentiated socio-technological configurations and equally diversely configured niches. Using the socio- technological systems framework the: socio-technological configuration, degree of system stability and the future transitional pathways of the each sub-sectoral system is examined. This framework also creates the basis for an assessment of how likely their innovations are to be adopted or absorbed by the conventional agri-food system in SW Wales. The thesis finds that meaningful interactions occur not only within each sub-sector and between their niches but also between sub-sectoral systems.

The thesis ultimately provides a nuanced analysis of SW Wales' agri-food systems that shows the complexity of regional food systems and critiques possible sustainable responses from public policy. It demonstrates that a socio-technical regime perspective can uncover the manifold relations between local and regional agri-food innovations and the dominant, multi-layered agri-food system. This constitutes a major empirical and conceptual contribution to the debates on sustainable food and rural development.

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Table of Contents

	Page	
1	Introduction	1
2	Theoretical Perspectives on Agri-Food Supply Chains	
2.1	Introduction	5
2.2	Understanding agri-food supply chains	8
2.3	Global Value Chains or the 'global' supply chain perspective	9
2.4	Alternative agri-food supply chains or the 'local' perspective	11
2.5	Agri-food paradigms and the broader perspectives on agri-food systems	23
2.6	Conclusion	31
3	The socio-technological systems framework and conceptualising agri-food	
3.1	Introduction	35
3.2	Socio-technological systems framework	36
3.3	Agri-food systems using the ST systems framework	58
3.4	Conclusion and notes for framing the empirical research of this thesis	78
4	Methodology	
4.1	Introduction	81
4.2	Defining the research questions	82
4.3	Epistemology and the empirical application of the ST Systems framework	83
4.4	Formation and collection of empirical data	87
4.5	Analysis of empirical data	99
4.6	Choice of and introduction to case study region	101
4.7	Methodological approaches to ST systems research	107
4.8	Ethical considerations	111
4.9	Conclusion	113
5	The SW Wales Meat Sector	
5.1	Introduction	115

5.2	SW Wales meat regime	116
5.3	Linkages between SW Wales meat regime and higher level regimes	144
5.4	Landscape pressures	150
5.5	SW Wales meat niche case studies	151
5.6	Conclusion	172
6	The SW Wales Dairy Sector	
6.1	Introduction	177
6.2	Elements of the SW Wales dairy regime	178
6.3	Linkages between the SW Wales dairy regime and higher level regimes	199
6.4	Landscape pressures on the SW Wales dairy regime	230
6.5	SW Wales dairy niche case studies	232
6.6	Conclusion	248
7	The SW Wales Horticultural Sector	
7.1	Introduction	254
7.2	SW Wales crop sector	255
7.3	Meet the industry – Insights into the SW Wales horticultural sector	274
7.4	Conclusion	287
8	Conclusion	
8.1	Introduction	294
8.2	Utility of ST system theory for regional agri-food research	296
8.3	Understanding rural development and the role of public policy in rural regions through transitions	320
8.4	Final remarks and the roads left to be taken	330
	Bibliography	338
	Appendices	367

Table of Figures

2.1	Typology of Global Value Chains (Gereffi et al, 2005)	10
2.2	Typology of SFSC's from Renting et al (2003), showing their interpretation of alternative food chains	14
3.1	Multi-level perspective on system transitions	37
3.2	Multi-level perspective as a nested hierarchy	41
3.3	Diagrammatic representations of environmental change	52
3.4	Nested agri-food socio-technological regimes	66
4.1	The different approaches to combining quantitative and qualitative data in mixed methods research	88
4.2	The rural counties of Wales	103
4.3	Agricultural land capability map for Wales	105
4.4	Summary of the methodological approach of the thesis	113
5.1	Historic trends in the national sheep and beef herds of Wales	118
5.2	Estimated numbers of sheep and cattle in the Agricultural Small Areas of Wales, based on the 2009 June survey data	119
5.3	Estimated percentages of holdings in Agricultural Small Areas of SW Wales with a particular type of livestock/production based on the 2009 June survey	122
5.4	Location of livestock markets whose weekly sales data is posted on the HCC website (left) and a comparison from the Livestock Auctioneers Association website (right)	132
5.5	Weekly sheep and beef market sales reports showing examples of the grading used in livestock markets	136
5.6	Two types of co-ordination between actors in a producer group supply chain	155
5.7	Summary of the inter-linkages within the SW Wales meat sector	174
6.1	Percentage of active holdings in ASA's with dairy activities in 2009.	180
6.2	Major milk producing regions and the location of processing facilities of the top six dairy processors in the UK.	196

6.3	The relationship between the major UK dairy processors.	211
6.4	The margins made in the UK liquid milk market	219
6.5	The retailer liquid market share held by three of the major processors.	222
6.6	Processor-retailer relationships pertaining to the supply of retailer own brand dairy goods.	223
6.7	Summary of key relationships between SW Wales and the UK dairy industry.	249
7.1	The historic trend in Welsh agricultural land use	256
7.2	The agricultural land capability map for Wales	258
7.3	The estimated percentage of agricultural land in ASAs, which was planted for horticulture or cereal crops in 2009	262
7.4	The estimated percentage of holdings in the ASAs of SW Wales that are engaged in some form of horticulture/crop growing	263
7.5	The percentage of agricultural land in the ASAs of SW Wales, which is graded 1 – 3	264
7.6	The percentage of total Welsh production by land area for Cereal, Potato and Horticultural production in SW Wales ASAs in 2009	266
8.1	The potential evolution of the agri-food regimes of SW Wales	311
8.2	Diagrammatic representation of the purview of WAG agri-food policy	322

Table of Tables

3.1	Typology of environmental change	52
3.2	Pathway of regime transition conceptualised by Geels & Schot (2007)	54
4.1	The second phase interview matrix	93
4.2	The range of available secondary agri-food data	98
5.1	Spatial distribution in Wales and farm holding intensity for three non-standard species of livestock for SW Wales in 2009	120
5.2	Change in total sheep numbers being kept in Wales by region, based on estimates from the June Census data	125
5.3	Change in total cattle numbers being kept in Wales by region, based on estimates from the June Census data	125
5.4	Change in total beef breeding numbers being kept in Wales by region, based on estimates from the June Census data	125
5.5	EUROP grading scales shown with the relative demand and percentages of 2009 lamb carcasses in Great Britain falling into each category	139
5.6	Summary of the properties of the SW Wales meat regime	148
5.7	Numbers of meat orientated businesses mentioned in the food directories of the three study counties	152
5.8	Deviations in rationale and nature of the meat niche case studies	170
6.1	Changes to the number of farm holdings with dairy cattle present on them from 2004-2010	182
6.2	Percentage changes in volume of milk produced in selected regions from 2005/06	183
6.3	Companies/regions outside SW Wales mentioned by interviewees in relation to dairy.	202
6.4	Major UK dairy concerns in the UK in 1995 and their current fate.	205
6.5	Relative buying power and interests of the major co-operatives	206

	and processors in the UK.	
6.6	The range of measures used in dairy contract in SW Wales	217
6.7	Price inflation in selected dairy input costs.	221
6.8	Summary of the properties of the SW Wales dairy regime	227
6.9	Numbers of dairy businesses mentioned in the food directories of the three study counties.	233
6.10	The deviations in the rationale and nature of observed innovations compared to the SW Wales dairy regime.	246
7.1	Areas covered by agricultural activities in Wales for selected years in hectares	260
7.2	Ratios of total farmed area in Wales by land use types for selected years	260
7.3	Temporal change in land use cover for the years shown in Table 7.1	260
7.4	Numbers of horticulture orientated businesses mentioned in the food directories of the three study regions	267
7.5	Socio-technological summary of the three horticultural industry case studies	289
8.1	Summary of the niches researched in the SW Wales agri-food system	300

Chapter 1

Introduction

This thesis investigates the contribution that the agri-food industry makes towards the development of rural regions and, more specifically, how public policy can assist in encouraging the agri-food industry to transition along rural developmental trajectories. The main body of the thesis is divided into this chapter and seven additional chapters, a summary of which comprises the balance of this introductory chapter.

Chapter 2 reviews the literature on global value chains, alternative/local food supply chains and agri-food paradigms, which provides the theoretical context for the thesis. The literature on global value chains discusses the changing nature of supply chains that are increasingly co-ordinated by key actors and is rooted in the ongoing discourse of globalising trade and industry. The global value chain literature is juxtaposed with the alternative food supply chain literature and finds that, whilst both contribute ideas towards sustainable agri-food supply chains, both also have gaps in their conceptual approaches. The agri-food paradigms literature is also reviewed as it provides an interesting ongoing debate about how agri-food systems are to be transitioned and the types of solutions that can be employed to deal with the problems that these systems face. The agri-food paradigms literature does not consider how the suggested solutions for each paradigm unfold and develop within a particular geographic region.

Chapter 3 discusses the literature around socio-technological systems theories and specifically the analytical model developed and refined by Geels (2004), Geels & Schot (2007) and Geels & Kemp (2007), which this thesis proposes as an analytical framework that helps address some of the issues raised during the review of the agri-food research in Chapter 2. It starts with a discussion of the multi-level perspective (MLP) of landscapes, regimes and niches that forms the core of socio-technological systems theories. The application and adaptation of the socio- technological (ST) analytical model for regionally focused agri-food research is then introduced. The chapter discusses two specific adaptations namely the need to analyse agri-food

regimes within a spatially nested regime structure and the need to add the biophysical element to the socio-technological constellation of elements within the ST analytical framework. The discussion of the first adaptation also sets out how this thesis defines the term 'regional'. The chapter concludes with some questions that a regional agri-food systems case study asks of the socio-technological analytical model if it is to be used to analyse these systems.

Chapter 4 sets out the epistemological and methodological basis that this thesis adopts in approaching the research. Rooted in a social constructivism perspective, this thesis utilises a mixed methodological approach to answering the research questions, the reasons for which are outlined in this chapter. The chapter also discusses the forms of data gathering and analysis, which utilises stakeholder and supply chain level interviews coupled with secondary data analysis of available agri-food data for the case study region. The case study region of South West Wales is also introduced.

Chapter 5 contains the analysis of the SW Wales meat sector and explores the most dynamically stable socio-technological regime in the region: the red meat industry. The SW Wales' red meat regime is dynamically stable despite a number of internal and external pressures discussed in this chapter including a reduction of the number of abattoirs in the region and foot and mouth disease. This chapter also discusses three niche innovations found during the course of the empirical research being: red meat producer groups, a small scale alternative meat producer and a regional wholesaler/feed company joint venture.

The dairy sector of SW Wales is analysed in Chapter 6 and presents a regime which the chapter terms as being dynamically unstable. The reason for this terminology is that the empirical evidence shows a regime structure which, under the pressures of intense cost-price squeeze on farm gate milk prices exacerbated by the peripheral geographic nature of the region and the consolidation of processing facilities into England, is leading to many producers leaving the dairy sector in the region. The empirical fieldwork uncovered three niche innovations which are discussed in this chapter being:

an ethical producer co-operative, a non-bovine dairy processor and an organic farmhouse cheese maker.

Chapter 7 discusses the horticultural sector in SW Wales and is set out slightly differently to the previous two chapters because, unlike the meat and dairy regimes, no clear SW Wales' horticultural regime could be identified. Instead the chapter examines the historical levels of and potential for crop production in SW Wales, which comprises arable and horticultural crop production types. The chapter goes on to look at private and public policy relating to the horticultural sector in SW Wales and subsequently examines case studies of horticultural producers in SW Wales demonstrating the differentiated socio-technological nature of the sector within the region. The chapter concludes with a discussion about why a coherent SW Wales horticultural regime is not apparent.

Chapter 8 is the discussion chapter of the thesis and commences with a synthesis of findings from the analytical chapters. This synthesis compares and contrasts the niche innovations/horticultural case studies with the incumbent regimes found in the region (or the wider UK in the case of horticulture). The chapter then discusses the most likely future transitional pathways of the three sub-sectors investigated in the analytical chapters and the potential shifts in agricultural production as a response to the differentiated circumstances/pressures the three sectors face. The chapter then considers the role of public policy in fostering rural development within regional agri-food systems. This is then followed by a critical reflection on the utility of the ST Systems framework as used in this thesis, together with the insights that this thesis provides for ST Systems theory and, finally, concludes with a discussion of potential further avenues for research.

This thesis aims to provide contribution to the understanding of the evolutionary nature of regional agri-food systems utilising a novel construction of the Socio-Technological Regime. In order to achieve these aims the thesis sets out to answer the following research questions:

1. What are the structural/network/governance characteristics of the SW Wales agri-food industry and is there significant differentiation between specific agri-food sub-sectors?
2. How can the heuristic model of Socio-Technological Systems be applied to the analysis of regional agri-food systems and the specific sectors within such regions? Does the ST framework allow us to develop a better understanding of changes in regional agri-food systems?
3. How has the SW Wales agri-food industry changed in response to developments in the wider national and international agri-food system? Can this change be understood as transitions in regional agri-food regime(s)?
4. Does an understanding of rural agri-food regions as differentiated Socio-Technological regime(s) help to analyse the transitional nature of regional agri-food systems, including the role that public policy plays in fostering their development?

Chapter 2

Theoretical Perspectives on Agri-Food Supply Chains

2.1: Introduction

‘We can economise in energy and do without many luxuries, but without enough food, of the proper quality, our population cannot survive’

(Mellenby, 1975, p.2)

These stark words by Kenneth Mellenby in 1975 portray exactly how important an adequate food supply was in a post Second World War era, when the rationing and shortages imposed on the population of Great Britain as a consequence of the war were fresh in people’s minds. The development of the green revolution and opening up of international trade after the Second World War has led to a modern agri-food system which is increasingly globalised and industrialised, creating mass production factories in the field. This system has developed supply chains of a greater physical distance and which have a heightened degree of disconnection between the consumer and the produce they consume (Morris & Buller, 2003). However, in turn, consumers in developed nations have been able to enjoy a diet that is not adjusted to seasonality (Smith, 2006) and with lower prices (Crawford, 1994). The globalised form of the agri-food system is not without its problems; these lyrics from Show of Hands neatly summarise some of those faced by producers:

‘If you want cheap food now here is the deal,
Family farms are brought to
heel, Hammer blows of size
and scale, Foot and mouth
the final nail,
The coffin of our English dream,

Lies out on the village green,
Where agri-barons CAP in hand,
Strip this green and pleasant land,
Of meadow, woodland, hedgerow, park.'

(Show of Hands, 2003)

Whilst these lyrics hark back to an idealised view of a British rural idyll that probably never really existed except in the social construction of the nation's collective imagination of the rural environment, they do allude to some of the pressures that the agri-food sector has faced in the last 50 years. These pressures have only become more, rather than less, challenging to the sustainability of the current agri-food systems with environmental, social and economic concerns all contributing to the multifaceted nature of these problems. Environmentally, the industrialised nature of the vast majority of what is commonly termed the conventional system of food production produces negative externalities. These externalities affect almost every aspect of the biosphere including: depletion or pollution of fresh water resources (Hoekstra & Chapagain, 2007 and Hildebrandt et al, 2008) as well as the denudation of soils from agricultural machinery and poor land use management practices (Pimentel et al, 1995 and Mäder et al, 2002). With respect to social concerns, there are the issues of malnutrition and malnourishment, which touch not only on the concepts of equity and fairness in terms of the access to food but also on the burgeoning issue of poor diets in both developed and developing countries (Lang and Heasman, 2004). Finally, in terms of the economic perspective, we find a 'race to the bottom' (Marsden et al, 2002), which poses significant challenges to the economic viability of rural areas in developed nations as well as continued tensions surrounding trade liberalisation of agricultural commodities (Hines, 2000).

These pressures faced by the agri-food system are intertwined and multi-scalar in nature, with the interplay and importance placed on these pressures varying not only between international, national, regional and farm levels but also in their consideration and comparison to individual units of analysis such as a single region or nation. All of these issues and scales of possible investigation provide a complex series

of problems for any researcher interested in the agri-food system. This thesis is concerned with regional agri-food systems and local/alternative food supply chains which are argued to represent an alternative to conventional agri-food supply chains. The alternative nature of local food supply chains, it is argued, provides palliatives to some of the issues presented by the conventional agri-food system and aids the development of rural areas. This thesis ultimately intends to provide a theoretical and empirical contribution to the local food and rural development debates within the regional context of the SW Wales region by proposing a new theoretical and methodological approach to researching regional agri-food systems and the supply chains within them.

The thesis commences with a review of the academic literature comprising two chapters. In the first chapter the concepts of agri-food supply chains are discussed. This starts with a review of the global value chains literature which highlights the changing nature of power relations in supply chains generally and some of the issues this may generate for agri-food systems. The literature on global value chains serves to provide a juxtaposition to the alternative/local food chains literature.

The alternative food supply chain literature commences with a discussion regarding the definition of 'local'. This is followed by an investigation of what alternative/ local food chains are and the role of local food chains in fostering rural development. The chapter also discusses the agri-food paradigms, which have served as a theoretical framework for wider discourses of food and rural development and provide a contextualisation and framework for local food debates.

The first chapter concludes that there are some gaps in the current research methodology and paradigms relating to alternative food research, most notably: a lack of evidence concerning the relationship between alternative and conventional agri-food supply chains within a regional scale; a de-emphasis concerning the nature of conventional agri-food chains and their role in rural development; and the need for a more nuanced understanding of how these systems change over time within the context of a single rural region.

The second chapter of the literature review introduces the Systems Transition framework as an alternative heuristic tool with which both local and conventional food chains can be studied and compared at a regional scale. The chapter discusses the nature of the Systems Transition framework including the multi-level perspective that it utilises and how this perspective can be appropriated within the context of agri-food research, albeit with some suggestions regarding changes to the framework and perspective that assists in its application in the empirical research of this thesis.

2.2: Understanding agri-food supply chains

This section of the literature review focuses upon the supply chain perspectives of agri-food systems. Understanding how supply chains in agri-food systems work and what their role is in shaping rural regions is important as they shape not only the rural landscape/environment but also the rural economy and communities.

This part of the literature review is divided into two key sub-sections. The first section discusses the Global Value Chains (GVC) literature that follows the evolution of the global agri-food industry and investigates the shift in large supply chains towards ever increasing levels of co-ordination and governance by key actors in these chains. The second section focuses on the alternative food literature, which in some ways, can be contrasted with the GVC literature because it considers agri-food supply chains from more regional/local perspective as opposed to the national/global focus of GVCs.

Before investigating agri-food supply chains it is necessary to define more generally what a supply chain is and what its constituent parts are. In simple terms, the process through which a final product for sale to consumers is created can be defined as a 'supply chain'. The term 'supply chain' describes the relational movement of a

product from its constituent parts to final creation. Beamon's (1998) definition of a supply chain alludes to some of the processes that occur within supply chains:

'an integrated process wherein a number of various business entities work together in an effort to: (1) acquire raw materials, (2) convert these raw materials into specified final products, and (3) deliver these final products to retailers.'

(Ibid, p.281).

Beamon's (1998) definition highlights three key elements of a supply chain. The first element is that as products move along the supply chain they are changed/converted/combined into new products. The second element is that products are transported between businesses/locations as they move along the supply chain in a linear progression from the basic materials through to the final product. The final element is that there exists a degree of collaboration/co-ordination between the various businesses involved in a supply chain, which is required to bring a particular product from its constituent parts to a final good for sale.

2.3: Global Value Chains or the 'global' supply chain perspective

Global Value Chain (GVC) orientated research has relevance to the research of agri-food systems/supply chains because, as Humphrey & Memedovic (2006) argue, the global agri-food industry has become increasingly dominated by the emergence of lead firms that exert a level of control and vertical co-ordination within their supply chains. This co-ordination between actors within a supply chain has created new power relationship structures and interactions that have changed the way that supply chains are constructed for which Gereffi et al (2005) propose a model comprising five types of supply chain (Market, Modular, Relational, Captive and Hierarchy) as shown in Figure 2.1:

Figure 2.1: Typology of Global Value Chains (Gereffi et al, 2005)

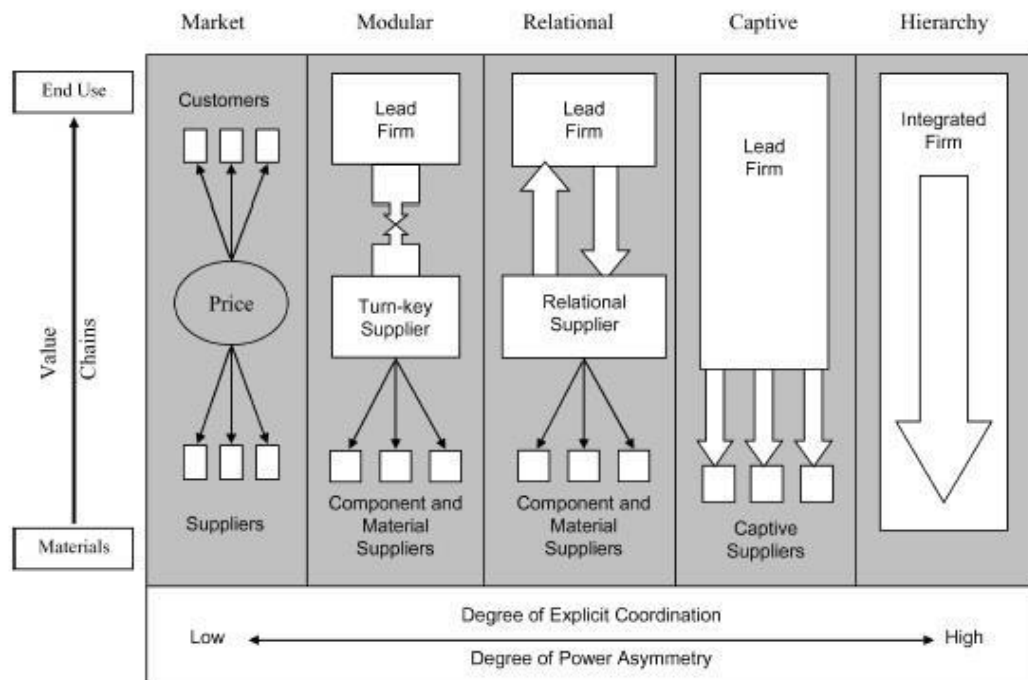


Figure 2.1 from Gereffi et al (2005) also shows the properties of the five typologies, including supply chain structure, how each of these structures can be contrasted in terms of the power relationships between ‘lead firms’ and suppliers and how much co-ordination is directed from the lead firm. The core rationale of GVC theory, and its predecessor global commodity chains, was to assist researchers in analysing how and where value is captured within different industries across the global economy (Gereffi & Christian, 2009). As Figure 2.1 suggests, GVC theory moves beyond the assumption that trade is merely co-ordinated through an open market, where buyers and producers respond to price signals, and instead points towards the existence of supply chains where lead firms or key ‘middle-men’ firms have acquired extended influence in supply chains beyond that which is normally exhibited within normal market structures (Gereffi & Christian, 2009). This influence takes a number of forms including: specifying business and product standards, timing and volume of production, use of technology, branding and agreeing prices (Gibbon and Ponte, 2008). This influence is already clearly apparent in the agri- food industry as Dobson et al (2003) and Humphrey & Memedovic (2006) discuss how the emergence of large multiple retailers and buyer groups have extended their influence in controlling food supply beyond the market and the impact that has on producers in the EU.

It is these lead firms which are an important aspect of agri-food based GVCs. They are responsible for, or at least highly influential in, developing product innovations and quality control (Humphrey & Memedovic, 2006). Milberg (2004) also argues that the profits of a supply chain tend to be focused where power is most concentrated within the chain and that it is this which provides the greatest opportunities for innovation.

The GVC perspective is rooted in the analysis of globalised industry and businesses (Gibbon & Ponte, 2008 and Gibbon et al, 2008) and necessarily focuses upon the large co-ordinated supply chains that are typified by trans-national companies. The literature on GVCs focuses on the governance within supply chains and locates innovation in production systems with the lead firms that co-ordinate GVCs. However, there are two key observations that connect to the agri-food supply chains that GVCs do not address. Firstly, whilst Gibbon et al (2008) states that there is a spatial nature to GVCs; it appears that how different GVC types interact and affect the development of specific regions is less well understood. Secondly, innovation is rooted principally in lead firms within the GVC literature which, whilst it may be the case in many examples, does not consider innovations that could occur elsewhere such as developments in: policy, societal/cultural attitudes or through public financed scientific endeavors. Moreover, innovations that occur within a GVC are likely to serve the purposes of perpetuating or improving the overall systems that a particular GVC and its lead firm desire; but it is not clear where innovations that do not serve this purpose, but which nevertheless may address issues with these supply chains, fit into the GVC model.

2.4: Alternative agri-food supply chains or the 'local' perspective

The existence of the increased pressures and demands upon the agri-food sector, which were introduced in the previous section, have led to intense academic debates regarding the nature of the direction(s) that agri-food sector is moving in. One of the significant elements of interest in the academic debate is the development of local

food as a sub-sector of the agri-food industry which is somehow seen to be an alternative to the continued industrialisation of the agri-food industry. This section of the literature review will introduce the local food literature, focusing on: what we mean by the term 'local'; what are local food chains; and what claims exist as to their benefits within rural areas. It then moves on to discuss the types of alternative food chains that have developed and before investigating the relative economic, environmental and social merits of these various supply chains. The section concludes with a critique of the alternative food literature and proposes a series of questions and challenges for future research in this field.

2.4.1: Defining the meaning of 'local' in the context of food

Before discussing the local food literature it is necessary to stipulate how the term 'local' is being defined for the purposes of this review. The term 'local' can be seen as a social construction (Hinrichs, 2003) and, by its very nature, it is a term with an inherent ambiguity that escapes a clear and precise definition (Jones et al, 2004). As a socially constructed term, 'local' can be defined in a multitude of ways often differing not only between individual personal perspectives but also depending upon the subject matter to which the term is being applied.

In terms of a geographic definition, Hinrichs (2003) notes for instance that the term 'local' has been ascribed to both state level administrative boundaries (in this case in Iowa, where 'local' covered some 56,000 square miles) as well as to the locales of small geographic areas, towns or counties. An alternative view of local food is also found in considering the re-spatialising/re-socialising effect that alternative food chains, such as box delivery schemes, can have in producing reconnections of provenance between consumers and food production (Renting et al, 2003). These types of food networks may extend way beyond a specific spatial boundary and yet provide benefits for both producers and consumers that may represent palliatives for the crisis in the agri-food industry. With these two points in mind, and for the purposes of this thesis, a strict geographical delineation of 'local' would therefore not be appropriate for the empirical work. Instead one that considers the alternativeness

that these types of supply chains have when compared to the conventional supply chains within the same region is more appropriate. This contrast between the conventional and alternative is further explored in chapter 3 within the Socio-Technological systems metaphors of regime and niche.

2.4.2: Understanding the types of alternative food chains

Alternative food supply chains cannot be summarised as a singular type of supply chain (see: Renting et al, 2003) but comprise instead an array of producer-processor-retailer-consumer configurations and as such within the academic debates, tend to be discussed using a similar array of terms. This array of academic terms can be discussed under the umbrella term of 'alternative food chains' because the overall loci of research interest regarding these supply chains is their alternativeness to conventional supply chains (Ilbery & Maye, 2005). For a new entrant into the field of alternative food chain research it can be a somewhat bewildering experience with diverse array of perspectives including: producer centric (Morris & Buller, 2003, Marsden & Smith, 2005 and Ilbery & Maye, 2005), consumer centric (Wells et al 1999, Weatherall et al, 2003 and Henrichs & Allen, 2008) and regional/rural development perspectives (Marsden et al, 2002a and Tregear et al, 2007). These perspectives have also generated a range of conceptual frameworks which have been employed in an effort to provide a greater understanding regarding the diversity of agri-food chains including: Alternative Agri-Food Networks (Sonnino & Marsden, 2006), Short Food Supply Chains (Renting et al, 2003) and the Quality Turn (Ilbery & Kneafsey, 2000a and b).

Elements of these frameworks will be discussed to some extent in this review of the literature; however, it should be noted that all use terms such as 'local', 'regional' and 'alternative' which, as Ilbery et al (2006) have argued, lack consistency in how they are applied. This point is further reinforced by Renting et al (2003) who argue that there is a need in agri-food research to generate 'more specific concepts that help us to grasp the variability of Agri-Food Networks' (ibid, p.394).

The term 'local', as was discussed earlier, is ambiguous and difficult to define in terms of agri-food supply chains, so it is perhaps not a surprise that one of the first key distinctions to make regarding local food literature is that there is a difference in the academic literature between local food chains and locality food chains (Jones et al, 2004). The term 'local food' has a geographical connection between consumer and producer as food is produced and consumed within a similar geographic area, being what Brunori (2007) defines as a local community made up of both consumers and producers. 'Locality food', in contrast, does not have a spatial aggregation that directly connects consumer and producer; instead the provenance of these products is conveyed by the producer through branding or certification (Jones et al, 2004). These distinctions do not, however, convey the full diversity of alternative food supply chains and instead the Short Food Supply Chains concept (SFSC) suggested by Renting et al (2003) goes some way to fully exploring this array of alternative supply chains.

The SFSC concept will be used here to discuss the types of alternative food chains and some of the key characteristics that make these particular chains alternative. The SFSC concept suggests the existence of three types of SFSC being: face to face, proximate and extended SFSCs. Figure 2.2 shows the various alternative supply chain types fit within the SFSC framework from Renting et al (2003).

Figure 2.2: Typology of SFSC's from Renting et al (2003), showing their interpretation of alternative food chains



Starting with Face-to-face SFSC's; here we have those alternative supply chains which most directly connect the consumer to the producer and, more importantly, to the provenance of their food. These alternative supply chains rely most closely on the mediation of trust and authenticity directly between the producer and the consumer

(Hinrichs, 2000). The types of supply chains under consideration here range from what were traditional direct retailing options for producers, such as farmers markets and farm shops, towards more recently developed supply chains, such as box schemes and mail order. Face-to-face SFSC's have the advantage of removing intermediary actors from the supply chain who would normally capture a certain amount of the economic value of the product. Conversely Face-to-face SFSC's potentially have a more limited exposure to consumers/buyers in terms of market presence, which would offset some of the benefits of achieved from removing the intermediaries.

Proximate SFSC's extend beyond direct contact between producer and consumer; they often involve some form of intermediary interface such as local shops or restaurants selling the produce of one or more producers in the area or the use of local fairs. The key aspect of proximate SFSC's is that they service a local demand for produce be this by either retailing to the indigenous population or by sale to visitors coming into the area. It is with proximate SFSC's that we see some of the more challenging alternative food chains to study from a research perspective, particularly in terms of how to analyse their role in delivering sustainable agri-food systems.

The final type of SFSC that Renting et al (2003) uses is the extended SFSC where the alternative supply chains extend beyond the local area and, more importantly, where the consumer is unlikely to have much experience of the locality where the produce was grown or raised. The provenance and trust attached to these products is guaranteed not directly by the producer, as in Face-to-face SFSC's, or through a local intermediary, as in Proximate SFSC's, but through the use of certification labelling schemes, such as Protected Designation of Origin (PDO) used throughout the EU, Fairtrade or Soil Association Organic branding and also through the reputation of product itself (the Duchy Originals brand, for example). Here the alternativeness of these supply chains is demonstrated not through the closeness of the spatial proximity between consumer and the produce but through 'value-laden information' (ibid, p.400) that the products of these chains contain when they reach consumer.

Food chains under the extended SFSC tend to rely on a degree of formalised governance to foster the trust and provenance connections with the consumer.

The SFSC classification of alternative supply chains into the three SFSC typologies does not fully specify the range of alternative supply chains and particularly owner/grower supply chains, which are possibly the shortest of supply chains. There has been increased interest from individuals in growing their own food in recent years; Jones et al (2004) noted that there has been renewed interest in allotment holdings and Hugh Fearnley-Whittingstall's Landshare movement successfully provided an interface between those who own land and those who wish to grow. Collectively this indicates that these chains need to be considered within the overall context of alternative food. A further point of contention with Renting et al's (2003) SFSC classification is the placing of community supported agriculture (CSA) within the proximate SFSC category. CSA schemes can come in a range of business arrangement configurations but are essentially a contract between a producer and consumers for the consumers to pay in advance for a share of produce produced over the course of a year/season (Thompson & Coskuner-Balli, 2007). Cox et al's (2008) research into the EarthShare CSA near Inverness found communication between CSA managers and consuming stakeholders which highlights that this form of alternative food chain is probably more characteristic of a Face-to-face SFSC rather than a Proximate SFSC.

Renting et al's (2003) framework demonstrates the sheer diversity of alternative food chains which are highly differentiated in terms of: their business models, the range of spatial extents over which that these supply chains operate and the range of relationship connections that exist between consumer, producer and other intermediaries. It is unsurprising that alternative food chains have created an equally diverse range of literature. Whilst Renting's model helps us grasp some of the differentiated nature of alternative supply chains, it does not adequately allow us to examine the relative merits of the different alternative food chains within a sustainability context, despite the fact that body of research on alternative food chains is largely focused upon how these alternatives to conventional food supply chain can contribute towards a more sustainable agri-food system.

2.4.3: Alternative food chains as agents of economic development in rural areas

One of the key components of rural areas and, arguably central to their development, is the agri-food sector (van der Ploeg et al, 2000) and so it has been argued that the long term economic viability of rural regions is tied to the long term viability of agri-food businesses within these regions. The agri-food sector has, however, been seeing a historical trend towards smaller economic returns at the farm gate (cost-price squeeze) which has, in part, led to a rationalisation of farm units and a decline in the number agricultural jobs (Marsden & Smith, 2005 and van der Ploeg et al, 2008). Alongside this rationalisation trend there has been at the same time a reduction in real terms in the level of financial support that agriculture has received (Marsden et al, 2001). This general decline in agricultural and rural prosperity has been addressed by both entrepreneurial producers, developing alternative methods of generating additional income, and states, through the development of new support mechanisms to assist producers and processors.

Producers have increasingly found new ways to improve their economic prosperity in the face of the increasing market pressures and we have seen the development of four main strategies or routes towards achieving this, which are: developing value added produce; expanding into new markets; diversifying into non-farm income generating activities; and taking non-farm jobs to supplement agricultural income activity. Of these four strategies the taking of non-farm related jobs and the diversification into non-farm related activities (such as Bed and Breakfast provision, pony trekking etc) have comparatively little or nothing to do with alternative food chains and are therefore not part of the focus of this thesis. Although it should be noted that there is growing interest in agri-food tourism which may, for some, develop into the provision of food orientated guest accommodation or other wider types of farm orientated tourism, the various options for which are well summarized by Busby & Rendle (2000) and may be considered by producers.

The development of value added produce has been followed in the academic debate through what is termed as the quality 'turn' or 'turn to quality' in alternative food

research (Goodman, 2003 and Winter, 2003). The turn to quality in the agri- food sector has been seen as a potential answer to the decreasing margins of return seen at the farm gate commonly associated with the conventional agri-food system by facilitating a redistribution of the proportion of economic return away from large retailers and wholesalers back towards producers (Whatmore et al, 2003 and Marsden & Smith, 2005). This turn to quality can take many forms, some of which are highlighted in part by the previous discussion on SFSCs, and comprise: on farm value adding; diversification into novel/high value products (e.g. Rare Breeds etc); and embedding environmental benefits into produce (Organics, permaculture, LEAF).

Governance has not been entirely absent from the quality turn, with the development of formalised regulatory protection for specific types of produce through PDO/PGI certification schemes. These schemes create protected areas of production for goods that have a regional distinctiveness so that only designated areas are permitted to use what is, effectively, a trade name (Ilbery & Kneafsey, 2000a). Many of these products are highly recognisable and even world renowned, such as Parmigiano-Reggiano cheese or Welsh lamb; in certain cases they dictate how the product is made or with what ingredients it can be made. This protects producers in these areas from having their products copied elsewhere and, in essence, secures a market for a specific product from a specific region.

2.4.5: Alternative food chains as environmental goods and ecological modernisers

Another aspect of alternative food supply chains that is relevant to rural development is their potential for providing environmental benefits; specifically how some of the diversification we see in alternative agri-food supply chains has arisen from adaptations of standardised conventional food produce. When discussing the environmental benefits we need to specify our definition relatively widely to include animal welfare and human health as well as improvements to the quality of the natural environment. It is perhaps not surprising that both actors in agri-food chains and actors whom are involved with agri-food chain regulators have reacted to this, creating a range of differentiated supply chains types and products. Within

alternative agri-food chains we have seen a range of developments the most obvious of which are those where the produce is embedded with environmental qualities which are discernable at point of sale such as the Soil Association logo, RSPCA freedom foods, LEAF mark (Linking Environment And Farming), Fair-trade and the red tractor logo, which are commonly referred to within the literature as private standards (Henson & Reardon, 2005). These private standards allow consumers to make informed choices about the quality of the food they are consuming. However, research has shown that there is a degree of confusion amongst the consuming public as to what some of these labels represent in terms of their environmental, animal or social benefits, which suggests that these types of schemes are ineffective to some extent (Eden et al, 2008). The private standards that have been discussed here are those that are visible to the consumer through branding; there is, however, a second form of private standards which have been increasingly mediated by private companies, most notably the multiple retailers and agri-food wholesalers, who have created an array of private standards to mediate their supply chains thus imposing regulations upon their producers in order to standardise products across many producers (Gereffi & Lee, 2009).

Actors of agri-food chain governance have engaged with some of the issues regarding the environmental sustainability of agri-food chains and have done so in a number of ways. However, this has not been achieved in a cross cutting manner, with the lack of environmental conditions attached to PDO/PGI status for products being a good example of where economic interests of producers have primacy without any environmental conditionality. Despite the lack of cross cutting policy agendas, some key aspects of the agri-food chain governance should be considered. It is important to distinguish between governance-centric initiatives and governance-support initiatives. Governance-centric initiatives are those initiatives which have been designed to provide a regulatory framework as a solution to the perceived environmental externality. Many of the regulatory frameworks are designed to enforce a minimum level of regulation (such as food standards); however, those more applicable to alternative food chains tend to be optional governance-support schemes designed to either attract a premium for the produce or to pay directly for the environmental

public goods that are created as a result of certain land use management options. Excellent examples of this can be seen within the organics sector where voluntary certification provides a premium to producers for the produce they sell whilst, at the same time, attaching environmental conditionality as to how that produce has to be grown/raised in order to qualify for certification.

Although not strictly considered as alternative food chains by the literature, it is worth considering government driven voluntary schemes such as Tir Gofal in Wales and the Higher Level Stewardship scheme in England. These schemes, which fall under axis 2 of the respective Rural Development Plans, involve producers signing up to a range of conditions regarding the way that they manage and use their land including habitat creation, restrictions on the use of pesticides and reductions to stocking levels (see: WAG, 2008). In return the state pays an amount to the producer; in effect the state is paying for the public good of enhanced environmental land management practices. Although this information is never shown on the packaging of produce sold to the consumer, those producers who have chosen to enter into particularly the higher level schemes have, by virtue of their participation, embedded a higher level of environmental quality into that produce which is not currently adequately reflected at the point of sale, albeit that the farmer is being compensated for this by the state.

These adaptations in how produce is grown, raised and branded to reflect higher environmental standards of production and, in turn, achieve a higher return at the point of sale (where applicable) are still rooted within the concept of economic return for higher value goods. There is an intrinsic value being added to these types of food that imbues them beyond simple food commodities into value products that carry information not only about taste or quality but also about the provenance of the produce. What is unclear, however, is whether these schemes are effective in providing higher economic return for producers in the long term. Furthermore, there is a question as to whether these types of schemes assist in transforming agri-food systems towards a more sustainable model of production.

2.4.6: Critique of alternative food supply chain research

Research into alternative food chains alludes tantalisingly to a series of benefits that can be derived from alternative food chains over their more conventional counterparts. What is unclear is how these benefits are best maintained and developed so as to engender a transition towards greater resilience within regional, national and global agri-food systems. 'Sustainability', like 'local', is a plastic word defying any certainty in its definition. When we as academics seek to frame our research with terms such as 'local' or 'sustainable' we attempt to define these terms into something that is measurable, often partitioning off one element of the meaning so that it may be analysed within an appropriate empirical context. This partitioning can be seen to have occurred in much of the agri-food literature for obvious reasons; however, it has served to make it unclear what suite of options is best able to deliver sustainable rural development coupled with a sustainable agri-food system. This challenge is further obfuscated by debates surrounding international free trade and the benefit of developing nations trading produce overseas, as is clearly seen in DEFRA's Food 2030 report (DEFRA, 2010) and some of the GVC literature (see: Swinnen & Maertens, 2007 or Humphrey & Memedovic, 2006) where there is a strong interplay between national and international concerns regarding the agri-food system. What are ultimately required are new frameworks and methodological approaches that allow for more nuanced, but nevertheless rigorous, framings of 'sustainability' and 'local' within the context of both regional and globalised aspects of the agri-food system.

One of the questions that then strikes at the heart of the issue of developing a suitable methodological framework then becomes: what is the appropriate spatial locus for study? Agri-food research with loci situated at the farm or business level analysis is imperative for acquiring a greater understanding how different types of business may acquire measures of resilience or what their benefits might be towards improved sustainability in agri-food sector. The next level for the loci of research would be to investigate regional level supply chains for which there has been some useful work already undertaken (Ilbery & Maye (2005), Gorton & Tregear (2008)

and others). Here there is a need to consider how differing supply chains are constructed, mediated and governed which is alluded to by the work of Gereffi et al (2005) and other academics using the GVC theory – albeit that up until now the GVC theorists have tended to concentrate on transnational and global supply chains. GVC theory asks an important question when considering both alternative and conventional food supply chains insofar as are alternative supply chains better configured to retain a higher value of agri-food products produced in a region within that region than conventional supply chains?

Supply chain analysis does not, however, assist in understanding how various sectors within a region are combined together to create the fabric of the wider agri-food sector within that region. When considering the regional perspective we can then begin to contrast between the alternative and the conventional seeking to acquire a greater understanding of what each provides a region in terms its local economy as well as understanding whether the pressures faced by comparable sectors are similar within the same geographic region.

Additionally, there appears to be a kind of developmental trajectory of local food produce that seems to end at locality food stuffs (i.e. branded goods) which end up in retailing distribution networks, for example in Extended SFSCs. Jones et al (2004) suggests this is the only way that local food will become mainstreamed (i.e. through the large multiple retailers and wholesalers). However, we have to be cautionary of this point of view with Smith's (2006) study of the evolution of the organics sector suggesting that the inclusion of that sector meant a return to the cost price squeeze for organic producers. Smith's argument would be backed up by GVC theory as it would suggest that the market in organic food products shifts away from a market based value chain towards one of the other four types of GVC, all of which include higher degrees of power asymmetry between buyers and suppliers.

The underlying dynamics of the international agri-food market are fundamentally flawed, favoring quantity at lowest cost and through the continued 'race to the bottom'; placing producers in states with higher quality and food safety regulations at

a competitive disadvantage in the open market. This is largely ignored by the march of the alternative food literature which engages with this, if at all, as part of the problematic narrative of the conventional agri-food system that contextualises alternative food supply chains. The alternative food literature's approach to dealing with this challenge clearly suggests that the further creation of higher level quality food products be these: organic, artisanal or simply just locally produced, will carve out enough niche markets to protect the agricultural sectors in the peripheral rural areas in developed nations. Given this, we might wonder what the future may be of the traditional standard commodities chains which feed the vast majority of the society?

2.5: Agri-food paradigms and the broader perspectives on agri-food systems

This section of the literature review investigates the broader theoretical perspective of agri-food paradigms and how these different paradigms suggest their own range of options for how agri-food systems can be transitioned to address the multifaceted challenges they face. These agri-food paradigms have been discussed in a number of ways but broadly they focus on the nature of ideas and theories surrounding not just agri-food systems but also the wider issues and land-use in rural areas and the role of the state. Agri-food paradigms should not be seen just as purely academic devices that contextualise the various debates and themes in agri-food research but also as a way to understand some of the wider unfolding developments in policy, technology and the evolution of global food production. This section will discuss the nature of each agri-food paradigm in turn.

2.5.1: Productivist and Post-Productivism Paradigms

The agri-food paradigms have evolved over time with the first of the paradigms being the known as the Productivist paradigm. The Productivist paradigm emerged as a concentrated field of agri-food research during and immediately after World War II (Morgan and Murdoch, 2000). The Productivist paradigm examines rural spaces from

a purely agricultural productivity perspective, seeing rural spaces as nothing more than areas in which food can be produced. This paradigm gives primacy to the increasing industrialisation and expansion of the agricultural sector (Ward et al, 2008) and is where support from the state for producers is dependent upon volume of output (Lowe et al, 1993). This led to what Halfacree (1997) argues as being 'agriculture's hegemonic position in the countryside' (ibid, p.71), which is a reflection of the wider agricultural exceptionalism adopted by policy makers (Stogstad, 1998 and Newby, 1985). Agricultural exceptionalism posits that the agricultural sector is unlike any other sector and, as such, warrants special attention from policy makers. The two central rationales given for agricultural exceptionalism are, firstly, that producers are subject to factors which are uncontrollable and unique to the agricultural sector (citing variable climatic conditions and imperfect market configurations as examples of this) and, secondly, that a secure food supply with stable food prices is important for the national interest of states (Stogstad, 1998 and Daugbjerg & Swinbank, 2008).

During this era of agricultural hegemony, agricultural land uses received immense support from the state not only in terms of the financial assistance but also by virtue of their exemption from planning controls to which other sectors had to adhere (Halfacree, 1997). The dominance of the Productivist view of rural areas was largely intertwined with the 'Green Revolution' in agriculture which improved productivity through intensive research into plant science, developing new strains of crops and animals with beneficial productivity traits, along with advances in fertiliser, pesticide and herbicide technology (Hedden, 2002 and Tilman et al, 2002). It should be noted, as a paper by Evenson & Gollin (2003) shows, that these advances led not only to increased productivity in the developed world, but were also diffused into the developing world, lowering average food prices and lifting daily average calorific intake, and so could be seen to have provided benefits globally rather than just in the developed world.

The advances tied to the Productivist paradigm and the resultant benefits were, however, not without complications. In the 1970's evidence of these began to emerge with *Silent Spring* by Rachel Carson (1962) showing some of the

environmental damage that was being wrought by the intensive measures used in agricultural production (Mellenby, 1975). Further challenges to the Productivist paradigm occurred as a result of a loss of consumer confidence in the 'dirty business of intensive farming' (Marsden, 2003, p.93,) due to disease outbreaks such as Bovine Spongiform Encephalopathy (Smith et al, 1999) and the over production of agricultural goods, particularly within the European Union (Walford, 2003). The result of these pressures is a change in the emphasis of what rural areas are for, moving away from being seen as solely spaces for food production towards spaces of consumption and a movement into what some academics have termed the Post-Productivism paradigm.

The Post-Productivism paradigm, as its name suggests, is a paradigm that evolved effectively after the Productivism paradigm fell out of favour, with references to the paradigm occurring in the early 1990's (Mather et al, 2006), and is particularly situated within an EU and, to lesser extent, other economically developed countries' perspective. Wilson (2001) provides an excellent overview of the differing dimensions between the Productivist and Post-Productivist paradigms however the central difference between the two paradigms, other than the loss of agricultural exceptionalism, is what has been referred to as the 'contested countryside' (see: Cloke & Little, 1997). The concept of a 'contested countryside' argues that the migration of middle class urbanites into rural areas has led to a re-shaping of economic and social relations in these areas into an urban image of rurality (Wilson, 2001) resulting in challenges to farmers' authority, particularly in relation to land access, farm pollution management and transport infrastructure usage (Meerburg et al, 2009). The next two subsections will discuss the final two paradigms, these being: the agri-industrial and rural development paradigms.

2.5.2: The Agri-Industrial Paradigm

The Agri-Industrial paradigm is a paradigm which emphasises that science and technology can overcome the problems of long term sustainability in the agri-food sector whilst continuing to produce ever greater amounts of higher quality food. As a

paradigm, the Agri-Industrial paradigm can be seen as a perpetuation of the Productivist paradigm insofar as it espouses technological development as a means to overcome what Marsden (2003, p.5) terms as the 'vagaries of nature' whilst maintaining or improving agricultural output (Darnton-Hill et al, 2004). The Agri-Industrial paradigm is often used as a counter point by academics focusing on Rural Development (see for example: Marsden et al, 2001) and Post-Productivist paradigms (see for example: Marsden, 2003 and Cocklin et al, 2006). Agri-Industrial paradigmatic research can be aligned with other academic research communities and traditions such as economics, logistics and biotechnology research. Reports such as The Royal Society (2009) report on the 'sustainable intensification of agriculture' is a good example of research work that would fit within the auspices of the Agri-Industrial paradigm. It is, of all the paradigms, the one which is most highly aligned with the current corporate and overall geopolitical interests in the agri-food sector (Cocklin et al, 2006).

The Agri-Industrial paradigm is perhaps best understood from an examination of how exemplar technologies and practices of this paradigm address the increasing challenges in the agri-food sector. One of these central challenges is that of global food security, for which Khush (2001) and Hedden (2002) identify the use of genetic engineering/modification as having a central role in meeting this challenge. Khush (2001) argues that genetic modification is simply an extension of the original cross-hybridisation techniques used during the Green Revolution. However, as has already been stated, the agri-food sector is not only faced with the problem of increasing yields for an increasing population, but also needs to address the growing obesity crisis in developed nations, the rise in non-communicable diseases and environmental degradation as a result of agricultural practices amongst others, to which the Agri-Industrial paradigm provides further potential technological fixes.

In terms of nutritional and health challenges, Chadwick (2004) helps us distinguish between two strands of growing research linking the genetics of humans to the genetics of the foods we consume. The first strand, known as Nutrigenomics, investigates the relationship between specific nutritional elements of the diet and

how this affects the incidence of dietary related illnesses. The second is Nutrigenetics which looks at how individual differences in humans affects the response to diet and, in the long term, may lead to personal dietary advice (Chadwick, 2004). This can further be linked with the supply side developments in biotechnology and, in particular, bio-fortification of crops to improve the abundance of essential minerals which, as White and Broadley (2005) indicate, may help combat poor nutritional intake of these minerals in diets.¹

Precision agriculture represents another type of exemplar of the Agri-Industrial paradigm, which has evolved out of advances in various remote sensing technologies and, in its broadest sense, seeks to reduce inputs into the farming system through the more effective targeting of fertiliser, pesticides and water (Bongiovanni & Lowenberg-DeBoer, 2004). The use of precision agriculture spans all the major agri-food production systems including arable, meat, dairy and orchard growing (Gebbers & Adamchuk, 2010 and Aggelopoulou et al, 2010).

When considered as a group, the exemplars of the Agri-Industrial paradigm exhibit two common traits. Firstly, they all represent the harnessing of technological and scientific developments to address the externalities and challenges that exist in the current global agri-food regime. Secondly, these exemplars represent patentable or marketable products which enables their diffusion to be controlled either by intellectual property right legislation or through large capital outlay required for remote sensing equipment. These protections foster innovation and research, because of the potential commercial revenue streams they can develop for the investors, but also have the potential to create a preclusionary environment which benefits those with the capital to invest and further reinforces capital lock in within certain farming communities (see Petty, 2001 p.254).

¹ Golden rice has been a recent example of bio-fortification that has received academic and popular press comment is golden rice, which has been designed to ameliorate vitamin A deficiencies in developing countries (Tang et al, 2009 and Sanders, 2013).

2.5.3: Rural Development Paradigm

The Rural Development paradigm has evolved as a paradigm in answer to the conflict and pressures that the agricultural modernisation of the Productivism paradigm had been seen to cause (van der Ploeg et al, 2000) and offers a radically different vision for the future development of rural areas and agri-food systems. Much of the alternative food literature discussed in Section 2.4 is in part rooted within the paradigm of Rural Development.

The Rural Development paradigm contrasts radically to the Agri-Industrial paradigm's position on the future development of agri-food systems (Marsden, 2008) and comprises many aspects which are both multi-level, actor and faceted in nature (van der Ploeg et al, 2000 and 2008). Whilst the Rural Development paradigm extends in many respects beyond the agri-food system into other areas important to the sustainable development of rural regions including: non-agricultural enterprises (Slee et al, 1997), wider environmental management and land access (Marsden, 2003); it can also be seen as reconfiguring the agri-food system, in particular at the primary producer level, towards a more sustainable system of production (Marsden & Sonnino, 2008 and van der Ploeg et al, 2008). One of the central aspects of the paradigm, which was highlighted in early papers on Rural Development such as van de Ploeg et al (2000), was the concept of synergistic relationships and activities both internally within individual farm holdings, between farms and other actors in the agri-food sector. This concept of synergy rapidly evolved into a wide conceptualisation of the multifunctional potential of rural landscapes, which played a role in the European Union's (EU) negotiating position at the WTO negotiations insofar as it provided the EU with a position from which to negotiate the need for state led support of the agriculture sector whilst not infringing upon WTO trade distortions rules regarding subsidies and tariffs (Renting et al, 2009).

Multi-functionality is a major component of the Rural Development paradigm's perspective of re-shaping the agricultural sector (van de Ploeg et al, 1990). Multi-functionality, in terms of agriculture, recognises that farming does not simply produce

food for us to consume but that it also provides a range of other functions such as landscape value, environmental benefits, cultural heritage and food safety (Belletti et al, 2002). Furthermore multi-functionality also recognises that increasingly farm households are turning to non-farm related activities to mitigate the cost-price squeeze in the conventional agri-food markets (Marsden & Sonnino, 2008). Marsden & Sonnino (2008) argue that for any activity/enterprise to be considered to represent multi-functional activity then it must add value in order that it contributes to constructing a sustainable agricultural sector which will deliver rural development benefits. Whilst ideas of diversification and revalorising land use are not new concepts, Marsden and Sonnino (2008) argue that it is within the Rural Development paradigm that multi-functionality draws its 'most comprehensive meaning' combining all of the various elements that contribute towards it being way of engendering sustainable rural development.

Belletti et al (2002) distinguish between commodity (produce) and non-commodity outputs of agricultural production and argue that multi-functionality becomes a policy issue where the non-commodity goods exhibit the traits of public goods which are typically not being accounted for within the normal operations of a free market economy. In this way we can see elements of Welsh Assembly Government² policy as displaying support for this idea of multi-functionality through the Tir Cynnal, Tir Gofal and the more recent Glastir environment schemes which pay for environmental improvements and greater land access as public goods under axis 2 of the 2007-2013 of the Rural Development Plan (WAG, 2008). Furthermore, we can see that there is also support for Marsden & Sonnino's (2008) notion of adding value through the Processing and Marketing Grants scheme which provides support to producers to add value to standard agricultural outputs and diversify their business (WAG, 2008).

² Welsh Assembly Government was renamed the Welsh Government in May 2011 (BBC, 2011). The thesis uses the nomenclature in place at the commencement of the research throughout in order to avoid confusion.

2.5.4: Reflection on agri-food paradigms

The agri-food paradigms not only provide us with a useful historical perspective to explain the rationale for the changing nature of agriculture, food production and the development of rural areas, particularly in developed nations, but also provide the theoretical framework and grounding for future transitions within the agri-food sector. The Agri-Industrial paradigm is a clear extension of the Green Revolution and is generally still Productivist in its focus; whereas the Rural Development paradigm considers the dynamic between the agri-food sector and the development of wider rural areas. Conversely the Rural Development paradigm has perhaps engaged less with some of the wider issues of sustainability in the agri-food system (such as diet, the spread of non-communicable diseases related to poor dietary health and food security/sovereignty debates) for which, as has been discussed, there are exemplars of potential solutions within the Agri-Industrial paradigm frame of research. Ultimately, it is clear that none of the paradigms offer a clearly defined set of solutions to the multifaceted challenges, which is reflected within the policy dynamics of the agri-food industry with the DEFRA Food 2030 strategy (DEFRA, 2010) showing elements of both the paradigms' dynamics within its writing.

If we accept *prima facie* that the Rural Development paradigm offers a more sustainable suite of solutions than the Agri-Industrial's technologically driven approach, then it is important to reflect more deeply upon the short comings of the Rural Development paradigm's current purview and develop an understanding of where improvements to the theoretical and empirical basis of the paradigm are required. The first critique stems from the paradigm's apparent dualism of conventional and alternative agricultural sectors which provides some unhelpful limitations upon the focus of the research. The paradigm, in terms of productivity of the agriculture sector, espouses a range of solutions to the pervasive issues within the conventional food sector which are broadly defined as alternative food supply chains (Goodman, 2003). This literature, as has already been discussed, has a predisposition towards what has been termed the 'turn to quality' (Winter, 2003)

where diversified value-added produce provides a solution to the decreasing margins of return experienced at the producer level but has rather ignored the continued pressures that have been placed upon the conventional production sector. There also seems to be a lack of analysis regarding the inter-linkages between producer, processor and retailer and how these effect rural economies. Moreover, there is a need to ensure that we have a sustainable conventional agri-food sector which is aligned towards many of the ideals espoused by Rural Development researchers; however this requires further investigation and theorisation.

One further issue with the agri-food research, as Lockie & Kitto (2000) argue, has been the subtle division that has occurred within the field between agricultural sociologists, who focus their attention on the productive side of agri-food systems and its impacts on rural areas, whereas other sociologists focus on the consumption side such as dietary and food cultures. This artificial division in research interests, whilst necessary at some levels of analysis, poses a significant challenge towards developing a broader theoretical and conceptual understanding of a sustainable agri-food system.³ This will require an appreciation of the symbiotic link between these two spheres and how governance can assist in forging sustainable linkages between them.

2.6: Conclusion

This chapter has investigated a range of literatures that address, in one way or another, some of the challenges faced by agri-food systems and some of the significant gaps in these literatures. The research field is necessarily broad and diverse in its approaches and constructions given the breadth of empirical phenomena that agri-food systems provide. This review chose to focus on research that deals with understanding agri-food supply chains through the global value chains and alternative food supply chain literature but also extended into the broader

³ This disconnect between consumption and production in terms of sustainable agri-food systems, whilst important, is not something that this thesis investigates but nevertheless is an issue that the author wished to raise.

paradigmatic debates that discuss the potential transitional futures for agri-food systems development.

The literature review began with a discussion of agri-food supply chains. It started with ideas from Global Value Chain (GVC) theories that help to describe the power relationships that occur between actors within a supply chains. GVC discourses do not see supply chains as being open market buyer-seller relationships but as co-ordinated chains of interactions that occur by virtue of key agents within these supply chains. These key agents, or lead firms, exert control on the other actors in the chain and this potentially goes some way to describing why certain agri-food supply chain configurations have led to excessive pressures being placed on producers/processors. What GVC research does not, however, explain are a number of issues pertinent to agri-food systems including: whether there is a differentiation in the types of GVC seen in a particular sector within a particular region, how such differences occurred and what the interplay between different GVC's in the same sector might be. Furthermore GVC research lacks the ability to discuss how supply chains are influenced by external factors such as disruption to supplies, development of new technology or changes in external aspects such as public policy or market preferences, which are significant aspects of agri-food systems.

On the other hand, the literature on alternative food networks shows the profusion of different types of agri-food supply chains that have emerged in response to the pressures of the conventional agri-food industry over the past 50 years. These alternative supply chains in one form or another seek to challenge the conventional agri-food system by providing economic, social and/or environmental benefits. To achieve their aims these alternative supply chains re-configure producer-processor-retailer-consumer relationships, either by shortening them in actuality or through standards/product information, in such a way as to allow the consumer to connect with the provenance of the produce they are consuming. The salient issue identified in this research is whether and how these alternative supply chain configurations can be diffused through an agri-food system within a region to provide greater sustainability to the wider regional agri-food system.

Overall, the aspects of supply chain orientated research that are not clear from the existing research are: firstly, what are the pre-dominant and diverse types of supply chains that arise in the agri-food sector of a particular region? Secondly, to what extent do these differentiated types of supply chains interact, co-exist and co-evolve within a particular rural region and as such form the regional agri-food system that also requires further investigation? Thirdly, are these combined regional systems becoming more dependent upon the particular spatial, institutional and bio-physical characteristics of the region itself, and thus aiding wider socio-technical transition processes?

The agri-food paradigms discussed in section 2.5 provide a series of debates as to how agri-food systems and rural regions can be transformed to meet the challenges these systems face. However, how these solutions are played out within a particular agri-food region need not necessarily be exclusionary in nature. Different aspects of the evolution of regional agri-food systems in a particular rural region could possibly be attributable to the Agri-Industrial, Post-Productivist or Rural Development paradigmatic ideas. The more poignant questions that then arise are: in what way are the agri-food systems within a particular rural region evolving; and, to what extent do these transitions represent beneficial or detrimental shifts in their overall stability?

What appears to be missing from the research on agri-food systems is an approach that allows for the juxtaposing of the conventional and alternative food supply chains within the same region in such a way as to understand how the alternatives came about and what, if any, interaction exists between the conventional and alternative supply chains (for example, such as a diffusion of alternative ideas/practices). Any regional level, agri-food system analysis requires a framework that allows a comparison not just between alternative and conventional but also between the alternatives themselves, in such a way that it provides a means of assessing both the uniqueness of the alternatives and what it is that makes each

alternative different⁴. Furthermore, whilst the agri-food paradigm literature suggests a range of ways in which agri-food supply chains, systems and the regions may transition to address the issues they face, the research appears to neglect how the various paradigmatic solutions are played out within a single geographic region or regions.

Chapter 3 introduces and proposes the use and critical application of a socio-technological systems approach and heuristic to researching regional agri-food systems. It is argued that its multi-level perspective and transitional approach to systems is well suited to investigating the temporal-spatial nuances and facets of regional agri-food systems as the following chapters will show.

⁴ Just how alternative is alternative if you will.

Chapter 3

The socio-technological systems framework and conceptualising agri-food

3.1: Introduction

In the previous chapter a review of the global value chains, alternative food supply chains and agri-food paradigms literatures was presented. Core arguments were developed around the utility of the juxtaposition between conventional and alternative food supply chains in terms of considering sustainability within agri-food supply chains/systems. These arguments focused on: the emphasis that the alternative/local/locality food literature places on the production and consumption elements of the food system to the exclusion of ‘middle’ elements of the supply chain⁵, the lack of attention that the Rural Development paradigm gives to the conventional agriculture sector, whether alternative local food chains can challenge or change the conventional system and, most importantly, the significance of regional over local framings of agri-food systems.

This chapter will introduce the Socio-Technological Systems framework as an alternative heuristic device for conceptualising agri-food systems, including conventional and alternative food supply chains. Firstly this chapter will commence by introducing the Socio-Technological Systems framework and its core elements of the multi-level perspective and transitions. The chapter will then progress onto reconstructing agri-food systems within the framework and, more specifically, will place the conventional, local and locality food sectors within the multi-level perspective. This chapter intends to offer a basis upon which the appropriation of the Socio-Technological Systems framework, with certain refinements⁶, provides a means to address the problems set out in Chapter 2.

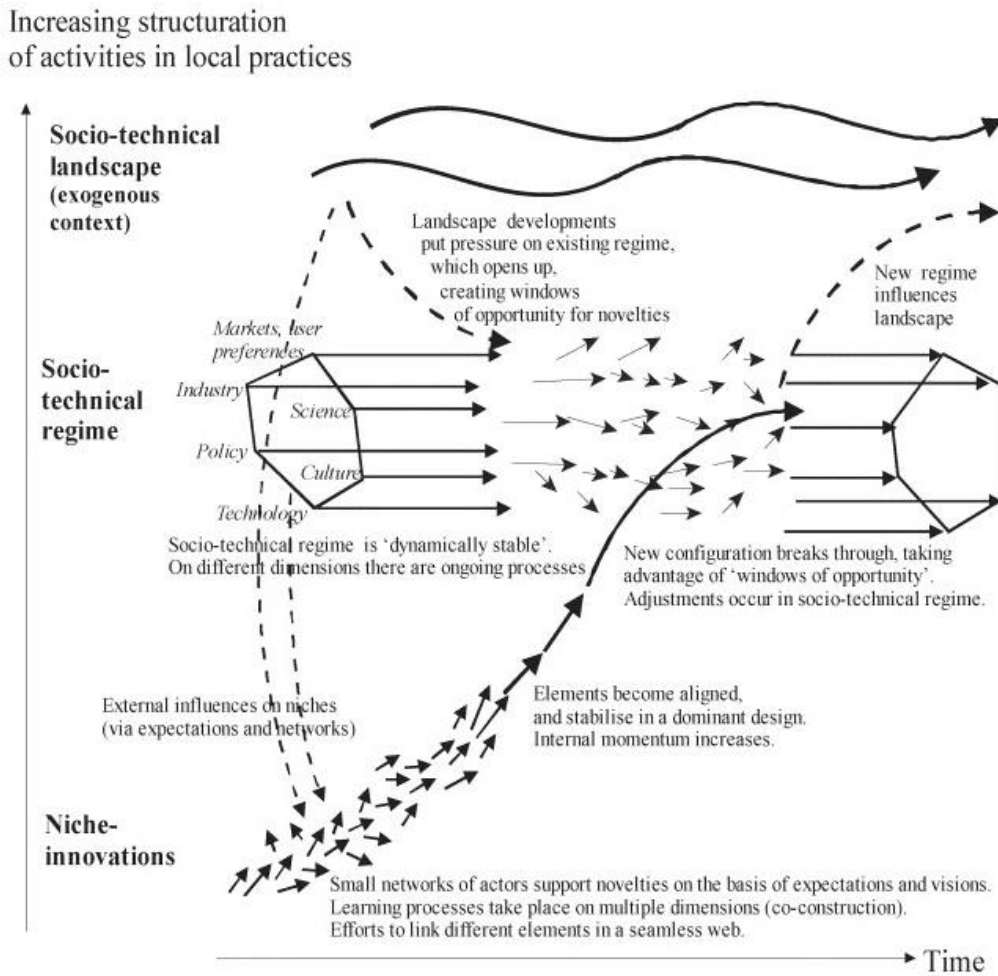
⁵ Namely: processing and wholesaling.

⁶ Namely: the addition of biophysical as an element to the ST constellation of elements and adding geographically defined levels to the idea of nested regimes within the multi-level perspective.

3.2: Socio-technological systems framework

The systems transitions framework, as developed by Geels (2002) and Geels & Schot (2007), evolved out of the 'evolutionary economics and sociology of technology' (Verbong & Geels, 2007, p.1026) and the strategic niche management literature which is interested in how new technological innovations can be diffused from small scale niches into the wider system (Lovell, 2007 & Berkhout et al, 2004). The key element of the systems transition framework is that of the multi-level perspective (MLP). The MLP is split into three distinctive analytical levels: the landscape, regime and niche elements. The MLP is best discussed within the context of Figure 3.1 which is from Geels & Schot (2007) adapted from Geels (2002). Figure 3.1 essentially shows that the MLP is a hierarchical perspective with the socio-technological regime at its core, an exogenous socio-technological landscape above this and multiple socio-technological niches below the regime, the elements of which will be defined in the following sections of this chapter.

Figure 3.1: The Multi-level perspective on system transitions



Source: Geels & Schot, (2007)

3.2.1: Socio-technological regimes

Systems change and evolve over time and it can often appear that advances in technology alone govern the nature and pace of these changes; however this is not necessarily the case (Geels, 2006). Initially the idea of socio-technological regimes evolved out of an interest in understanding how new technologies were created, innovated and eventually adopted (Geels & Schot, 2007 and Smith et al, 2005). These early technological innovations studies and strategic niche management research have, however, over time been seen as a research tradition that is too focused upon technology development and not sufficiently sensitive to the wider contexts of regime development (Lawhon & Murphy, 2012). Smith and Stirling (2008) state that there is a risk, with a focus on technological systems, of falling into 'technological determinism' (ibid, p.10) and consider that socio-technological systems research needs to

acknowledge that a wider constellation of elements, including: policy, science, industry actors and wider society through cultural and market demands, help shape the processes of innovation (Rip & Kemp, 1998 and Geels & Schot, 2007)

In response to these critiques, rather than observe system development from a purely technological innovation perspective, the Socio-technological systems framework takes a wider approach incorporating an analytical lens which embeds the technological element of systems together with other elements that a particular system comprises to form a constellation of elements (Smith et al, 2005). In part this is embedded into the concept that regimes are described as being 'socio' as well as technical in nature, which acknowledges that there is a wider constituency of actors including policy makers, NGO's and customers, rather than just engineers and technologists, who shape the nature and evolutionary trajectories of socio-technological regimes (Geels, 2007 and Hodson & Marvin, 2010)⁷.

Socio-technological regimes are the central element of the MLP and are characterised as being constellations of elements as Figure 3.1 shows. The actors conceptualised in the constellation of elements comprise those from industry, policy and science arenas as well as consumers and society at large (Verbong & Geels, 2007 and Geels, 2002). Additionally, socio-technological regimes are also constructed around the accepted norms, cultural practices and rules that govern all aspects of a regime including the 'normal development and use of technologies' (Smith et al, 2005, p.1493 and Rip & Kemp, 1998).

Firms that comprise the industry aspect of the socio-technological constellation of elements can be seen as being one of the central actor groups within a socio-technological regime by both shaping and defining the key logics of how a particular socio-technological regime operates. However, these firms should not be seen as being homogenous in their construction as firms may also be responsible for the transitions as they develop along differing trajectories in response to external

⁷ This thesis takes the wider constituency of actors into account in its methodological approach by using a stakeholder's interview phase as part of empirical data collection. This is discussed further in chapter 4.

landscape pressures⁸ (Karlton & Sandén, 2012). These elements, as shown in Figure 3.1, are combined into particular arrangements and interrelations that define the nature of a system or systems.

Regimes are stable but not necessarily static; that is to say that there can be a degree of change or adjustment within the regime's dynamics/actors without necessarily changing the overall robustness of the regime and, in this way, socio-technological regimes are dynamically stable constellations allowing for incremental adaptation and change (Geels & Schot, 2007 and Bergman et al, 2008). The reason for this dynamic stability is partly due to inertia, which is a key aspect of socio-technological systems theory as it proposes that incumbent firms (situated at the regime level) do not consider the full range of available options for change/innovation open to them (Karlton, K. & Sandén, 2012). Instead these incumbent firms focus their efforts along pathways of innovation and development that are locked into 'a prevailing technological paradigm' (ibid p.68, and Dosi, 1982). Part of this inertia results from what Smith & Stirling (2008) argue is that: 'Some socio-technological systems are embedded more robustly than others, in the sense that they enjoy greater institutional support, larger economic significance, more supportive infrastructures, better integration with other social practices, and broader political legitimacy' (ibid p.7). Furthermore, the incremental adaptations seen in socio-technological regimes are deemed to be path dependent because they 'tend to be steered by the interests, values, cognitive structures and problem-solving routines prevailing in the incumbent regime' (Smith et al, 2005, p.1500).

In a sense socio-technological regimes exist as a set of rules (which include both formal and normative rules) that govern regimes and provide a stabilising effect on the use of existing technologies as well as assisting in defining the future trajectory of technological development (Geels, 2005b). The interaction between actors in a regime

⁸ There is a question here, however, as to whether, where a firm deviates slightly from the given rules/norms of the regime and innovates in some way, this action represents an incremental adjustment to an otherwise dynamic regime configuration or the creation of a niche innovation as a consequence of the firm leaving the domain of a socio-technological regime. The answer depends on the extent to which the aforementioned innovation is predicated upon the regime's existing logics and hence part of path dependent innovation within a regime. This aspect is discussed further in section 3.2.3 on the niche level of the MLP.

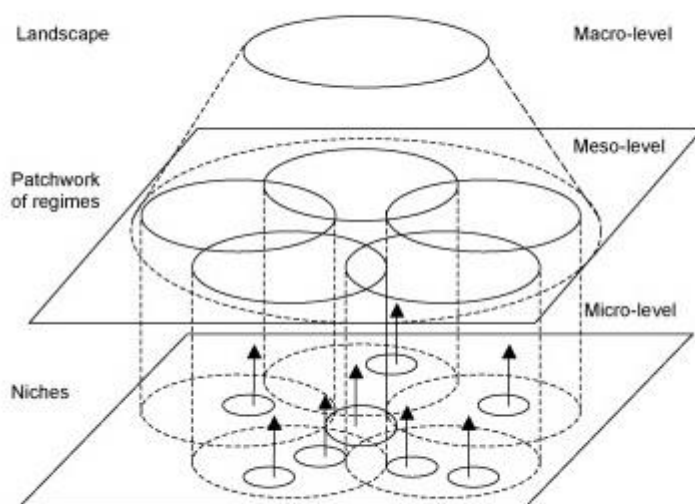
and the regime's rules should not be seen as one of 'passive rule following' but instead comprises a range of behaviours, including creative application and interpretation of these rules, to meet local conditions (Geels, 2005b p.77). The rules that govern socio-technological regimes also have a constraining property in that they make some actions, inter-linkages and configurations that deviate from the accepted rules and norms more difficult to undertake, in part defining the nature of the regime's dynamic stability.

Given the embedded nature of socio-technological regimes and the rules or 'logic' that defines them, we can see that regimes do not simply come into being but instead are predicated on previous regimes' configurations. These prior configurations dictate the direction and future configurations of newer regimes (Konrad et al, 2008) which, in the case of agri-food regimes in Europe, means that these have their roots in the modernisation projects that emerged from the 1950's onwards (van der Ploeg, 2004). Van der Ploeg et al (2004) argue that this has meant that agricultural businesses have increasingly become disconnected from the locally embedded aspects that once shaped their regimes including 'local eco-systems, local knowledge, local skills and craftsmanship, local specialities, local social relations and cultural repertoires, regional town-country relations and the economic relations embedded in them' (ibid, p.5). There is however one point that cannot be escaped, which is that whilst agri-food businesses may have become increasingly disconnected from some local factors they are nevertheless still located in the same localities. Consequently, understanding how these businesses and the socio-technological systems in which they are embedded are able to re-shape aspects of these localities is nevertheless still key in understanding rural development processes.

It is important to note that regimes can operate over a range of empirical scales. Using the electricity industry as an exemplar Smith et al (2005) explain the difference between the large scale generating regime, typified by a centralised alternating current grid system, and the individual regimes of different power generation technologies (e.g. coal fired and hydro-electric generation). There is not, therefore, necessarily a single socio-technological regime operating at a given spatial or empirical

level of an overall system, thus resulting in a patchwork of nested regimes as indicated by Figure 3.2 from Genus & Coles (2008). Figure 3.2 also alludes to a critical element of the socio-technological systems theory, which is the interplay between the wider landscape, niche and regime levels and how interactions between levels might bring about transitions in the regime (Geels, 2004). One of the issues with this concept of a patchwork of nested regimes from a practical perspective is that ‘attempts to capture the interplay of multiple regimes accentuate the methodological problems of identifying the boundaries and interplay of regimes and sequences of transformation within the multi-level perspective’ (Lauridsen & Jørgensen 2010, p.393).

Figure 3.2: Multiple level perspective as a nested hierarchy



Source: Genus & Coles, (2008) as adapted from Geels, (2002)

In discussing the delimitation of regime boundaries in the German utility sector, Konrad et al (2008) propose several potential empirical boundaries⁹ within which socio-technological regimes could exist for that sector. What Konrad et al (2008) eventually settle on is the argument that a regime exists where there is a sufficient ‘density and strength of couplings between the elements of socio-technological (ST) configurations’ (ibid p.1193). Konrad et al (2008) also go on to explain that boundaries between regimes exist when the couplings between elements, such as networks, institutional actors, rules and technologies are more alike within a particular system

⁹ As individual utilities (gas, water) or as an overarching regime of all German utilities or as specific technologies such as nuclear or wind.

than outside it, which provides a potential basis of delimitation of regimes¹⁰ as well as the interplay between them. One or more regimes may, therefore, share some couplings (for instance it may share an institutional actor such as the National Farmers' Union) but not necessarily be part of the same socio-technological regime. In the context of regional agri-food systems, it is necessary to analyse the constituent linkages/couplings that exist in the system to determine whether one or more regimes exist. These regimes may be split along multiple lines (organic-non organic, livestock based-plant based, product based etc). This idea, that a density of couplings between the elements of the ST regime's constellation can be used as a means to de-limit where a regime exists and thus show how different regimes within a wider sector/system interact, addresses the concerns of Lauridsen & Jørgensen (2010) set out in the previous paragraph by arguing that regimes must have a degree of internal consistency within their ST configuration that is greater than the wider system's. Although this section has touched on the idea of spatiality and regimes, this has been dealt with in further detail, with respect to agri-food socio-technological systems, in section 3.3.1 below.

3.2.2: Socio-technological landscape

This section discusses what is meant by a socio-technological landscape. It introduces the concept and highlights the interplay between landscape, as a level of the MLP, and the other levels of regime and niche. These interactions in the context of agri-food systems and between the landscape and regime levels particularly are discussed later in the chapter when reflecting on the spatial nature of socio-technological systems.

Geels & Kemp (2007) describe the use of the term 'landscape' in the MLP as a 'metaphor used to emphasise the large-scale material context of society, e.g. the material and spatial arrangements of cities, pervasive technologies that affect all of society' (ibid p.443) and it is in this way that these elements are seen as exogenous to the regime. The landscape level represents a range of phenomena including: the global economic climate, cultural values, environmental problems and scarcity of

¹⁰ However we should be aware that the boundaries between nested regimes are likely to be fuzzily defined.

resources, as well as 'the large-scale material contexts of society' (Geels, 2005b, p.79) which include infrastructural elements such as highways, water systems and electricity grids and the location and disposition of cities. There are, according to Geels (2005b), two types of landscape change: the first represents the slow gradual shifts that occur as a result of demographic and societal changes whereas the second comprises more rapidly occurring phenomena such as natural disasters, war and economic shocks e.g. stock market crashes or commodity price fluctuations¹¹.

In essence the landscape level of the MLP represents aspects of the world outside the control of the actors within socio-technological regimes which nevertheless can either exert pressures upon or provide support for the current regime dynamics (Berkhout et al, 2004 and Geels, 2012). Some technological systems become so pervasive in their impact on human endeavours that they become landscape artefacts to other socio-technological regimes, a good example of which is the motor car (Rip & Kemp, 1998 and Smith et al, 2010). In discussing the slow diffusion of renewable technology, Negro et al (2012) cite the embedded nature of incumbent energy production methods within wider economic processes as an inhibiting factor. The nature of this inhibition is that there would be significant ramifications to such a radical change, to the energy production mix, for the wider socio-technological landscapes of human endeavour and thus creating a barrier to entry for wide-scale renewable power adoption (Negro et al, 2012).

Landscape pressures have the potential to de-stabilise the regime dynamic causing it to re-orientate itself (Geels, 2004). Smith et al (2005) state that many landscape pressures exist that can act upon a given regime at a given time, highlighting that there are likely to be 'no shortage of pressures acting on any given regime' (ibid p.1495) and, furthermore, argue that it is not the existence of these pressures which is important but how these pressures are articulated towards a particular regime transition. This articulation results from two elements: firstly, how 'coherently' the pressures are orientated towards a particular change, with Smith et al (2005) arguing that where said pressures are incoherently orientated then these will hamper regime

¹¹ Geels (2005b) identifies oil price shocks but this can easily include any of the globally traded commodities.

transformation and, secondly, that these pressures must also be viewed by actors of the regime in a manner that enables these actors to adapt and elicit a regime level response. Smith et al (2005) couple the idea of 'pressure selection' with the idea of 'adaptive capacity', which describes the ability of a regime to bring the necessary resources to protect itself against pressures the system faces, and make the point that those regimes with less adaptive capacity are likely to be 'subsumed or substituted' over time (ibid p.1496). This idea of adaptive capacity is an extension to the idea that regimes' possess dynamic stability and so is less useful, perhaps, in explaining the regime constellation composition. However, it becomes a more useful tool for future scenario building as it is one of the two sources of leverage for regime transformation, with the other being the articulation of pressures within regime actor knowledge/discourse.

If viable niches exist then landscape pressures can provide an opportunity for these niches to bring about a transition in the regime level dynamics along new trajectories (Geels, 2004). In this way the landscape level aspects are those outside the control of regime and niche actors but nevertheless provide a defining 'backdrop' to a regime, niches and the interplay between them (Geels & Schot, 2007 and Smith et al, 2010). Whilst landscape elements have the ability to create de-stabilising or, indeed, stabilising influences on existing regime configurations, and thus affect the potential of niches to be up-scaled into the regime, they do not have the ability to 'determine the constitution of regimes and niches' (Hodson & Marvin, 2010, p.479).

Finally, Morrissey et al (2013) state that there is a wealth of literature regarding what they term the 'landscape factors of significance to the agri-food socio-technical system' (ibid, p.5). Morrissey et al (2013) argue that the globalisation of agri-food systems, with the predominance of large agri-corporations engendering closer integration both horizontally and vertically within supply chains, together with the increased diffusion of refrigeration/transportation technologies are exemplars of the global agri-food landscape factors. Moreover, Morrissey et al (2013) also cite the dominant perspectives on the use and development of agri-science and technology which have allowed human consumption to ignore local and seasonal variations in

production as another example of landscape factors. Finally, Morrissey et al (2013) see the rapid economic growth in Asian countries as having led to a more urbanised population with a shifting diet towards more meat and dairy products as a further exemplar. Morrissey et al (2013) contend that all of these and other elements of the 'landscape' of agri-food systems are becoming increasingly volatile and that such volatility is little studied by academic research using ST systems.

However, are all the elements suggested by Morrissey et al (2013) really aspects of a landscape nature with respect to global agri-food systems? It is contended in this thesis that most of the aspects mentioned in the previous paragraph are part of a global agri-food socio-technological regime and not landscape affects upon it because, as is highlighted earlier in this section, landscape aspects act upon a regime and are not therefore part of it. The exceptions from Morrissey et al (2013), are the economic development of Asian countries and the impact that this has had on diets in this region and the diffusion of transportation/refrigeration technologies, both of which fit with the ideas of landscape aspects as argued by Geels (2005b) with respect to demographic changes and with regard to structurally important technologies as argued by Rip & Kemp (1998). A discussion of the spatiality of socio-technological landscapes, regimes and how they are envisioned within this thesis is included in section 3.3.1 of this chapter.

3.2.3: Socio-technological niches

The niche level of the MLP contains novel socio-technological configurations which may potentially develop to affect, replace or be absorbed by the incumbent socio-technological regime (Geels, 2002). These niches provide alternative configurations to the existing regime which, as Geels (2004) discusses, could not happen within the larger regime dynamics due to the path dependency of incremental transitions in the regime.

Niches are an important aspect of the overall system because it is here from which the existing rules, norms and practices of the dominant regime can be deviated or

ignored, thus allowing for new technologies and novel practices to be developed within protected spaces away from the prevailing market forces and mechanisms that operate within the regime and wider system (Geels, 2004 and Berkhout et al, 2004). In order for this deviation from norms to occur, niches are said to be championed in some way by actors who actively attempt to incite interest in the innovation with the aim of trying to elicit resources to develop the innovation further (Geels, 2005b). Van der Ploeg et al (2004) also acknowledge this idea of championing through recognising that niches require the right context in which to flourish otherwise niches might never flourish or achieve their true potential. These early adopting actors are more likely to tolerate early problems as a result of their interest/buy in to the particular niche configuration. However, for wider adoption to occur regime actors have to become interested in the nascent configuration, rules and logics that a niche offers (Smith et al, 2010).

Niches are, according to Smith and Stirling (2008), less exposed to the prevailing forces of conventional market pressures as a result of the expectations of their performance being undefined by the existing conventional (regime) expectations and rules. However, whilst these protected spaces away from conventional markets/systems of the regime allow niches to develop, they may require broader socio-technological changes such as the creation of new infrastructures, regulations, industries, cultural norms and rules in order to facilitate their wider diffusion/adoption (Raven & Geels, 2010 and Geels, 2004). Geels and Raven (2010) discuss the challenges in the development of new socio-technological contexts from the perspective of a 'valley of death' that exists between the advent of new inventions and their eventual innovation into society, through which many inventions fail to cross from invention to wider adoption. The existence of a 'valley of death' can potentially be mitigated by support from public policy actors who can help bridge the valley between newer technologies and existing ones (Suwa & Jupesta, 2012).

Whilst this idea of a 'valley of death' between invention and innovation is discussed in terms of technological innovation (Negro et al, 2012, Suwa & Jupesta, 2012 and Raven & Geels, 2010), it is an idea that can also be observed in the realm of social

conventions/attitudes, where more sustainable concepts challenging and indeed opposing the existing norms/rules governing conventional patterns in regimes exist well in niche innovations but nevertheless face significant challenges to bridge the 'valley of death' into wider adoption (Seyfang & Longhurst, 2013). Arguably it is possible to foresee the potential for 'valleys of death' to occur within any of the elements of the ST constellation which would create barriers to new innovations arising along a particular socio-technological transitions.

One of criticisms levelled at the MLP approach is that it places too much emphasis on regime change being through the up scaling of niche innovations into the regime rather than as a result of on-going processes occurring within the regime constellation itself (Berkhout et al, 2004). Geels & Schot (2007), in response to this criticism, argue that the niche driven bias in the ST literature applied to the earlier strategic niche management literature. Furthermore, Geels & Schot (2007) state that a more nuanced approach has evolved in the ST systems theory which takes into account transitions resulting from regime level changes, as discussed in a previous section, as well as up-scaling of niche innovations.

An interesting distinction, which in some way addresses this critique, is between 'niche novelties' and 'regime innovation' by Van der Ploeg et al (2004). Regime innovations in van der Ploeg et al's (2004) context represent changes that arise from within the prevailing logics of the regime, are often created by actors within the regime's dynamics and are, as such, incremental in nature. Whereas, niche novelties are radical types of innovation that are at odds with the current regime's dynamics and have the potential to provide a shift in those dynamics, but are essentially not easy to integrate (van der Ploeg et al, 2004). However, Van der Ploeg et al (2004) highlight that their idea of regime innovations versus niche novelties is problematic as it is not, in their own words, 'clear cut' (ibid, p.12). The bifurcation of innovation into radical 'niche novelties' and 'regime innovation' does not fully express the diversity of novelty or innovation that can be observed within a particular socio-technological system and still essentially leaves us with the same notions that Geels (2005b, 2007, 2010) and others have expressed of incremental regime adjustments leading to and as

a result of dynamically stable regimes (van der Ploeg et al's regime innovation) and radical 'niche' innovations.

One further issue of note is that much of the literature on socio-technological systems focuses on the idea of innovation where regimes are the locus for 'normal' innovation and niches provide more revolutionary changes; an analogous metaphor of which would be Kuhnian paradigms (Smith et al, 2010). This bifurcated contrast of niches and regimes assumes a dipolar existence between the two, with few studies (Konrad et al, 2008 and Vanloqueren & Baret, 2009 are two examples) discussing the existence of multiple regimes and, to a lesser extent, multiple niches within the same socio-technological context.

In order to address some of the criticisms that this section has raised of the existing approaches to niche configurations, this thesis proposes that there is a need for a redefinition of how innovativeness and the interaction between regime and niches can be understood. Initially, by taking the idea that niches are innovative because they are 'novel socio-technological configurations' when compared to their respective regimes, it is proposed that the degree of divergence between a particular niche and its incumbent regime assesses how novel a niche really is. This degree of divergence can be assessed by way of an analysis of what and/or how many elements¹² of a niche's socio-technological constellation of elements are divergent from the regime's constellation and the nature/degree of these divergences. This comparative analytical approach between the regime and niche socio-technological configurations leads to an expression of what is termed in this thesis as a niche's ***assimilative potential***.

Assimilative potential implies a scale of readiness that a niche could, under the right circumstances, be taken into the regime's socio-technological configuration. At one end of this scale exist niches which are very closely aligned to the regime's current socio-technological configuration of the constellation of elements and can therefore be more easily taken up by the regime as they represent a small (almost incremental) adjustment in the regime's own configuration. These niches can be said to be

¹² That is to say is it merely in one element of the ST constellation that a potential niche deviates from the regime or many? Additionally, in which elements are these deviation(s) to be found?

absorbed by the regime because they offer some useful adjustment to the regime's configuration without significantly altering the overall sum of the logics or practices. At the other end of this scale there are niche configurations which are radically different to those of the incumbent regime, so much so that they are highly unlikely to be **absorbed** into the regime without either significant destabilisation of the regime or proof that they represent a substantial benefit to the regime's actors compared to the existing configuration. Consequently these types of radically configured niches can only be **adopted** by regime actors as a result of a transition of the regime to a new socio-technological configuration along some of the lines that the niche espoused.

Where a particular niche might 'sit' on this assimilative potential scale and whether its configuration is representative of a potentially absorbable or adoptable niche is a matter of analysis of both the particularities of the socio-technological regime and the niche(s) in question. It is entirely feasible that niches shift along the assimilative potential scale as they develop, becoming more viable as a result of evolution in the nature of their innovation which assists in clarifying/enhancing the potential benefits of the niche and/or they become more like the regimes with which they co-exist in terms of their socio-technological configurations as a result of the interaction between niche and regime actors. It is also feasible that some niches will remain unlikely to ever be taken up by the regime because they represent some novel configuration that does not or cannot have wider appeal and therefore they represent what this thesis defines as 'novelty' niche modes of production.

Overall, in terms of how this thesis defines the concept of niche and its interaction with regimes, it is posited that it removes some of the black and white view that the MLP model has of niches and regimes. Instead this thesis accepts that some niches propose developmental trajectories that are very closely but nevertheless differently configured to that of the incumbent regime whereas others are more radically divergent in their proposed ST configuration. It therefore defines niches in part by the extent of the differentiation they have from their regime through the concept of their assimilative potential discussed earlier in this section.

3.2.4: The nature of transitions

This section has thus far dealt with the vertical axis of Figure 3.1 namely the multi-level perspective that comprises the elements of socio-technological systems themselves. It has not yet dealt with the horizontal axis, which is concerned with time and how regimes transition between different socio-technological configurations. Understanding the dynamics that influence how regimes transition between differing configurations assists in giving a more nuanced understanding of the development and nature of socio-technological systems themselves. Transitions in a particular socio-technological regime occur as a result of manifold interactions between the regime, niche and landscape levels (Geels, 2010). Smith et al (2005) characterise four types of transitional scenarios that set out potential contextual interactions between the three MLP levels:

1. Endogenous renewal – highly coordinated transition by regime actors in response to landscape pressures upon the regime leading to incremental adjustments to the regime’s socio-technological configuration.
2. Re-orientation trajectories – a result of significant ‘shock(s)’ that translate into destabilising pressures on a regime that can arise from within or outside regime constellations. An uncoordinated response from regime actors results from their poor appreciation/understanding of the aforementioned pressures, which are both landscape and endogenous to the regime, that results in the response.
3. Emergent transformations – arise from uncoordinated pressures and because of resources outside the regime, typically in the field of science. Smith et al (2005) use the example of developments in science at universities or within small firms operating outside existing industries/regime structures generating new niche potentials that are eventually absorbed into the incumbent regime as a new transition. It is, according Smith et al (2005), hard to distinguish which of the available niche alternatives will be taken up by the regime until that regime has taken it up

(an example of such science/technology developments is genetic modification).

4. Purposive transitions – occur due to coordinated influences external to the regime pushing for transition to occur along particular pathways, for which Smith et al (2005) use the example of nuclear power.

One of the central aspects of the Smith et al (2005) transition typology is the coordinated/uncoordinated axis of responses to niche innovations and landscape pressures that they propose, which belies their interest in the governance of socio-technological regimes and the potential to guide transitions (Geels and Schot, 2007). Geels and Schot (2007) instead argue that no regime transition is truly, purposefully planned/coordinated from its inception and instead suggest that regime transition becomes more planned as the visions and actions of various actor groups become increasingly aligned. Whilst Geels and Schot's point is essentially right, that on one level no one actor group could direct a regime transition solely without agreement/cooperation from other actor groups both within (and without?) the regime. It is nevertheless the case that transitions occur because these actors decide to do something therefore there is a degree of purposiveness about any regime change. Instead Geels and Schot's critique of Smith et al (2005) can be read as a cautionary observation of the degree to which individual actor/actor groups (such as policy makers) have the power drive purposive transitions in the socio-technological configurations of regimes.

Geels & Schot (2007) developed a conceptualised taxonomy of five transition pathways that a regime may go through which are known as: transformation, technological substitution, de-alignment and re-alignment, opening up of a new domain and reconfiguration in part in response to Smith et al (2005). Each of these transitional taxa result from differing pressures arising both endogenously and exogenously upon the socio-technological regime. These pressures were refined in Geels & Schot (2007) as a

result of the niche driven bias critiques of early strategic niche management work¹³ and furthermore utilised the work of Saurez and Oliva (2005).

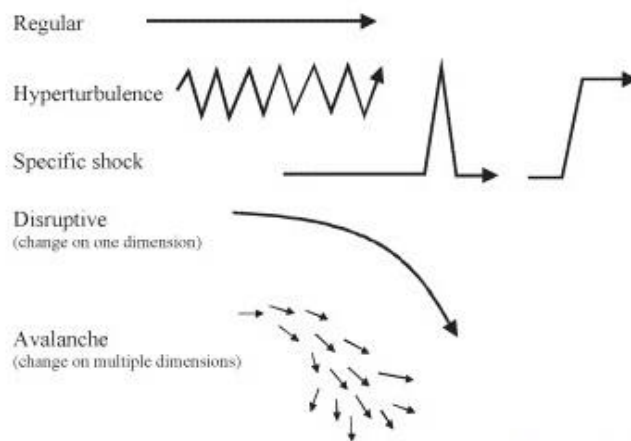
Saurez and Oliva (2005) proposed a typology of ‘environmental’ shocks that represented the types of shocks which occur from the landscape or within the socio-technological regime. This typology is constructed in Table 3.1 and Figure 3.3 provides a visual summary:

Table 3.1: Typology of environmental change

Frequency	Amplitude	Speed	Scope	Type of environmental change
Low	Low	Low	Low	Regular
High	Low	High	Low	Hyperturbulence
Low	High	High	Low	Specific shock
Low	High	Low	Low	Disruptive
Low	High	High	High	Avalanche

Source: Saurez & Oliva, (2005)

Figure 3.3: Diagrammatic representations of environmental change



Source: Saurez & Oliva, (2005)

Geels & Schot’s (2007) re-formulation of the transitional pathways to incorporate Saurez & Oliva’s (2005) environmental change typologies is useful as it allows for a closer examination of the probable interactions between the landscape, regime and niche levels, which has been reproduced in Table 3.2. Understanding how transitional

¹³ Strategic niche management is one of the precursor literatures from which the socio-technological perspective later evolved.

pathways relate to the agri-food sector is a key aspect of this research as being able to explain how transitional pathways evolve in an agri-food context may assist in understanding how the governance of these systems could be used to better direct them along rural development pathways. Central to this understanding will be the exploration of the ways in which the agri-food landscape, regimes and niches interact together to produce pressures, opportunities and transitions in an incumbent socio-technological regime.

Table 3.2: Pathway of regime transition conceptualised by Geels & Schot (2007)

Pathway	Name ¹	Landscape	Regime	Niches
P0	Reproduction processes	No pressure (<i>Regular change</i>)	Dynamically stable and able to evolve with incremental improvements without major restructuring.	May be present but unable to break through to the regime due to stability
P1	Transformation path	Moderate pressure (<i>disruptive change</i>)	Reacts to landscape pressure by reorientating development trajectories. Regime changes but actors and structure remains largely similar.	Not sufficiently developed to capitalise on landscape pressures
P2	De-alignment and re-alignment path	Large, sudden and divergent (<i>avalanche change</i>)	Actors may lose faith in current regime leading to dissolution and eventual re-definement of the regime based on dominant niche success.	Space is created for numerous niche innovations until one reaches maturity and acceptance becoming the basis for the new re-aligned regime.
P3	Technological substitution	Sufficient pressure (<i>specific shock, avalanche or disruptive change</i>)	Becomes destabilised due to landscape pressure	Sufficiently mature in their development to replace regime.
P4	Reconfiguration pathways	Either P0 or P1 level	Either P0 or P1 level	symbiotic relationship to the regime which means they can be easily added on to the current regime with little change in the overall regime structure/rules.
P5	Sequential transitions	Increasingly disruptive pressures	Potentially responses from P0 - P4	Dependent on presence, configuration and maturity.

Notes

Derived from Geels & Schot (2007)

1 - P0 - P4's pathway names are derived from Geels and Schot.

The final consideration in terms of the nature of time and transition in the ST systems framework is that there are two distinctive modes of analysis employed in the utilisation of the framework. The first mode is to look backwards in time to understand how transitions have occurred in systems such as the transition between horse drawn carriages to automobiles (Geels, 2005), the breakthrough of Rock and Roll (Geels, 2007) and the evolution of the organic vegetable market in the UK (Smith, 2006). The second mode looks forward and seeks to utilise the ST systems analytical model to investigate how regimes can be assisted in transitioning along more sustainable pathways (Markard et al, 2012 and Smith et al, 2005).

Sustainable transitions are not simply the result of changes in technological or scientific elements of the ST constellation of elements, but arise from incremental shifts within the regime or from innovations in the niche, and include changes in societal and policy practices that lead to substantive shifts in the underlying logics upon which a particular regime is based (Markard et al, 2012). One of the key issues with sustainable transitions, as Berkhout et al (2004) explain, is that different actors or networks of actors may hold very varied views on the concept of what is sustainable and how the socio-technological regime needs to be restructured to meet the challenge of improved sustainability which has relevance within the context of transitions in the agri-food system. This is where the ST systems perspective on the management of transitions is particularly useful as it emphasises the need to use tools to develop guiding visions to assist in bringing about discourse and understanding of the issues and potential solutions pertinent to those issues within a particular systems (Smith et al, 2005 and Rotmans & Kemp, 2001).

In essence this thesis stands in a moment in time for the SW Wales agri-food system. In order to understand that system we need to look backwards to identify and construct the regime(s) that operate within the regional system and establish to what extent there have been transitions within these regimes. Only when the current regional regime configurations and regional capacities are understood can future visioning for more sustainable ST regime configurations be effectively undertaken. This thesis seeks to deal with the first requirement of understanding the regional regime configurations

and, where possible, suggest what some of the capacities of regional agri-food systems may be, however the nature of these capacities would require a second research project to fully explore.

One empirical issue here is that it is important to develop a greater understanding of how differing actors/stakeholder groups perceive the challenges/pressures faced within the agri-food sector and, moreover, in what directions those stakeholders perceive the regime must be reconfigured in order to tackle these pressures. One way of ascertaining this would be to utilise a stakeholder analysis as espoused by Grimble & Wellard (1997) to ascertain a cross cutting understanding of how different stakeholders view the agri-food industry and the pressures it faces within a particular regional or sectoral setting. A stakeholder analysis may show, as work by Hanke et al (2002) found, that stakeholders can be diametrically opposed in their views. In Hanke et al's case this was in terms of the stakeholders views on the utilisation of the environment and, as such, it showed that where a number of different stakeholder groups exist, we may find that they each have their own vested interests and opinions which may be based upon their position within a sector (producer/processor/procurer within either a regime or a niche). It is also equally possible that we may find a degree of agreement between stakeholders regarding what pressures exist, which would lend validation to stakeholder views where there is some degree of agreement. Equally we must recognise that stakeholders may be members of different sectors which are differentiated, for example, by product type (e.g. horticulture, meat, dairy etc)¹⁴. These, it will be argued later in this chapter, represent different regimes and, as such, where we find common pressures being raised by stakeholders in more than one regime in a similar geographic region, then these pressures should be considered to be structural to the wider agri-food system rather than peculiar to a single regime. Where a pressure is not peculiar to a particular regime then there is a question as to whether a regime and related niches may adequately reorientate themselves to address this pressure.

¹⁴ The differentiation of the SW Wales agri-food regime into regional sub-sectoral regimes is adopted as part of the methodological approach of this thesis and discussed further in chapter 4.

In terms of the application of systems transition theory, there are two studies which have some relevant insights into the applications of the systems transition framework to local agri-food and the wider food sector: a study of the Dutch electricity system by Verbong & Geels (2007) and a study of the UK organic market by Smith (2006). In the Verbong & Geels' (2007) paper the authors highlight two interesting points regarding systems transition for consideration in our future investigation of up scaling local agri-food systems in Wales. The first point Verbong & Geels (2007) make is that in terms of the uptake of renewable energy production in Denmark there was a gap between policy goals and real policy measures which will stifle or limit the development of a sector in a particular direction. This can, interestingly, be contrasted by the experience of Rob Hopkins who, after applying for funds from the South West Regional Development Agency to promote a local food directory for the Totnes area, was turned down on the pretext that promoting local food in any way as superior to internationally sourced food was in contravention of WTO¹⁵ rules (Hopkins, 2008, p.69).

The second point made in Verbong & Geels (2007) which is of interest is the widening of the biomass definition to include waste products which were not viewed as being sustainable by Dutch environmental groups. In some respects there seems to be a distinction between definitions of terms which might be seen as being sustainable in their entirety and those that are partially sustainable; this ambiguity in definitions is easily extended in an agri-food context to what we mean by 'local' and 'locality' food, as the previous chapter discussed, as well as how we define 'sustainable' food.

Smith's 2006 paper on green niches in sustainable development, which focuses on the organics sector in the UK, provides a very cautionary tale regarding the emergence of sustainable food niches insofar as the organics sector from the 1990's to the present date is seen, in Smith's view, to be fracturing between those that are engaging with the mainstream socio-technological regime who were re-embedded into the incumbent agri-food regime dominated by the large multiples and those who wanted to return to the early vision of locally produced organic food. In essence what Smith (2006) appears

¹⁵ World Trade Organisation.

to suggest is that the incumbent socio-technological regime in the UK was able to absorb the organics niche, with little or no adoption of the core ideals of organic production, into the wider mainstream agri-food sector production which would suggest that there has been no real transition in that regime. There are two key quotes from Smith (2006) which have resonance in the overall agri-food system debate:

‘How can innovative socio-technical niches which are at radical odds with incumbent regimes actually effect significant regime changes?’

(ibid, p.440)

‘Given these powerfully entrenched, mutually reinforcing tendencies [of the incumbent socio-technical regime], what hope is there for the kinds of radical shift implied by a normative goal such as sustainable development?’

(ibid, p.442)

These criticisms and observations about the systems transition framework do not inevitably invalidate its usefulness as a heuristic tool for investigating sustainable transitions in the agri-food sector but merely serve to provide essential insights into its application to empirical research. Most clearly shown in the writings of Smith, Berkhout and others is the concern regarding how the up-scaling of niche innovations can contribute to greater sustainability of the regime, which raises questions regarding how the up-scaling of successful local agri-food networks and schemes can transform the dominant agri-food regimes of the region.

3.3: Agri-food systems using the ST systems framework

The next section of this literature review focuses on how the ST systems framework can be applied to agri-food systems. There has already been some existing agri-food research framed within the systems-transition perspective: Stuiver (2006) investigated retro-innovations and system change within two case studies in the Netherlands and Wales; Smith (2005) used the ST framework to analyse the transition of the UK

organics sector from a niche to an integral part of the UK agri-food industry; Yakovleva & Flynn (2009) also investigated the organics sector as a niche and identified regime stability and barriers to entry for the niche; and Vanloqueren & Baret (2009) examined the 'lock-in' of genetic engineering and exclusion of agro-ecological engineering science and technology due to the global agri-food regime morphology. These papers and the research upon which they are based highlight a number of important points to consider when using the ST framework in relation to local food and agri-food systems research. The central points, which will be addressed in the next sections, are:

1. How do we apply the analytical levels of the MLP to empirical levels in an appropriate manner for researching agri-food systems?
2. Does the ST systems constellation of elements require anything else to be used for regional agri-food research?
3. What interplay exists between the regime and niches as they have been framed for the research?

3.3.1: Applying MLP analytical levels to empirical levels of the agri-food system

When applying the ST framework and the MLP in the context of agri-food systems there are a number of potential ways in which the system could be conceptualised, a problem which was highlighted by Smith et al (2005) who questioned the how the analytical levels of the MLP of the ST framework should be applied empirically. Schot & Geels (2007) argued that the application of empirical case studies to analytical levels in the framework is the responsibility of the researcher who must select levels which are appropriate to the research questions under analysis. The arguments of Schot & Geels (2007) and Smith et al (2005) do not go far enough when considering agri-food research because systems transition research to date tends to focus overly on socio-technological niches and their role in creating transitions at a regime level within a single series of empirical levels (i.e. one set of niches, one regime and one landscape level) and does not consider that within an overall system such as the agri-food system there may be several regimes in operation.

This section presents two key aspects of the ST systems framework that need to be explicitly considered for use in regional agri-food research and which have been largely underemphasized in the literature on socio-technological systems and transitions to date. The first is the spatial component of regimes and transitions which, because the nature of agri-food supply chains is that all food is produced somewhere and what food can be produced where is partially a function of the where in the world a plot of land is located, implies that there is a spatial context to agri-food socio-technological regimes. The second element, which naturally leads from the first element, is the need for a biophysical component to be added to the ST constellation of elements to provide a complete analytical framework for analysing regional agri-food regimes and niches.

3.3.1.1: Spatial ST systems

Within the ST framework there is not an explicit expression of a spatial component and yet innovations/transitions do not occur in a spatially homogenous manner. This is because some areas/regions/localities choose not to adopt a particular innovation or are even unable to utilise it due to restrictions/inappropriateness of that innovation to the locality (Wilson, 2007). This issue of spatial homogeneity is one of the significant criticisms of the ST systems transitions literature in that it generally ignores the role that spatiality plays in shaping the context and nature of regimes and transitions within regimes (Coenen et al, 2012, Coenen & Truffer, 2012, Geels, 2012, Lawhon & Murphy, 2011 and Raven & Geels, 2010). This section discusses the spatiality aspects of ST systems seen within the existing literature and, additionally, provides a definitional discussion of the concept of regional space that this thesis uses as part of its investigation into regional agri-food systems.

Specifically, Coenen et al (2012) argue that the transitions literature has ignored the 'socio-spatial relations and dynamics within which transitions evolve' (ibid, p.969) and that this in turn has neglected the spatial nature of each ST system and limits the extent to which transitions in different geographical locations can be compared. The empirical case of regional agri-food systems, where there is consideration of rural

development and the long term sustainability of rural regions, further highlights the importance of spatiality as an issue because all regions have differing embedded degrees of capital/capacity in each specific element of the ST constellation which agri-food regimes can harness and, in doing so, either denude, maintain or augment these differing capitals/capacities.

Although the dynamics of spatiality of ST systems have been somewhat neglected by ST system studies to date, there is an implicit spatial element in most of the research already carried out with many of the case studies being orientated towards a national or global level. At the national level there have been numerous studies in: energy transitions (Foxon et al, 2010 and Verbong & Geels, 2007), factory production systems (Geels, 2006), the Swedish pulp mill industry (Karlton & Sandén, 2012) and organic food in the UK (Smith, 2006). On a more global level, examples are equally wide ranging with: Vanloqueren & Baret (2009) investigating how agro-ecological innovations are locked out of agri-food research systems; Negro et al (2012) studying the difficulties in the diffusion of renewable power technologies across multiple countries to ascertain common problems in innovation diffusion; and, Geels (2002) investigating the transition of global shipping from a sail based technology to steam.

Others engage with the concept of spatially situated ST systems in more detail, such as Raven & Geels (2010) who contrast the niche management of biogas in Denmark and the Netherlands finding significant differences between their agriculture and energy industries that had in turn shaped the development of biogas niches in the two countries. In their study of European directives of electronic waste disposal, Lauridsen & Jørgensen (2010) found that two regimes were linked: an electronics regime¹⁶ and an electronics waste disposal regime via the EU Waste Electrical Equipment (WEE) directives which highlighted two points. Firstly, they considered that policy was a linking factor between regimes¹⁷ that exist in the same geographic space (Europe);

¹⁶ They identify this regime as being the production and consumption of electrical products in contrast to the waste management of the electronic products, which they argue is a separate regime. The interesting point here is that over the course of the life cycle of an electrical product two separate regimes are argued to exist, one that deals with the 'life' of the product and one that deals with the product after its 'death', which has a credence when considering most products of consumption.

¹⁷ Although it is equally conceivable that other socio-technological elements (science, technology, industry etc) at larger spatial levels may link multiple regimes together at smaller spatial aggregations.

and, secondly, they considered that, where such higher socio-technological regimes interact with smaller spatial regimes, stated policy objectives and the regulatory frameworks that arise from them must be tightly aligned in order to avoid unintended consequences¹⁸.

In terms of agri-food systems, van der Ploeg et al (2004) position ST regimes in spatial terms in a non-specific manner by referring to them in the context of their work as 'socio-technological regimes in Western agriculture' (ibid, p.4)¹⁹. Within Western agriculture van der Ploeg et al (2004) identify three spatial scales (supranational, national and regional) which create agri-food policy that shapes decision making and the utilisation of resources at an individual farm level. Van der Ploeg et al (2004) argue that aspects of socio-technological regimes link different places whilst citing the standardising effects of public policy, the diffusion of agri-food R&D (research and development) and the communication of the current potentials and future trajectories for the system as exemplars of these inter-linkages. These inter-linkages are a key aspect of regimes for van der Ploeg et al (2004) as they argue that: 'the more coherent these inter-linkages are, the more efficient the regime will be' (van der Ploeg et al, 2004, p.5), which aligns with the idea of dynamic stability that is discussed in section 3.2.1.

Spatiality in terms of niche production in agriculture is, according to van der Ploeg et al (2004), a specifically localised process that is shaped by 'local eco-systems and by local cultural repertoires in which the organisation of labour process is embedded' (ibid, p.3). Van der Ploeg et al (2004) links local eco-systems and cultural repertoires together with local knowledge, local skills and local economies to produce a local set of rules or logics which have shaped regional agri-food enterprises and systems

¹⁸ In their case, the policy objectives of EU WEE regulations were designed to place the waste management burden upon the electronic production industry that created the products. However an unintended consequence of misaligned regulation meant that waste has been transported across borders rather than dealt with as the regulations intended. Lauridsen & Jørgensen (2012) contend that whilst initially the nation states benefitted financially from not needing to build facilities and associated infrastructure to deal with the sustainable disposal of electrical goods waste, in the long term the costs that will be attributable to 'enforcement and control may counter these savings considerably'.

¹⁹ Regimes, in van der Ploeg et al's (2004) construction, refer to the conventional agri-food systems that are predominant and which can be aligned to the productivist and, latterly, agri-industrial paradigmatic approaches to rural regions and the production of food as discussed in chapter 2.

historically; albeit that agricultural production has become increasingly disconnected from these local rules through the processes of agricultural modernisation. For van der Ploeg et al (2004) there is clearly a spatial aspect to agri-food production that is rooted in local and regional geographies.

Whereas Morrissey et al (2013) argue that, from a globalised perspective, delineations of regimes into products or 'regional products' (tomatoes or Italian tomatoes in their examples) are likely to be not particularly useful, stating that: 'The agri-food regime, like most real-world complex systems, is not characterized by neatly defined, easily identifiable boundaries; for analysis purposes, narrowly defined boundaries are likely to underestimate complexity and oversimplify reality.' (ibid, p.5). Whilst Morrissey et al (2013) makes a very valid point that complex systems rarely have neat delineations in their spatial boundaries, such boundaries do exist and are shaped by any number of factors, in particular a combination of the biophysical characteristics of land/climate²⁰ and the social constructions of space that actors within a particular area choose to adopt and use to create new institutions, regulations, practices and industries that add further definition and strength to these spatial delineations (Bérard & Marchenay, 2007). Ignoring these delineations, however difficult to define, risks missing important nuances that are appropriate for a given spatial delineation and thus in Morrissey's own words 'underestimate complexity and simplify reality' (ibid, p.5).

There is a tension in the literature between those, like Morrissey et al (2013), who believe that there is little relevance to considering regional agri-food systems given the homogenizing influences of the global agri-food system on regional agri-food systems and those, like van der Ploeg et al (2004), who find evidence of local rules in regional agri-food systems. Bach-Faig et al (2011), is an interesting example of this tension which sees, on the one hand, the authors identify the importance of the Mediterranean diet that comprises both the types of foods people should eat for a healthy diet but also the seasonality, biodiversity, traditional and local aspects that

²⁰ For example Kurukulasuriya & Rosenthal's (2003) World Bank report into the impacts of climate change on agriculture, citing work by Matarira et al (1996) and Mendelsohn et al (2001), which indicates that producers in some regions may have to switch to more drought tolerant crops or alternative forms of production such as grassland grazing whereas producers in other areas may find the range of crop options expand as a result of favourable changes in the climate.

such a diet should have whilst simultaneously recognising that the Mediterranean diet is being encroached upon by the 'dissemination of the Western-type economy, urban and technology-driven culture' (ibid, p.2274).

Other work, such as van Berkel & Verburg (2011) and Dissart & Vollet (2011), investigates the diversity of local factors that shape regions with these two studies finding that these factors can be ascribed to the potential of regions to support differing and various rural industries. Dissart & Vollet (2011), in investigating the links between biophysical aspects of regions and local economies, found that the role of biophysical aspects varied between regions but nevertheless had significant influence on local economies. Moreover, in a further detailed analysis of two counties with similar biophysical aspects, Dissart & Vollet (2011) found that an under-utilisation of these aspects was attributed partly to a difference in the local policies thus showing that local socio-political variances interact with biophysical aspects. Whereas, van Berkel & Verburg (2011) investigated the differences in rural development options across Europe and found a range of differing capacities for rural development, furthermore arguing that rural development should 'not be seen as a static characterisation of the landscape, but rather as a potential for development given the current physical, socio-economic and policy context' (ibid, p.457).

Ultimately local factors do play a part in shaping regional agri-food systems and any research of these systems has to consider how the nuances of the local rules/logics of a region shape the configuration of the region's socio-technological agri-food regimes. Furthermore such research also needs to consider how the local logics of these regional agri-food regimes are influenced by the logics from higher spatial aggregations be they national, supranational or global.

As this section has thus far alluded, there are a number of potential empirical levels that could be used to investigate agri-food socio-technological systems including: product levels (beef, dairy, horticulture), governance levels (global, regional, national) and climatic regions (temperate, Mediterranean, tropical). Socio-technological systems do exist at multiple empirical scales of analysis; however Konrad et al (2008) argue that

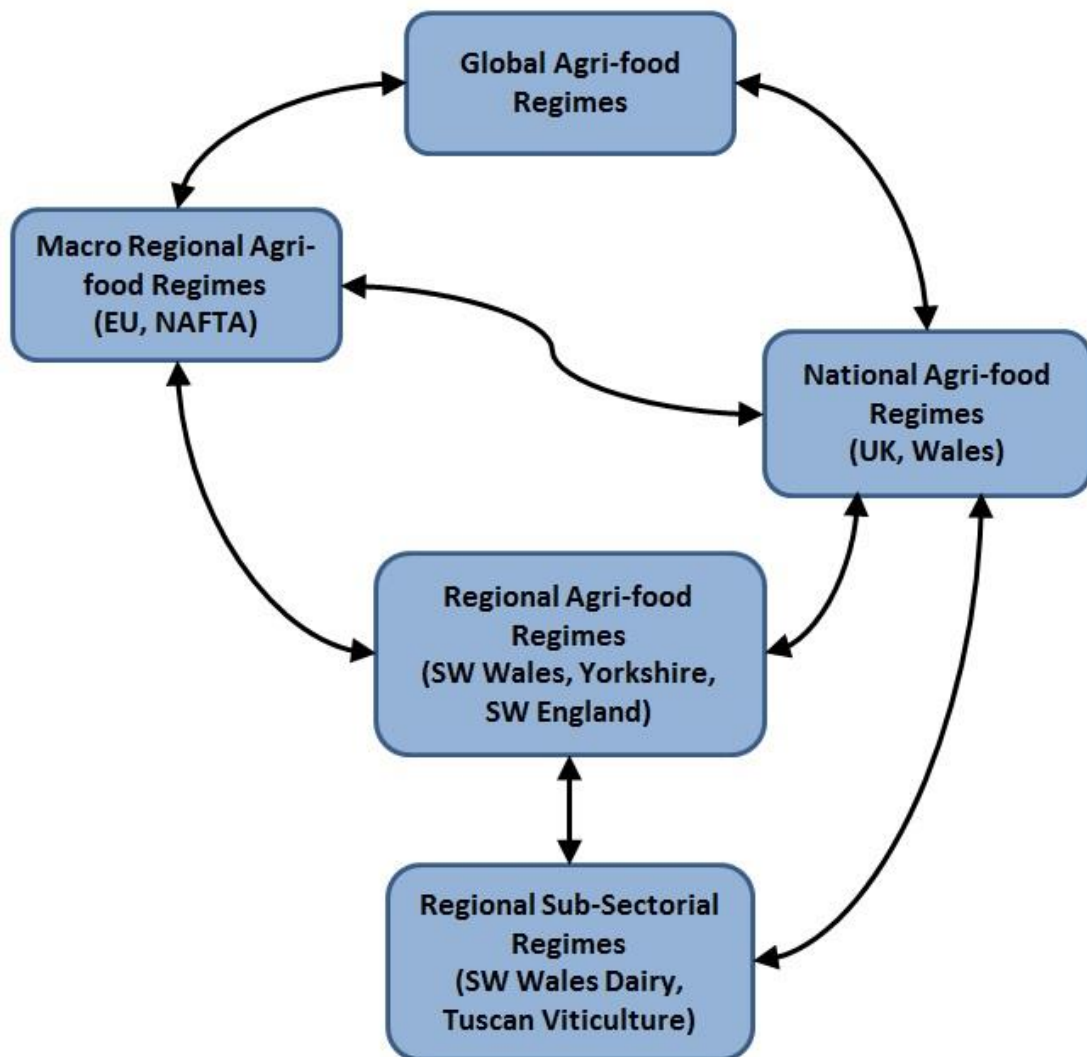
it is unlikely that the regime level can be applied to the level of an individual firm or to the entirety of society but to any scalable level between them. This being said, the focus of this thesis is on alternative food supply chains and their role in rural development and, therefore, in order to conceptualise the empirical levels of the model, it is also essential to consider what the most appropriate formulation for investigating agri-food systems and local food might be. Implicitly within these various levels is the concept of geographical space, as Longley et al (2005) points out:

‘Almost everything that happens, happens somewhere. Knowing where something happens can be critically important.’

(Ibid, p.4)

Any of the empirical levels mentioned in the previous paragraphs are appropriate for investigating pressures and solutions found within the agri-food system as there are pressures faced by almost every element of the current agri-food system. Although, as has already been argued, there is a spatial aspect to these pressures with different regions being placed under different pressures, any operationalisation of the MLP and ST framework must therefore consider spatiality as an aspect in its formulation. In essence we must operationalise the MLP along lines which make sense in terms of where regimes might exist. In this regard, regimes in the agri-food industry are bounded in different ways across elements of governance, technological usages, social/market preferences and climatic constraints/considerations and, with this in mind, Figure 3.4 suggests a hierarchy of regimes that take these elements into account in the construction of a series of nested agri-food systems that will be used to frame the construction of regional sub-sectoral specific regimes in this thesis:

Figure 3.4: Nested agri-food socio-technological regimes



This operationalisation of the systems transition framework shown in Figure 3.4 is defined not only by the governance structures but also by the global industry, culture, markets, science and technology that it is perpetuating. Morgan et al (2006) acknowledge these facets of the wider agri-food system as being a critical backdrop to any evaluation of localised or alternative food systems, citing that ‘while a growing number of consumers may be turning to ‘alternative’ food products, the vast majority can still be found in mass markets’ (ibid, p.17), and so allow for an investigation of hierarchical and inter-regime interactions.

The hierarchical nature of the nested regimes shown in Figure 3.4 takes into account that there are likely to be significant differences in the socio-technological constellation of elements at different spatial aggregations. Indications of differentiation can already be found within academic research on agri-food systems, for example: the regional and national differences in biophysical²¹ characteristics (Olesen & Bindi, 2002 and Rounsevell et al, 2003); the multi-level nature of agri-food policy (Lang et al, 2009 and van der Ploeg et al, 2004); and the unevenness of agri-food science and technology diffusion between different countries (Millstone et al, 2009). Furthermore, it should be acknowledged that each of these regime levels does not operate in a vacuum from one another and there are interactions between regimes at the same level as well as at differing spatial levels. These intra-level interactions are potentially key to shaping the socio-technological regime constellation of elements at a particular spatial level (an example of this would be the role that EU level agricultural policies have had in shaping EU nation states' agricultural policies and the response of these national level regimes; see Lowe et al (2002) for an example of differentiation in UK and French policy approaches to CAP reform).

If regimes do operate at different levels of spatial and/or sectoral aggregations they are likely to face differentiated pressures; some of which may be peculiar to a single regime and some of which may be common to many different regimes. In this way regimes may be compared and contrasted in analysis at a case study level to ascertain whether pressures upon/within individual regime dynamics are common or part of a wider systemic pressure. Niches and reorientations within regime dynamics within one regime level may suggest solutions to common problems found in similar types of regimes elsewhere. However, whilst similarities may exist between regimes operating within differing spatial or sectoral aggregations, this does not necessarily mean that a solution found within a particular regime or its associated niches may be propagated to other regimes; although as yet, as has already been noted in this section, there is a paucity of work contrasting regime configurations.

²¹ This is an additional element to the socio-technological constellation of elements which is proposed in this thesis and will be discussed in section 3.3.2 of this chapter.

The inclusive application of the nested regimes suggested in Figure 3.4 covers everything from the global food regime to regional sub-sector specific regimes (such as Danish dairy or red meat in South West Wales) and their associated niches. This may seem somewhat simplistic but there are some clear indications of the need for this kind of framing such as Morgan (2008) who postulates whether there is room for both the local food and fair-trade movements in agri-food and yet, as Renting et al (2003) indicate, one of the key structural problems with the agri-food system in the UK is the cost-price squeeze which suggests that there are issues of fair trade for producers and processors in the UK as well as producers in developing countries. Consider also that empirically agri-food research is carried out at differentiated spatial scales with, say, Smith (2005) investigating the organics sector at a UK level whereas Marsden & Smith (2005) used the case study of an organic farming co-operative at a regional level; the question then becomes what these pieces of research equate to when we consider, say, the organics movement in the United States or Kenya.

Finally, consider also the implications of variegated pieces of research such as Gabriel et al (2010) who argued for a more differentiated regional basis for agri-environment schemes in the UK on the basis of their research around taxa abundance in cold and hot spots for organic production in the UK whereas Thompson & Coskuner-Bali (2007) discuss the role of community supported agriculture in reconnecting consumers with the produce they consume. These two pieces of research represent examples of work by authors who have differentiated lenses on agri-food research but who nevertheless present a common interest in producing answers to how we construct a more sustainable agri-food system. However, what is lacking from such variegated research is an overall framework that can assess how these multiple ideas for 'improvements' to agri-food systems interact within the same geographic area. Whilst the research in this thesis does not intend to construct a fully rigorous framework for considering the issue of multidisciplinary research findings, it suggests and seeks to utilise a ST framework as a heuristic tool to study regional agri-food systems within the context of larger spatially aggregated agri-food regimes, as set out in figure 3.4 earlier.

3.3.1.2: Defining 'regional' in terms of socio-technological agri-food systems

This thesis sets out to investigate a regional agri-food system using the socio-technological systems model as an analytical lens. However, one of the key words here is 'regional' and this raises an important geographic question, namely: what do we take to be 'regional' within the context of agri-food systems research?

Locational theorist Lösch (1939) wrote that: 'If everything occurred at the same time, there would be no development. If everything existed in the same place, there would be no particularity. Only space makes possible the particular, which then unfolds in time' (Ibid, p.508 in Garretsen & Martin, 2010). When dealing with rural development we are talking about regional development which, by its very nature, occurs (as Lösch wrote) in a particular space and time. Without both a temporal and spatial component we essentially have no 'particularity' in the sense of what we are trying to understand as this thing called 'rural development'. The Socio-Technological Systems framework already encompasses a sense of time through the metaphor of transition but this thesis intends to add a sense of place through a regional level of spatial aggregation. 'Regional' is a socially constructed term and can have many meanings but it is nevertheless a key concept within this thesis. The idea of a 'regional' spatial aggregation is one that is neither of macro level or micro level but, instead, involves some of both and thus operates at an 'intermediate' or meso- level of aggregation (Behrens & Thisse, 2007). Furthermore, as Behrens & Thisse (2007) argue, the concept of a 'regional' spatial aggregation depends primarily upon the particular empirical application of the term.

There are many ways that we as humans 'cut up' land, dividing it into different parcels/areas to suit a plethora of purposes both in actuality (i.e. fields or plots of land for development) and in a socially constructed sense (i.e. counties, local authorities, health authority districts et cetera), which naturally leads to the question as to what is the most appropriate way to define a region in terms of regional agri-food research and rural development. Following the idea that 'regional' is a meso level term that

bridges between the macro and micro scales, it is worth considering what constitutes 'macro' and 'micro' in the context of this particular research.

The micro level, in the context of agri-food systems, represents the individual businesses and their supply chains that would make up a 'regional' agri-food system. It is also arguable that individual fields might represent the smallest 'micro' aggregation that could be considered. However, field level aggregation, in terms of a 'regional' analysis, might be more contextually appropriate in research aimed at investigating small numbers of producers, producer decision making and changes in field level land use patterns rather than the objectives of this thesis, which clearly positions the term 'rural development' in the context of wider rural economies and larger agri-food systems.

The macro level is more complex to define within this context because we are faced with the question of where a spatial aggregation ceases to be a meso-regional one and enters the realm of being a macro level one. The most obvious macro spatial entities with the context of agri-food systems are global, supra-national bodies such as the European Union or NAFTA²² and nation states such as England, Wales or France. These macro spatial entities can be thought of as being macro because they exhibit a sense of being a whole unit of analysis and so we can locate production data on them, we can see governmental policy and national level institutional actors working on behalf of their respective industries and so, at these spatial levels, elements of socio-technological regimes are clearly apparent.

There are, however, still many discernible elements of differentiation within smaller spatial units contained in these nations in that we can identify readily, for example: areas such as the Loire Valley in France being a particular region of French wine production; the Piedmont region of Italy, famous for its hazelnut groves and Barolo wines; or Yorkshire which is known for the pudding that bears its name, the quality of its lamb and the rhubarb triangle around the Leeds and Wakefield area that produces excellent quality forced rhubarb. What can be seen just from these very simple

²² North America Free Trade Area

examples is that there exists a potentially coherent spatial aggregation below the level of 'national' that approaches what a regional aggregation could be conceived to be in terms of agri-food systems. There are, however, secondary issues to consider: how do we define/delineate areas of land into regionally defined spaces; and, moreover, in specifying regional areas how do we define them as being coherent?

When approaching this research a lot of thought was put into the spatial level of aggregation to be used for analysis and how this was to be delineated. The researcher's own *a priori* interests stem from the ideas of bio-regionalism which, in part, influenced the proposed addition of a biophysical element to the ST regime constellation discussed in section 3.3.2 of this chapter. Aberley (1999) argues that bio-regionalism is hard to define because of the rapid pace of the development of its concepts/theories and the lack of a set of 'potentates' who can be interviewed. Brunckhorst (2000), however, defines the term 'bio-regional' as being: 'a regional landscape scale of matching social and ecological functions as a unit of governance for future sustainability that can be flexible and congruent still with various forms of government found around the world' (Ibid, p.8). The key aspect of this definition is that a region is defined by reference to both the ecological or biophysical characteristics and socio-cultural factors. A bio-regional approach is of interest to agri-food systems research because the biophysical properties are in some way delineated within the spatial aggregation. This idea has already been adopted by the Environment Agency in its Water Framework Directive (Environment Agency, 2012) which naturally sees river drainage basins and catchments as units of analysis for their work and, more appropriately, to regional agri-food research in the embryonic work of Peters et al (2009) and others who seek to model the idea of whether regions can feed the populations that live within them to an acceptable level of nutrition. Furthermore, some producers also think within a bio-regional delineation, with Cothi Valley Lamb or the Cambrian Mountains initiatives²³ being examples of these. However, it is unclear to what extent these brand names are tied directly to specifically observable physical geographic units or phenomena and, in reality, they may represent more 'fuzzily' defined areas.

²³ These are two examples of bio-regional delineations noted within the wider case study region of SW Wales.

The central issue that detracts from using a bio-physical approach to the reconstruction of 'regions' is that these do not 'map' easily on to the pre-existing delineations and jurisdictions that are already used in Wales by both institutional and industry actors. The key pre-existing delineations that are relevant for the agri-food industry are: 'counties' and 'regions', where regions represent amalgamations of counties in Wales²⁴. These two aggregations represent key administrative units for local government and, historically, for some agricultural policies such as the War Ags²⁵ (Moore-Colyer, 2011).

These rural regions and counties have legitimacy from a governance perspective for two reasons: firstly, because they are often tied to the political elective boundaries where decision making is made; and, secondly, because they are often also the principal units of analysis and administration for agri-food policy in Wales. Evidence of this regional institutional legitimacy can be seen, for example, in SW Wales having a WAG rural development co-ordinator and team who are tasked with overseeing the delivery of the Welsh RDP²⁶ and, from a non-governmental institutional perspective, the NFU has regional co-ordinators who are also responsible for the same SW Wales region. The result of this legitimacy is that in many respects it becomes a focus for spatial delineation in terms of the agri-food industry. This thesis therefore will take the area of SW Wales as being a regional area for the purposes of defining a regional spatial delineation for investigation. Although this does not form part of this thesis; there are certainly questions as to whether the use of political elective boundaries is the best approach to administering agri-food policy and, furthermore, whether the legitimacy that institutional actors provide these areas excludes more appropriate regions of governance for the agri-food industry.

²⁴ The amalgamation of Carmarthenshire, Pembrokeshire and Ceredigion to form a SW Wales region is an example of such an aggregation that has occur in Wales.

²⁵ War Agricultural Executive Committees, which helped the government co-ordinate and improve productivity during the Second World War.

²⁶ Rural Development Plan.

3.3.2: Biophysical: a missing star in the ST constellation of elements

The other amendment to the ST systems model shown in Figure 3.1 that this chapter proposes for analysing agri-food systems using the ST systems approach is the addition of a bio-physical element to the ST constellation of elements. This additional element should not be seen as solely because the empirical objects under investigation are focused upon a productive agri-food region where the resources of the producers are tied partly to the land they farm, as will be shown in the empirical chapters of this thesis, but instead as a necessary addition to any socio-technological regimes because: 'All technologies rely on the natural world to furnish raw materials, provide energy, and assimilate wastes' (Smith and Stirling, 2010, p.4). It is the case though that this inclusion of biophysical as an element of the socio-technological regime is particularly poignant for agri-food systems research given, Roebeling et al's (2006) statement that the:

'bio-physical characteristics of the land vary widely according to location and, in turn, determine agricultural production potentials, ii) climatic and geomorphologic conditions differ according to location and, in combination with land use and management, determine diffuse source water pollution.'

(Roebeling et al, 2006, Page 5)

The biophysical aspects of regional agri-food systems have, in part, been shaped by the global agri-food system which, in a drive towards increasing productivity, has resulted in regimes that have 'consequently focused on mechanisation, specialisation and increased inputs of energy and chemicals that have boosted massively agricultural output per unit of labour' (Smith et al, 2005, p.1493). Consequently, the bio-physical characteristics of a region determine in part what can be produced and can be distinguished between controllable and non-controllable aspects. Controllable biophysical aspects are defined as those which the actors at that particular spatial scale have some ability to manage through the utilisation of science/knowledge and

technology²⁷ to overcome limitations posed by that particular aspect; with the use genetic modification (GM) to overcome soil salinity (Brown, 2001) being one example of such a technological solution. GM is part of one approach to the ST configurations of food production and specifies a particular interaction between the science-technology and biophysical elements of the agri-food regimes. However, within the production of food countless different configurations of science-technology-biophysical elements can be found amongst the academic research communities with Vanloqueren, G. & Baret (2009) contrasting the GM research tradition with an agro-ecological one which proposes a range of management approaches that limit the use of inputs and focuses principally of land management knowledge to improve yields (Branca et al, 2011)²⁸.

Furthermore, biophysical properties are also highly significant in terms of the eventual products that the agri-food industry produces. Food products have many biophysical properties²⁹ but those that aid in improving the nutritional health of the population are increasingly being seen as an important issue for society to address, particularly in developing countries where malnutrition has a significant social and economic cost (Pfeiffer & McClafferty, 2007 and Frison et al, 2011). Additionally, these biophysical qualities of final products are also of increasing interest to the biotechnology research community with changes to improve the content of 'good' omega 3 oils in oilseeds to bring their nutritional benefits for human consumption closer to fish oils and attempts to 'biofortify' maize and rice crops being two examples of crop based GM improvements (Park et al, 2011). Equally the ongoing debate regarding the benefits of organic produce and farming has seen research which shows that the benefits of organic production systems can be traced into the food produced in terms of enhanced nutritional benefits and a reduction in the concentration of harmful elements such as cadmium (Barański et al, 2014).

²⁷ Note that interaction between science, technology and the biophysical is an important aspect of the thesis and discussed in more length in Chapter 8.

²⁸ Branca et al (2011) is a good overall summary of some of the research that has considered some of the management options. The options included: zero/reduced tillage, green manure, improved rotational techniques, terracing, agroforestry modes of agriculture (crops on tree-land, live barriers, trees on cropland) amongst others.

²⁹ Fat content, types of fat present, vitamins, minerals and other micro nutrients being but a few examples.

Understanding what the key configurations are within a region, how they co-evolve with the rest of an agri-food regime/niche configurations and the extent to which they are sustainable for rural regions, is critical for understanding the rural development implications of regimes and niches. Without the inclusion of the biophysical element the socio-technological system analysis of regional agri-food systems would only be a partial analysis.

3.3.3: The importance of interplay between niche, regime and landscape levels

A key aspect of the ST framework is the analysis of the interplay and dynamics between different levels within the MLP (Geels, 2005). It is this key aspect of ST theory and the MLP it adopts that makes it an attractive tool for analysing local/locality food businesses within the wider context of the conventional agri-food sector. The alternative and local/locality food literature, as discussed in chapter 2, portrays local and locality food supply chains as being: alternatives to the conventional sectors that coexist within the same region(s); and radically different in their configuration. This portrayal makes it sensible to characterise local/locality food supply chains as niches and conventional agri-food supply chains as being part of the wider regime dynamics within similar geographical and sectoral clusters. One of the important considerations with respect to the empirical work of this thesis is to attempt to develop an understanding of whether there is interplay between local niches and the conventional regime and, if so, what form it takes.

Whilst the MLP of the ST framework is useful in describing niche, regime and landscape structures/interactions, Lovell's (2007) study of governance and the UK low energy housing niche argues that more attention is needed with 'regard to the messiness of socio-technical system change' (Ibid, p.42), reasoning that it is rarely the case that niche management is as ordered or as neat as the ST framework suggests. Lovell's argument is more poignant when considering agri-food systems as both Renting et al's (2003) short food supply chain typologies and Marsden's (2008) rural development agri-food dynamics have alluded to the diverse array of supply chains in existence; some of which may represent regime level configurations and some of which are one

of a multitude of niche innovations or sub sectors. Deciding whether case study businesses/supply chains uncovered in the empirical phase of the research represent exemplars of regime or niche configurations is a key analytical aspect of this thesis and is discussed further in Chapter 4.

Niches can be considered novel socio-technological configurations (Geels & Schot, 2007) because, in essence, they are proto-regimes suggesting alternative configurations that may provide new dynamically stable regimes. Within the ST framework discourse, niches have hitherto tended to be discussed and examined in the terms of a technological innovation perspective, which is an entirely reasonable proposition as it is often technology that brings about regime change. For example, consider the advent of compact disc technology and then MP3 encoding technology and how it has altered the way society uses and interacts with music and other media products.

It must be understood, however, that within the agri-food sector there exists a more diverse array of niche configurations than may typically be found within other technological sectors. This is due to the multifaceted nature of food production and consumption which is apparent from the following examples: the array of supply chains listed in Figure 2.1 in the previous chapter from Renting et al (2003); and the diversity of local rules/logics that van der Ploeg et al (2004) identify in their work on niche novelties. These diverse arrays of niches from face-to-face SFSC³⁰ (such as farm shops and pick your own) to proximate/extended SFSC (such as CSA³¹, certification labels and hospitality sales) produce different emphases upon new proposed regime formulations.

Some niche innovations focus upon a couple of the socio-technological elements of the regime dynamic with, for example, genetic modification and biotechnological advances proposing a new regime dynamic based on changes to the technological and science elements, which will assist in maintaining the overall dominant elements of the existing global regime espousing global free trade structures and free choice for

³⁰ Short food supply chains.

³¹ Community supported agriculture.

consumers. Other niche innovations such as CSAs, however, propose radically different socio-technological configurations to how food commodity chains are constructed and negotiated by consumers and producers, reconstructing markets/user preferences and changing the underlying culture of food procurement and farm businesses whilst allowing flexibility in the modes of productions (technology). Local/locality food niches can be examined using the socio-technological constellation of elements and can be compared to the current regime and in doing so, will provide a structure to assess what differences exist between the local/locality agri-food niches and the conventional sector (regime) within a region.

Another example of the interplay between niche and regime comes from Lovell (2007), which provides an interesting argument with respect to the preferences that public policy makers have regarding policy making for socio-technological systems:

‘There are reasons why policies to encourage niches might appeal to governments more than sector-wide regulatory changes, in particular because niches are less likely to threaten powerful interests embedded within the existing socio-technical system.’

(Ibid p.42)

Essentially the argument that Lovell (2007) proposes is that niches, being smaller than socio-technological regimes, do not necessarily challenge the status quo enjoyed by powerful actors who are embedded within a current socio-technological regime’s dynamics, making it easier for governance actors to support niches as opposed to tackling wider issues found within the structure of larger regime constellations. In terms of governance of the wider regimes, when placed within the context of the agri-food industry in the UK, this argument has particular resonance if we consider the economic position of producers, processors and retailers in the UK. On the one hand we see policy that is aimed at reshaping producer level businesses towards new processing & marketing opportunities and environmental public goods as

demonstrated within Axis 1 & 2 of the recent 2006-2013 RDP³² such as the agri-environmental schemes, processing and marketing grants and, more historically, the capital grants for farm investment and enterprise (e.g. WAG, 2008 and DEFRA, 2007) which are implicitly aimed at improving farm economic viability. On the other hand we see DEFRA's Food 2030 strategy containing only a single reference to managing the agri-food supply chain relationships (DEFRA, 2010, p.69) despite the unevenness of power relations between retailers, processors and producers which has created market structures where market price signals can be completely translated down from retailers to producers but cost price signals from producers can only partially be translated upwards (Dewick & Foster, 2007).

Essentially, it appears easier to provide some support to the producer level of the agri-food systems in the UK rather than address perceived systemic issues. The wider question that this argument poses is what elements of the current regime impede or resist regime transformation and moreover reduce the ability of agri-food niches to challenge the dominant regime dynamics?

3.4: Conclusion and notes for framing the empirical research of this thesis.

This chapter started with an introduction to the systems transition framework and the regime, niche and landscape levels of the MLP and how dynamically stable regimes transition in response to landscape forces, internal reshaping and socio-technological niche innovations. In defining the concepts of niche, regime and landscape some key nuances applicable to this research are described, most notably regarding the delineation of regimes through the density of connections between the elements of the ST constellation of elements, and how these couplings produce a dynamic stability that allow regimes to adjust itself in response to external pressures without changing its underlying logics. In terms of niches, the concept of assimilative potential was introduced which adds nuance to the comparative analysis of niches and regimes and helps to understand whether niches are liable to be readily absorbed or adopted into

³² Rural Development Plan.

the regime together with the implications this has upon the regime ST constellation of elements as a result.

The chapter then raised a series of points regarding how these heuristic tools may be appropriated for researching regional agri-food systems. Two key adaptations to the ST systems framework that allowed it to be used, were proposed, which are the implicit construction of spatiality in ST regimes and the addition of biophysical as an element of the ST constellation of elements.

A spatial framing of the MLP for regional agri-food research conceptualised the agri-food system as a nested hierarchy of regimes, arguing that these regimes exist at multiple empirical levels as follows: Global-> Macro Regional-> National-> Regional-> Regional Sub-Sectoral Systems. This nesting of agri-food systems is important when considering the empirical analysis of one regime/a set of regimes within a region and, in particular, how multiple regimes in the same area interact with each other as well as with higher level regimes. The definition of what a regional spatial aggregation could be was also discussed, positioning it as a meso level of space between the local and the national. The delineation of regional aggregations was discussed in terms of biophysical and socio-political factors and it was concluded that the thesis will adopt a socio-political aggregation due to the legitimacy that actors in the agri-food system place in these social constructions, but nevertheless questioned whether these constructions are the most appropriate for regional agri-food research.³³

Additionally, this chapter argued that a further element of biophysical characteristics is added to the socio technological constellation of elements when using the socio-technological systems framework due to the intrinsic biophysical aspect that is embedded within all socio-technological systems. It is certainly the case the biophysical aspects are more apparent within agri-food socio-technological systems because of their rootedness in land based production which, in turn, presents the point that, in terms of agri-food, it is the biophysical nature of regions that in part shapes what can be produced and therefore partly shapes the possible ST regime(s) configurations.

³³ Whilst not addressed in the thesis the researcher believes that this is an interesting question that requires further investigation.

The chapter also reflected on the framing of local/locality agri-food supply chains within the MLP and argued that these were niches when compared to the more conventionally based agri-food supply chains which are part of sector specific regimes. It produced key questions regarding local/locality niches, their regimes and the wider system that are pertinent to the study, namely:

1. How do we apply the analytical levels of the MLP to empirical levels in an appropriate manner for researching agri-food systems?
2. What interplay exists between the conventional regime actors and alternative niche actors?
3. Do regimes impede or resist regime transformation and moreover reduce the viability of local/locality agri-food niches to challenge the dominant regime dynamics?
4. If pressures exist in the wider landscape/higher regime levels that interconnect several regimes, to what extent are niche or regime actors in these lower regimes able to respond effectively to these pressures?

The answers to some of these questions have been discussed within this chapter, although they will be further expanded upon within the context of the results of the empirical research and revisited in later chapters. One final question that should be added at this point is to what extent are local/locality agri-food niche supply chains dissimilar to regime level supply chains? This final question is certainly linked to questions two and three because it asks fundamentally whether local/locality food supply chains are transformed by the regime and do they in turn transform the regime or whether regimes simply consume these expanding niches.

Chapter 4

Methodology

4.1: Introduction

Chapter 2 discussed the rural development/local food research traditions and highlighted a number of perceived issues with the research in these fields, most notably the lack of an interpretive framing of the research that is inclusive of developments both within conventional and niche sectors. Chapter 3 posited that an adaptation of the socio-technological systems framework developed by Geels (2002 and 2004), Geels & Schot (2007) and others within the strategic niche management literature would be able to provide a suitable framework to address some of the perceived problems with the literature discussed in Chapter 2.

This chapter deals with the methodology of the research and how it approaches a deployment of ST Systems Framework for regional agri-food research. The chapter starts by re-stating the key questions that the thesis will address and follows this with a discussion of the epistemological perspective which the thesis adopts and how this perspective is translated into an empirical application of the ST Systems Framework for regional agri-food research. Section 4.4 details the methodology employed in the thesis, discussing in detail the formation of each stage of data collection and the rationale behind them, which is followed by a brief discussion of how this data is analysed in the results chapters. The case study region of SW Wales is introduced in section 4.6. How previous research applied the ST Systems Framework to empirical settings and the methodological approach is of interest and discussed in Section 4.7. The chapter finishes with a brief discussion of the ethical considerations undertaken whilst researching for this thesis.

4.2: Defining the research questions

Chapter 2 asked a number of questions on issues with Rural Development theories focusing on the contention that these theories, whilst contributing much to our knowledge of local/alternative food chains, do not locate the development of these local food chains within the wider context of an evolving conventional food system within the same geographic region. Chapter 3 introduced Socio-Technological Systems Theory as a potential heuristic tool that could be used in the study of rural regions, investigating rural development, whilst addressing the concerns of pre-existing work in the field suggested in Chapter 2. However, Chapter 3 also argued that the ST systems heuristic tool required modification in order for it to be an appropriate analytical tool for the task. Two modifications were put forward being: the use of a nested, spatially defined series of regimes (regional, national, supra-national, global) where the regional level is the focus of analysis for this thesis; and the addition of a biophysical element to the ST constellation of elements that encompasses the climate, metrological and soil qualities of a study region. With these two modifications, it is argued that the multi-level perspective metaphor of landscape-regime-niche at a regional level provides a lens to analyse the alternative/conventional food supply chains thus allowing a richer understanding of the contribution that these systems make to the development of a particular rural region. This thesis intends therefore, to answer the following questions:

1. What are the structural/network/governance characteristics of the SW Wales agri-food industry and is there significant differentiation between specific agri-food sub-sectors?
2. How can the heuristic model of Socio-Technological Systems be applied to the analysis of regional agri-food systems and the specific sectors within such regions? Does the ST framework allow us to develop a better understanding of changes in regional agri-food systems?

3. How has the SW Wales agri-food industry changed in response to developments in the wider national and international agri-food system? Can this change be understood as transitions in regional agri-food regime(s)?
4. Does an understanding of rural agri-food regions as differentiated Socio-Technological regime(s) help to analyse the transitional nature of regional agri-food systems, including the role that public policy plays in fostering their development?

4.3: Epistemology and the empirical application of the ST systems framework

The epistemological perspective of a thesis is often a key consideration in terms of how it frames the types of knowledge claims that it is able to make and how it approaches the interpretation of empirical data. There are many different epistemological perspectives that could be adopted for the particular research questions posed in Section 4.2 and a debate of the relative merits of these perspectives rages in the annals of many well respected academic journals and is the subject of numerous books. This thesis intends to adopt a Social Constructionism epistemological perspective and does not seek to contribute to the overall debate regarding epistemological perspectives.

Constructionism contends that individuals shape their understanding of the world through their own experiences whereas Social Constructionism focuses on how concepts are defined at the societal level and accepted as norms (Andrews, 2012). An example of how constructionism can be applied to rural spaces is shown in the following quotation:

‘Why does a real estate developer look across an open field and see comfortable suburban ranch homes nestled in quiet cul-de-sacs, while a farmer envisions endless rows of waving wheat and a hunter sees a five-point buck cautiously grazing in preparation for the coming winter? The open field is the

same physical thing, but carries multiple symbolic meanings that emanate from the values by which people define themselves.' (Greider & Garkovich, 1994, p.1)

The quotation shows how each individual's perspective shapes their perception of the same physical space. The individuals in the above quotation come from very different backgrounds and therefore their constructions of space are equally different, which would be interesting from the perspective of constructing ideas about how land could be utilised. This thesis, in researching agri-food supply chains/systems and their role in rural development, focuses on the actors who work in (e.g. producers, processors and retailers) or are closely connected (e.g. institutional actors and consultants) to these systems and will investigate how these actors have constructed the concepts that govern how these systems are perceived and operate.

Social Constructionism does not attempt, as Cruickshank (2012) argues of realism and positivism, to apply knowledge in a literal manner but instead recognises that knowledge claims are connected to power and, as such, seeks to 'delegitimise prevailing knowledge' (ibid, p.75). A further point of interest is that the Social Constructionism approach recognises that 'realities are ... local and specific in nature' (Guba & Lincoln, 1994, p.110). Social Constructionism's position regarding the delegitimation of prevailing knowledge placed within a regional or local context is a particularly interesting approach for the investigation of regional agri-food research which seeks to understand the differences between conventional-'prevailing'³⁴ and alternative systems.

This thesis centres upon the application of the ST Systems Framework to provide an analytical model or lens for examining regional agri-food systems. The ST Systems

³⁴ It is worth considering that there are two levels of prevailing knowledge in this context. In terms of a regional context, 'prevailing' can be taken to represent the dominant norms of the agri-food system found in that region. Alternatively, there is some debate about the prevailing academic knowledge claims of agri-food systems in a rural development context where, as Chapter 2 discussed, the alternative is positioned in preference to the conventional agri-food systems. Through the empirical fieldwork and analysis this thesis seeks to make some comments about both levels using SW Wales as a case study region.

Framework is essentially model, but why do we use models? The answer to this question is neatly summarised by Sayer (1992) who, when discussing what he terms the double movement from 'concrete → abstract, abstract → concrete' (ibid, p.87), where concrete objects in his discussion represent objects such as 'people, economics, nations, institution, activities and so on' (ibid, p.87), goes on to explain this double movement by claiming that:

'At the outset our concepts of concrete objects are likely to be superficial or chaotic. In order to understand their diverse determinations we must first abstract them systematically. When each of the abstracted aspects has been examined it is possible to combine the abstractions so as to form concepts which grasp the concreteness of their objects.' (Ibid, p.87)

What Sayer is suggesting is that at first glance concrete objects seem chaotic and our understanding of them can be somewhat superficial. It is only when the process of organising concrete objects into abstract elements of a model is completed that we can begin to form ideas about the relationships between these concrete objects. Essentially what this thesis will do on a methodological level is abstract from various sources of data collected from a number of concrete objects into the relevant elements of the ST Systems Framework analytical model. The aim in Chapters 5, 6 and 7 is to present an analysis of these abstracted elements that will produce a conceptual understanding of regional agri-food systems along the lines detailed in Chapter 3. This will mean that conventional aspects of the agri-food industry within the case study region are abstracted into elements of the regime level in the ST Systems Framework analytical model; whereas those business/supply chains which present characteristics that appear to be radically different from the conventional regional sub-sector will be abstracted into the niche level of the analytical model.

It was believed, even before empirical fieldwork was undertaken, that the agri-food system in the case study region was divided largely along production type lines, with the meat sub-sector of the agri-food system being distinctively different to the dairy sub-sector, which is in turn different to the horticulture sub-sector etc. The idea of

distinctive agri-food sub-sectors within Wales itself is partly supported by a review of the policy documentation and infrastructure of the Welsh Assembly Government (WAG), which has separate strategic action plans for each sub-sector as well as dedicated institutional actors such as Hybu Cig Cymru who represent the Welsh red meat industry or the Dairy Development Centre which supports the dissemination of market, technical and scientific knowledge for the Welsh dairy sector. This very preliminary desk research along with discussions with CASE award industry partner, ADAS Cymru, suggested that there are significant differences between sub-sectors of the agri-food system. Consequently greater nuance of the empirical realities of the case study region's agri-food industry can be achieved by abstracting into three distinctive sub-sector specific regime levels for the case study region being: Meat, Dairy and Horticulture; rather than abstracting data from interviews and secondary sources into a single regional agri-food regime.

One of the additional empirical challenges that the ST Systems Framework model presents for a researcher in agri-food systems and rural development arises when the 'regional' is the focal scale of analysis and so necessarily becomes abstracted at the regime level of the MLP model. The challenge is this: where does the 'regional' finish as a spatial aggregation and become something larger and therefore becomes part of another system that interacts with the 'regional'? This is an important question to address in terms of regional agri-food research as it will define the extent to which affects upon agri-food system are intra-regional or extra-regional and thus suggests the degree to which regional actors are able to influence them. The concept of regional was discussed in chapter 3, within the context of regional agri-food socio-technological systems, and placed regional as a meso level of spatial aggregation between local and national before specifying that the SW Wales region would represent regional for the purposes of this thesis. An introduction to the SW Wales agri-food region is set out in section 4.6 below.

The final element of 'fitting' the empirical data to the ST Systems Framework model is considering how comparisons are made between the regime level and niche level in the analysis. This was partially covered in Chapter 3 which discussed the difference

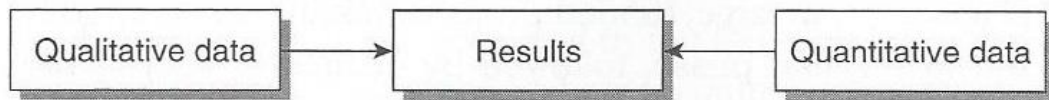
between regime and niche innovations, in that a niche within the context of ST systems theory must be significantly different from the regime or, to put it another way, it must be innovative in one or more aspects of its operations when contrasted with the relevant regime. The method through which a niche can be considered innovative is that it presents an alternative configuration of the ST elements (biophysical – culture – industry – policy - science/knowledge – technology - user/market preferences) to the regime. It is these elements that will be abstracted from interviews and secondary data in order to construct the sub-sectoral regime which, once constructed, will be used to compare to potential niche businesses. Further discussion on what it is that makes a business or supply chain a niche within a regional agri-food context are considered partially within each results chapter (where relevant) but a fuller discussion is set out in the concluding chapter, particularly in section 8.2.1.

4.4: Formation and collection of empirical data

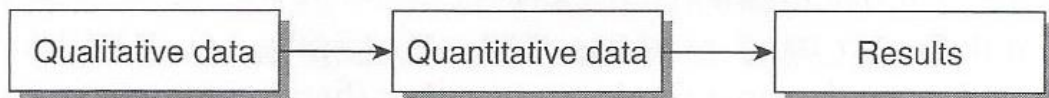
This thesis adopts a mixed methodological approach to the collection and analysis of data which relies on both quantitative and qualitative data to create an in depth analysis of SW Wales' regional agri-food system. Mixed methodological approaches contain a: 'central premise ... that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone' (Creswell & Plano Clark, 2007, p.5). There are three key ways that quantitative and qualitative data can be combined to arrive at a set of results; these are shown in Figure 4.1.

Figure 4.1: Showing the different approaches to combining quantitative and qualitative data in mixed methods research

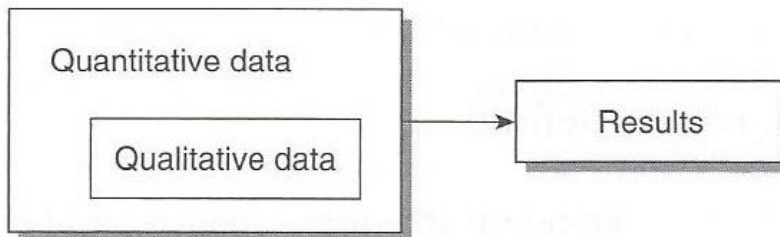
Merge the data:



Connect the data:



Embed the data:



Source: Creswell & Clark, (2007, p.7)

This thesis adopts the merging of data approach which will allow the construction of regimes to emerge from both deep empirically rich qualitative interview data and broad based contextually relevant quantitative data, in order to provide the best possible understanding of the three sub-sectoral regimes within the case study region. How this particular thesis constructs the empirical data collection and analyses under this mixed methodological approach is covered in the balance of this section and in section 4.5.

There are three distinctive phases of data collection: a first phase of 'key stakeholder' interviews, a second phase of exemplar business/supply chain interviews and, finally, desk based secondary data collection. Each phase will be discussed in the following sub-sections which will detail: the aim of each phase, the choice of interviewees and what data was collected. Following these sections, there is a discussion of how the

data collection from these three phases is analysed together using the ST Systems heuristic model.

4.4.1: First phase of interviews: 'The stakeholders'

The first phase of the empirical interviews was intended to provide three functions: to be an informative pilot study into the overall structure of the regional agri-food system, to provide suggestions for potential interviewees for the second phase of interviews and, where appropriate, to support the detailed analysis of the three sub-sectoral regimes. Participants for this phase of interviews were selected based on a purposive sampling strategy.

Purposive sampling strategies enable the researcher to select interviewees and/or cases that will be sources of empirically rich data which best provide an in-depth understanding aimed at answering the research questions posed (Agourram, 2009 and Colasanti et al, 2012). Potential interviewees were selected based on recommendations from the CASE partner and on the identification of key stakeholders from policy documentation. The strategic action plans such as the Red Meat Action Plan (WAG, 2009) were particularly useful in identifying potential key stakeholders for interviewing as these key stakeholders were either directly involved in the writing of these action plan documents or are mentioned within the plans themselves. Fourteen interviewees were selected spanning a cross-section of the agri-food community including agri-food businesses, consultants and trade association officials together with local authorities and other related institutions. Appendix A shows the composition of the interview group.

The semi-structured interviews used open-ended questions, which were aimed at directing the interviewees to discuss the issues of interest whilst allowing the interviewer to explore the specific expertise of interviewee (DiCicco-Bloom & Crabtree, 2006). A copy of the interview matrix is enclosed in Appendix B and comprises the following six open-ended sections:

- Background information;
- Changes in the agri-food sector in the last decade;
- Specifics about sectors;
- Actors and influence;
- Future prospects and SWOT³⁵; and
- The local food sector.

The background information section was primarily a starting point for the interviews which was designed to put the interviewee at ease and to elicit information about the interviewees and their organisation or business. The second section commenced the discussion about the agri-food system in SW Wales by asking interviewees to discuss what major changes have occurred in the agri-food sector of SW Wales over the last decade. The interviewee was specifically asked what changes have occurred in how food is produced, processed and distributed in the region, which was intended to attempt to draw the stakeholders into discussing the agri-food system in SW Wales in its widest sense rather than focusing on just the area in which they are engaged. Interviewees were also asked to rank the changes in the order of the importance/impact that they have had on the SW Wales agri-food system, the intent being to highlight whether there was broad agreement between stakeholders about how the agri-food system has developed over time.

The third section looked at specific sectors and splits the agri-food system into the following aspects: producers, processors/wholesalers, public sector, hospitality and retailers. Going into the region the researcher had no a priori knowledge of whether aspects such as the public sector and hospitality play a significant role in the overall agri-food system in SW Wales and therefore this data would help to define the scope of the second phase of interviews. Interviewees were asked to: describe a particular aspect, discuss how the changes mentioned in the previous section had effected the

³⁵ Strengths, weaknesses, opportunities and threats.

that aspect, and highlight specifically whether there were any effects on the that aspect from changes to WAG policy before, finally, being asked if there were any particularly dominant businesses of that aspect in the region, which would assist in identifying possible regime actors that could be interviewed as part of the second phase of interviews.

The fourth section on actors and influence was designed to ascertain who were the perceived major actors in the agri-food system. The interviewees were instructed that actors could represent individuals, institutions or organisations so as to indicate to them that the widest possible meaning of the word 'actor' was to be applied in the context of this section.

The fifth section asked the interviewees for their own SWOT analysis of the agri-food sector in SW Wales. The core aim was to provide a further opportunity for the interviewees' knowledge of the SW Wales agri-food system to be articulated using a commonly used analytical tool with which all the interviewees would be familiar. Interviewees were also asked what they thought the shape of the agri-food sector would be in the SW Wales region in fifteen years' time. This question regarding the future of the region's agri-food system was designed to provide an indication of the interviewees' view/vision of the agri-food system which will assist in understanding both the relative stability of the current sub-sectoral regimes and suggest potential future transitions in those regimes based on 'expert' opinions.

The penultimate section focused on the local food sector of SW Wales and was primarily aimed at gaining a sense of the extent and nature of the local/locality food sector in SW Wales. The difference between 'local' and 'locality' were explained to the interviewees, using the following statement, by the interviewer prior to the questions for this section in order that every interviewee had the same understanding of those two terms:

'With the term 'local food' we mean that which is produced and consumed within Carmarthenshire or the surrounding counties. 'Locality food' we would

describe as being branded in a particular way, be this Caerphilly cheese, Welsh lamb, True Taste brand or PDO marks for example. These two definitions may be both applied separately and together when we think about particular food businesses in the region.'

The other motive behind this section was to ask interviewees about successful businesses based in the region which produce, process or retail 'local' or 'locality' food products. Any businesses identified by the stakeholders could then be researched through desk based means and then, if they appeared to represent a niche business when compared to the 'conventional' sub-sectoral regime present in the region, they were then approached to request their participation in the second phase of interviews.

The final section was designed to be a brief wrap up of the interview, giving the interviewee an opportunity to discuss anything else which they consider pertinent to the issues of interest. Interviewees were specifically asked whether they felt that there was anything which was important to the agri-food sector of the region that had not already been discussed during the interview.

4.4.2: Second phase of interviews: 'The supply chain'

The aim of the second phase of interviews was to interview key personnel within businesses directly involved in the production, processing and retailing of agri-food products within the case study region which might be seen as members of either the regime or niches of each of the three sub-sectors. This section follows a similar format to the previous one with a discussion of how interviewees were selected for this phase followed by an outline of the interview structure.

The second phase of the interviews relied, in the first instance, on recommendations from the stakeholder interview cohort to find potential participants but also used other second phase interviewee recommendations; this kind of sampling strategy is known as 'snowball sampling'. According to Noy (2008, p. 330): 'A sampling procedure may be defined as snowball sampling when the researcher accesses informants

through contact information that is provided by other informants'. Furthermore, the interview selection was, at the same time, mindful of the fact that essentially this phase of interviews is a 2 by 3 matrix comprising regime/niche by meat/dairy/horticulture and so it was necessary to prioritise the selection of potential interviewees into this matrix as shown in Table 4.1 below.

Table 4.1: The second phase interview matrix

	Meat	Dairy	Horticulture
Regime	Conventional meat businesses	Conventional dairy businesses	Conventional horticultural businesses
Niche	Niche meat businesses	Niche dairy businesses	Niche horticultural businesses

Deciding initially on whether a potential interviewee was part of the sub-sectoral regime or a niche depended largely on the description given by the interviewee who recommended the potential interviewee and also upon available desk based research into their business activities, such as information contained in a company website or the county level food directories. This was not always successful, with some of the potential interviewees for the regime level becoming more obviously examples of potential niches. This aspect of the research and analysis will be discussed further in Chapter 8.

The second phase of interviews used a semi-structured format similar to that of the first phase and comprised 20 interviews. The interview was slightly different depending on whether the interviewee was a producer or a processor. Copies of both the producer and processor interview metrics can be found in Appendix C. The focus of these interviews was to acquire a detailed understanding of the interviewee's business practices and circumstances as well as obtaining their impression and understanding of the regional agri-food sector. There are distinctive differences between the businesses run by producers and those run by processors and retailers, specifically in terms of how producers utilise their land in diverse ways to produce the goods they sell and, as such,

the producer interview structure is slightly different from the interview structure for processors and retailers. The interviews both have four main sections: respondent's business, sector history, business relationships and agri-food policy. The producer interviews have a slightly different 'respondent's business' section and two additional sections on business income and interactions with institutional actors. The interview sections will be explained over the next few paragraphs.

The first section on the respondent's business was aimed at both providing something that the interviewees will be most comfortable discussing but which also covers some of the key information needed to help answer the research questions. Interviewees were asked to discuss their role in the business before explaining what the business does in terms of: the products it makes, the branding and the number of people it employs and so on. Interviewees were also asked what changes had occurred in the last ten years to elicit some understanding of what challenges and opportunities the business faced in the recent past and how the business addressed them, which allowed for cross comparison with what the stakeholders identified as the major changes to the agri-food sector in the first phase of interviews.

The producer version of the respondent's business section of the interview is largely similar to that of the processor/retailer interview but additionally asked about the size of their holding, how the business is owned and whether they changed their production strategies over the last ten years in terms of what they grow/raise and in terms of the acreage dedicated to each production type. These additional questions put to producers merely recognise some of the distinctive differences in the running of a land based business compared to what are essentially manufacturing, wholesaling or retailing businesses.

The interview then moved on to a discussion of the specifics of the sub-sector in which their business operated within the SW Wales region, be that meat, dairy or horticulture, in the sector history section. This allowed the interviewee to talk more widely about the region's agri-food industry as it applies to them. Change was again a major theme in this section, which provided a link to the previous section for

continuity. Interviewees were also asked to explain why the changes at the sub-sectoral level have occurred, which would assist in describing these changes in terms of how the configuration of elements in the ST regime model for the sub-sectoral regional regime have changed.

The third section on business relationships looked specifically at the relationships between the interviewee and their buyers and suppliers. The interviewer was interested in who was buying from the interviewee, where the purchasers are located, what kind of relationship the interviewee considers they have with their buyers and how prices for the interviewees' goods are determined between themselves and their buyers. When talking about the interviewees' suppliers, the interviewer was interested in the same things as for the interviewees' buyers. The only additional question of interest in this section is how processors and wholesalers manage their suppliers to meet the demands of their buyers.

The agri-food policy and government section was designed to investigate what interactions the interviewee had experienced with agri-food policy and regulations. This section intends to develop an understanding of the interviewee's opinions regarding public policy and regulation of the agri-food industry in the region and specifically whether (and, if so, how) the interviewee's business has been affected by any particular regulation of policy. Whilst this is a specific direction in the interview to discuss part of the ST systems' constellation of elements, namely policy, it was felt that this is a key aspect of the agri-food industry which affects producers and processors in differing sub-sectors and is therefore an key aspect of the agri-food system that needed to be explored within the interviews.

Interviews with producers required two additional sections: business income and interactions with institutional actors. The business income section recognises that producers obtain their income from multiple sources: the sale of produce from the farm, state payments such as the Single Farm Payment and agri-environmental scheme payments together with non-farming related or off-farm income from sources such as holiday lettings, machine contracting and non-farm employment. Interviewees were

asked how frequent their income from each source was and what the changes to these income streams have been over the last 10 years. These questions were designed to give a further opportunity to discuss aspects covered in the Respondent's Business section but also to enquire how interviewees may or may not have adapted to changes in the relative levels of income they have seen from different sources. The sources of income for the producer interviewee are also important because it is necessary to understand how reliant they are on agriculture for their livelihood as this may reflect upon their responses elsewhere in the interview.

The institutional actors section was added to the initial interview design after some of the interviews with key stakeholders during the first phase of interviews. It was apparent that there were a significant number of institutional actors including: trade associations like the National Farmers Union and Farmers Union of Wales; an array of quasi-autonomous non-governmental organisations (QANGOs) such as Hybu Cig Cymru and Food Development Centre; and private companies like Menter a Busnes, ADAS and Agri Angels; all of whom offer various services and advice to the producers in SW Wales. It appeared from the first phase of interviews³⁶ that these institutional actors were a significant resource for the dissemination of knowledge to producers about new equipment, new agricultural practices/methods and market information. Understanding the role that these institutional actors play in the regional agri-food system from the perspective of the producers appears to be key in both understanding the nature of the knowledge support network to which producers have access but also to assist in judging the perceived success of state funded rural development support through QANGOs.

4.4.3: Secondary data sources

Agri-food systems, regardless of whether we consider them at a regional, national or global spatial extent, are inherently complex systems comprising many different facets, businesses and supply chains with numerous governmental and non-governmental agencies all with differing roles, goals and responsibilities. These agencies often collect

³⁶ which included some of these institutional actors

and analyse data on parts of the agri-food systems pertinent to their specific agendas or roles and publish reports and, occasionally, data sets of the collected data. This array of data, although 'tainted' by the particular agenda of the agency that collected it, can provide a useful and diverse source of secondary data sets for regional agri-food system researchers. There are, however, several issues to be aware of when using secondary data in research which will be discussed in this section. A discussion of how the secondary data has been used and analysed is covered in Section 4.7.

One of the central challenges specific to the use of secondary data sources for regional agri-food systems research is deciding what of the wide array of data is relevant to the research. The focus of the agencies collecting the data is not upon the specific case study region but often a wider national, sector-specific industrial or international focus, which therefore means that there is a large body of additional data. It would be fairly easy, therefore, to resort to a study of the entirety of an agri-food system rather than a regional system, which is complex enough, or to sketch national agri-food sector narratives. This thesis addresses the problem of data relevance by reviewing much of data/reports³⁷ that are available but using only that which either helped to inform an understanding of the agri-food systems within the case study region or were needed to assist in the corroboration of information given by the interviewees. Furthermore, secondary data sets of a wider geographic level are useful to highlight differences between the dynamics/nature of the specific sub-sector in the case study region.

The availability and quality of secondary data sets is of concern for any researcher using them (Bryman, 2004). Table 4.2 shows the types of data and provenance for a selection of data which was acquired during the course of the data collection phase. As discussed earlier, one of the key issues with all the data is the bias of the data collectors which can manifest in a number of different ways. The principal ways in which data sets have been tainted with bias are: data collection, data interpretation and data presentation. The next few paragraphs will focus on the collection and presentation of secondary data.

³⁷ The researcher, for example, read all available documents, that were available at the time that, the WAG published in relation to agri-food related policy/strategy including: Rural Development Plan 2007-2014 and the range of agri-food strategy documents such as the Red Meat Strategic Action Plan (2009).

Table 4.2: Showing the range of available secondary agri-food data

Source Provider	Data Type	Typical Contents
Welsh Assembly Government	Strategic Action Plans	Detailed sector-specific reports, high degree of Welsh contextual quantitative/qualitative data. Gives an institutional actor view of the sector (WAG and associated actors).
	Agricultural Business Survey (Agri 'Census')	Basic structure of agricultural production in Wales aggregated into regions, counties and Agricultural Small Areas.
	Commissioned reports	Commissioned reports contain contextually relevant information gathered by third parties on behalf of the WAG, examples include: Food for Wales, Food from Wales 2010-2020 (WAG, 2010b).
Trade Associations & Institutional Actors Examples: National Farmers Union, Farmers Union of Wales, Dairy Development Centre, DairyCo, Hybu Cig Cymru	Principally reports as well as some raw data depending on the institution	Institutional actors gather, collect, analyse and report on specific aspect(s) of the agri-food system with which they are concerned. The information gathered provides contextual depth to specific elements of the agri-food system usually aggregated to a national (UK) level.
UK and EU government departments	Various data sets and reports	Provides relevant information setting Wales within a national or European context
Company websites/financial information	Data about specific companies and their dealings with other actors	Garner understanding about key businesses within a specific sector

The presence or, more accurately, the absence of data for certain aspects of the agri-food industry can be anything from a minor issue to a major problem in terms of 'regional' levels of analysis (Renting et al, 2003, and Sonnino & Marsden, 2006). Actors collect, analyse and report on aspects of the agri-food sector based on what they perceive best represents their priorities depending largely on the level of resources that they have available to facilitate the collection and analysis of data. Whilst there is nothing essentially wrong with this approach (indeed it makes good commercial sense for the collators of data in many respects) it does mean that, whilst there is a reasonable amount of data on the perceived core aspects of the agri-food industry in a particular region, the peripheral aspects are less well served by secondary data analysis, if at all.

There are two issues with these 'gaps' in the secondary data. The first issue arises from the complete absence of data for a particular aspect of the agri-food industry with

prime examples of this being the lack of longitudinal data on numbers and types of food related businesses active in the SW Wales region, the absence of breed specific numbers for sheep and cattle, and actual milk price per litre for payments to producers. These data gaps in the agri-food sector knowledge for the case study region can only be examined through primary interview data, which does not allow for a more in depth examination of these aspects of the regional agri-food system, and it should be recognised that the data gaps also represent potential avenues for future research.

The second issue relates to what conclusions can be drawn from secondary data that is published in reports rather than in a raw, unprocessed format. This type of secondary data is processed and presented in various formats including: graphs, infographics, tables and statistical information in the text of reports, all of which gives a researcher a single perspective overview of the raw data collected by the report's authors. It is this single perspective overview on secondary data given in reports that presents a potential issue for the researcher as it does not allow additional investigation of the underlying data, meaning that the researcher is unable to form their own opinions of the data and must rely solely on the perspective provided by the report's author.

4.5: Analysis of empirical data

This section will discuss the analysis of all the empirical data and deals specifically with how regimes and niches were abstracted from the range of sources of collected data discussed in the previous sections. Firstly a discussion of the ways in which primary interview data and secondary data are combined in this thesis is undertaken, which is then followed by an outline of how these data sources were coded into ST Systems' analytical framework.

4.5.1: Combining data sources

Section 4.4 commenced by stating that mixed methodological approaches can provide a more rounded analysis of research problems through the combination of both

qualitative and quantitative data. Furthermore it was established that the intention of the thesis is to merge quantitative and qualitative data equally in the examination of the research problems stated in Section 4.2, rather than using one data type to inform the collection of another or having one data type as a smaller part of another's collection. This approach to merging qualitative and quantitative data sets has been selected because neither data type is wholly objective or valueless. Most notably, both data types are only samples of much larger populations and, furthermore, sources of secondary (mainly quantitative) data cannot be considered to be completely devoid of the perceptual 'taint' of the originating body who collected and, in most cases, processed that data into the form found within the public domain. Consequently, both the data that has been collected personally by the researcher and that which has been collated from available secondary sources have to be viewed through the lens that they represent, in part the views of the source provider (either interviewee or originating body), and have to be evaluated for their representativeness of the particular agri-food sector.

The primary interview data, once collected, was transcribed into a bullet point format that focused around either the key questions asked in the interview or the key themes that the interviewee was trying to make, with direct quotations of key evidence being recorded for later use in the analytical chapters. This format of transcribing was intended to allow the resultant interview transcripts to be more easily navigated than a standard word-for-word recording and to facilitate the quicker location of themes and key points which can then be seen in context³⁸. This approach was also adopted because of the tendency of interviewees to discuss aspects that were intended for discussion later in the interview in early sections and vice-versa; and thus it is clearer to identify and group comments from interviewees into the most appropriate thematic themes for analysis.

This data was then analysed by categorising the key themes and points arising from each interview into thematic themes using both the ST elements and each of the MLP levels as themes. The themes were then collated into three sub-sectoral groupings

³⁸ In the first instance this format was overly brief and many recordings were listened to and re-transcribed a second time in order that sufficient data was recorded. You live and you learn!

being: meat, dairy and horticulture. Within each sub-sectoral group the ST elements and, where relevant, the MLP level comments could be compared for converging and diverging opinions within the interviewee population (both the stakeholder and supply chain interviews). The abstraction of the key thematic themes relevant to each regional sub-sectoral agri-food system can come from both the analysis of interview data, secondary data or a combination of both. It is at this point in the analysis that many of what became the organising themes for key sub-sections of analytical chapters emerged.

Secondary data is also a key component of the analysis of the three sub-sectoral systems within the case study region. The various sources of data, as discussed in Section 4.4.3, were utilised in two key ways namely: to complement the interview data by providing the broader contextual 'brush strokes' of the nature of the regional sub-sectoral systems for analysis and as a means to investigate/ corroborate/validate the divergent interview opinions³⁹. The broader perspective provided by the secondary data principally arises from the various historical and spatial data sources available. This data is used to give a contextual overview of the nature of each sub-sectoral industry, which allowed for a description of the spatial distribution and changes therein; this was then further supported and compared with descriptions provided by the interviewees.

4.6: Introduction to case study region

So far in this chapter we have discussed what data has been collected and how it will then be analysed in the following results and discussion chapters. What has not been discussed as yet is the rationale for the choice of case study region, nor has the case study region of SW Wales been introduced which this section will address.

³⁹ An example of this that will be most obvious is in Chapter 6: The dairy sector, where a lot of data gathering was undertaken to investigate the degree of co-operation between the major dairy processors in response to a quote from one interviewee about the number of 'processors' in his supply chain and comments from other interviewees about the arbitrary nature of price setting in the producer-processor part of the supply chain.

4.6.1: Introduction and selection of the case study region

The theoretical concerns regarding the selection of an appropriate regional space to meet the needs of the research questions were addressed in chapter 3 as part of the discussion regarding spatial ST Systems. The key points emerging from that discussion surround what is a meso level of spatial aggregation for the purposes of agri-food systems research and that such an aggregation, as Behrens & Thisse (2007) argued, emerges from the empirical application of the term 'regional'. This section will briefly introduce the considerations which resulted in SW Wales being selected as the eventual case study region.

The choice of region commenced initially with a requirement that it must be a rural region within Wales itself due to the CASE partner, ADAS Wales', expertise and assistance being of greatest value within the country that they knew best. If a choice of case study region outside Wales had been made that would limit the assistance and advice they could provide to the empirical phase of the thesis. Despite this basic requirement, Wales is still a suitably large area so as to present numerous potential case study regions that could be selected. Figure 4.2 shows one potential level aggregation being that of rural counties in Wales. These counties cover most of Wales except the South Wales area, which contains most of the major metropolitan areas in Wales including Cardiff, Swansea, Neath-Port Talbot and Newport, together with a relatively small amount of agricultural land compared to the other counties shown in Figure 4.2.

Figure 4.2: The rural counties of Wales



Initially the county of Carmarthenshire was selected as the regional case study representing a large rural county which was thought to have a relatively diverse range of supply chains given its relative proximity to the major urban area of South Wales. Carmarthenshire is well connected to South Wales and England through the M4

motorway which terminates in the county. The first phase of 'stakeholder' interviews was conducted with this spatial aggregation in mind; however, several interviewees from this phase discussed various aspects of the regional agri-food system with reference to Pembrokeshire and Ceredigion as well as Carmarthenshire and, at times, this occurred in an almost inter-changeable way which suggested that the agri-food industry is linked across the three counties in at least some aspects. This linkage between the three counties is partly reinforced because all three counties used to be a single county known as Dyfed. The other issue with selection of a case study region is that we were interested in examining three separate sub-sectoral industries within the agri-food system, namely: meat, dairy and horticulture. It was not clear from the first phase of interviews whether this would have been possible if the region was confined to Carmarthenshire alone.

Figure 4.3: Showing the agricultural land capability map for Wales

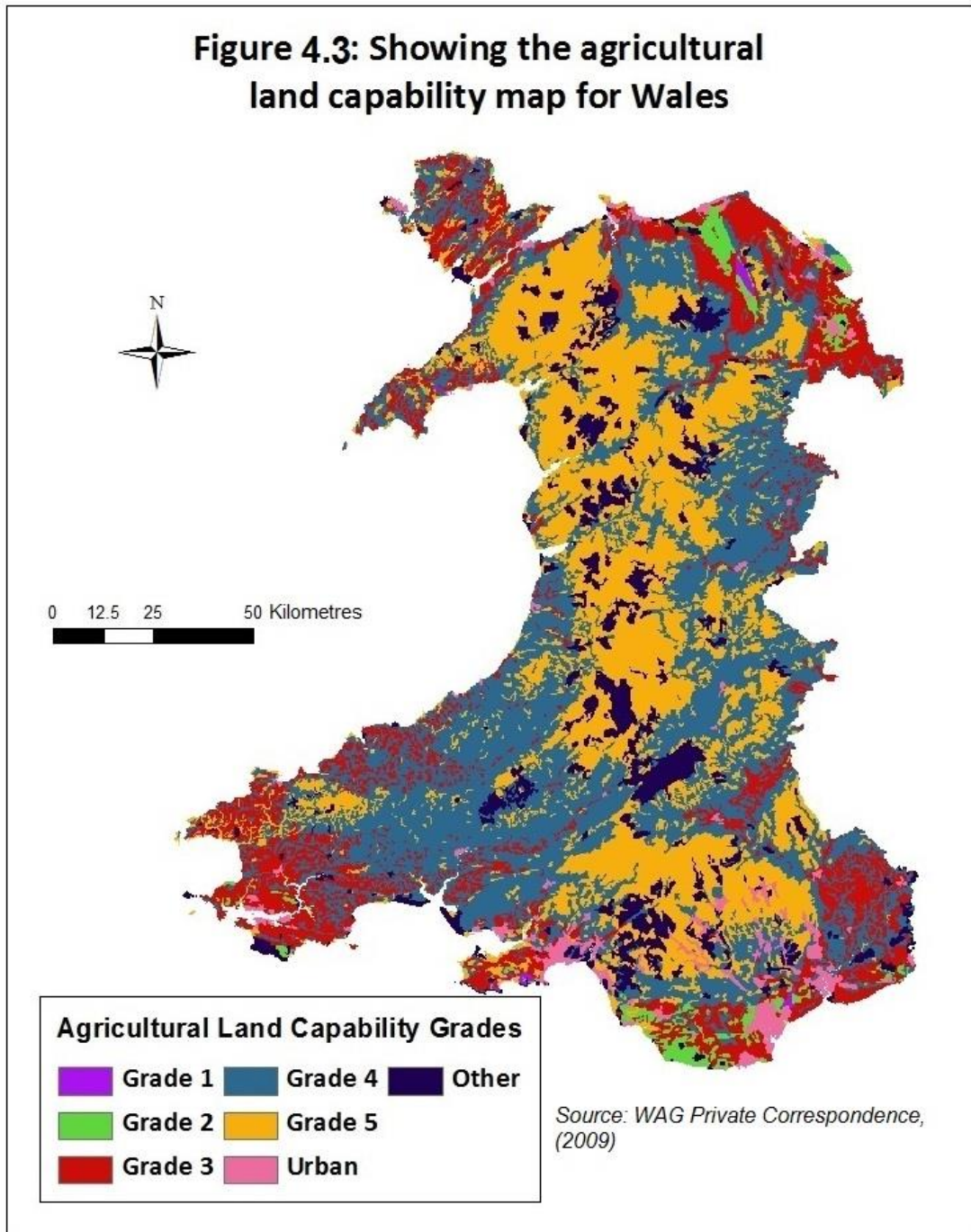


Figure 4.3 is the agricultural land capability (ALC) map of Wales, which shows an approximate measure of how able the land is to sustain the widest range of agricultural activities with grade 1 being land of the highest quality with fewest limitations to agricultural land use and grade 5 being the lowest quality. The ALC classification is created from a composite of altitude, slope relief, slope aspect, soil typology and climatic data sets and so provides a good general indicator of suitability. Figure 4.3 indicates that Carmarthenshire comprises principally grade 4 land, whereas

Ceredigion and Pembrokeshire have more grade 3 and, in the case of Pembrokeshire, a small amount of grade 2 land which is more likely to support a more diverse array of agriculture and, most importantly, horticulture.⁴⁰ Both the greater chance of fully populating the second phase interviewee matrix, shown in Table 4.1, because of more diverse land capability coupled with an indication from the first phase of interviews that a larger spatial aggregation of SW Wales (being the land mass comprising the counties of Pembrokeshire, Carmarthenshire and Ceredigion) makes better sense in terms of the agri-food industry operating in the area means that SW Wales was chosen as the spatial extent of the case study region.

The region has varying levels of transport connectivity with Wales and the rest of the UK. The M4 is the main route way of the region; however, this ends just inside the Carmarthenshire border in the East of the study region. The balance of the region is served mainly by A and B class route ways, the majority of which are single carriage ways, the exceptions being sections of the A40 and A48. It would be entirely reasonable to describe large parts of the SW Wales study region as being relatively remote in terms of their connectivity to the rest of the UK when compared to other rural regions of UK. However, there is a degree of relativity in terms of how remote these areas are or indeed how important proximity to 'chimney pots'⁴¹ is for the various sectors of the agri-food industry under investigation. This issue about market connectivity and remoteness of SW Wales as a region is touched upon in the following results chapters, along with a more detailed analysis of the development of specific agri-food sectors. Finally, it should be noted that whilst some comparatives between SW Wales and other rural regions in the UK are made in the following three results chapters, a robust comparative analysis cannot be adequately investigated within the remit of this thesis.

⁴⁰ The ALC map and an analysis of its contents in context of SW Wales are discussed in greater detail in Chapter 7 on the horticultural agri-food sector in SW Wales.

⁴¹ A proximity to 'chimney pots' refers to being near to centres of population. This reference was made during one of the interviews.

4.7: Methodological approaches to ST systems research

This section considers how previous research using the ST Systems Framework has been conducted. It finds that there are two notable aspects to the methodological approaches that need to be considered in terms of how this thesis approaches the use of the ST Systems Framework. The first aspect relates to the type of data gathering which has typically been employed by researchers, whereas the second aspect is concerned with how the ST Systems Framework has been applied to different empirical settings. These two points are considered in turn in this section, which is not intended to be an exhaustive review of the ST systems orientated research.

The first aspect that becomes apparent when reviewing many of the studies is the type of data that is typically used, which seemed to comprise the use of secondary data and/or the use of existing academic literature on the same empirical phenomena, which is a criticism that Genus & Coles (2008) makes of applications of the Socio-Technological Systems Framework. For example, in a case study of land use changes in Vietnam, Lambin & Meyfroidt (2010) utilised both existing academic and policy maker generated texts to construct the dynamics operating in the system they were examining. In cases of historical ST regime transitions, such as understanding the transition from sail to steam on ships or the rise of the automobile (Geels, 2002 & 2005a), secondary data gathering and analysis is the only possible way of investigating these phenomena.

Whilst secondary data is the only option for research based on historical regime/transition analysis, primary data collection, with or without secondary data, is an option still open to researchers investigating regimes/transitions that exist today or occurred in the recent past where actors are still alive to provide an opportunity to collect data. Primary data collection for more recent ST regime orientated research is, however, a relatively under-used option by researchers. Verbong & Geels' (2007) study of transitions in the Dutch energy production sector used elements of their own previous research as well as other academics' research to construct a composite of case studies which provided an overall assessment of the Dutch energy system that no

one single piece of research could provide. Whereas Lauridsen & Jørgensen (2010) instead relied more on policy literature and other academics' work in their analysis of electronic product transition through changes in European waste product policy.

Primary data collection may not necessarily be required to acquire a modicum of understanding of particular socio-technological regimes and their circumstances. However, it is arguable that ignoring primary data collection and relying predominantly on data/texts⁴², to construct the landscape/regime/niche levels and interactional narratives between them, risks missing a more nuanced understanding of socio-technological systems and system dynamics. This is potentially of particular issue in uncovering the existence of niche innovations as these may be unclear or dismissed by actors operating within the predominant regime. Geels (2011) argues that: 'complex phenomena such as transitions cannot be reduced to the application of methodological procedures and will always contain elements of creative interpretations' (ibid, p.36) and it is for this reason that this thesis proposes utilising a mix methodological approach as set out earlier in this chapter.

Turning to the second aspect of interest, which is how the ST system heuristic model is applied to different empirical settings, we can see a number of examples of differentiated application in the existing literature. Berkhout et al (2009) used the ST Systems heuristic model and, in particular, its metaphor of sustainable transitions applied to developmental economics of Asian economies to envisage the potential of more 'resource efficient' developmental pathways. In their paper, Berkhout et al (2009) link the ST framework and metaphor of transition with the idea of the Environmental Kuznet Curves and existing literature on the development of Asian countries, however without fully suggesting what the potential socio-technological regime configurations of these alternative pathways may be. Similarly, Foxon et al (2010) use the ST framework metaphor to explore potential future transitional pathways this time in the UK energy system. In both the examples of Berkhout et al (2009) and Foxon et al (2010) we find that the ST Systems Framework is used in a

⁴² Such sources of data are most likely generated by actors within the incumbent regime dynamic and, as such, their view could be considered to be partially biased towards incumbent regime logics and views of how the overall system operates.

general way, with the transitional metaphor and the MLP providing a useful analytical framework to look at future energy transitions, but neither fully utilise the regime constellation of elements nor provide suitable comparatives between the competing ST configurations of niches/potential future energy regimes post transition.

Stuiver's (2008) thesis on manure practices and their innovation in farming in the Netherlands and Smith's (2006) on the transitions of the organic sector in the UK are the closest examples of research that has utilised the ST systems framework in terms of their chosen subject matter and, consequently, their application of the framework is of interest. Stuiver's (2008) research focused on knowledge transfer, creation and innovation at the dairy producer level using the ST heuristic tool to discuss the interaction between different actors, the emergence of multiple niches and how those niches created a new socio-technological regime in manure practices. Stuiver (2008) does not appear to engage with the configuration of the socio-technological regime, choosing to focus more closely at the niche level and its interaction with the incumbent regime. Smith's (2006) work on the transition of the organics niche into the UK food retail regime is a very good example of a fully operationalised ST regime constellation of elements, which Smith (2006) then improves upon by contrasting the regime configuration with the organic niche innovation configuration. This approach from Smith (2006) gives a clear understanding of how these two elements of the MLP are differentiated and, moreover, how the niche level adapted through time.

What is apparent from the almost all of the literature reviewed during the course of this thesis is that, to varying extents, they pick and choose what aspects of the ST systems framework to use based on its relevance to the empirical subject being investigated. On one level it can be argued that this represents the 'creative imagination' of researchers in their application of the ST systems framework to suit their particular empirical case or cases. However, it is also reasonable to question whether the hollowing out of the ST systems framework to suit the researchers' interests risks diminishing the analytical value that the framework can bring to understanding how specific systems develop and respond to pressures as well as the emergence of new innovations.

This section has discussed two aspects of interest that are discerned from the methodologies employed by those using the ST systems framework. Firstly, there is the issue of the paucity of primary data collection and analysis used by researchers across a wide range of empirical settings. This in itself may not be a major issue, certainly for purely historical research works such as Geels (2002 and 2005a) where it is not possible to collect data upon the phenomena/transitions as they have passed. However, it is arguable that the reliance solely on knowledge from other sources for research that intends to be forward looking, like sustainability transitions research, is missing an opportunity to fully explore the empirical case studies they are investigating. This missed opportunity for primary data gathering has the potential to result in a number of issues with the eventual findings using ST Systems approach including: poor appreciation of ST regime constellation and the interactional dynamics between elements, failure to identify potential niche innovations and consideration of the ST system only from hegemonic perspective(s) of regime actors rather than from the interpretation of system actors.

The issue with primary data gathering naturally leads to the discussion of the second issue discerned from previous ST systems' orientated research, which is how this research has tended to approach the use of the ST systems heuristic model. It is apparent from most of the literature that the use of the ST systems heuristic model is rarely, if ever, fully constructed for a particular empirical application. Many of the studies choose to focus on one specific part of the ST systems heuristic model such as the dynamics of transition of regimes and their interaction with niche innovations. Geels (2011) cautions researchers not to relegate the ST framework to a purely mechanistic application and encourages 'creative interpretations' in its use. However, without fully specifying the regime constellation and dynamics, it is questionable how empirically or theoretically useful such studies findings might be. This being said, there is nothing entirely wrong with back-grounding and fore-grounding aspects of a system; however, this must be borne from the empirical findings rather than the approach to the research.

This thesis approaches the use of the ST Systems heuristic model in a more rigorous manner than much of the previous literature. It has attempted to construct the socio-technological regime constellations for three agri-food sectors within the same geographical region and has also identified how sector specific niches can be differentiated from the appropriate ST regime constellation. Furthermore, the foregrounding/back-grounding of specific regime elements is borne out of empirical findings and without specifically leading interviewees to discussing specific ST systems elements. Instead this thesis allows elements of the socio-technological system to be identified and evolve from the broad interview metrics shown at Appendices B and C. The one exception to this is the policy element, which is of interest to the thesis given the focus on the role it plays in agri-food systems and, by extension, in the development of rural regions. This ontological approach to the ST systems framework and its application, together with the mixed methodological research design, provides an innovative and original contribution to how the ST Systems framework can be utilised for empirical case study based research.

4.8: Ethical considerations

Research, regardless of what form it takes, always requires a certain degree of ethical consideration. Initially the fieldwork design and its intentions were first cleared by Cardiff University's School of Geography & Planning's⁴³ Ethics Committee. Whilst acquiring the Ethics Committee's approval was a requirement, there were further considerations regarding consent and confidentiality which the balance of this section will discuss further.

Informed consent is a major ethical consideration that has to be taken into account when the research design requires the use of interviews (Silverman, 2005). Interviewees must be made fully aware of the aims and objectives of the research and be assured that their position/reputation/business is unharmed by their participation in the research. In order to ensure that every potential interviewee had an opportunity

⁴³ Formerly School of City and Regional Planning as it was known at the time the Ethics Committee's approval was sought.

to be able to give informed consent, they were first contacted by telephone when the interviewer introduced himself, the reason for calling and gave a description both of the aims of the research generally and what the overall interview structure would be. Potential interviewees were assured that any information they were unhappy/uncomfortable disclosing for any reason could be withheld and that they were completely at liberty to decline to answer any of the question(s)/section(s) put to them during the interview. Furthermore, upon arriving at the interview location the interviewer would again introduce himself, the overall research aims and the structure of the interview. Additionally, permission would be sought before the interview commenced to record the interview with a promise being given that recordings would be deleted after the research was complete.⁴⁴

Confidentiality was a key consideration for some interviewees, with some being uncomfortable giving the most empirically rich and interesting information about the agri-food system because they were directly involved in the supply chains/industries they were discussing. In order to elicit the most honest and open responses from these interviewees their identities had to be protected within the thesis. To achieve this, personal details regarding the interviewee/interviewee's business are kept to a minimum and all interviewee's identities are obscured using generic names such as Meat Producer 1, Dairy Processor 2 and Consultant 1.

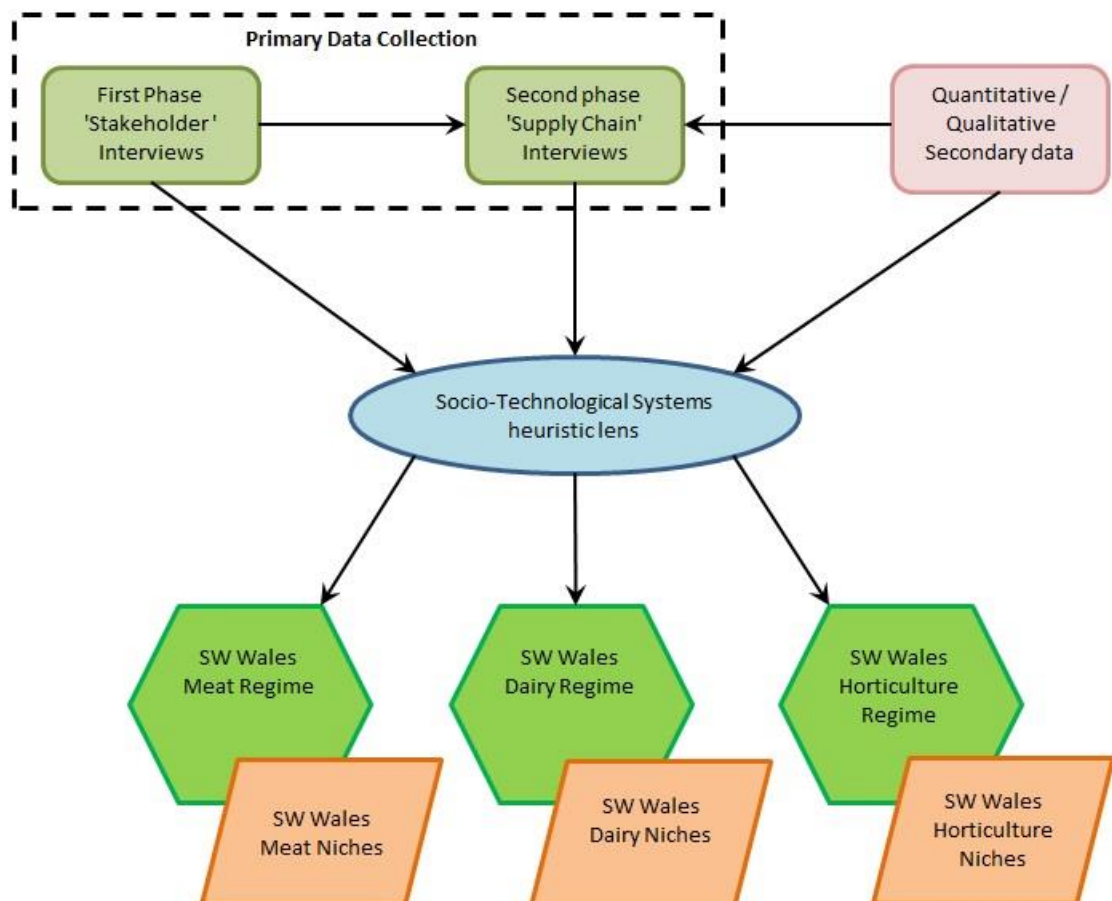
Although not considered at the time of designing the interviews, a few interviewees gave details during the interview that they had not intended to and asked (usually immediately) for those comments to be taken as being off the record. These requests have at all times been honoured, even when the information given would have been highly useful in the context of achieving the thesis aims and could potentially have been garnered elsewhere. This position regarding what are essentially 'unintended comments' from interviewees has been pursued in order that the interviewees' wishes are honoured and that in no way their confidence has been compromised.

⁴⁴ The deletion of recordings will be undertaken after shortly after the viva voce has taken place.

4.9: Conclusion

This chapter has dealt with the approach this thesis has taken in addressing the research questions posed in Section 4.2. Figure 4.4 provides a summary of the approach that this thesis has adopted. The thesis uses a mixed methodological approach combining two phases of interviews (stakeholder and supply chain) together with an analysis of the available secondary data. The selection of second phase interviews was based on information garnered from the first phase and secondary data. All three sources of data were then analysed through the heuristic lens of the Socio-Technological Systems Framework to produce three regional, sector specific constructions of the conventional (regime) and alternative (niche) agri-food systems found in SW Wales.

Figure 4.4: Summary of the methodological approach of the thesis



The analysis of these three sector specific agri-food systems forms the basis for the next three chapters. These chapters are principally organised around the key aspects

of the multi-level perspective of the Socio-Technological Systems framework, except Chapter 7 on SW Wales' horticultural regime which deviates from this formulation in response to the empirical data. The rationale for this deviation will be explained fully in Chapter 7.

Chapter 5

The South West Wales Meat Sector

5.1: Introduction

This chapter investigates the meat sector⁴⁵ within the agri-food sector in SW Wales. The chapter is organised around the Socio-Technological Systems (ST Systems) framework as was discussed in Chapters 3 and 4. The SW Wales meat sector will be shown to be a dynamically stable⁴⁶, red meat centric regime. The regime has undergone many changes in the recent years, including a decline in the livestock numbers and a reduction in the number of abattoirs in the region, but nevertheless is dynamically stable and able to adjust incrementally to the pressures it faces.

The chapter commences with an investigation of the regime level elements of the SW Wales meat sector and specifically: the historical changes that have occurred in the production and processing aspect of the sector, how prices are set within the red meat market and the role that PGI status and animal movement restrictions have played in the SW Wales region. Furthermore section 5.3 highlights some considerations arising from the empirical data regarding the ST System theory and the application of its heuristic model. Section 5.4 will discuss the benefit that the SW Wales meat regime has been able to derive from the landscape effect of preferential exchange rates between the Pound and the Euro. Niches are discussed in Section 5.5 which will also present three case studies of socio-technological innovation located within the SW Wales meat sector namely: a meat producer group, a small scale 'alternative' meat producer and regional wholesaler/feed company joint venture. Each of these case

⁴⁵ Sector, as defined here, is taken to mean all business concerns involved in the production, processing and retailing of meat in the SW Wales region. This includes businesses and supply chains that can be ascribed to either the regime or niche innovation levels of the multi-level perspective in the ST systems framework.

⁴⁶ The term dynamic stability, as discussed in Chapter 3, is where a regime is capable of incrementally adjusting their configuration in response to landscape pressures and innovation without changing the underlying logic upon which that regime operates.

studies is explored in turn and specific attention is given to the rationale for why each innovation occurred and the socio-technological nature of each innovation. The discussion of the niche case studies highlights the tension between niche novelty and regime innovation, which was identified in chapter 3 and which is addressed in more detail in section 8.2.1 where all the niches in this study are considered together.

Finally, section 5.6 presents a summary of the findings for the SW Wales red meat regime and discusses the interaction between a strong red meat regime and the niche innovation case studies. Finally it should be noted that any item that is in bold and italicised text should be read as an identifying aspect of the SW Wales Red Meat regime or the niche under discussion, which will later be summarised in the appropriate table.

5.2: SW Wales meat regime

The first section of this chapter will investigate the nature of key elements of the SW Wales meat regime, these being the production of meat and, as we shall see to a lesser extent, the processing of meat in the region. This section will reflect upon the dominant elements present in the SW meat sector and we will include the configuration of key market actors/routes to market together with a discussion of the pressures/opportunities faced by actors and how they have adjusted to them.

5.2.1: Producer elements

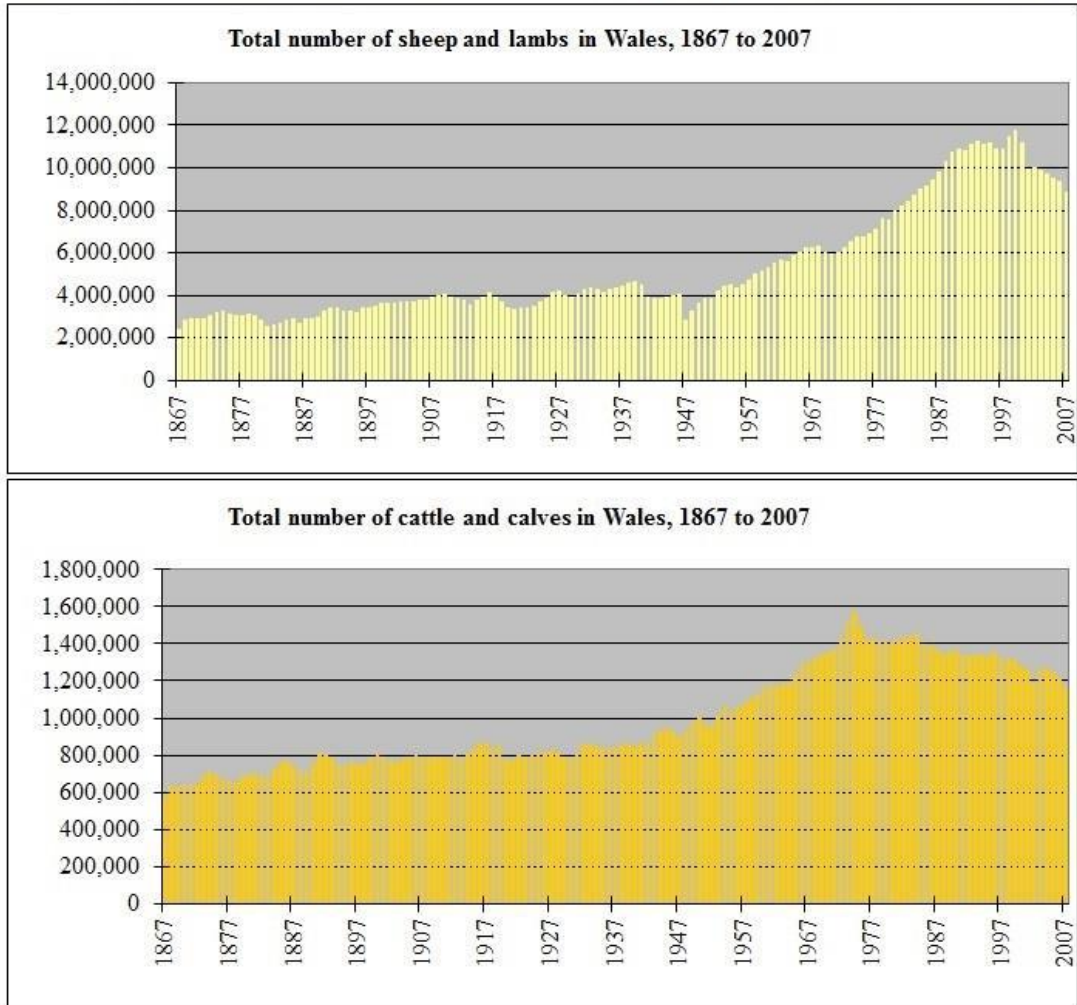
This part of Section 5.2 is dedicated to the meat producers of SW Wales with it first investigating the structure of meat production in SW Wales and comparing this to the rest of Wales. This is followed with an investigation of the reduction of beef and sheep numbers in SW Wales. The discussion regarding SW Wales producers concludes with an investigation into facets of producer knowledge which are typically seen in meat producers of the region.

5.2.1.1: The structure of meat production in SW Wales

Starting with the production element of the SW Wales meat sector; the rearing of animals for meat production and in particular the production of red meat is the main mode of agriculture practiced in Wales. Figure 5.1 shows the trends in beef and sheep numbers for the whole of Wales from 1867 to 2007 with two facets being clear in both graphs. The first is that both cattle and sheep numbers remained relatively stable before the end of the Second World War, after which both increased with beef numbers peaking at 1.57 million in 1974 and sheep numbers peaking at 11.7 million in 1999. Moore-Colyer (2011) attributes the post war increase in livestock numbers with an associated focus on improving grasslands in Wales, resulting in a shift in rough grazing to improved grassland. The second facet is that both sheep and beef numbers have declined in recent years⁴⁷, however it is impossible from the historical data to determine whether this decline has any spatial dimension within Wales. It is also not possible to determine whether the increase in cattle numbers relates to dairy, beef or mixed herds; however Moore- Colyer (2011) noted that there was a three-fold increase in the number of dairy cattle from 1945 to 1965.

⁴⁷ The possible reasons for this decline will be discussed later in this chapter.

Figure 5.1: Showing historic trends in the national sheep and beef herds of Wales

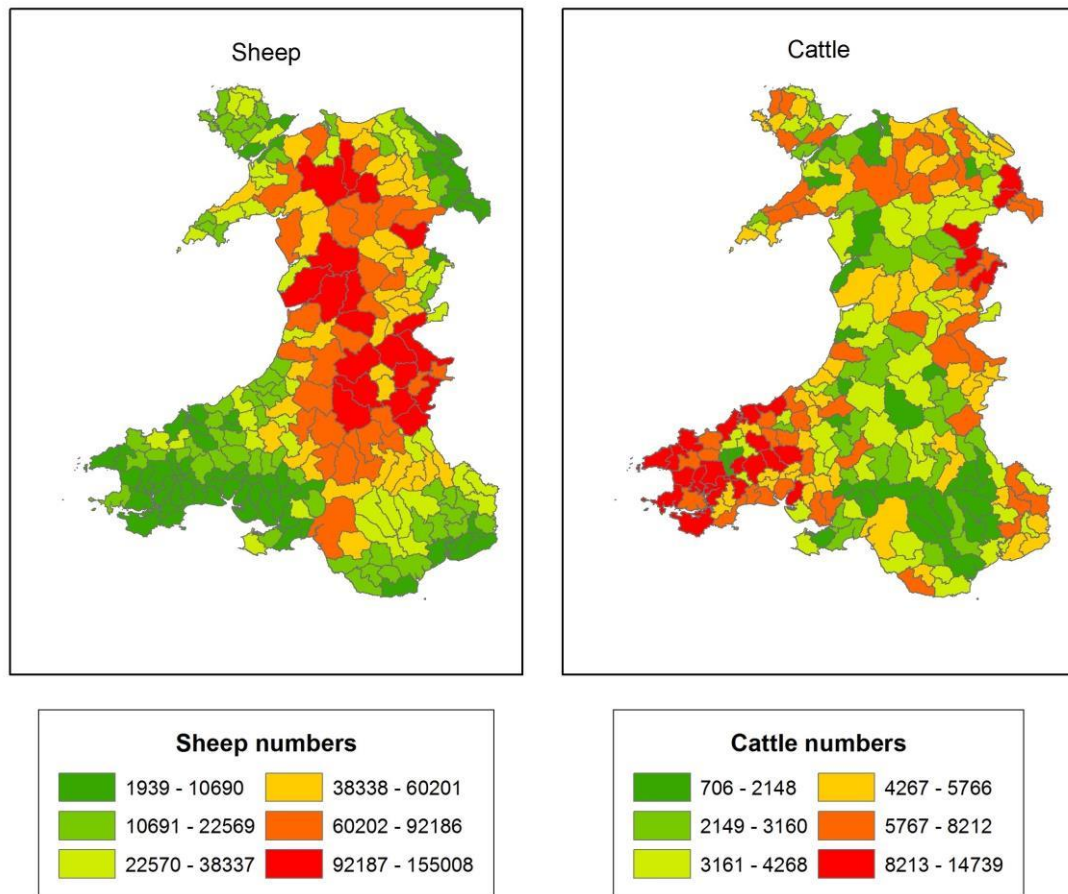


Source: WAG Statistics Directorate, (2009)

Figure 5.2 shows more recent data from the June Agricultural Census⁴⁸, which is aggregated into Agricultural Small Areas (ASA) and shows that there is a distinctive difference between the distribution of cattle and sheep within the Wales. What Figure 5.2 shows is that sheep production is predominantly concentrated in central and North Wales, although areas in the lower three quartiles (green into yellow in the legend) still show significant numbers of sheep in the rest of Wales. The distribution of sheep numbers contrasts with cattle numbers, with the main concentrations of cattle in Wales to be found principally in SW Wales and some scattered pockets along the Northern end of the England-Wales border.

⁴⁸ The June Agricultural Census is a survey of farm holdings carried out across the UK. It is conducted by the devolved administrations but is a sampled survey rather than a full census. (WAG, 2013)

Figure 5.2: Showing the estimated numbers of sheep and cattle in the Agricultural Small Areas of Wales, based on the 2009 June survey data



Source: WAG Statistics Directorate, (2009 and 2011)

There are other types of livestock that are raised on farms in Wales and the June Census contains information about the numbers of pigs, goats and chickens. A summary of these other types of livestock is shown in Table 5.1 and clearly shows that there are relatively low numbers of goats and pigs across the whole of Wales, albeit that pig farming appears to be more prevalent in the North and East of Wales. A low percentage of holdings in any region of Wales have either goats or pigs, suggesting that they are not a significant concern in the Welsh Meat regime, let alone the SW Wales Meat regime.

Table 5.1 : Showing the spatial distribution in Wales and farm holding intensity for three non-standard species of livestock for SW Wales in 2009

Region	Goats			Pigs			Poultry					
	Total number	Percentage of Welsh population	Percentage of regions holdings with	Average number per holding	Total number	Percentage of Welsh population	Percentage of regions holdings with	Average number per holding	Total number	Percentage of Welsh population	Percentage of regions holdings with	Average number per holding
North West	425	6.2	3.0	4	4,427	19.8	2.7	49	730,236	10.1	22.2	991
North East	385	5.7	3.8	3	3,996	17.9	3.0	40	3,176,024	43.8	22.6	4,114
Powys	585	8.6	3.3	4	5,060	22.7	2.7	39	1,598,040	22.0	20.7	1,617
Ceredigion	432	6.4	5.1	3	1,051	4.7	3.8	11	37,556	0.5	26.6	56
Pembrokeshire	577	8.5	5.2	5	656	2.9	4.0	8	149,256	2.1	21.4	322
Carmarthenshire	2,011	29.6	7.0	7	1,252	5.6	3.9	8	84,779	1.2	24.4	89
South	2,386	35.1	6.4	10	5,861	26.3	5.3	29	1,474,707	20.3	27.9	1,389

Source: WAG Statistics Directorate, (2009 and 2011)

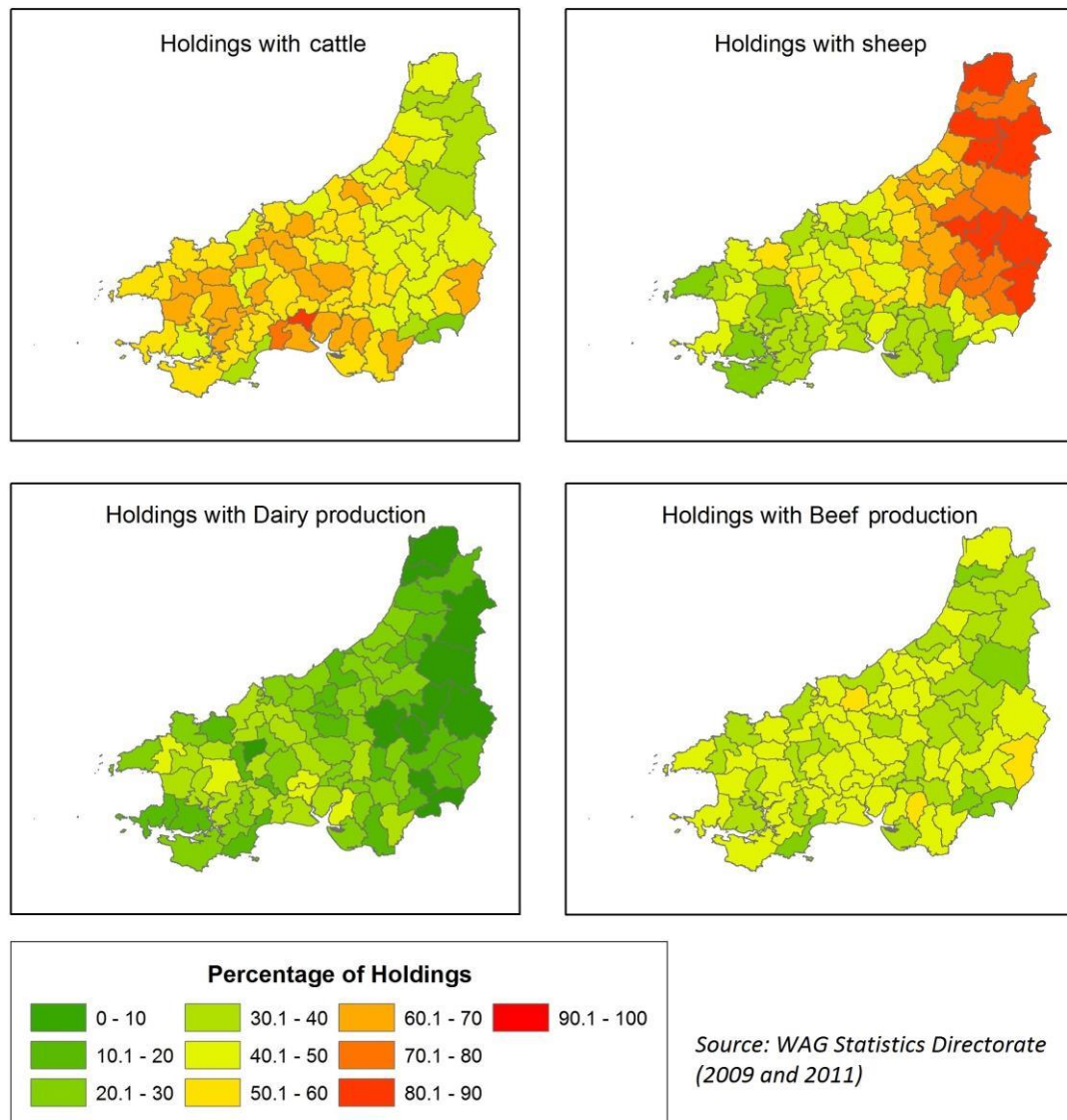
There are larger numbers of poultry present in all regions of Wales as shown in Table 5.1, and they are also present in a greater number of holdings than pigs or goats. There is a greater variability in the average numbers of poultry per holding across Wales, with the average being significantly lower in the counties of SW Wales compared to the rest of Wales. This lower average suggests that there is no large scale commercial poultry farming active in SW Wales, which is further supported by the absence of comments from any interviewee or evidence in the regional food business directories for this type of farming. However smaller scale poultry enterprises do exist in the region and the Small Scale Mixed Livestock Producer interviewee explained that they were: 'hatching between 250 and 300 chickens a week' and were also raising 300 turkeys a year on a 13 acre smallholding, which further supports the idea that the poultry present in SW Wales is either for personal consumption on larger farms or in small scale enterprises.

The data contained in Figures 5.1 and 5.2 shows that the meat regime of SW Wales is based on a production *industry* of lamb and beef, but as Figure 5.3 shows the distribution of this production is not uniform within the SW Wales region. Figure 5.3 also shows that more holdings in the North and East of the region have the highest percentage of holdings per ASA engaged in sheep based farm enterprises. Most ASA's in the region have at least 30 per cent of their farm holdings engaged in some degree of sheep based activity, which indicates that lamb rearing for market is a significant proportion of the agricultural sector in SW Wales. The data on cattle suggests that farm enterprises with cattle are more concentrated towards the South and West of the region; however, the additional distinction between beef and dairy enterprises shows that beef is fairly uniformly distributed throughout the study region whereas farm enterprises that are engaged in dairy are located in the SW of the region. This caricature of the region was echoed during the first phase of empirical interviews by some the interviewees, with Institutional Actor 3's description of the region being a good example of this:

'Carmarthenshire as a county is probably a good mix of types of farming enterprises really. Traditionally with regard to the relatively mild climate

and relatively high rainfall is very conducive to the production of grass. Carmarthenshire is traditionally seen as a dairying area particularly in the West and the coastal belts. Whereas if you move more to the North and East of the county, more upland area and more less favoured area then the production in these areas has traditionally been more beef and sheep.’
 Institutional Actor 3

Figure 5.3: Estimated percentages of holdings in Agricultural Small Areas of SW Wales with a particular type of livestock/production based on the 2009 June survey



What the quotation alludes to is that the distribution of meat production in SW Wales is partly shaped by natural characteristics of the region, central to which is the ability of the region to grow good quality grass. This ability to grow grass was one of

the most common strengths mentioned by many interviewees including producers such as Meat Producer 2 who commented that: ‘down this way we can grow grass.’ This ability to grow excellent grass is a defining element of the SW Wales meat regime as it highlights the particular *biophysical* capacity the region possesses that producers are harnessing to raise their livestock.

The degree of agreement between interviewees, regardless of whether they are producers, consultants or institutional actors presents also a *cultural* facet of the SW Wales meat regime, where grass production and livestock rearing from grasses is the only thing that many actors see as the potential for the land to sustain in many areas of SW Wales. This predominance of grass growing was challenged during an interview with Horticultural Consultant, who was more interested in horticulture and argued that there were:

‘Lots of things that we could be growing here that we just don’t grow because farmers have been told to just stick to sheep. I think that government agencies have told them and the funding they have been given helped to encourage them to have monoculture.’

This *cultural* facet is an important aspect of the wider Welsh agri-food regime and has influence over all three regional sub-sectors investigated in the thesis. It is in part influenced by the biophysical aspects of Wales and will be discussed further in this chapter and examined more closely in Chapters 7 on the Horticultural regime of SW Wales and in chapter 8 where the differences in its influence on the three sub- sectors in SW Wales can be adequately compared and discussed.

5.2.1.2: Decline in SW Wales beef and sheep numbers

Figure 5.1 shows that there has been a decline in beef and sheep numbers present in Wales, which has been noted in the sector by both the institutional actors, such as Institutional Actor 6, who began his interview by stating that the national herds of Wales: ‘have been declining over the last 5 to 10 years, particularly the sheep

herd' and processors such as Meat Processor 1, who commented that: 'farmers want to farm but they need that incentive to go and keep stock.'

The decline in livestock numbers from the June census data for sheep, overall cattle and breeding beef numbers is summarised in Tables 5.2 to 5.4 respectively for Wales from 2002 to 2009. The tables show there has been a decrease in the livestock numbers across all but one of the regions of Wales with sheep showing the most significant rate of decline over the period including a decrease of 23.67% in sheep numbers in the SW Wales region. Whilst the decline in sheep numbers is sharper than the decline in beef, what has to be remembered is that the decline in beef numbers started in the 1970's whereas with sheep it started in the early 2000's as shown in Figure 5.1. The decline in sheep numbers coincides with the first major outbreak of Foot and Mouth disease, but this does not adequately explain the continued decrease that can be seen in the long term trends.

Table 5.2: Showing the change in total sheep numbers being kept in Wales by region, based on estimates from the June Census data.

	2002	2003	2004	2005	2006	2007	2008	2009	Change in Period	Change as a percentage
North West	1,578,796	1,558,635	1,534,790	1,494,174	1,456,955	1,382,312	1,313,202	1,266,553	(312,243)	-24.65%
North East	1,607,010	1,574,302	1,554,471	1,511,864	1,483,395	1,424,330	1,345,053	1,302,898	(304,112)	-23.34%
Powys	3,767,079	3,715,707	3,678,681	3,634,962	3,597,209	3,485,449	3,326,965	3,234,449	(532,630)	-16.47%
South West	2,086,273	2,033,356	2,012,693	1,947,299	1,910,435	1,864,635	1,752,746	1,686,904	(399,369)	-23.67%
South	981,874	947,625	924,023	890,218	864,531	830,309	779,629	746,933	(234,941)	-31.45%
Total	10,021,032	9,829,625	9,704,658	9,478,517	9,312,525	8,987,035	8,517,595	8,237,737	(1,783,295)	-21.65%

Table 5.3: Showing the change in the total cattle numbers being kept in Wales by region, based on estimates from the June Census data.

	2002	2003	2004	2005	2006	2007	2008	2009	Change in Period	Change as a percentage
North West	144,270	155,607	156,617	152,211	163,455	140,598	139,902	135,265	(9,005)	-6.66%
North East	185,902	195,812	196,503	190,264	200,008	174,679	170,376	172,504	(13,398)	-7.77%
Powys	230,744	247,699	245,897	239,001	252,500	214,423	206,331	205,951	(24,793)	-12.04%
South West	485,428	515,863	524,339	506,452	544,196	499,779	493,575	483,267	(2,161)	-0.45%
South	144,484	151,712	152,794	147,788	156,959	134,948	133,034	132,981	(11,503)	-8.65%
Total	1,190,828	1,266,693	1,276,150	1,235,716	1,317,118	1,164,427	1,143,218	1,129,968	(60,860)	-5.39%

Table 5.4: Showing the change in the beef breeding cattle numbers being kept in Wales by region, based on estimates from the June Census data.

	2002	2003	2004	2005	2006	2007	2008	2009	Change in Period	Change as a percentage
North West	41,098	44,801	44,413	43,104	44,626	56,681	41,124	39,879	(1,219)	-3.06%
North East	30,554	33,051	33,235	31,704	33,413	43,014	27,688	27,427	(3,127)	-11.40%
Powys	80,700	88,597	88,525	86,702	89,486	93,085	68,769	67,257	(13,443)	-19.99%
South West	78,810	86,522	85,026	81,755	86,099	108,139	71,492	69,236	(9,574)	-13.83%
South	32,180	34,761	35,507	34,416	36,521	46,425	33,291	32,891	711	2.16%
Total	263,342	287,732	286,706	277,681	290,145	347,344	242,364	236,690	(26,652)	-11.26%

Source: WAG Statistics Directorate, (2011)

The cause for the continued decrease in livestock numbers and sheep numbers in particular was brought up by a number of different interviewees and relates to the changes in farm subsidy payments. The subsidy payments for producers in Wales can be very significant, particularly for livestock producers (WRO, 2010), as was echoed by Consultant 2 when discussing the role of policy in the SW Wales agri-food who

commented that: 'Producers are very money orientated to the government; if the government encourages something with money they jump for it. Especially beef and sheep who have been heavily reliant on that in the past.'

This motivation towards government policy changes from producers helps drive changes in the red meat sector in SW Wales and can be seen in the effect that decoupling CAP subsidies has had on livestock numbers. The decoupling of CAP subsidies from production and the use of the historic method in Wales, which calculates the level of subsidy farm holdings could receive based on a historic production benchmark of 2001/02, removed the requirement for producers to rear or grow anything in order to receive their entitlement to a CAP payment. The effect of the changes to the Single Farm Payment (SFP) is outlined in the following quotes from two interviewees:

'Decoupling has meant that you can get the same subsidy that you gained in 2005/06 without having to keep as many stock and if you are getting a little bit older and that is a change that is going to continue.' Consultant 1

'What I call brown envelope money. I think they [WAG] are trying to do something about that but there are a lot of farmers who retired and they get their SFP and they let their land out. There is not the intensity of farming around I think.' Auctioneer 1

Whilst the SFP regime is set through negotiations between the EU and the WAG, the role that it has had on sheep and beef numbers in SW Wales means that it represents a **policy** facet of the SW Wales meat regime. This **policy** facet has to also be viewed with reference to the issue of succession in farming enterprises. It is the relative age profile of producers, in combination with the current SFP policy framework, that has produced the circumstances for the decline in livestock numbers and so the aged profile of producers represents an **industry** facet of the SW Wales meat regime. It is therefore not the change in SFP **policy** alone that altered the national flock sizes; instead it is the influence of policy combined with the age

structure facet of the industry that created the affect seen in the SW Wales meat regime.

5.2.1.3: Producer knowledge

This section examines facets of producer knowledge, which were highlighted by interviewees and which appear to be facets of the SW Wales Meat regime. The first facet to be examined is the knowledge of genetics that producers have employed to 'grow' the carcasses of their livestock. It goes on to examine the role of producers' business acumen and finally looks at how some producers are shifting from importing fodder and feed from off farm to producing their own in an effort to reduce their exposure to rising input costs.

Whilst there has been a reduction in the number of sheep and beef in Wales, as shown in Figure 5.1, this has not entirely worked through into the overall quantity of meat being produced in Wales. This may sound counter-intuitive but over the same period that livestock numbers have been falling there have also been improvements in the way that producers are farming, mainly through genetics and breeding practices, that have allowed producers to breed stock that produces more young per animal and have these young be capable of yielding heavier carcasses as Meat Processor 1 noted:

'In the 1990's we would kill lamb which probably averaged deadweight of 15 kilograms whereas we are killing our lamb now averaging 19 kilograms. So over 20 years farmers have changed their lambs to grow 4 kilograms, which is quite phenomenal growth.'

Animal genetics plays a vital role for Meat Producers in SW Wales with Meat Producer 3 commenting that: 'unless you keep up with the genetics you are going to fall behind'. Producers in the SW Wales region are well supported in developing the genetic quality of their herds. The support comes from a number of sources including the trade press, other producers and trade associations and, more importantly,

dedicated institutional actors such as Hybu Cig Cymru (HCC), the Welsh Meat Promotions organisation, as Institutional Actor 6 indicates:

‘Including the work that HCC and others have undertaken with respect to the red meat sector to improve efficiency and to support genetic improvements, grassland improvements...the kilos of meat produced from each animal, the number of ewes, the number of lambs produced by each animal, the number of calves produced and the weight of those calves has increased.’

Another facet that emerged during some of the interviews was the lack of knowledge that producers had about their cost of production. During the interviews all producers could quote the average price in lamb in the market place or the price per kilo that can currently be obtained from the local abattoir, however none could give a per kilo or profit margin⁴⁹ on their lamb enterprise as this comment from Meat Processor 1 indicated: ‘sheep farmers are disastrous at it. If you go and ask them what their cost per kilo is they have got no idea’. This issue around the financial acumen of meat producers extends beyond a mere awareness of margins, profit and costs and extends into their approach to the pricing of their product, which came up during a discussion with Meat Producer 1 about the problems of the industry citing ‘that is our problem as an industry; we need to know our own costs and we need to know how to negotiate’.

The rising costs of production are another problem the producers have continually faced, which makes up one half of the classic cost-price squeeze as was discussed in Chapter 2. Whilst negotiating on the pricing of the final product appears to be an issue for some meat producers, what was apparent during the interview with Meat Producer 2 is that some producers are trying to address the cost side of the problem. Meat Producer 2 was growing turnips and barley on his land to feed his livestock, arguing that:

⁴⁹ Although one producer declined to give a margin, which may mean they did not wish to disclose this or might have meant that they did not know and did not wish to disclose that fact.

‘I have got to do it as insurance, it is a protection. Yes last year it was cheap but then if you buy straw now its £90 delivered where a couple of years ago it was £60 - £68. That is £90 now and already they are talking about it being well into the 100’s later in the year. Well if I have produced barley for myself I have got the straw as well. Yes I will have to buy some feed plus I will have to buy a bit of bedding straw in but I will have a good percentage to average the year.’

Meat Producer 2 is, essentially, bucking the trend of other livestock producers in the region, who principally raise their livestock on their own grass/silage and supplement with additional grains and fodder brought from off the farm. The quotation above alludes to the fact that Meat Producer 2 saw this on farm growing as an insurance against market fluctuations and did not render him completely reliant on off-farm feed, which he summarised during the interview stating that:

‘When I was ploughing my land for planting barley one of them [another farmer] was saying ‘it does not pay to produce barley it is much cheaper to buy it in’ and I said then: you cannot go on a year you have got to keep your hand in on a bit of everything.’

This section has highlighted a number of interesting facets of the SW Wales meat regime. Firstly, producers improve their financial performance through their **knowledge** of genetics and breeding, which has had support from institutional **policy** based actors such as HCC and WAG. Despite meat producers’ knowledge of genetics, there is a **culture** of poor business acumen among the regions producers, who do not negotiate often and as such are ‘price takers’ rather ‘price makers’⁵⁰. Finally, some producers are changing their production habits, reinterpreting the **biophysical** production possibilities of their land from grass based production towards grain and fodder crops as an insurance against rising feed costs.

⁵⁰ The role of negotiation, price taking and price making behaviors among producers is examined further in section 5.5.1 as part of a niche case study into producer groups.

5.2.2: Processing in SW Wales

Processing by its very definition implies the transformation of the product from one distinctive state to another be that living to dead or from a raw meat product into processed pie ready for sale. Within the meat processing sector we can distinguish between two distinctive types of businesses. The first of these are those primary processing businesses who handle live animals and comprise: livestock markets and abattoirs. The other businesses are the secondary processors who process meat into other prepared goods such as pies, ready meals and sausages.

There was some discussion from interviewees about the nature of secondary processors. This was mainly communicated by institutional actor interviewees and revolved around two aspects of secondary processing in the region. The first aspect was the food park development at Cross Hands and the businesses located there, most notable of which is Castell Howell Foods who are a significant buyer, processor and wholesaler of Welsh food to the Welsh market. The other secondary processor aspect that was mentioned by some interviewees was the number and quality of the region's butchers which will be discussed further in Section 5.5.

Although there was some discussion regarding secondary processors, there were more responses from both the first and second phase interviews regarding the roles that the primary processors play in the agri-food supply chains within SW Wales. This section will examine the role that these primary processors play in the SW Wales meat regime by first discussing the nature of livestock markets and abattoirs in Wales, followed by the methods of price setting that occur in these two different routes to market. This focus on the primary processors of meat appears to reflect the focus of lamb production not only by the meat producers of SW Wales but also the wider institutional actors.

5.2.2.1: Livestock markets and abattoirs in SW Wales

There are numerous livestock markets in Wales. Figure 5.4 shows the location of livestock markets in Wales and on the Welsh-English border according to Hybu Cig Cymru (HCC), the meat levy and promotions board of Wales, and the UK's Livestock Auctioneers Association (LAA). HCC is a primary point of market information for both Welsh and UK meat markets, but has a focus on the Welsh agri-food sector. The initial analysis into the number of livestock markets present in the SW Wales region and further afield was prompted by a comment from Meat Producer 2 that suggested there were potentially too many markets in the SW region and that this was a problem regarding their strength⁵¹:

'I do not know if the problem is that we have got too many markets perhaps? We have a small market at Cardigan, a small market at Newcastle Emlyn, we have got a massive market in Carmarthen, spot on regarding transport with the M4 and everything but it never seems to get much stock.'

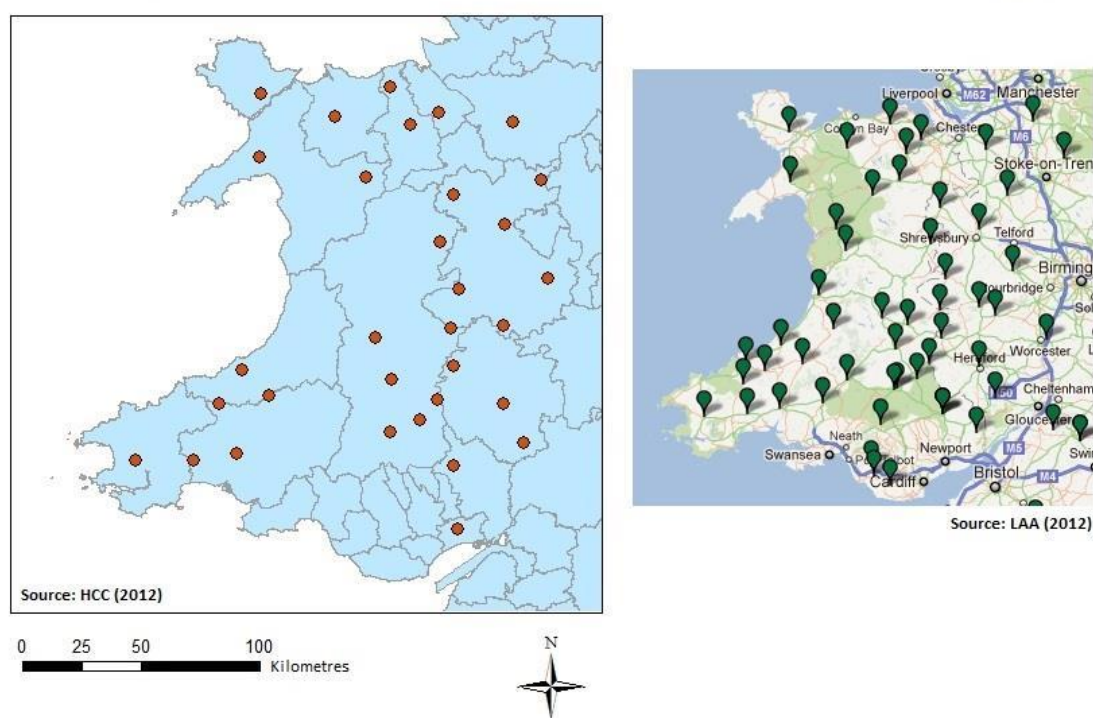
The data shown in Figure 5.4 indicates that according to HCC there are six livestock markets in the SW Wales region, whereas the LAA information indicates that there are twelve in the same region⁵². The reason for the difference between the HCC and LAA databases is unclear; as further investigations showed that the unmentioned markets such as Llandeilo and Crymmch sell the same types of livestock as those shown in the HCC database (e.g.: Morris, 2012 & BJP, 2012). A further issue of interest is that HCC's weekly livestock market data includes markets in England such as: Hereford, Ludlow and Bridgenorth. This connectivity of Welsh producers to English livestock markets was highlighted by Dairy Producer 3 who, when discussing the role Welsh TB compensation payments had on livestock markets, explained that:

'What you were getting then is Welsh buyers going across the border to England and they just buy everything.'

⁵¹ There is more on the strength of livestock markets in Section 5.2.2.2.

⁵² During the empirical phase of research, no reason could be identified for this discrepancy.

Figure 5.4: Showing the location of livestock markets whose weekly sales data is posted on the HCC website (left) and a comparison from the Livestock Auctioneers Association website (right)



Livestock markets in SW Wales have different livestock profiles, with some like Carmarthen and Whitland operating mixed markets, others like Newcastle Emlyn offering two markets a week with one dedicated to sheep and one to cattle whereas others like Haverfordwest are dedicated to a single type of livestock⁵³. Some livestock markets have gained a reputation with some producers for being specialists for certain types of auction as was noted in a discussion with Dairy Producer 3 regarding the destination of his beef sales: ‘It varies at the stage in life. The younger ones go to Carmarthen and the better quality ones go up to Llandovery because of the beef specific auction.’

Turning to the abattoirs and based on information from HCC there are twenty four abattoirs currently operating throughout Wales with four being located within the SW Wales region. This current number of abattoirs represents a reduction in the overall number that were present in the region, with changes to the regulatory requirements for abattoirs passed down from the EU being one of the reasons given:

⁵³ In this case cattle, according to HCC and the auctioneers data.

‘There have been significant legislative changes over the past ten to twenty years driven by EC regulations on meat hygiene which has required significant investment for small and medium sized abattoirs. Some have decided that that investment could not be justified and they have closed shop so it means basically that the aspirations which some will have to have animals slaughtered locally will not always have been realised through the reduction in availability of local slaughterhouses?’ Institutional Actor 6

The reduction in the number of abattoirs goes further than just a reduction in the number of plants and extends into a concentration of the flow of livestock as this comment from Institutional Actor 6 suggested: ‘85% of Welsh lamb is sold by the major retailers and slaughtered by four main abattoirs which are owned by three main companies’. The three largest abattoirs in Wales are Dunbia in Carmarthenshire, Randler Parker Foods in Powys and St Merryn Meats in Merthyr Tydfil, each of which is owned by a larger parent company who operates other plants either in the UK or overseas. It has been suggested by various interviewees that each processor has a key relationship with a single multiple retailer being: Sainsbury’s, Tesco and Asda respectively. Meat Processor 1 explained the consequences:

‘It became quite apparent that as you deal with the retailer you need a lot more infrastructure. You need technical departments, your HR departments, your big procurement departments and so what happens then is perhaps the smaller boys cannot handle that infrastructure and spend and went by the wayside.’

It is this turn-key relationship that the major retailers have been developing with key abattoirs, coupled with the cost of EU regulations, that has led to the consolidation and/or closing of abattoirs across the country. Although, on the one hand, this might be seen as a bad thing for some rural settlements, as they lose a local employer, it clearly has benefits for others as these abattoirs have expanded to cope with the demands of servicing retailers. Furthermore, by being bigger the

remaining abattoirs are able to leverage resources to develop their businesses in ways that were hitherto not possible, as Meat Processor 1 explains: 'if you are on your own it is very hard to take on PhD students and doctors with one factory'.

The primary processor *industry* provides a diverse number of outlets for producers to sell their produce both in SW Wales, the rest of Wales and within the wider UK. The rationalisation of the region's abattoir *industry* has, on the one hand, reduced the number of outlets for producers to sell their produce and concentrated the employment in primary processing into a smaller number of plants, but it has also given the remaining processors the capacity to develop their own research and *knowledge*.

5.2.2.2: Price setting in the red meat market

During the course of the interviews the complex interaction between the primary processors, producers and the mechanisms that set prices between them became apparent. This section examines the mechanisms that govern how prices are set in the red meat market of SW Wales and the next section will examine the interplay between abattoirs, livestock markets and livestock prices.

Firstly, there is the distinction that needs to be made between what producers refer to as the 'live' and 'dead' markets. Producers can either sell their livestock through the livestock 'live' markets thus achieving what is called the live-weight price for their stock or, alternatively, sell direct to abattoirs and be paid for the dead-weight price based on the weight of the carcass after it has been killed and exsanguinated. The live-weight price is lower than the dead weight price due to the live animal weighing more than the useful meat on the carcass.

In the livestock markets prices are set in an open market auction where anyone can buy the produce and if a producer does not like the price that they are offered for their stock they can withdraw them from the auction. Auctioneer 1 explained that they sort the stock into different weight grades prior to the auction, which then

translates into slightly different prices being achieved in the auction as Figure 5.5 shows. There is clearly a difference in price depending on whether the livestock originates from a farm with farm assurance standards as shown in the examples of cattle data from Market Drayton detailed Figure 5.5.

One of the key aspects of livestock markets and price setting that became apparent is the use of industry gathered information. Although livestock markets operate on an auction basis there is freely available information regarding what has been achieved at auctions elsewhere in the UK which meant, according to Auctioneer 1, that: 'you have got to try and keep a fairly standard price; you know what price lambs have made in the week, you can get that from the internet or HCC'. This freely available data allows auctioneers, buyers and producers to know what certain classes of animal have achieved elsewhere; specifically the industry standard for lamb is called the Standard Quality Quotation (SQQ) which is shown in the examples in Figure 5.5. The weekly averages of SQQ for the whole of the UK can be obtained from EBLEX, which is the English beef and sheep industry levy board.

Figure 5.5: Weekly sheep and beef market sales reports showing examples of the grading used in livestock markets

Newcastle Emlyn

03/05/2012 - Daily Average - Final

Sheep		Farm Assured (p/kg)	Non-Farm Assured (p/kg)	Average Price (p/kg)	Numbers (head)
New Season Lamb	Light (25.5-32.0 kg)	-	215.60	215.60	11
	Standard (32.1-39.0 kg)	-	218.00	218.00	11
	Medium (39.1-45.5 kg)	-	214.00	214.00	14
	Heavy (45.6-52.0 kg)	-	209.90	209.90	14
	Standard Quality Quotation (SQQ)	-	215.71	215.71	36
New Season Lamb Total		-	-	-	50
Old Season Lamb	Medium (39.1-45.5 kg)	-	154.50	154.50	13
	Heavy (45.6-52.0 kg)	-	146.30	146.30	16
	Standard Quality Quotation (SQQ)	-	154.50	154.50	13
Old Season Lamb Total		-	-	-	46
Total Cull Ewes		-	(£/head) 70.53	(£/head) 70.53	145

Market Drayton

07/05/2012 - Daily Average - Final

Cattle		Farm Assured (p/kg)	Non-farm Assured (p/kg)	Average Price (p/kg)	Numbers (head)
Steers	Light (370-550 kg)	164.89	168.00	130.33	3
	Medium (551-650 kg)	175.76	-	152.40	5
	Heavy (over 650 kg)	178.39	-	165.60	10
	All Steers	175.00	168.00	156.06	18
Young Bulls	Medium (551-650 kg)	179.72	155.85	170.00	1
	Heavy (over 650 kg)	173.60	183.00	137.25	4
	All Young Bulls	171.55	161.07	143.80	5
All Prime Cattle		175.05	163.22	153.39	23
Cull Cows	Dairy Sired	-	-	121.02	169
	Beef Sired	-	-	149.96	24
	All Cull Cows	-	-	124.62	193

Source: HCC (2012)

Abattoirs, in contrast to livestock markets, do not operate an auction system but instead use an industry standard measure of quality known as EUROP standards to derive the price they pay to producers. The EUROP standard grades carcasses on the deadweight based on two qualities: the leanness of the meat and how each carcass conforms to accepted industry standards. Where a carcass falls within the EUROP metric determines the price per kilogram that the producer receives, which is a product of the relative desirability to the abattoirs buyers. Table 5.5 shows an example of the EUROP metric for lamb, which shows the level of demand for carcasses in each box and the percentage of British carcasses that achieved the given grading in 2009. The key observation from Table 5.5 is that 78.1% of all the lamb that entered abattoirs in 2009 was graded at either the high or medium levels of demand which, based on the fact that these grades are excellent-good in terms of conformity and optimum-lean in terms of fatness, shows that producers in Britain (including Wales) have not only produced lamb in large quantities but also of high quality as defined by the *industry*.

What constitutes quality is an interesting idea from the perspective of food products. The qualities of meat used by the abattoirs, such as its leanness, are quantifiable aspects of the meat that can be measured. However, as Meat Producer 3 argues: 'we have got a bit obsessed by the leanness of red meat but we have lost some of the taste'. Meat Producer 3's perception is that these quantifiable factors have been preferred by the *industry* over taste which is a far less quantifiable factor and arguably one of individual opinion.

There were also several comments from producers about selling to abattoirs, the most detailed of which is that of Meat Producer 3, who had moved from selling in the livestock market towards selling to the abattoir and commented that: 'it takes time to learn how to sell lambs on the dead; because if you get one nasty grading you shy off them and go back to the live markets'. What Meat Producer 3 was alluding to is a key difference between selling at livestock markets and abattoirs, which is that once you have handed the livestock to the abattoir, they are deemed to be sold and cannot be reclaimed should the producer be unhappy with the grading they

receive for their animals. Meat producer 3 went on to discuss how EUROP standards shaped the way he thought about lamb production explaining: 'but R [good conformation] is middle of the road. If you aim to produce R then half of your lambs will end up as O's, ordinaries; well then they [the abattoir] will dock your nose then'. Essentially, the suggestion from Meat Producer 3 is that producers have to watch their livestock carefully to arrive at an animal which 'hits' the right point on the EUROP scale for the highest return, which is reflected in Table 5.5.

Table 5.5 : The EUROP grading scales shown with the relative demand and percentage of 2009 Lamb carcasses in Great Britain falling into each category

		Increasing Fatness					Total % of carcasses by conformity		
		1 (Very Lean)	2 (Lean)	3L (Optimum)	3H (Slightly Over)	4L (Fat)		4H (Very Fat)	5 (Excessively Fat)
E (Excellent)	Medium/Low	0.01	High 0.4	High 1.3	Medium 0.4	Medium/Low 0.1	Low 0.01	Low 0.01	2.23
	Medium/Low	0.01	High 2.3	High 9.5	Medium 4.4	Medium/Low 0.9	Low 0.2	Low 0.1	
U (Very Good)	Medium/Low	0.3	High 11.6	High 33.9	Medium 14.3	Medium/Low 2.3	Low 0.4	Low 0.1	17.41
	Low	0.5	Medium/Low 5.8	Medium/Low 8.1	Medium/Low 2.2	Low 0.3	Low 0.01	Low 0.01	
R (Good)	Low	0.3	Low 0.1	Low 0.01	Low 0.01	Low 0.01	Low 0.01	Low 0.01	62.9
	Low	0.3	Low 0.1	Low 0.01	Low 0.01	Low 0.01	Low 0.01	Low 0.01	
O (Fair)	Low	0.3	Low 0.1	Low 0.01	Low 0.01	Low 0.01	Low 0.01	Low 0.01	16.92
	Low	0.3	Low 0.1	Low 0.01	Low 0.01	Low 0.01	Low 0.01	Low 0.01	
P (Poor)	Low	0.3	Low 0.1	Low 0.01	Low 0.01	Low 0.01	Low 0.01	Low 0.01	0.45
	Low	0.3	Low 0.1	Low 0.01	Low 0.01	Low 0.01	Low 0.01	Low 0.01	
Total % of GB carcasses by fatness		1.12	20.2	52.81	21.31	3.61	0.63	0.23	

Notes

Source: HCC, 2011

Where the % of GB market 2009 is shown as 0.01% were shown as 0.1% in the HCC data

5.2.2.3: Interplay between abattoirs and livestock markets

The astute will have realised that how abattoirs ascribe a price to a particular EUROP grade was not discussed in the previous section. This is because how abattoirs arrive at the prices to pay their suppliers relates to the interplay between livestock markets, abattoirs and the region's producers.

Traditionally it would have been the livestock markets through which producers would have sold their produce through and which provided a 'social event' for producers; although there have been shifts in the perceived nature/operation of the livestock market system that has led to some uncertainty and reluctance for some producers to use the livestock markets as their principal outlet for produce. Auctioneer 1 noted that: 'there used to be a great alliance in the farming community to a particular auctioneer or market; that does not seem to happen quite as much now'. There were three different reasons⁵⁴ for this loss of confidence in the livestock markets in SW Wales; the first relates to the relative 'weakness' of the region's markets. The weakness of the livestock markets relates to both the lower supply of livestock (as was alluded to earlier) but, more importantly, to the number of buyers in the market as Meat Producer 2 highlights:

'With the small nature of the markets in rural Wales you might only have a small number of buyers and it is not their fault but because there is only a couple of buyers they naturally become friends and there is naturally only likely to be one buyer for each type of lamb.'

The point made by Meat Producer 2 in the above quote was also echoed by Auctioneer 1 who commented that: 'if you had 20 buyers there would be no problem, the fact is that a lot of these buyers buy on two or three accounts'. There are fewer buyers in the markets because the loss of the smaller local abattoirs in the region has meant that more local butchers are no longer buying the livestock from the markets but are sourcing from wholesalers or one of the remaining abattoirs. The

⁵⁴ One of which will be covered in Section 5.3

concentration of buying power in the few remaining buyers creates a buyer's rather than a seller's market, which may help to depress the prices and thus lower producers' confidence in livestock markets as an outlet for their produce.

A further issue with livestock markets is the variability of trading conditions found in livestock auction rooms. Livestock markets are like any other trading floor in that there will be inherent ebbs and flows in the trading during the course of a market day, which can mean that one producer's livestock gets a lower price than others on the day just by virtue of when their animals are sold, which Meat Producer 3 highlighted during a discussion of why he sold purely through an abattoir:

'If you start selling at the [beginning] of the day and trade has not settled and at the end of the mart a ewe may be worth three quid more perhaps, obviously you'll take the average. I get the average in the abattoir.'

The average, mentioned by Meat Producer 3 in the above quote, alludes to the interplay between abattoirs and the livestock markets. There was a perception expressed by Meat Producer 3 and Auctioneer 1 that the abattoirs utilise the average Standard Quality Quotations (SQQ) of the previous day's livestock markets on which to base their prices. The SQQ is based on an average of the livestock market prices and it allows producers to ensure that they achieve at least the average price within the abattoir.

A further potential problem that was highlighted is that as producers (including producer groups, which will be discussed in Section 5.5) move away from the livestock markets the quality in the market drops. This is because those producers who are producing to a slightly lower quality standard might achieve a better return on their produce by selling in the market relative to the abattoirs due to the less stringent grading system used in the livestock markets. This led to one interviewee commenting that: 'the [livestock] market tends to be a litter bin for everything'⁵⁵. This

⁵⁵ This interviewee asked to be quoted anonymously and as such I have not even given the interviewee a typological identifier either in order to maintain the highest level of anonymity.

creates a paradoxical situation for producers in SW Wales when choosing who they sell their produce to which was succinctly summarised by Meat Producer 3.

‘They [the abattoirs] tell you ‘they were down in the markets yesterday’ and I say ‘look now you are not selling in the marts.’ But they still use that livestock system as a barometer so the more people who sell in the marts the happier I am, stronger trade. Although I do not do it myself, I should do it, I should be selling in the marts.’

Sections 5.2.2.2 and 5.2.2.3 show that there is a complex market relationship between livestock markets, abattoirs and producers in SW Wales that is potentially evolving towards a dead rather than live-weight market. The *market preferences* are based around carcass weight and, more specifically, the leanness and conformity by the time the animal reaches the abattoir. There is clearly a good awareness of market *knowledge* relating to the prices that can be achieved at livestock markets for both producers and processors. The utilisation of this knowledge by producers has in part led to a *culture* of push-pull factors developing, which have placed the region’s producers in a paradoxical position about where they should sell their livestock.

5.2.3: PGI status of Welsh lamb and beef

The quality and provenance of Welsh lamb and beef are so highly regarded that they have successfully been awarded European Protected Geographical Indications (PGI) status (WAG, 2009 and 2009a). The PGI status limits the use of the terms ‘Welsh lamb’ or ‘Welsh beef’ to meat that has been produced in Wales and only slaughtered/processed in approved abattoirs (HCC, 2013). Welsh lamb was entered into the official register of PGI through Commission Regulation No 1257/2003, which is based on the application outlined in the official journal of the EC (OJ) on 23 October 2002. The application outlined the uniqueness of Welsh lamb based on ‘the influence of the traditional hardy Welsh breeds that dominate the Welsh flock and also by the lambs feeding on the abundant natural grassland in Wales, which flourishes as a result of the wet and mild Welsh climate and topography’ (OJ, 2002,

C255 p.14). The application limits the use of the term 'Welsh lamb' to all lambs 'bred, born and reared' in Wales, extensively on grassland with suitable traceability from farm until they are slaughtered in approved abattoirs.

The initial regulations were amended in 2010 to: increase the specificity of what breeds could be defined as Welsh lamb; set a minimum quality for lamb to qualify for the PGI status; and change the labelling of lamb products for sale (OJ, 2010, C112). The amended regulations specify that the lambs must come from breeds such as: 'the Welsh Mountain, Welsh Mules, Welsh Halfbreds, Beulah, Welsh Hill Speckled Face, Lleyn Sheep, Llanwennog, and Radnor (ibid, p.12) but allows that the resultant lambs may be sired from Texel, Suffolk 'or any other terminal sire breed' (ibid, p.12). Whilst the tightening of the breeds specification that still qualify for the PGI status might appear to be a restriction for producers of Welsh lamb, discussions with all the lamb producers interviewed showed that all were using what they commonly referred to as a: 'Texel cross' suggesting that *policy* change reflects existing *industry* practice in SW Wales.

The quality specification added as a qualifying condition for the PGI standard in 2010 uses the existing EUROP standards discussed in Section 5.2.2 to determine whether lamb qualifies for the PGI. The standard specifies that lamb must be between good and excellent conformity with between lean and slightly over optimal levels of fat to qualify for the PGI status; based on Table 5.5 this represents 77.8% of the UK wide grading in 2009⁵⁶. The interesting aspect here is that the private policy standards of industry in the form of the EUROP grading are, in effect, codified by the WAG as public policy standards through the amending of the Welsh lamb PGI conditions. The question remains whether private standards should determine what lamb born and reared in Wales can be sold as Welsh lamb solely on whether it conforms to the industry's quality standards.⁵⁷

⁵⁶ Whether the EUROP grading achieved collectively by producers in SW Wales are similar to the UK wide data shown in Table 5.5 is unclear as no regional data is exists.

⁵⁷ This question does not form part of the thesis but is an important aspect for further consideration by way of future research.

The overall effect of the PGI status, as with other products with the designation, is that it creates a perceived quality mark for consumers and a protected brand for Welsh lamb and beef producers (Teuber, 2011). However, Institutional Actor 6 explained that in terms of Welsh lamb and beef there was a: 'need to raise awareness amongst the UK public of the virtues of PGI. It's well known across other countries in Europe, Parma ham being an example, but it's not well known in the UK', which clearly limits its current efficacy as a marketing tool.

The addition of the EUROP standards to the qualifying conditions of the PGI status has, in effect, turned it from a perceived to an actual quality standard for Welsh lamb and beef, despite the fact that the EUROP standards are not known to the majority of consumers. The change in the qualifying conditions indicates that *industry* and *policy* actors are working in concert together and, in effect, further embedding the industry's standards as being the arbiter of what constitutes quality within the red meat market.

5.3: Linkages between the SW Wales meat regime and higher level regimes

Section 5.2 discussed some of the linkages between the SW Wales meat regime and the UK meat regime in terms of the connectivity of producers in SW Wales to primary processors in England. This section looks at two other linkages between the SW Wales regime, namely the importance of international markets to meat production in the region and also the role that the six day livestock movement restriction has had on where producers in SW Wales can sell their produce. Finally, the end of this section provides a summary of the SW Wales meat regime based on the information and data discussed in this section and section 5.2.

5.3.1 Market for Welsh meat

The reduction in lamb and beef livestock numbers in Wales discussed in section 5.2 has not been met with a similar reduction in the demand for these products, Welsh

lamb in particular. The 2009 WAG strategic action plan for the Red Meat industry identifies export to outside the UK as being particularly of benefit to the Welsh red meat markets, as a larger market would enable producers to secure greater demand for Welsh red meat products. The importance of overseas markets is reflected in the discussion with Institutional Actor 6 about the importance of Europe particularly as a destination for Welsh lamb meat:

‘You still need to identify and encourage buyers in those European countries to purchase in favour of Welsh lamb and beef but buyers in France, Germany, Italy, Spain, Belgium (with France being the most important market for Welsh lamb) have bought significant numbers of Welsh lamb and, to a lesser extent, beef from Welsh processors. One in every three lambs sold in the last twelve months has gone to the European countries.’

These linkages to export markets are a key aspect of the SW Wales red meat market and do not extend to just European markets, with Meat Processor 1 commenting on the current growing and future demand for lamb from Asia and China in particular: ‘They [China] are not ready for the expensive legs of lamb at the moment [it is mainly] the cheaper cuts but with 200 million middle class developing it is going to become a huge market’. The connectivity of the SW Wales and wider Welsh red meat markets to the global demand for meat is clearly a core facet of the *user/market preferences* upon which the SW Wales red meat regime is based.

5.3.2: Role of UK animal movement restrictions

The restrictions on animal movements have impacted producers’ ability to buy or sell new stock in the livestock markets. The restriction is colloquially referred to in the industry as the ‘six day rule’ and is designed to contain/limit the risk of disease spreading in the event of an outbreak of common animal diseases such as FMD⁵⁸ or tuberculosis (TB). It stops producers moving livestock on or off of a farm holding within a six day period of any other movement of livestock, except when sending

⁵⁸ Foot and Mouth Disease

livestock direct to an abattoir for slaughter. The six day rule limits producers' ability to sell in the livestock markets and has affected the way that they sell their produce as Meat Producer 3 explained that for him: 'it [the six day rule] changed people's way of farming. I don't bother selling cull ewes anymore; I send them straight to the abattoir'. These comments were also echoed by Meat Producer 2 who explained that: 'although I am an advocate for live marketing, I cannot survive in the live market because of the six day restriction'. Meat Producer 2 went on to explain that because he had livestock maturing at different rates, he always had new stock that was ready for sale and that the six day restriction stopped him from selling the stock when they are in peak condition. This meant that he would incur additional costs in terms of continued feeding to maintain the condition of his stock if he continued to sell through the livestock markets.

The six day movement restriction, whilst clearly being a *policy* born out of protecting the security of the nation's livestock production industry, has provided a push factor for producers to sell more of their livestock direct to the abattoirs rather than the livestock markets. This factor, along with the other two factors discussed in section 5.2.2.3, has created a shift in the relative power of the primary processing *industry*, from livestock markets towards abattoirs which are increasingly becoming the venue of choice for producers to sell to.

5.3.3: Reconstructing the SW Wales meat regime

Both section 5.2 and this section have discussed a number of aspects of the SW Wales meat regime. The most obvious questions that arise when attempting to reconstruct a SW Wales meat regime are: does a distinct SW Wales meat regime exist and, if it exists, what are its defining features? Table 5.6 shows a summary of the defining facets of the SW Wales meat industry that have been identified in sections 5.2 and 5.3 organised into the ST Regime constellation. It is apparent from Table 5.6 that there are facets of the SW Wales meat regime which can be perceived as strengths and others that are weaknesses within the current regime configuration. The facets are interlinked within the SW Wales region, evolving in response to developments within

the region and outside the region. Nevertheless, the distribution of these facets within the socio-technological regime constellation and their strongly interlinked nature supports the contention that a coherent SW Wales meat regime does exist.

Although the regime exists there is an on-going process of re-orientation occurring within the regime in the processing sector. This process of re-orientation, whilst creating challenges and opportunities for the region's processors and producers, has not really challenged the underlying logics of the regime. The SW Wales meat regime's underlying logics are grounded in production of red meat that meets a narrow range of leanness and conformity criteria, suiting the preferences of the retailers and managed through a small number of turn-key abattoirs. This core set of logics has endured two outbreaks of FMD, and the reduction in the national flocks that accompanied this, as well as the de-coupling of farm subsidies from production. This suggests that the SW Wales meat regime is a dynamically stable regime that has been able to adjust to pressures incrementally. During the course of the interviews and the desk based research there has been very little to suggest that there are any significant threats that would result in the destabilisation of this regime.

Table 5.6 : Showing a summary of the properties of the SW Wales Meat Regime.

User/Market Preferences	Policy	Industry	Science / Knowledge	Culture	Biophysical	Technology
<ul style="list-style-type: none"> - Quantity means leanness and conformity to a 'standard'. - High demand for Welsh lamb and beef in the UK with significant EU demand and growing international demand 	<ul style="list-style-type: none"> - Single Farm Payment regime that provides a de-emphasis for production. - Dedicated regional institutional actors supporting the red meat sector. - Institutional actors support for genetics/breed improvement. - Regulatory burdens for public safety and disease prevention. 	<ul style="list-style-type: none"> - Large number of producers focused on red meat production. - Aging producer demography has impacted on supply of livestock to the market. - Diverse number of outlets for producers to sell to, particularly in terms of the livestock markets. - Rationalisation of the abattoirs in the SW Wales region. - Shift in buying power to abattoirs from livestock markets. 	<ul style="list-style-type: none"> - Breed genetics principal source of 'quality improvement'. - Gap in knowledge of costs (lamb producers). - Larger abattoirs engaging in their own research to support their business. - Excellent market price information that shapes to some extent producer-processor trading. 	<ul style="list-style-type: none"> - Assumption by producers, consultants and institutional actors that grass based is the best route for agriculture as a whole in the region. - Culture of poor business acumen/knowledge in producers whom rarely negotiate with buyers. - Producer culture of dependency of state based payments. - Move away from livestock markets to abattoirs for some producers route to market. 	<ul style="list-style-type: none"> - Excellent attributes to produce grass fed systems suitable for meat production. - Some producers moving to growing their own feed rather than buying all their feed requirements in. 	

5.3.4: Considerations for socio-technological systems arising from the SW Wales red meat regime

The SW Wales Meat Regime is an interesting case study from an ST systems perspective. The regime shows a high degree of internal conformity in its socio-technological configuration with many couplings between individual elements that conform to the idea of what a regime is according to Konrad et al (2008) and yet, at the same time, is distinct from other parts of the agri-food sector in SW Wales. There are, however, two aspects of the future development of the regime that pose interesting questions of the ST framework.

Firstly, there was an apparent difference in the vision of how the market for red meat products is likely to develop, with some institutional actors and a processor looking outside the EU for sources of future growth in demand for Welsh red meat whereas some producers in the region seemed more interested in the potential changes in local wholesale market dynamics than the growth in demand. The second aspect, which is linked to the first, is the question of whether the weakening of local livestock markets and closure of local abattoirs represents a potential hollowing out of the regional regime.

Taken together these two aspects ask interesting questions of ST systems theory. Chapter 3 highlighted that relatively little has been discussed in the ST literature with respect to how regimes at different spatial aggregations interact. A nested hierarchy of agri-food regimes was proposed in chapter 3 with regional sub-sectoral specific regimes being the smallest aggregation of regime proposed, nested within regional, national and supra national agri-food regimes. The SW Wales red meat regime is an interesting case study with respect to nested regimes because we have an example here of a higher spatial level regime altering a regional regime as the ST constellation of elements at regional level become more aligned with a national level regime, potentially hollowing the regional regime's distinctiveness. The questions that remain to be addressed as a result are: at what point does the hollowed out regime cease to exist, what bearing does this have on the actors in the hollowed out regime and,

finally, what are the potential implications for the sustainability/capacity of the regional agri-food sector itself?

These questions can only in part be answered by this thesis, as further research is required to ascertain whether the effects seen in the SW Wales red meat regime are particular to that region or symptomatic of many red meat producing regional regimes. This being said, one observation from the empirical evidence is that where effects to a regional agri-food regime originate from higher spatial regime scales they can have both destabilizing and stabilizing effects at a regional regime level. These multiple effects have resulted in divergent opinions between the regime's actors, regarding the exact nature of the effects on their regional regime. These divergent opinions were particularly seen in the region's producers who have adopted a range of responses as a result. Whether these differing responses from producers will end up coalescing into a single response over time remains unclear. What can be observed is that these higher spatial level factors have created opportunities for experimentation for some regime actors, as will be shown in the Producer Group innovation discussed in section 5.5.

5.4: Landscape pressures

Geels and other researchers in the field of Socio-Technological Systems research frequently use the metaphor of landscape in the ST framework to describe influences upon the regime that are outside the control of the regime's actors in terms of negative influences upon the regime; however it is entirely conceivable that there are outside influences that assist in supporting the regime in its current configuration. In the case of the SW Wales meat regime the most obvious landscape element, which was having a positive effect on the SW Wales meat regime, was the Euro- Sterling exchange rate, which Institutional Actor 6 explained as: 'a key element [in maintaining high lamb prices] has been the changes in the exchange rates which has made exports more attractive'. If the exchange rate between the pound and the Euro changes sufficiently to favour British exports to Europe then the demand for Welsh

lamb in Europe increases; this, coupled with the shrinking ewe flock, has pushed lamb prices up due to increasing demand with, at best, a static supply of lamb meat.

5.5: SW Wales meat niche case studies

This section of the chapter discusses selected niche meat businesses present in the SW Wales region. The term 'niche', as was discussed in chapter 3, is not used here to describe a business or supply chain that is small in the scale of its operations but to distinguish businesses that deviate from the norms of the meat regime configuration of the SW Wales region discussed in the two previous sections and summarised in Table 5.6.

Each of the three counties within the SW Wales region maintains its own food business directory, which are broadly split along the food type lines. The directories can only be treated as indicative of the range of niche businesses in the SW Wales region as other businesses were identified during the course of the interviews which were not present in the directories. Table 5.7 summarises the businesses in the directories which relate to meat production in SW Wales.

The on-farm businesses data shown in Table 5.7 indicates an interesting disparity between the principal species being raised in the meat regime of SW Wales and those mentioned in the directory, with poultry and pork rearing being prominent as opposed to lamb and beef. There were a number of producers in the directory who reared multiple species. Whilst lamb and beef were prominent in these multiple species enterprises there were also ten businesses that have pork and three with poultry as part of their production mix. The beef and lamb producers mentioned in the directories appear to either stock breed-specific species such as Welsh Black beef, which can command a premium for the quality of the meat it produces, and/or provide on farm butchery/direct sales. The overall impression of the on-farm businesses in the directories is that they are not the standard producers of the region

either by virtue of animals they are rearing (specialist breeds or non-standard species) or because of the additional services that they offer such as direct sales.

The off-farm businesses in Table 5.7 represent a range of different businesses, with the most obvious being the butchers. Whilst it might not seem surprising that butchers are included in the directories, what has to be remembered is that we are dealing with a region which is relatively sparsely populated but nevertheless has a large number of independent butchers. The processors ranged from an abattoir to businesses who dealt with the processing of meat products such as pie and sausage makers.

Table 5.7 : Numbers of meat orientated businesses mentioned in the food directories of the three study counties.

	On Farm						Off Farm		
	Beef	Lamb	Pork	Poultry	Goat	Multiple	Butcher	Processor	Wholesaler
Carmarthenshire	4	4	5	5	2	4	8	8	1
Ceredigion	0	1	3	2	0	1	9	0	0
Pembrokeshire	2	1	1	11	0	10	10	4	0
Total	6	6	9	18	2	15	27	12	1

Notes

Table excludes known large businesses.

Sources : CCC (2011), PCC (2011) & Ceredigion CC (2011)

During the course of the empirical interviews a total of four niche businesses were chosen for further interview. The basis for selection of the particular niche businesses for this research is that they are both unique from each other in terms of their innovation and that they differed in their configuration to the regime, as discussed in Sections 5.2 and 5.3. The selected niches comprised: a producer group, a local non-standard species producer, an innovative wholesaler and an on-farm feed producer. When reflecting on the nature of each niche it is important to identify what makes a particular niche innovative compared to the dominant meat regime in SW Wales and, furthermore, what the *modus operandi* or rationale is for the niche's deviation from the standard regime logics. The ST regime elements are used in this section as a typology to identify what aspects have caused the rationale for innovation and what exactly the nature is of the innovation in comparison to the regional meat regime.

5.5.1: Case study of Meat Producer 1 as member of a meat producer group

The existence of active meat-centric producer groups in the region became apparent during the first phase of interviews. The producer groups are neither new nor limited to the red meat market as farming co-operatives have been present in many forms across many counties for a considerable time now. Producer groups are not unique to the meat sector in SW Wales, as evidence of producer groups is present either by direct interviews or by reference from other interviewees in both the dairy and horticultural sectors of the region, and will be discussed in chapters 6 and 7. The core reason for the inclusion of producer groups as a meat niche is that they are a relatively new development among meat producers in SW Wales and present an alternative approach to the established producer-processor-retailer relationship seen among actors within the established SW Wales meat regime.

The mechanics of producer groups seem to be relatively simple at first glance in that they comprise a group of producers who band together to leverage a greater degree of negotiating power in the market place when trying to sell their produce through collective bargaining. The producer groups mentioned in the interviews all created some idea/vision of a 'brand image' as a way of selling their produce in the market place, often linking the product with the area where it is produced. Meat Producer 1 explained: 'When we sell our product we are not just selling the lamb, we are selling the valley, the culture, the environment, we are selling everything really'. Producer groups create specific arrangements with one dedicated retailer who provides the principal route to market for the group's produce. When discussing the arrangements between his group and the retailer, Meat Producer 1 commented that: 'we are exclusive to [major retailer]. They look after us very well as we look after them'. It is interesting that in the producer group interviewed there appears to be a much closer relationship between both the retailer and producers in the group and the individual producers than there is in the regime actors which will be discussed further in the following sub-sections.

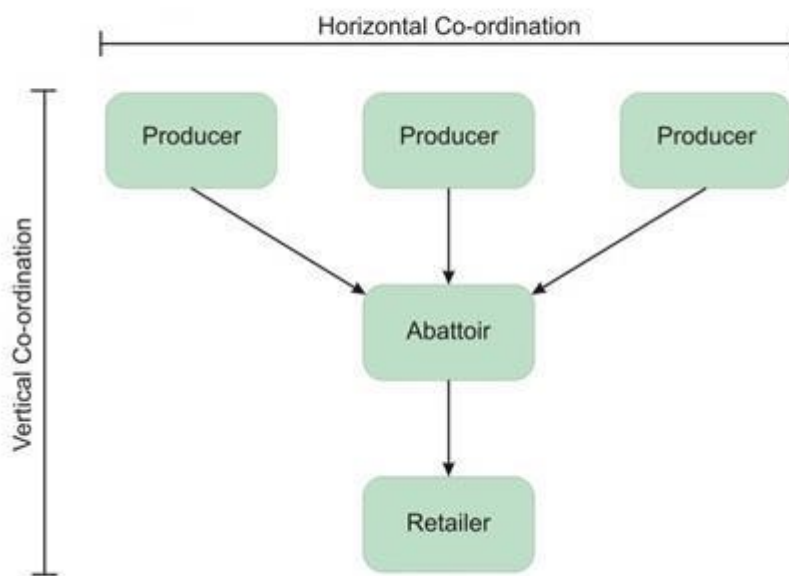
Meat producer groups in the region, both in terms of a specific group's dynamics and its role within the wider regional meat regime dynamic, are worthy of study and should, like the other producer groups discussed in later chapters, be reflected upon in the light of what Consultant 1 caricatured as the success of producer co-operation in the region: 'Wales is littered with the carcasses of failed co-operatives; more co-operatives have failed in Wales than anywhere else'. Despite this suggestion of negative outcomes arising from producer co-operation in the region, which Consultant 1 put down to 'too many chiefs and not enough Indians', it is interesting to note that through all of the interviews at least five red meat producer groups were specifically mentioned; three lamb producer groups and two being orientated around beef production. Interviews were conducted with a member of one of the lamb producer groups and the wholesaler involved with one of the beef producer groups, although the beef group is a special case involving a scientific feed based innovation and will be discussed separately as the innovative wholesaler innovation in this chapter.

5.5.1.1: Rationale for the meat producer group

The core rationale given by Meat Producer 1 for the formation of his producer group was neatly summed up when he said: 'we decided that we wanted to move away from price takers to price makers'. Section 5.2 discussed the price setting relationships between producers and the main two routes to market for the majority of producers in the region: abattoirs and livestock markets. In the case of the producer-abattoir route it is clear that producers find themselves in a price taking arrangement. Whilst there is a degree of price making in the producer-livestock markets, in that producers are able to pull their livestock from the market if they feel the price bid is not high enough, the discussions made clear that there are not always enough buyers in a market to provide a competitive environment. The key rationale for the producer group niche is clearly an economic one; however its occurrence is the result of a change in producer's *cultural* attitudes to how they conduct their business arrangements with processors and retailers.

The control in the producer group niche arises in two levels of co-operation, which can be summarised using Figure 5.6 in the operation of a producer group. The first level is the co-operation which is horizontally aligned and occurs between the producers in a producer group. This horizontal level of co-operation provides the additional market power for the producers to engage with prospective retailer buyers and abattoirs. The second is the vertical co-operation between producer, processor and retailer that secures the route to market for the product. In attempting to understand the rationale for the rise of producer groups in the region it is apparent that there is no one common rationale but a series of reasons held by each actor within the supply chain; one set provides for the horizontal co-operation and one set that provides the reasons for the vertical co-operation.

Figure 5.6: The two types of co-ordination between actors in a producer group supply chain



The primary reason for the horizontal co-operation among producers is an economic one but there is also a secondary reason which is tied to the impact animal diseases can have on the market for red meat. This was discussed in the earlier section detailing the nature of the SW Wales meat regime, where the 2001 and 2007 outbreaks of FMD saw prices for lamb drop in the livestock markets to below two pounds per kilogram. These shocks in price place a degree of price pressure upon producers over and above the standard cost-price squeeze encountered in the

conventional agri-food markets. The producer group covered by an empirical interview was set up shortly after the 2001 FMD outbreak and Meat Producer 1 commented that protecting the price they received for their lamb from these particular shocks was an important motive for setting up the producer group saying that: ‘what we had set out to do in 2002 [sic], paid dividends in 2007’, in that his group had a contractually protected price for their lamb. In essence this is arguably a risk spreading behaviour as the arrangements allow producers to mitigate the market shocks associated with regional and national *biophysical* risks with retailers and abattoirs.

Turning to the rationale for vertical integration; the reasons for abattoirs and multiples wanting to become involved with a producer group appear to be slightly differentiated. A dwindling national sheep flock in Wales, coupled with steady domestic demand and a strong export trade for Welsh lamb, has resulted in shift in the supply chain dynamics to the point where security of supply has become an issue of concern for the processing sector. This was clearly expressed by Meat Processor 1 during the interview when asked about pressures on the business: ‘sustainability of livestock, that is a big big concern for us, because the ewe flock is shrinking ... a big thing for us is to encourage farmers to farm’. In essence the de-emphasis on production in Welsh agri-food policy has, in part, led to the shrinking of the national flock as seen in Figure 5.1, which in turn has meant that processors increasingly needed to think innovatively about how to secure sufficient supply of the annual Welsh lamb production. Forward contracting with producers through the use of producer groups has been one innovation that the abattoirs have adopted to secure their supply chains. Forward contracting is innovative insofar as processors are agreeing a price in advance with producers where they hitherto would offer a price to producers when lambs were received at the abattoir.

The attraction for the multiple retailers to engage with producer groups is two-fold with the most obvious being the same as for abattoirs: the security of supply. The second rationale is that producer groups create a locality branding and exclusivity which, in effect, elevates a conventional meat product (lamb) into a regionally

branded product (Welsh lamb) that can be sold at a premium. Not only can the product be branded as Welsh lamb, with its associated PGI status, but it can be branded as originating from a small geographic area of Wales which is, according to Meat Producer 1: 'selling the valley, the culture, and the environment'. This type of geographical conceptualization can be targeted by the retailers to stores with the higher value buying demographics whose customers are willing to pay higher prices for this specific product provenance. Meat Producer 1 confirmed during the interview that the produce from their group was going into the top twenty stores for their retailer in the UK based mainly in London and SE England as a premium brand product. This premium branding creates value at every level of the supply chain and so is of economic benefit to the retailer as well as the abattoir and producer group. The rationale for retailers to participate in producer groups appears to be one of premium brand building and does not necessarily represent a major departure from their standard business rationale.

5.5.1.2: Nature of innovation in the meat producer group

The most obvious innovation exemplified by the producer group interviewed is the shift that has occurred as a result of producers moving away from independently selling their stock on the open livestock markets or dead markets to a collective bargaining arrangement with an abattoir and a retailer. This innovation has required a shift from the traditional *cultural* attitudes of producers in the region, which Meat Producer 1 explained as: 'it is always trying to get the farmer instead of thinking 'me me me' [to realise] that it is everybody [working together] and then you will get the rewards'. The level of co-operation in producer groups has also altered the producer-processor-retailer relationships, with contracts and more communication between retailers and their producers being evident, which in essence represents a departure from the SW Wales Meat regime in terms of the *industry* configuration.

The shift in the *culture* of producers towards co-operation has needed to extend further than simply co-operating on whom to sell to but has also created closer co-operation regarding the running of their respective holdings, in order to ensure that

there is consistency in the quality of their product as Meat Producer 1 emphasized: 'when you sell a premium product you have to make sure that there are no failings in it at all'. Whilst there is already a degree of private standards in the red meat sector under the auspices of the EUROP standards, producer groups hold themselves to a higher degree of standards, which they self-regulate because, as Meat Producer 1 argued: 'You can kid a farm assurance chap coming around once a year, but you cannot kid your fellow farmers'. Meat Producer 1 inferred that because the producer group's farmers saw each other's farms regularly they were better positioned to monitor their adherence to the agreed assurance standards than an external person visiting annually. Meat Producer 1 discussed other groups that he was aware of during the course of the interview and indicated that other producer groups had similar self-regulated standards where producers could be penalised if they did not maintain the expected standards. This type of self-regulation and private standard setting from within producer groups, rather than from wider industry bodies or retailers, is innovative because it arises from a shared consensus between actors in the groups. This represents a significant deviation from how the private standards that represent the *policies* maintained in the SW Wales meat regime are typically decided upon and administered.

The spatialisation of the branding used by producer groups is another facet of innovation away from the regime. The spatialisation is more specific than just Welsh lamb or beef and provides a degree of 'value-adding' to the product that is the core incentive for the actors in the group to co-operate. The interest in the 'local' or 'regional' produce from the retailers has created more differentiated *market preferences* in the UK meat regime level which has, in part, allowed for the development of producer groups in the SW Wales region.

The final aspect of innovation to be considered is the development of producer's *knowledge* beyond mere production. Meat Producer 1 commented one of the issues he sees with other producers of lamb in SW Wales is: 'I think like a lot of primary producers, we are very good at producing the primary product but lose interest once its left the farm gate'. This comment harks back to the discussion regarding

producer knowledge in section 5.2 and alludes again to a general lack of knowledge/interest in the wider operation of a business beyond the production of the product. Producers within the producer group interviewed actively engaged with the process of selling/marketing their product, with the producer interviewed conceding that the quality of the group's lamb was probably no higher than those of his fellow non-group producers in the region but arguing that the key difference between them and those producers in the producer group was that they were 'telling people how good it is whereas they [the non-group producers] do not'. Meat Producer 1 went on to explain how he and other producers engaged in promotional events with their retailer to raise the profile of their product, which requires an innovation in the *cultural* attitude that producers have when operating their businesses and the requisite *knowledge* they require to run them effectively.

5.5.2: Case study of Meat Producer 4 as a small scale 'alternative' meat producer

The term 'small scale producer' conjures an image of producers with a small amount of land relative to the conventional producers in the region and who may not be able to sell their livestock through the conventional routes to market for one of two key reasons. The first reason is that there may not be the conventional route to market available in the region, such as is the case of pork. The other reason is that the producer is unable to realise sufficient income from their produce from the conventional market prices. Regardless of whether it is the latter, former or both reasons, small scale producers have to think differently about: what they produce, how they market it and where they might be able to sell it, which often means looking towards higher value niche or artisan products in order to secure sufficient income to maintain their business and household.

Small scale producers cannot usually produce sufficient goods to supply the large multiple retailers or processor/wholesalers with the continuity that these routes to market demand. Instead they must find alternative routes for the sale of their produce such as: local hospitality businesses, smaller scale retailing or wholesaling outlets, or the populace local to the producer. These types of producers are often

seen as being part of the growing local food movement that seeks to move away from the dynamics of the conventional marketplace where the drive to squeeze producers' margins prevails. However, the counter argument against more producers moving towards niche production was made by Meat Producer 3: 'It is pointless having these niche little markets'. Meat Producer 3 felt that there was not really sufficient demand for niche products for it to be worth many producers to engage with this and, moreover, considered that it did not really help shape the region's agricultural fabric.

Despite Meat Producer 3's point, it was observed both throughout the interviews and in the county food business directories that there were many different meat producers operating within the region who might be considered small scale. An interrogation of the food directories showed that the on-farm businesses were engaged in different niche markets from: red meat producers who reared non-standard produce, either by virtue of where they farmed (in the case of salt marsh lamb) or by rearing specialist breeds that were prized for the quality of meat (such as Welsh Black Beef), to, at the other end, producers who were rearing products that were non-standard in the region such as turkey, chicken, pork or goat and who consequently could be considered niche by virtue of their uniqueness in the regional market.

There were two interviews conducted as part of the second phase of interviews with small scale alternative producers. Meat Producer 4 produced a range of poultry, fowl and pork products which were sold in the local area and Dairy Producer 4 produced goat meat as an ancillary part of the related goat milk enterprise. Meat Producer 4 will be the principal focus of this case study into small scale meat producers in SW Wales and as the name implies, Dairy Producer 4 is the focus of a case study in Chapter 6.

5.5.2.1: Rationale for the small scale 'alternative' meat producer

There are two rationales for the existence of Meat Producer 4 as a small scale meat producer in SW Wales. The first rationale is related to their personal reasons for starting the business in the first place, for which Meat Producer 4 stated that: 'we came here for financial reasons, we had a mortgage of 15.5% and we had to get out of [the more expensive region] basically'. This first rationale is not of direct interest to this thesis as it does not speak to why the small scale meat producers exist in the SW Wales region. All the first rationale points to is the particular external reasons that some new entrants have for entering the market, which may require further study if this facet of innovation is seen to be important in terms of shaping and driving new innovations in the agri-food sector.

The second rationale for the existence of small scale meat producers in SW Wales relates specifically to the on-going process of specialisation in agricultural production, which is occurring on farm holdings in the SW Wales region. Meat Producer 4 saw that 'a lot of farms going back used to rear their own pigs, you know a couple of pigs and a few chickens, but then they are [now] more focused, the local farmers ... so they have focused a lot more like all dairying rather than being a bit of this and a bit of that'. This specialisation of farms away from traditional mixed agricultural production has meant that non-mainstream produce such as chickens, pigs and turkeys, which were only ever produced in small quantities alongside the main produce of the regions' farms, are now no longer produced at all. Based on discussions both with Meat Producer 4 and other interviewees, there is anecdotal evidence that suggests these non-mainstream animals were unlikely to have been sold into the commercial market in the same way as the main products of lamb, beef and milk but instead were consumed on farm or sold locally. This meant that a regionally specific gap in the market has been created, due to the specialisation of farms, which producers such as Meat Producer 4 are able to exploit. Meat Producer 4 characterised this niche as being represented by 'discerning people who can't get a decent bit of meat or chicken', implying that some consumers in the region have a specific desire or requirement regarding the quality of their meat products that

cannot be easily found in the conventional retail outlets for meat. This regional demand, with its particular requirements, is distinctive from the markets with which meat producers in SW Wales are typically engaged and as such represents a *user/market preference* departure from the dominant SW Wales meat regime configuration.

The final reason that allows for the existence of small scale producers is the benefit that they have in remaining small from a regulatory perspective. During the interview with Meat Producer 4 there were several references to this theme: 'Because we slaughter less than 10,000 birds we are exempt from meat hygiene regulations but are covered by Environmental Health'. Meat Producer 4 did also explain the complexity of the regulations and the risks associated with it, citing the example of when they opened their own shop, which was situated away from the farm holding, they were told that they were now deemed to be 'wholesalers, even although it was our own shop'. This new status would have meant they had to upgrade their premises at a cost for new equipment that they deemed to be unaffordable if they had not found a way to work around it within the regulations. The complexity of regulations aside, what was clear is that being relatively small enabled Meat Producer 4 to keep the business costs down. What the regulatory frameworks in the meat industry appear to be providing is a space where small scale/niche meat production is made possible by complimenting the small size of these specialist meat markets. This complementarity on the one hand allows small scale local producers to be economically feasible by lowering their compliance costs relative to larger scale concerns, whilst at the same time the size of the local niche markets are too small to be of serious interest to retailers. Although it cannot be ascertained for all small scale meat producers, the interview with Meat Producer 4 suggests that they may have a beneficial *policy* position relative to the larger actors in the SW Wales meat regime, which, in part, fosters their existence.

5.5.2.2: Nature of innovation in the Small Scale 'Alternative' Meat Producer

What is interesting about the circumstances of Meat Producer 4 is that when discussing the role of incomers in the agri-food sector with Consultant 1, he commented that of the successfully diversified agri-food businesses in the region what you 'generally find is that the ones who have been more successful are newcomers to the area ... people who tend to come in have got different skills if they have done different things'; whereas Meat Producer 4 commented that they: 'could not go out and start doing anything as we did not have the experience'. Meat Producer 4 explained that they started on a small scale on the holding and, with a mixture of personal experience and formal/informal courses, built their knowledge of rearing animals, growing feed and the processing of carcasses to grow the business. Some newcomers may indeed possess skills that assist them in the setting up and running of an agri-food business whereas others, like Meat Producer 4, do not initially possess them but do learn them in some way. Equally there are also some traditionally farming families in the region who have also moved into niche meat markets in the region, which suggests that they have also thought differently about their production and sales methods in order to allow them to move from conventional to niche markets. This suggests that, as a group, the small scale meat producers are different from the conventional producers in their thinking representing an innovation in the *culture* aspect of the ST regime constellation of the conventional meat producers in the SW Wales meat regime.

The innovation in how small scale producers think translates into three significant innovations that deviate from the standard configuration of the meat regime in SW Wales. The first innovation noted was how Meat Producer 4 expanded from the initial enterprise of raising chickens. Producers in the SW Wales meat regime typically expand by increasing the size of their herds and, where necessary, by buying/renting more land, whereas Meat Producer 4 expanded their range of products into other fowl and pork products despite the limited amount of land they had available. Meat Producer 4 explained that:

'We decided that while we were going around selling chickens we might as well sell something else ... I go around on a round every three weeks and if I was only selling one product then I would have to do a lot of miles ... we were able to sell more things to the same customer.'

There are three potential benefits of producing and selling multiple products for Meat Producer 4. Firstly, as the above quotation from Meat Producer 4 suggests, it expands the range of goods they can sell to a single customer. Secondly, by diversifying, Meat Producer 4 spreads what risks there might be if one product fails for whatever reason (e.g. loss resulting from disease or loss of a market/customer). Lastly, by increasing the range of species rather than increasing the number of an individual species held the producer could keep under regulatory limits. Ultimately the diversification of products represents a clear innovation from the *industry* and *biophysical* elements of the SW Wales regime, where it was observed that regime producers frequently specialised in lamb or beef or produced both, like Meat Producer 2.

Another element of the innovation is that, unlike conventional producers who tend to sell through one or two types of actors (being either livestock markets or abattoirs), Meat Producer 4 was selling through a network of multiple actors which, in this case, included direct to customer sales from their own delivery service, local hospitality businesses, a local farm shop and their own butchers shop located in a nearby settlement. These supply chains are shorter than conventional supply chain routes both in terms of their spatial extent and also in the number of buyers involved with this single producer. Moreover, this multimodal network of outlets for the producer's goods spreads the risk in a way that conventional producers are less able to, by virtue of the standard routes to market, and represents an innovation in the *industry* element.

The final aspect of this case that is innovative is that the producer uses secondary processing of their meat products into cooked pies, faggots and other processed meat goods in order to increase the shelf life of produce, thus limiting the amount of their produce that goes to waste, whilst at the same time further expanding the range of

goods that they have to sell. The Meat Producer 4 quipped that 'if it is not turnover it is left over' which exemplifies a degree of efficiency and entrepreneurial thinking in the operation of the business that is synergistic with the other innovations already discussed in this section. All of these aspects of innovation have at their root a **knowledge** facet that distinguishes them from the configuration of the SW Wales Meat regime. As Section 5.2 discussed, the conventional producers in SW Wales are interested in building their businesses primarily through knowledge/science developments (such as carcass improvement, grassland management and disease prevention) whereas the small scale meat producer has built their business with the same interests as conventional producers but additionally considers a wider set of knowhow including processing and market development.

5.5.3 Case study of Meat Processor 3 as a regional wholesaler/feed company joint venture

Meat Processor 3 was mentioned by a number of interviewees as being an innovative business in SW Wales. Meat Processor 3 is a business which supplies premium quality Welsh sourced beef for sale in the Welsh market. The business is a joint venture arrangement between a major food wholesaler and a feed company, which is designed to bring mutual benefits to both of the partner companies. The beef has a 'point of difference' in the market by being Welsh branded but also as a premium quality meat, which is achieved through a specific feed regime, monitored and regulated by a specialist analyst on a farm-by-farm basis.

The supply chain structure appears similar to that of the producer group in Section 5.5.1. There are two key differences, however. Firstly, unlike the Meat Producer Group, there exists no contractual relationship between the wholesaler and the producers that supply them. Secondly, Meat Processor 3 extends a degree of control onto the farms that supply them through the standard of the feed that they insist producers feed their stock. Furthermore, the provenance indicator attached to the final products is more widely specified in Meat Processor 3's case than in the meat

producer group insofar as it is not tied to specific area/sub-region of Wales but rather to a Welsh designation.

5.5.3.1: Rationale for the regional wholesaler/feed company joint venture

The primary rationale for the joint venture is similar to that of the Small Producer innovation, in that the company was formed to take advantage of a gap in the Welsh beef market as highlighted by Meat Producer 2: '[Finished] beef cattle are very rarely seen in the livestock markets'. This gap in the market is also corroborated by Meat Processor 3 who, in discussing the security of their supply, commented: 'what we have realised in the last 18 months, store cattle prices are very good compared to fat cattle and farmers have taken the decision of selling the cattle as unfinished cattle so therefore they have not got the cost of feeding them and what is unfortunate as well is that those cattle are going across the border into England'. Welsh Beef is subject to a European PGI status and therefore as Meat Processor 3 indicates: 'once those cattle go over the border out of Wales they no longer qualify and they lose the PGI', which is a market niche that Meat Processor 3 is exploiting. Meat Processor 3's central business rationale is to generate a Welsh finished beef market where the livestock 'has got to be born, reared, slaughtered and processed within Wales'. The enticement of producers to sell finished beef into the Welsh market through Meat Processor 3 represents a diversion from the SW Wales regime to address **a market preference** which the SW Wales meat regime was not adequately fulfilling.

5.5.3.2: Nature of the conventional wholesaler innovation

The conventional wholesaler innovation comprises deviation from the dominant SW Wales meat regime dynamic in terms of **science**, **biophysical** and **policy** elements. The **science** aspect of this innovation relates to how a point of difference is obtained in the meat this wholesaler buys from its producers. The core focus of the regime is for the improvement of carcass quality, focused upon genetics, to produce larger and generally leaner meat using the EUROP tables shown in Table 5.5; whereas, in the

case of Meat Processor 3, improvements were achieved both through livestock genetics and also by managing the characteristics of the feed that the animals were fed. Meat Processor 3's aim was to produce excellent quality meat and also to have higher quantities of vitamin E present in the meat. This is achieved through a nut or protein-balancing feed and was chosen as a point of difference, due to scientific research done for the company by an academic specialising in animal and feed science, for its ability to improve the quality of the meat and, in particular, the ability to improve the shelf-life of the meat after slaughter: 'what it does is it gives you an extra shelf life for your beef and it gives you a better colour' (Meat Processor 3).

The amount of feed/nut additive to be used by producers is complicated by whether the producers feed their livestock on pastures or use silage/feed concentrates and because there is variability in how much vitamin E is created by differing qualities of grass/silage depending on a range of *biophysical* and land management factors. Any producer wishing to sell to Meat Processor 3 is required to send a sample of their grass/silage to a specialist feed advisor who analyses the sample and then directs the producer as to how much additional feed to give to the livestock in order to mitigate the issue of variability in meat quality. The feed must be brought from the parent feed company, which allows the wholesaler/feed company to ensure compliance to their quality standards. Meat Processor 3 acts as a conduit for information and oversight to ensure compliance with their standards and explained that:

'I monitor [the compliance]. I get the information back on a monthly basis from [the feed company] about how much feed is sold to every producer and then we can work out how many cattle are going through, how much feed they have brought and I know from the silage analysis how much they should be using.'

This additional monitoring by Meat Processor 3 of the producers, who sell to them, is distinctive from the SW Wales meat regime. In the regime, private standards are managed through the EUROP classification standards, with which producers attempt to comply without any direct monitoring by abattoirs or livestock auctioneers;

whereas Meat Processor 3 directly engages with producers. Meat Processor 3's control of their supply chain represents an innovation in the *policies* that govern the supply chain, compared to the SW Wales meat regime, which delves deeper into the management of on-farm *biophysical* resources based upon on-going *scientific* monitoring.

Whilst the additional compliance incurs higher input costs for producers selling to Meat Processor 3 it also has benefits as they are paid an additional premium for any carcasses which fall within certain criteria on the EUROP scale. Meat Processor 3 explained that they typically paid 14 pence per kilogram more. However, he indicated that: 'there is more dairy influence coming into some abattoirs so their prices are lower [and] so the price difference between us and other competitors is 17 pence'. It is this additional inducement for producers that allows Meat Processor 3 to organise the supply chain, inducing a sufficient number of producers to comply with their 'protocols' bringing benefits to the two parent companies (the wholesaler and the feed company).

5.5.4: Summary of the SW Wales meat niches

Table 5.8 summarises the three niches discussed in this section using the ST heuristic model, which allows for a comparison between the niches and also between the niches and the dominant regime. The commentary in Table 5.8 shows where there is a departure from the SW Wales meat regime configuration, with any blank cells indicating that there was no significant difference between the regime and the niche. All three niche case studies presented in this section are quite different from one another. There are two central questions when studying the niches; the first is 'how similar is the niche in comparison to the regime?' The other question is 'to what extent could a niche be absorbed or up-scaled into the regime?'

The Producer Group innovation has the most similar characteristics when compared to the SW Wales meat regime, which is due to the fact that two of the key actor types that shape the SW Wales meat regime are involved in the observed producer groups,

namely abattoirs and the multiple retailers. Whereas the small scale meat producers are most unlike the SW Wales meat regime and the least likely to be absorbed into it. Small scale producers exist because they service a series of niche markets that are not adequately fulfilled by the region's producers who create these gaps in the market because of the continued specialisation of production in the regime. It is entirely likely that small scale meat producers would be found in any region one chose to study filling the spaces vacated by 'conventional' agri-food supply chains. Finally, the conventional wholesaler joint venture is something of an interesting case that shows how novel private standards together with detailed co-ordination between suppliers-producers-wholesalers and retailers create viable supply chains that, whilst being similar in many respects to the supply chains seen in the regime, have a point of difference in their product that allows them to carve out their own niche in the market.

Table 5.8: Showing the deviations in Rationale and Nature of the meat niche case studies

	User/Market Preferences	Policy	Industry	Science / Knowledge	Culture	Biophysical	Technology
Producer Groups Innovation			<ul style="list-style-type: none"> - Provides benefits to producer, processor and retailer 		<ul style="list-style-type: none"> - Moving away from price taking culture and contractual relationship 	<ul style="list-style-type: none"> - Insulating producers against price shocks due to disease 	
	<ul style="list-style-type: none"> - Selling the local environment and culture as part of the branding 	<ul style="list-style-type: none"> - Producer private standards being self-governed by producers 	<ul style="list-style-type: none"> - Exclusive to one key retailer who works with producers as well as the processor 		<ul style="list-style-type: none"> - Horizontal co-operation between producers changing independent producer culture 		
Small Scale 'Alternative' Producer Innovation	<ul style="list-style-type: none"> - Advantage of being small enough to be below certain regulations, keeping costs down 		<ul style="list-style-type: none"> - Gap in market created by SW Wales meat regime producer specialisation 				
		<ul style="list-style-type: none"> - Operating below regulatory thresholds avoids higher costs of business 	<ul style="list-style-type: none"> - Expanded through further diversification rather than specialisation. <ul style="list-style-type: none"> - Multiple outlets/routes to market 	<ul style="list-style-type: none"> - Needed wider knowledge than just production (processing skills) 	<ul style="list-style-type: none"> - Approaches skills and knowledge development differently from conventional producers 	<ul style="list-style-type: none"> - Non standard and/or wider range of species and breeds used 	
Conventional Wholesaler Innovation	<ul style="list-style-type: none"> - Wanted Welsh product for Welsh market 				<ul style="list-style-type: none"> - Need to entice Welsh producers to finish beef rather than sell as stores 		
		<ul style="list-style-type: none"> - Private standards that extend beyond the EUROP industry standards 	<ul style="list-style-type: none"> - Higher degree of top-down control from wholesaler 	<ul style="list-style-type: none"> - Feed science to produce point of difference in product quality 	<ul style="list-style-type: none"> - Synergistic partnership between a feed producer and a wholesaler 	<ul style="list-style-type: none"> - Monitoring of nutrient levels in grass/silage and managing the supplements being fed to livestock. 	

5.5.4.1: Considerations for socio-technological systems arising from the SW Wales red meat niches

The three case studies analysed in this section displayed some of the diversity of socio-technological configurations that can arise from regional agri-food systems. On a first reading of the analytical data for the three niche case studies, van der Ploeg et al's (2004) distinction between niche novelty and regime innovations appears to fit the data well; with the small scale alternative meat producer representing a niche novelty and the producer group/regional wholesaler- feed company joint venture niches being more closely aligned to the logics of the regional meat regime representing innovations in that regime. Upon a closer inspection of the interplay between the ST constellation of elements in each case study a more diverse and nuanced understanding does however emerge.

For example, in the small scale alternative meat producer we see a type of production that is novel for the region, based on the available secondary data, and their locally rooted retail system is aligned to van der Ploeg et al's (2004) concept of niche novelty. However, the production methodologies, the know-how employed by the producer and policy frameworks are still closely related to those of the regional regime⁵⁹.

Whereas, in contrast, in the wholesaler-feed company niche the underlying logics under which it operates with the increased vertical integration and private policy standards are closely aligned to those of the regional regime, suggesting a regime innovation. However, the innovation is rooted in close monitoring of on farm biophysical attributes and the co-ordination of actors in the supply chain both upstream and downstream of production to achieve a very specific biophysical point of difference in the final product. This monitoring of on farm biophysical properties and the nature of the co-ordination presents an innovation that is rooted to the

⁵⁹ Albeit that policy/regulatory constraints are somewhat inescapable as niches in this sector are exposed to the same regulatory framework as the rest of the sector. Although some policies may work to a niches benefit by the niche being under limits for a particular policy to apply, such as is the case for the alternative meat producer.

specificities of the localities that leaves this niche in a space, analytically speaking, between van der Ploeg et al's (2004) niche novelty and regime innovation.

This distinction between niche novelty and regime innovation was discussed in chapter 3. The concept of assimilative potential was proposed as a scale of innovativeness that helped describe whether niches are likely to be absorbed into the regime with little overall change in the regime or whether, in order for the regime to adopt the niche innovation, the regime needed to change fundamentally the configuration of the ST regimes' constellation of elements. This idea of assimilative potential and its implications are discussed further in section 8.2.1 when the nature of all niches are contrasted to their regimes in greater detail and their potential to be absorbed or adopted, along the lines discussed in section 3.2.3, is explored.

5.6: Conclusion

This section will summarise the main findings of this chapter. It will focus on two aspects of the chapter, the first being the nature of the SW Wales meat regime, which is followed with a discussion of the key points from the niche case studies.

Throughout the chapter, observations were also made regarding implications that the empirical findings have on the ST systems theory and the application of the MLP. Where these implications are not dealt with specifically in this chapter they are discussed further in chapter 8, where the data from all three results chapters can be considered together. It has also been noted, where appropriate, that some of the implications will require further research to investigate the questions raised in this chapter.

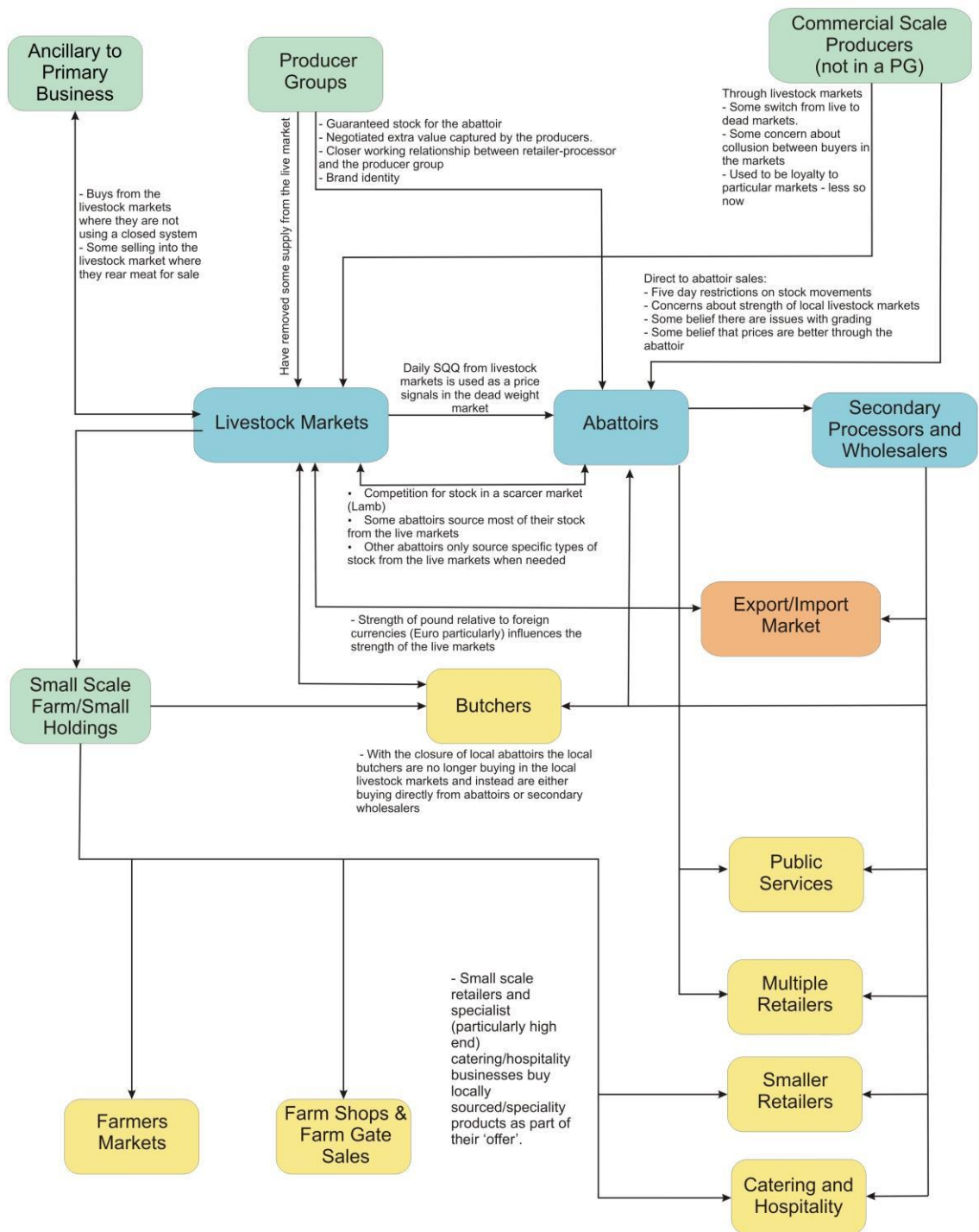
5.6.1: Nature of the SW Wales meat regime

What has been observed is a regime that is dynamically stable within the region, buoyed by strong domestic/European markets and growing international demands

from Asia and the Middle East. Strong demand has been coupled with a reduction in supply of livestock resulting from a confluence of the de-coupling of farm subsidies from production and the aging farm population increasingly choosing to (as one interviewee put it): 'farming the form' rather than focusing on increasing production, seeing perhaps farm subsidies as partly a retirement fund. This has supported strong prices for those producers who are still raising livestock in SW Wales. Producers need to be incentivised to farm when input costs are rising faster than livestock prices; it was unsurprising to hear, not only them but consultants, processors and other institutional actors, all comment about the importance of a fair price.

Figure 5.7 summarises the inter-linkages derived from the empirical data and highlights some of the key interactions that define and drive the SW Wales red meat regime. One of the key drivers shown in Figure 5.7 is the reorientation of buying power in the middle tier of the supply chain between livestock markets and abattoirs where a complex combination of UK livestock movement restrictions, EU abattoir export standards, competitive dead-weight pricing and new dedicated supply chain arrangements through producer groups have shifted the balance of power between the livestock markets and the remaining abattoirs. This reorientation should not be seen as a change in the overall trajectory of the SW Wales Meat regime but as a reorganisation of actors or actor influence within the regime along the existing logics of high volume production that conforms to the EUROP standards upon which the regime is based.

Figure 5.7: Summary of the inter-linkages within the SW Wales meat sector



It is apparent that producers still wish to be paid as much as possible for their produce whereas abattoirs and retailers wish to secure sufficient supplies of different meat products, which conform to their standards to satisfy market demand, at the lowest possible prices. For some retailers/abattoirs this has led them to consider paying a select group of producers more in order to secure the supply they require which leads to the distinction between producers within a producer group and those outside a producer group shown in Figure 5.7.

The SW Wales meat regime seen today is robust and dynamically stable with a large producer base, sufficient presence and strength of processors, significant interest and support from the institutional actors of the Welsh Assembly Government, HCC and others and the enduring popularity of its red meat products. There will certainly be new challenges in the near future, most notably the inevitable change in farm subsidies with EU expansion and the pressures this is having on the EU CAP budget, which will place a further squeeze on farm incomes. However, the regime is dynamically stable and well placed to adjust itself to face new challenges.

5.6.2: Niche innovations in the SW Wales meat sector

It is perhaps unsurprising with a strong regime that the niches uncovered are either: very small scale enterprises that are literally filling niches in the market that the regional regime has chosen not to occupy, or are variations upon the regime dynamic that still closely resemble the regime configuration. One of the clearest examples of small scale enterprises literally filling a 'niche' in the market is the 'alternative' meat producers⁶⁰, who have typically utilised local butchers, hospitality businesses and direct selling as their route to market as shown in Figure 5.7.

It is the Producer Group niches that have the greatest possibility to be absorbed into the SW Wales meat regime and, in fact, there is a good deal of evidence to suggest that this is already happening. All of the groups mentioned during the

⁶⁰ Alternative meat comprises: pork, chicken, goat and any other meat that is not the standardised beef or lamb that the regime level producers are supplying to the market in the case of the SW Wales meat sector.

interviews appeared to be selling directly to one of the multiple retailers. The question that then arises is: are Producer Groups really a niche innovation in the SW Wales Meat regime? In the case of Producers Groups these probably are niche innovations, albeit of a temporary nature. Producers in a Producer Group have chosen to innovate away from the current regime configuration⁶¹ in response to pressures on regime (e.g. FMD), creating new interactions and relationships with abattoirs, retailers and buyers to assist them in securing better prices for their goods. However, as these new relationships ostensibly do not significantly change the underlying logic of the supply chain and bring mutual benefits to all supply chain actors, they represent a set of new practices that are being quickly replicated by other regime actors, becoming more prevalent and therefore being reabsorbed into the regimes underlying logics. What cannot be foreseen, though, is what will occur during this normalising process as more and more groups are created; will they create more competition that ultimately allows abattoir/retailers to renegotiate and hollow out the additional value that producers have negotiated for themselves due to their uniqueness?

⁶¹ In this case to begin to become negotiators who 'make' prices rather than take prices, which incidentally addresses an inherent weakness with the SW Wales meat regime dynamic.

Chapter 6

The SW Wales Dairy Sector

6.1: Introduction

This second results chapter will examine the empirical data and evidence for the dairy sector⁶². It is presented in broadly the same format as the previous chapter. This chapter will show that the SW Wales dairy regime is a significant part of the agricultural fabric of the region as well as being an important dairy producing region for the UK dairy sector. The regional regimes' producers are technically adept, pursuing a number of different land and livestock management strategies, partly in response to market requirements.

Whilst the SW Wales dairy regime is a significant part of the SW Wales agri-food industry, compared to the SW Wales red meat regime it is not a dynamically stable sector-specific regional regime. The instability of this regime has principally been born out of the de-regulation of the national processing market leading to concentration in national processing businesses and loss of processing capacity in the regional regime, the effect of which will be discussed in Sections 6.2 and 6.3. In essence, it will be argued that the SW Wales dairy regime is a regime which has been partially co-opted into a UK wide regime principally as a result of this process. It is not until the end of Section 6.3, dealing with the connectivity between SW Wales' dairy regime and higher level regimes, that we are able to show the configuration of the regime's socio-technological constellation because of the co-opted nature of the SW Wales dairy regime. The configuration of the regional dairy regime's constellation of elements, in part, reflects that of the national dairy regime due to the nature and connectivity between the SW Wales regional and national regimes. This interaction between the

⁶² Sector, as defined here, is taken to mean all business concerns involved in the production, processing and retailing of dairy products in the SW Wales region. This includes businesses and supply chains that can be ascribed to either the regime or niche innovation levels of the multi-level perspective in the ST systems framework.

regional and national regime raises some interesting questions for ST Systems' research which are discussed at the end of section 6.3.

Section 6.4 discusses the landscape pressure being exerted on the dairy industry from the banking sector regarding the availability of credit and the handling of ongoing finance arrangements with producers. The interaction between regional regime and higher spatial level regime actors is reflected upon again in 6.4 as the higher level regime appears to operate in close concert with the regional regime and act as a pressure upon it. Niche innovations are covered in Section 6.5 which examines three potential alternative innovations: an ethical producer co-operative, an organic farmhouse cheese producer and a non-bovine dairy producer-processor. The niches' case studies elicit a discussion between the ideas of niche novelty, regime innovation and assimilative potential, which were introduced in chapter 3, as part of the conclusion to section 6.5. Finally, Section 6.6 contains the concluding remarks for the chapter and suggests that in the SW Wales dairy regime we see a regime which is under pressure to the point of being destabilised and that this is creating space for innovation in the dairy sector.

The chapter is organised around the Socio-Technological Systems (ST Systems) framework as is discussed in Chapters 3 and 4. Any item that is in bold and italicised text should be read as an identifying aspect of the SW Wales dairy regime or the niche under discussion, which will later be summarised in the appropriate table.

6.2: Elements of the SW Wales dairy regime

This section will discuss the elements of the SW Wales dairy regime and will commence in Section 6.2.1 with an exploration of what is actually present in SW Wales in terms of the dairy production and the changes to dairy production/producers over the last 5-10 years. Section 6.2.2 then looks at the specific elements of science and technological knowledge that producers in SW Wales utilise in order to produce

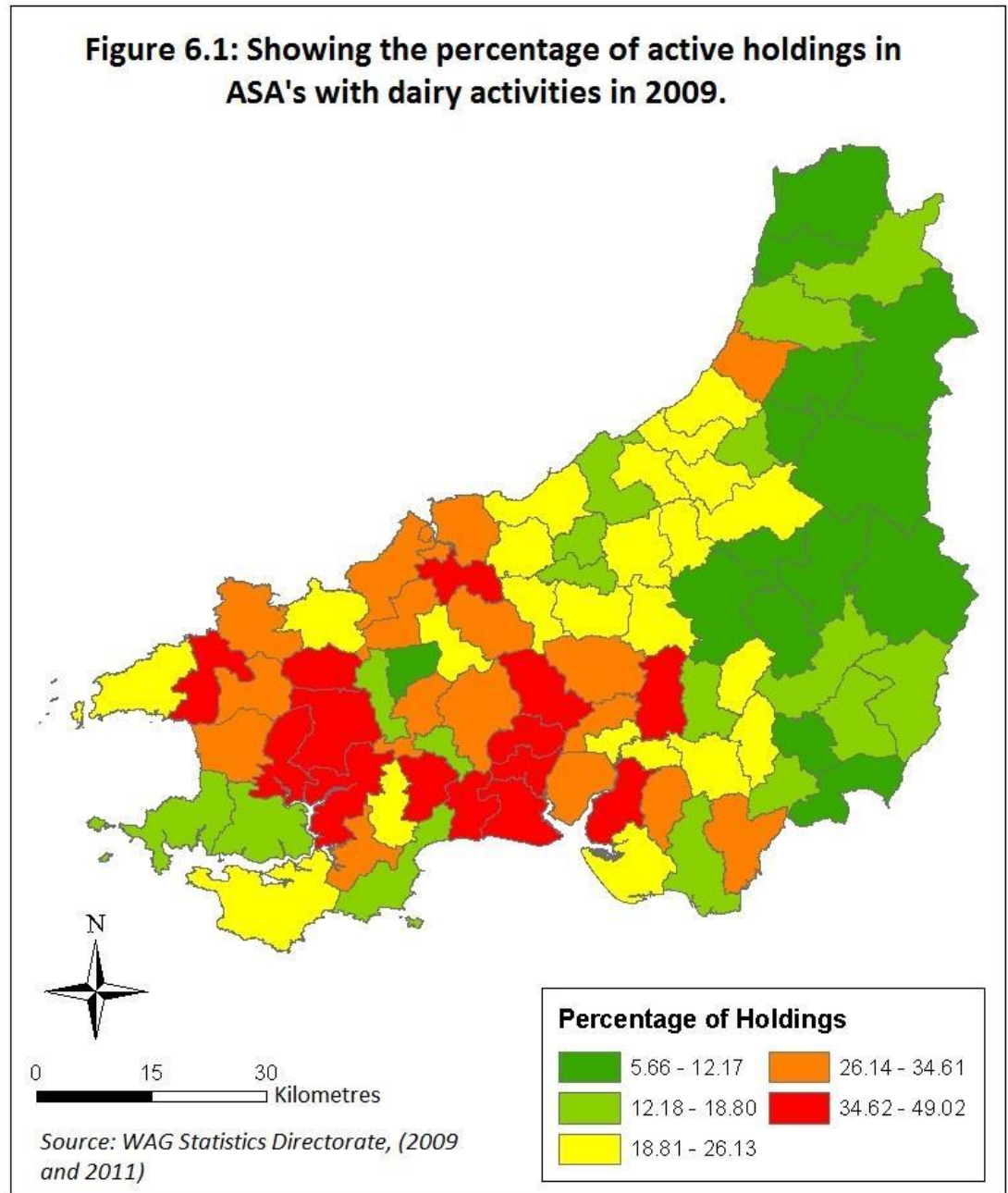
milk in the region to meet the demands of the market. Dairy processing in the region and its decline will be discussed in Section 6.2.3.

6.2.1: Dairy production in SW Wales

Using data collected by the WAG through the annual farm business survey (FBS) we can plot the distribution of active holdings in the SW Wales region within the agricultural small areas (ASA) which have some kind of dairy enterprise as part of their holding expressed as percentage of the active holdings in that region as shown in Figure 6.1. This figure shows the percentage of holdings with dairy enterprises within the three counties under investigation. Figure 6.1 indicates that there are more holdings in Pembrokeshire, along the Carmarthenshire-Pembrokeshire border and, to a lesser extent, along the coastal corridor of Ceredigion than in the East of the region. These concentrations are corroborated by a comment from Institutional Actor 3: 'Carmarthenshire is traditionally seen as a predominately dairy area, particularly to the West of the county and along the coastal belts; whereas if you move more to the North and maybe to the East of the county into more LFA⁶³ and those areas are traditionally more sheep and beef'.

⁶³ Less favoured areas

Figure 6.1: Showing the percentage of active holdings in ASA's with dairy activities in 2009.



Focusing on the dynamics of the SW Wales dairy industry, one of the clearest messages from the interviewees both within the dairy industry and those outside the industry is the degree of change within the sub-sector. This is summarised best by Institutional Actor 4's comment on the situation: 'We believe that, if you look at the dynamics of the industry, there is a 3% drop off every year of people leaving the industry and there is, historically, a 3% rise of stock numbers or milk output more accurately of remaining people. So we produced the same amount of milk each year until a point about four years ago where expansion did not equal the leavers in

terms of the closure of herd numbers'. The WAG Statistics Directorate collates data on agricultural activities, as was discussed in Chapter 5, which we can utilise to observe what changes have happened in SW Wales. These changes can also be compared and cross-referenced with data with from DairyCo⁶⁴, which covers the rest of the UK. Table 6.1 begins this analysis by looking at the change in the number of producers who had a dairy enterprise on their holding in different regions of Wales from 2004-2010 and shows a marked decline in the number of producers engaged in dairying over the period. The table shows that the decline is fairly uniform across all regions of Wales, whilst the decline in dairy cattle numbers is less marked, with a 8.57% drop in SW Wales (entitled 'Dyfed' in the table) over the same period (WAG Statistics Directorate, 2011).

⁶⁴ DairyCo is an industry body which collates and analyses data on a range of dairy specific topics.

Table 6.1: Changes to the number of farm holdings with dairy cattle present on them from 2004 - 2010

	2004	2005	2006	2007	2008	2009	2010	Percentage Change 2004-2010
Unallocated residual	17	16	21	0	0	0	68	
North West	424	404	405	395	372	340	326	(23.11)
North East	750	710	694	690	651	617	587	(21.73)
Powys	462	441	443	422	392	380	366	(20.78)
Ceredigion	548	526	521	501	477	464	438	(20.07)
Pembrokeshire	753	725	712	688	638	613	574	(23.77)
Carmarthenshire	1099	1063	1019	984	937	879	834	(24.11)
South	511	505	496	473	451	418	411	(19.57)
Dyfed Total	2400	2314	2252	2173	2052	1956	1846	(23.08)
Wales Total	4564	4390	4311	4153	3918	3711	3604	(21.03)
Percentage of Wales total represented in Dyfed	52.59	52.71	52.24	52.32	52.37	52.71	51.22	

Notes

Source: WAG Statistics Directorate (2011)

Unallocated residual - Represents an amount of data that cannot be allocated to a particular small area due to data confidentiality issues and which is expressed as an aggregate for the whole country in the regional data set.

Dyfed - Represents the old county area comprising Ceredigion, Pembrokeshire and Carmarthenshire and, furthermore, represents the entire area of SW Wales under investigation in this thesis.

The difference between the percentages for the decrease in the number of producers in Dyfed compared to the smaller decrease for dairy cattle supports the general opinion, as stated by Consultant 1 (when discussing changes in the agri- food industry in S W Wales), that: ‘the ones that are left- it is a case of polarisation; the big are getting bigger, small are getting out’. Using Dairy Co’s data for milk production,

a similar period to that shown in Table 6.1 can be reviewed to assess what affects the changes in SW Wales have had on the volume of the milk produced and, furthermore, to assess whether the changes are specific to SW Wales; a summary analysis of which is shown in Table 6.2 for the period from 2005-2010. Table 6.2 shows that, despite a loss of 8.57% (WAG Statistics Directorate, 2011) in the number of dairy cattle, there has only been a drop of 4.47% in the volume of milk produced from SW Wales for a similar period. The lower drop in production capacity is probably due to the technical capability and genetic improvements that have allowed for improvements in the yield per dairy cow on a holding. However, as the data from selected other regions shows, the rate and pattern of decline and, in some cases, growth is by no means universal which suggests that there is some difference in the productive dynamics between regions both in the UK and Wales.

Table 6.2: Percentage changes in volume of milk produced in selected regions from 2005/06

	2009/2010	2008/2009	2007/2008	2006/2007	2005/2006
Clwyd	14.96	(2.26)	0.71	1.37	0.00
Dyfed	(4.47)	(4.21)	(1.49)	(2.42)	0.00
Gwent	(6.65)	(12.01)	(7.91)	(4.71)	0.00
Gwynedd	(12.29)	(10.55)	(11.47)	(2.98)	0.00
Mid Glamorgan	(4.01)	(6.50)	(2.08)	(2.87)	0.00
Powys	(1.27)	(6.89)	(1.80)	(1.02)	0.00
South Glamorgan	(12.30)	(16.34)	(11.61)	(3.09)	0.00
West Glamorgan	(16.00)	(14.32)	(7.93)	(6.58)	0.00
Devon	3.21	1.07	2.78	1.19	0.00
Cumbria	(1.46)	(1.34)	0.10	1.81	0.00
Staffordshire	(4.28)	(5.40)	15.05	(2.44)	0.00
Shropshire	(15.79)	(10.52)	(23.23)	(6.53)	0.00
Hampshire	(12.84)	(13.98)	(7.53)	(1.55)	0.00
Kent	(6.33)	(4.62)	(3.50)	(5.99)	0.00
Oxfordshire	(8.70)	(7.16)	(3.53)	(2.63)	0.00
All Wales	(1.86)	(5.30)	(2.38)	(1.92)	0.00
All UK	(5.72)	(5.27)	(3.07)	(1.19)	0.00

Source: WAG Statistics Directorate, (2011)

The data and information contained in this section shows that whilst the SW Wales Dairy Regime has seen a large reduction in the number of producers in the region, it has broadly maintained both the number of dairy cattle and volume of milk. This

suggests an increasing intensity of dairy production on fewer farm holdings and is indicative of a facet of *industry* for the region's dairy ST Regime constellation.

The expansion of dairy farms in SW Wales is noted by many of the interviewees but Dairy Producer 3 noted, when discussing these changes in the dairy production sector, that this trend: 'is probably very similar to what [is seen] throughout the country; bigger farms are getting bigger and the smaller ones just can't get tidy enough contracts'. Dairy Producer 3's comment regarding the inability of smaller producers to get 'tidy' contracts is supported by Meat Producer 3, a traditional mixed lamb meat and dairy enterprise in the area, who (when discussing to whom he was selling his milk) commented: 'They have upped the threshold now from 500 litres to 800 litres, which is about a 60% increase in the threshold. Initially, years ago, [they went up] from 300 to 500 which has drove out a lot of the smaller producers'. This marginalization of smaller dairy producers by the processing sector is also a facet of *industry* of SW Wales' Dairy ST Regime constellation.

Whilst the FBS⁶⁵ data used in Figure 6.1 allows us to see the broad distribution of dairy farming enterprises, what it cannot show is the extent to which those producers are engaged in dairy production to the exclusion of any other agricultural enterprise. Meat Producer 3, for example, considers his mixed enterprise of dairy with lamb and beef production to be of the style of a 'traditional Welsh family farm' whereas Dairy Producer 3 explains that 'we are a dairy farm out of choice, but due to TB we rear beef calves'. The other dairy farmers interviewed were also specialist dairy-only holdings. If the degree of specialism is high then, whilst Figure 6.1 shows that no area has more than 50% of its active holdings as dairy, it might mean that those who have some dairy on their holdings are likely to be specialist mono-functional units, who might dip into the meat enterprises only by the necessity of the influence that TB has on their holdings.

Although those producers who remain in the dairy industry in SW Wales are clearly expanding their farms and herd sizes, there is a question in the mind of some

⁶⁵ Farm Businesses Survey (as collated and distributed by WAG Statistics Directorate, 2011)

producers as to whether the additional capital costs are worth it with two comments from the interviews being of interest. The first was from Dairy Producer 3 who talked about the plans he had to expand his business: 'The budgets and forecasts that I have done say that we will probably only be marginally better off than we are now. So it does beg, why should we be doing it but I think: if you stand still then you are going back'. This can be contrasted with a comment from Dairy Processor 1 regarding a producer within his dairy co-operative who decided to downsize their herd and the benefits that brought: 'he is back to 120/130 cows and he feels happier, milking is more of a joy, it is less stressful, the cows look better, the farm looks better and this is the interesting thing: he was losing his clover and his swards because he was overstocked. Now his clover is coming back and it is a whole lot better so now rather than thinking of getting out he is saying well maybe I can just stay here until I retire'. This statement raises an interesting question regarding the nature of the dairy production industry as to whether, in the drive to sustain increasingly larger volumes of production within individual holdings, producers are unduly placing stress on the systems they rely on to achieve that production. As Dairy Producer 1 puts it when he was discussing the growth of his farm and others in the area: 'a lot of farmers are adding to their herds naturally through replacements, but the infrastructure has to match the numbers; everything has to be matched: labour, numbers, cows'. Indeed, at current market prices, some producers such as Meat Producer 3, believe that 'milk is ok but it does not leave a margin for reinvestment'. This is indicative of an internal regime pressure for the SW Wales dairy regime along both the *biophysical* and *industry* elements, where remaining dairy producers might reach or have reached both the natural and infrastructural capacity of their existing holdings. The issue of expansion is dealt with further in Section 6.4: Landscape pressures, when considering the relationship between the banking industry and SW Wales dairy producers.

6.2.2: Technical expertise of dairy producers

One of the distinguishing features of dairy producers is in the degree of technological and scientific 'know-how' that they possess, which is typified by this comment by Meat Producer 1 who was discussing why dairy producers are so much more aware

of their costs than the red meat producers of the region: 'a dairy person would never dream of buying bull semen unless he has seen their actual performance figures where we will go out and spend £700-800 on a ram just because it looks pretty'. The attitudes of producers to the use of *technological* and *scientific* 'know-how' on their holdings have changed over time in the dairy sector of SW Wales. Real changes in these attitudes towards modernisation occurred during 1946-1966, according to Moore-Colyer (2011), when Wales as a whole saw dairy heifer numbers increase threefold and virtually all milking done by machine coupled with an increase in pharmaceutical use and extensive grassland improvements. There is now a second shift occurring in the focus of dairy farming in SW Wales but, whereas the first shift was aimed solely at increasing the milk yields that producers were able to achieve, producers can now have very different aims. Some of these aims became apparent during the interview with Dairy Producer 1, who was discussing his yield and farming system compared to other systems that you would find in the SW Wales region and noted the difference particularly between what he describes as 'low-yielding systems' and his own:

'What I call traditional farming is 'plod on', their average yield arrived at by accident, almost just through what the cows give them. We have to focus on an output. Where the low-yielding producers would be focusing on cost per litre, so they would have to rip out every cost they could possibly find because ultimately their cows are only going to give them 4,500 litres, which doesn't come to a lot in total value. Our cows have to convert every bit of bought-in food as efficiently as they possibly can, because if they don't perform, that ratio comes out a kilter. Probably the best way to describe this change is to call it increasing focus on system.' – Dairy Producer 1

Both the first shift and second shifts in dairy producers' attitudes to and adoption of technological and scientific 'know-how' appears to have three key dynamics: use of inputs, animal genetics and animal health. Whilst it might seem suspicious that the use of plant and machinery is omitted from this list of dynamics, it would appear that the use of tractors, mechanical milking parlours, muck spreaders and other farm

machinery is so ingrained in the fabric of dairy farming in the region that it was not raised by interviewees, except for the earlier comment regarding the cost/benefits of expanding. The three technological and scientific 'know-how' dynamics will be discussed in turn.

6.2.2.1: Use of feed and fertiliser inputs on dairy holdings

The use of fertiliser and feed inputs on dairy holdings represents an investment by the producer for which they hope to receive adequate returns in terms of land improvement, fodder yields and, ultimately, through the quality and quantity of milk produced by their dairy herd. During the first shift in technological and scientific 'know-how', importance was given to on-farm grassland management according to Moore-Colyer (2011) who indicates that it was 'advisors and teachers' who were placing this emphasis on grassland management but that farmers were disinterested because 'there was little point in going to the trouble and expense of grassland renovation when imported starches and proteins were available at rock-bottom prices' (ibid, p.33).

In the more recent shift to the adoption of technological and scientific 'know-how', the picture is more diverse and focused around the production strategies employed by producers. Whilst, in the first shift, the choice seemed to be between sourcing feed from on-farm grassland management and the use of off-farm sources, the range of feed strategies in the second shift ranges from: on-farm grassland, on-farm grass and fodder/feed and off-farm fodder/feed additions to complete off-farm fodder/feed strategies. The other half of the strategy is the degree of use of fertiliser: a producer, for instance, could be producing all his feed requirements from on-farm grassland but might be doing so using either a lot or a little off-farm fertiliser; conversely, a complete off-farm fodder/feed producer probably needs very little fertiliser other than that which is produced by their herd. Of the dairy producers interviewed three specifically mentioned growing feed on farm, one did not mention anything during the interview, nor did Dairy Processors 3 and 4, however it was not a

specific question posed in the survey and interviewees did mention the other feed strategies.

The choice of feed strategy employed is shaped by the overall farm strategy, in that dairy producers are attempting to meet different specifications in their respective dairy contracts (contract specification is discussed further in Section 6.3.2.2), which renders some input strategies unsuitable for certain desired production outcomes. One of the most obvious production outcomes that provided a contrast for input strategies in SW Wales is between the organic and non-organic producers in the region with this quote from Dairy Processor 2 who discussed the difference between organic and conventional dairy systems during the interview: 'Because from an organic point you are constrained by stocking rate, again on a conventional farm you can stack them up to the ceilings in a way because you can just bang more and more fertiliser on'. This view of constraint of the system was echoed during my interview with Dairy Producer 2, a former organic dairy producer who moved away from organics back to conventional production because: 'it wasn't paying: feed costs too high, and the style of farming was too restricted'. Dairy Producer 2 was bringing in organic feed from off-farm as well as having an extensive grass growing system. But his view was counter-posed by Dairy Processor 2 who argued that: 'it depends on your system, you see, a lot of it is down to the systems. Organic does not suit high input, high output systems. The whole principal [of] organics is that it is a closed system, isn't it. The ideal organic farm is that you grow the crop on the farm and you feed that to the cows and produce your milk. So once you start becoming more dependent on purchased feeds then obviously [they] have a big effect on you'.

The other contrasting system of production, which has arrived in the region as well as the rest of the UK, is the shed based system of dairy production which is sometimes referred to as 'super-' or 'mega-dairies'. The shed based system has been subject to a high degree of attention in both the professional and public press recently (see: BBC (2010 & 2012a) and Tasker (2010)) and is an exemplar of a system that is mostly or completely reliant on off-farm sources for fodder/feed. In the shed system, the dairy cattle are housed in sheds for the majority of the time with feed being

brought to them which, as a strategy, gives producers the ability to de-couple the production system from the constraints of land availability by bringing all of the feed from off the farm and, additionally, allows a large rise in the number of animals that can be kept on a holding. Shed systems and their implications in SW Wales were mentioned by most dairy specific interviewees as well as some who were not directly engaged in the dairy sector from phase I of the empirical research. Most merely commented that they knew that one existed in SW Wales but said little else of note.

It was a discussion with Institutional Actor 4 regarding shed systems and their appropriateness for SW Wales in the light of the Land Use Climate Change Report (WAG 2010c), which specifically considered 'zero grazing' systems as part of a strategy to assist in reducing GHG⁶⁶ emissions. Institutional Actor 4 was opposed to this idea stating that: 'the issue is that shed farming is not what West Wales is all about. Our competitive point is the ability to grow cheap grass which therefore you have to fertilise which therefore means cows need to be on it outside. Once the government says 'yeah maybe we need some sucker on the top of every shed to capture the methane' [then this] greenhouse gas solution [will] spell disaster'. The key issue here is, as Institutional Actor 1 stresses in discussing one of the effects of the loss of processing capacity in the SW region: 'people don't take into consideration the movement of goods in and out of a place that is fairly remote, it costs to take milk out, it costs to bring straw and feed in... you can't be competitive'.

Finally, it is worth considering the potential role that leavers from dairy production might play in supporting those who continue to produce. Discussions with actors from across the interviews indicated that producers either up-scaled, diversified or left the industry, whereby the leavers' land was acquired by the remaining up-scaling producers (supported in part by the fact that two of the dairy producers interviewed had acquired land within the last 10 years). However, Institutional Actor 4 considered that there was an alternative role that the leavers could play:

⁶⁶ Greenhouse gases

‘What we have realised is that for everyone leaving the industry that they have got a big resource that can support, become a satellite unit really for, the milking platform of the remaining farms. So you can say, ‘look if I take all your young stock away from you, then you can keep an extra 20% of cows on this farm because you have not got that work, that land requirement, that slurry issue’, so then the non-milking farmer that used to milk can become a support farmer for a farm that is now only milking.’ (Institutional Actor 4)

In essence what Institutional Actor 4 is suggesting is a system model that allows for the intensification of dairy production on a single farm, whilst allowing the rearing of replacements, growing of feed and the management of the slurry created by non-milking stock to be managed away from the main producing hub. In many respects this represents another intensive system with feed being brought from off farm, similar in a way to the shed based systems.

Finally, it can be concluded that feed strategies represent an important part of dairy production in SW Wales. Furthermore, strategies have developed and diversified over time and have become more focused on specific production goals that are not necessarily just the production of the largest volume of milk. This represents an aspect of both the *science/knowledge*, *technology* and *industry* elements of the SW Wales dairy regime as it sits at an interface between achieving results, as demanded by the market through the application of technology, and use of on farm management practices.

6.2.2.2: Herd genetics

Another key element of the dairy farming system, identified through the interviews, is that of herd genetics. The importance of genetics is symbiotic to the importance of feed strategies which, as Moore-Colyer (2011) indicates, has been of interest to advisors to the dairy industry since the 1940’s as: ‘genetic improvement can only be properly expressed under a suitable nutritional regime’ (ibid, p.33). Herd genetics has continued to be of importance to the dairy producers of SW Wales as neatly summed

up by Meat Producer 3 (who keeps a dairy herd as well as his sheep flock) who commented that 'Unless you keep up with the genetics you are going to fall behind'.

The use of genetics in the dairy sector has led to the development of the Holstein-Friesian dairy cow, whose use in the dairy sector is so prevalent now that its characteristic black and white markings are used in the marketing of dairy products (see as examples: Wiseman's delivery vehicle livery, Arla's Lactofree branding, Calon Wen's cow character or Milk Link's 'Moo' branding). According to Meat Producer 3, the development of the Holstein-Friesian led to 'an improvement, a larger animal capable of producing efficiently more milk; although I think we have probably gone too far right now'. Meat Producer 3 cited specific examples of the problems that he felt were associated with the Holstein-Friesian, which included lower fertility and handling of the animals. But his specific concern was that where traditionally he could have 'expected a cow to calf every year around the same month so she would milk for 300 days and be dry for 65 days the year of the [dairy] cow - first 100 days of up to good production, second 100 days then a plateau and then 100 days cruising down to dryness and then she would be dry for calving; but you cannot do that with a Holstein because the calving index has gone from 365 to well over 400 days.' This irregularity makes it more difficult for dairy producers to plan their year around a defined calving period as well as providing challenges in estimating what milk they have to sell at any point in time.

Further complexity in terms of the genetic provenance of dairy production is highlighted by two of the 'niche' exemplars of this chapter, Dairy Processors 2 and 3, both of whose business models depend on the quality, rather than the quantity, of the milk they produce. These processors source either all or most of their milk from 'non-standard' dairy breeds as Dairy Processor 2 disclosed during a discussion of the cost of inputs into the organic dairy market: 'I think we have got two black and white herds and the rest are mixed herds because they [their producers] have all tried to generate better quality milk and derive value out of the milk price that way as well as looking at volume'. Dairy Processor 3's comments about their herd contrasts this further because their focus is just to produce cheese from their pure Ayrshire herd

which are 'small but a good size for what we are doing but disastrous if you are just producing milk. Ayrshire's produce much less milk than Friesian-Holstein'.

The development and reliance on the Friesian-Holstein breed in the SW Wales dairy industry represents the *science/knowledge* element of the SW Wales dairy regime. However, the reliance on a single breed of genetics, whilst suiting the production logic of large volumes required by the national/global dairy regime, may not be particularly beneficial in the long term for all systems of dairy production nor for the market itself. This reliance on single breed genetics may represent an example of a system whose drive to incrementally improve and evolve has created a weakness inside its own ST regime configuration. This building in of weaknesses into regime configurations is not something that is dealt with in the ST Systems literature, which sees pressures acting on the regime evolving from the landscape level; this internal regime de-stabilisation will be discussed further in the concluding chapter.

6.2.2.3: Animal health

The final aspect, which pertains to the technical expertise of producers in the dairy industry, is animal health and welfare. Whilst getting the right genetics to suit your intended target for milk production is critical, producers also have to keep their animals healthy. This is important for any producer who is keeping livestock, particularly in the wake of foot and mouth and Tuberculosis (TB), with TB being mentioned by all interviewees as being a problem. Dairy Producer 2 gave a very typical comment on the status of TB in the region: 'we have been under restrictions for 3 years; it's had a huge impact on the herd. We have lost 60 cows in the last 3 years and they took two of those from us a month ago'.

A further point of interest arose from the conversation with Dairy Processor 2 who had worked in the wider dairy industry. He was discussing, with reference to a processor based in Shropshire, how a dairy cow's health impacts on the price producers might receive for their milk from their buyers:

‘They are really, really hard on cell counts, so if you want to get top price then you have to have a cell count that is less than 150. Well 150 is bloody insane really. Cell count is the white blood cell count which is more a measure of the cow’s health status. If the cow is ill then therefore there is a lot of white blood cells in the milk then that has an issue with keep quality. When I was at college years ago if you had a cell count of 500 you were doing ok, around 450-300 you were doing well. The government brought in a standard that said you cannot sell milk with a cell count of over 400 which sets a base in the market⁶⁷, but other than that the economic benefit of having milk at 300 vs 150 I would challenge any dairy to tell you that there is an economic differential from their point of view on yields. By essence if you get down to a cell count of nil, then you have no immune response what so ever. So you get below 150 you have effectively totally compromised the cows’ immune system’.

Dairy Processor 2 went on to explain that producers were using antibiotics ‘excessively’ in order to meet the cell count targets set by the processor. This comment from Dairy Processor 2 suggests that demands from processors may have more subtly damaging or de-stabilising effects on producers where their demands run contra to natural biophysical properties of the land or the animals being reared on that land. How exactly these private standards, that affect the price producers receive, are decided upon and whether they are backed either by scientific evidence or through discussion/negotiation with producers remains to be seen; certainly Dairy Processor 2’s comment suggests that there is little in the way of the latter of these, however this has not been independently corroborated.

In this section there are two factors to consider for the construction of the SW Wales dairy regime. Firstly, there is the ever present threat of disease and the need to maintain animal health. The risk of disease could be seen to be both a **landscape** pressure and another example of an internal **regime** issue, because disease can be

⁶⁷ Corroborated through DairyCo.org information which confirms that the EU has set a minimum standard for Somatic Cell Count of less 400,000 per ml for milk to be deemed fit for human consumption. (DairyCo, 2013a).

transmitted from outside the regional regime, and hence is a landscape problem, but it can also be a regime level issue if standards are lax among some producers within the regional regime which allows disease to be transferred between neighbouring holdings. Secondly, the health of the cows can affect the quality of the milk they produce and processors use this as a determinant for the setting of prices. However, there is some uncertainty as to whether producers in the pursuit of the best prices have had to over-use medication to reach a desired level of cell count and, moreover, whether this is building *biophysical* weaknesses into the regime in order to meet the *market* preferences demanded by the processors.

6.2.3: Dairy processors in SW Wales

There are no weekly sales of milk taking place in any of the market towns located in the SW region, instead the vast majority of the conventional milk supply leaves the farm and goes directly to a processor. The conveyance of milk from farm to processors is arranged through contractual relationships, which have a significant effect on the producers in SW Wales as this section and Section 6.3.2 will show. This section addresses the processing capacity that exists in SW Wales, whereas Section 6.3.2 will deal with the shape of the UK dairy processing sector and how this has influenced the SW Wales dairy regime.

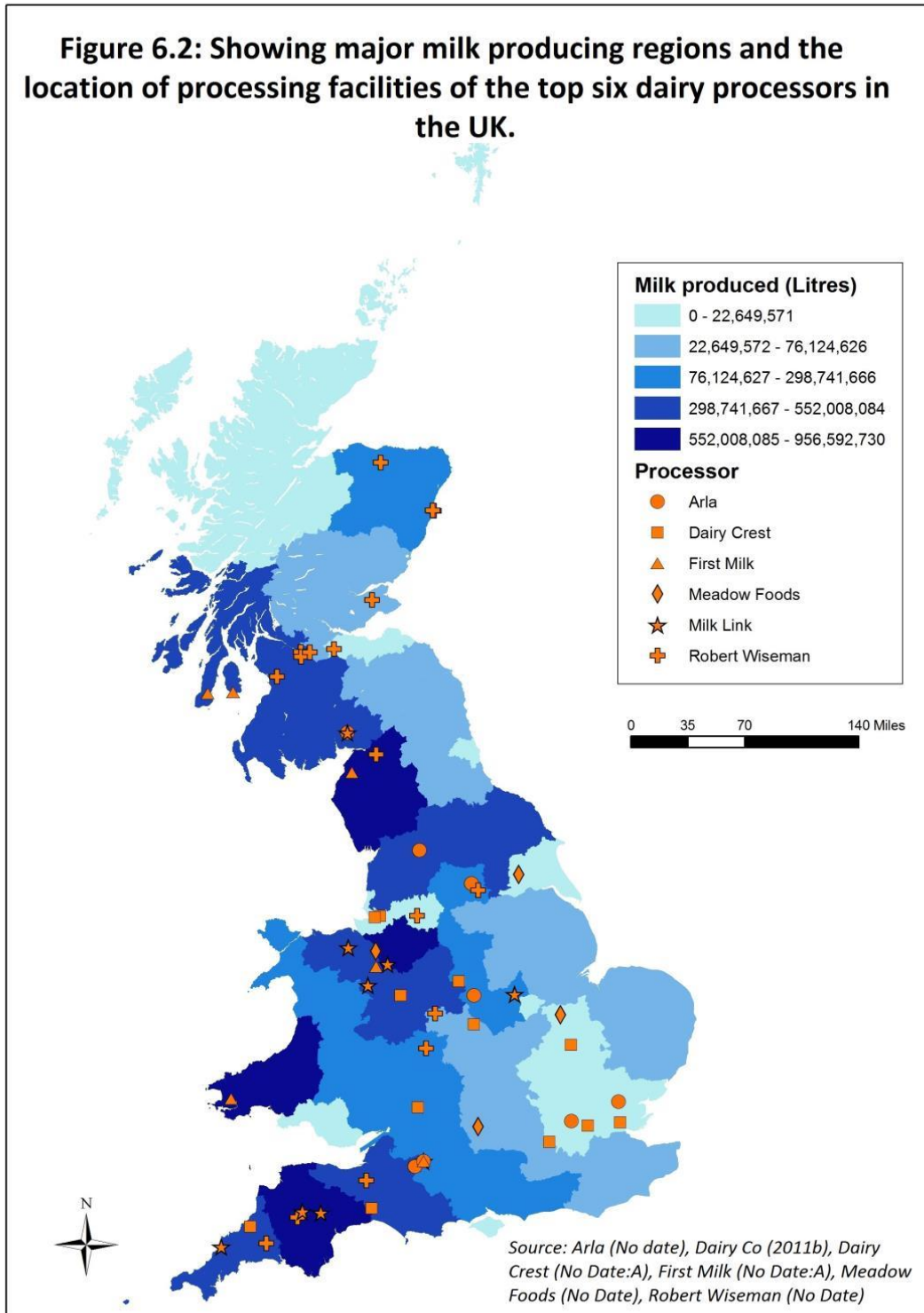
There are three major dairy processing plants in SW Wales, being First Milk's plant at Haverfordwest, Rachel's Dairy's plant at Aberystwyth and Saputo's plant at Newcastle Emlyn, with First Milk's plant being by far the largest of the three. Although these processors give some in-region capacity for the processing of milk from SW Wales, they represent what remains of a larger network of processing plants in the region which declined following the break-up of the Milk Marketing Board, as illustrated by this quotation from Dairy Producer 2 being typical of the comments from interviewees:

'the closure of factories during my time as a farmer: two factories in Carmarthen, one in Whitland, others; one reopened under a different name,

but at least five closed, so that doesn't go well for the industry if we haven't got significant processing here and we have to ship the milk out of Wales – especially with bottling.' (Dairy Producer 2 talking about major changes.)

The loss of processing capacity and the impact that it has had on producers in the region were the most frequent comments given when discussing changes in the dairy sector in SW Wales. For example, Institutional Actor 1, in discussing the processing sector in Carmarthenshire, commented: 'how disadvantaged the West Wales dairy producer is because his milk has to be transhipped [sic] east towards the centres of population and with the increased cost of fuel that means he is at a disadvantage because you can guarantee that the processor is going to offset haulage costs by paying the producer less for his milk'. This can be clearly seen from Figure 6.2, which combines data on milk production from DairyCo and data on the location of processing facilities from the websites and financial statements of the six major processors. There are three things to observe about the data displayed in Figure 6.2: firstly, there are four principal producing areas (Cheshire, Cumbria, Devon and Dyfed) in the UK, all of which are situated on the West of the UK, with the balance of the larger producing areas also being on the Western side of the UK. Secondly, the spatial distribution of processors is mixed across the country with no one individual processor having a concentration of facilities in any particular region. The final point of interest is that, of the four largest producing regions, Dyfed (i.e. SW Wales) is the only region to have a single major processing facility, whereas other regions of the UK such as the South East, where there is a comparatively lower production of milk, have comparatively more processing/distribution facilities.

Figure 6.2: Showing major milk producing regions and the location of processing facilities of the top six dairy processors in the UK.



A clear narrative was told during multiple interviews which cited the de-regulation of the Milk Marketing Board (MMB) as the starting point for the decline in the processing sector in the region. The MMB was a state run levy board which was the sole point of sale for milk produced in the UK. Meat Producer 3, when discussing the history of

the processing industry, commented that producers 'did not realise how lucky we were to have that Milk Marketing Board; the motto of the Milk Marketing board was 'together in enterprise''. The ultimate effect of the deregulation of the MMB was that it brought a degree of geographic differentiation into the market place, suggested in Figure 6.2, where none previously existed as Dairy Processor 1 mentions in talking about the virtues of the MMB: 'it was a great institution in many respects, one of the things that it had in its favour was equality right across its members. So irrespective of where you lived or how much you produced you had the same milk price as the guy close to the city or close to the bottling plant.' This de-emphasis on geographic location meant that producers who were the furthest away from centralised processing facilities were not penalised for this through the resultant milk price they received despite the higher costs of haulage that would be associated with moving the milk from the farm gate to the processor. This position has been reversed since the end of the MMB, as Dairy Processor 2 commented: 'we have seen that the Welsh dairy farmers as a rule get a penny and a half less than their English contemporaries and that is an economic fact'.

This re-spatialisation of the UK dairy pricing mechanism and its resultant effect on farm-gate prices in the area is not the only effect of note in SW Wales following the deregulation and splitting up of the MMB. The MMB was broken up to allow market liberalisation to occur, which allowed a number of new entrants to come into the market as well as privatisation of the MMB's processing arm. The overall effect of this has been that many of the processing centres that existed in the region have closed. Dairy Producer 2⁶⁸ and other interviewees saw this loss of processing as a significant issue for the dairy industry in SW Wales. Whereas, Institutional Actor 4 did not see the loss of processing as the most important issue facing the dairy sector in SW Wales but, in ranking the changes in the region commented that: 'the [loss of] milk processing is the smallest one because you can just take milk anywhere to process it. But it is the fact that they have gone, Llandaddog has closed, Whitland has closed, Camarthen has closed. So those three processors who were big employers in the county that are no more, but

⁶⁸ As previously quoted.

Carmarthenshire milk is processed still, so it is not a big issue'. The comment from Institutional Actor 4 leads us to two points regarding the role that an agri-food business has within its relevant sector and role it plays in the region where it is situated. The impact of losing these facilities, or any processing capacity, out of a peripheral region such as SW Wales is not only the loss of local markets for producers to sell their milk but also the loss of employment in areas where there are potentially fewer employment opportunities:

'Shift in processing within Carmarthenshire has had a big bearing on Carmarthenshire as an area, economically, not just the farms themselves, but you have seen, towns like Whitland, where they had the large creamery, would sustain a large population, and a large percentage of the local work force would have been involved with that creamery, so obviously, it has had multiplying effects in the wider community and not just at the farm gate level.' (Institutional Actor 3 in discussing the impact of major changes in the region)

'Yes, because that employment is not happening and the added value does not happen in our region. So my young sons won't have a chance to process or to be a factory worker or manager because there are no factories.' (Institutional Actor 4 in discussing the implications of losing processing in the region)

In addition to the presence of large scale processors there are also a number of small scale processors in the region. It would be easy to overlook the small scale farmhouse cheese processors with significant brand presence in the region, such as Caws Canarth, Haffod Cheese and Llanboidy Cheese, who offer highly visible market brands for the region, which are valorised by and for the promoters of the regional provenance. However, these processors, whilst being valued by some actors in the industry, are not easily able to deal with changes in demand as Dairy Farmer 2 intimated in a discussion about the processing capacity in the region: 'There are some nice local cheese plants, but they're too small, they can't cope with the size'.

Nonetheless these small cheese processors represent a significant part of the SW dairy regime, if only in terms of their market presence. They will be discussed further in Section 6.5.

The decline of processing in SW Wales represents a significant shift in the *industry* element of the SW Wales dairy regime from a system that produces and processes in the same region to one that is processing outside the region. Whilst there seems to be an argument as to whether the loss of regional processing is an issue for the dairy industry in SW Wales, if it has meant that dairy producers in the region are receiving less than producers elsewhere in the UK then it seems reasonable to suggest that the dairy market in SW Wales is spatially disadvantaged compared to other regions of the UK and this represents a key *industry* element of the SW Wales dairy regime configuration. The final message to take from this section is that the hollowing out of the regional processing capacity has, at the very least, had a significant bearing on the rural development of SW Wales in terms of the resultant number of jobs lost as a result of processing plant closures.

6.3: Linkages between the SW Wales dairy regime and higher regime levels

The story of the SW Wales dairy regime and, specifically, its elements dealing with the processing and retailing can be only be understood when it is considered as part of the wider UK dairy regime. This section starts with a discussion about the connectivity between the SW Wales Dairy regime and other regime levels. The section then moves on to discuss the role that the deregulation of the Milk Marketing Board in 1994 has had in reshaping the national dairy processing structure and capacity. The analysis then continues by investigating the measures being used to set prices in producer to processor milk contracts. The role that retailers play in the UK dairy industry is then discussed. The section concludes with the construction of the SW Wales dairy regime based on the analysis contained in Sections 6.2 and 6.3.

6.3.1: Connectivity between the SW Wales dairy regime and higher level spatial regimes.

Dairy farming has long been a significant part of the agricultural sector in SW Wales, particularly in Carmarthenshire, and is perceived by one interviewee as being a significant 'field' in terms of European production: 'It was one of the biggest milk fields in the whole of Europe in Carmarthenshire' (Institutional Actor 2 when discussing the nature of the production sector in West Wales). Carmarthenshire is not the only county in the SW Wales region where dairy production is important, with both Pembrokeshire and Ceredigion⁶⁹ having significant numbers of dairy farms⁷⁰:

'in Cardiganshire alone there would have been circa 1000 dairy farms of all shapes and sizes and now today, and this is only a rough estimate, I would say that there is probably about 300 dairy farms, tops, left in Cardiganshire today.' (Dairy Processor 1 – discussing the changes in farm numbers since quotas.)

Whilst it is difficult to compare the regional production figures outside the UK to test the assertion of Institutional Actor 2, DairyCo, the UK dairy industry's levy board, collects data from producers and processors across the UK and provides us with regional measures of comparison for the UK. The counties of Carmarthenshire, Pembrokeshire and Ceredigion are amalgamated into the old administrative amalgamation of Dyfed, which covers the complete region under investigation. According to the DairyCo's data (2011b) UK dairy producers delivered 12.82 billion litres of milk to the UK market with Wales contributing 11.3% of the UK total and Dyfed contributes 6.54% of the UK total. Dyfed is the second largest area by volume for milk production in the UK with Devon being the largest based on the production data from DairyCo (2011b). This confirms SW Wales' importance for the UK dairy industry.

⁶⁹ Also known as Cardiganshire.

⁷⁰ No direct quotation was available to show the importance of dairy production in Pembrokeshire. However it had 574 farms with dairy cattle on in 2010 (see Table 6.1).

Turning to the connectivity between processors and markets outside Wales, Table 6.4 shows the list of processing businesses that have no physical presence in SW Wales but were nevertheless mentioned by one or more of the interviewees. The first thing that should be noted is that both the Wisemans dairy at Droitwich and Westbury Dairies (which is a joint venture between Milk Link, First Milk and Arla) were mentioned most frequently which seems to be related to their equivalent size and proximity to the area.

Table 6.3: Companies/regions outside SW Wales mentioned by interviewees in relation to dairy.

Region	Company name	Nature of reference	
Linked to SW Wales	Belgium	Bought milk from interviewee	
	Droitwich	Bought milk from region	
	SW England	Location of milk processing for milk produced in SW Wales	
	Southampton	Milk was hauled by them to a dairy in Southampton from SW Wales	
	N Wales	Processor for producer group	
	Wrexham	Processor for producer group	
	Gwynedd	Processor for producer group	
	Bristol	Bought milk from interviewee	
	Various	Organic Milk Producer Group who buys milk from SW Wales but is not based in Wales (N.B. Does not possess any of its own processing facilities)	
	Mentioned	Ireland	Referred to as a competitor for cheese products. Also used as a direct comparison to the region for growing conditions
New Zealand		Multiple references - efficiency/system references, competitor to producers in SW Wales	
South Africa		Referred to as a competitor for cheese products	
Thailand		Claimed that butter was being imported from region and packaged in Wales as Welsh	
N/K		Supplied by some producers in region	
Shropshire		Example of differing pricing structures	
		Not applicable	
		Not applicable	
	Not applicable		
	Not applicable		

Whilst Table 6.3 is by no means comprehensive in terms of the processors who are processing milk produced in the SW Wales region but are not themselves located in the region, it illustrates how connected the dairy producing area of SW Wales is to the wider UK and even EU market. Table 6.3 also tells us (as some of the

interviewees hinted) how connected the Welsh/UK market is to the rest of the world in terms of cheese production particularly, as this comment from Dairy Farmer 1 indicated when discussing the difference between the dynamics of the UK liquid and cheese market, because: ‘whereas fresh milk is needed daily, cheese can be manufactured anywhere in the world and brought to the UK, hence dedicated supplies exist in the liquid market and not in the cheese market because they can tender for it from South Africa or New Zealand or wherever’. Whilst being able to bring in goods from overseas that are of a cheaper or unique nature is perhaps desirable in this age of the pro-choice, consumer-is-king culture in the UK; there is equally a concern in terms of provenance because, as Institutional Actor 5 raised during a discussion about dairy processing and packaging businesses in SW Wales: ‘you can have New Zealand butter, Danish bacon and pork arrive in a container in Cross Hands, have something done to it and then be branded as Welsh butter’. The gap in regulation that allows food produce to be brought in from overseas, repackaged in the UK and sold as Welsh or British could undermine the strength of the UK/Welsh agri-food sector by weakening the demand for genuine regionally sourced food stuffs.

We can abstract, from the data gathered on the connectivity of the dairy industry between SW Wales and the rest of the UK, that the SW Wales dairy regime is an *industry* that is a significant and well connected part of the UK dairy regime. Furthermore, we can see that the dairy regime of SW Wales is also a regime whose actors have *knowledge* of developments in the wider global dairy industry, particularly in relation to cheeses, whose importance will become clearer when discussing the nature and availability of buying contracts for producers in the region in Section 6.3.2.

6.3.2: The effect of processing deregulation and the role of national/international processors

Some of the role that the dairy processing sector plays in the SW Wales Dairy regime has already been alluded to in earlier sections of this chapter; but it is here

where this is to be discussed in greater detail. This section examines the rationalisation that has occurred in the UK dairy processing industry, some of the effects of which were discussed in Section 6.2.3, principally the loss of processing capacity in SW Wales itself. This section goes further in its examination of the process of rationalisation since the deregulation of the Milk Marketing Board (MMB). The section begins with a discussion of how the UK dairy processing sector has changed since 1994, as it has moved from a dynamically competitive market with many key companies towards a processing market with fewer key companies who are themselves interconnected through their own business relationships.

6.3.2.1: UK dairy processing since 1994 in a post-deregulation world

The deregulation of the MMB took place in 1994 and has led to a significant and on-going process of restructuring, which Banks and Marsden (1997) indicate was 'set within the context of a food system which [was] also undergoing significant and continuing structural change' (ibid, p.382). Table 6.4 is derived from Banks & Marsden (1997) and shows the names and market shares of the major dairy concerns within the UK in 1995. Table 6.4 also shows the current fate (where it is known) of those processors. There are two things to draw from Table 6.4; firstly that the top four processors controlled 38% of the UK dairy processing market in 1995 and, secondly, that there has been a reasonable amount of reorganisation activity since 1995 between the named processors in Table 6.4 let alone what might have occurred in the unnamed 34% of processors.

Table 6.4: Major UK Dairy concerns in the UK in 1995 and their current fate

Name	UK Share of the buyer market*	Fate
Northern Foods Plc	12%	Still active but demerged its dairy arm which was then called Express Dairies. The demerged company was takeover multiple times and eventually bought by Dairy Crest in 2006. ¹
Unigate Plc	10%	Bought out in 2011 by Greencore. Sold its milk and cheese concerns to Dairy Crest in 2000. ²
Dairy Crest Plc	9%	Still active
Waterford*	7%	Merged with Avonmore to become Glanbia. ³
Nestle	5%	Still active
ACC	5%	Appears to be active, although unable to locate an active company on Companies House.
MD Foods*	5%	Merged with Arla in 2000. ⁴
Avonmore*	5%	Merged with Waterford to become Glanbia. ³
Wiseman	3%	Still active
Scottish Pride	3%	Wound up in 1996, name appears to have been acquired by First Milk. ⁵
Golden Vale	2%	Irish company still active in Ireland - uncertain about UK ⁶
Other	34%	

Sources

Original market share data from Banks & Marsden (1997)

- 1 - Dairy Crest (No Date)
- 2 - Greencore (No Date)
- 3 - Glanbia (No Date)
- 4 - Just-Food (2000)
- 5 - First Milk (No Date)
- 6 - Golden Vale (No Date)

The shape of the UK dairy processing sector today (as at December 2011) is shown in Table 6.5, which shows a summary of the major actors in the processing sector and an estimate of the share of UK milk brought by these processors from UK dairy producers. The estimated shares of the market shown in Table 6.5 are based on a survey sample from a 2011 DairyCo Farmer Intention Survey of 12,522 dairy producers (ibid, p.3); it should not be interpreted to represent the exact amount of the UK milk supply brought by each processor but as a good indicator of the relative size of the processors and their importance to UK dairy producers as a result.

Table 6.5: Relative buying power and interests of the major co-operatives and processors in the UK

Name	UK Share of the buyer market*	Type of Business	Key products
First Milk	21%	Producer Co-operative (PVI)	Liquid Milk, Cheeses and Ingredients
Milk Link	18%	Producer Co-operative (PVI)	Liquid Milk, Cheeses and Ingredients
Dairy Crest	15%	Processor	Liquid Milk, Cheeses, Butter and Ingredients
Arla	11%	Processor	Liquid Milk, Cheeses, Butter and Ingredients
Robert Wiseman	8%	Processor	Liquid Milk
Meadow Foods	3%	Processor	Cream and Ingredients
Glanbia	1%	International Processor	Liquid Milk and Nutritional Products
Lactalis/Caledonian Cheese	1%	International Processor	Cheese
Other	22%	Various	Various

Notes

*Based on the DairyCo's 2011 Farmer Intention Survey results with 1200 respondents across the UK.

The first observation to draw from Table 6.5 is that the top four processors now control around 65% of the UK milk buying market, which represents a 27% shift from the 1995 data. If we consider the major processors then Robert Wiseman must also be considered as a current major processor by virtue of its holding an additional

8% of the market, which brings the share of the five major processors up to 73%, showing a significant consolidation within the last 16 years. This on-going process of consolidation in UK dairy processing, over a relatively short length of time during which it has taken place, and the fact that, during the writing of this thesis, the German processor Müller agreed to take over Robert Wiseman in 2012 (Müller-Wiseman, 2013), is indicative of a UK national dairy regime and, by extension, SW Wales dairy regime which has continued to rationalise since deregulation of MMB. This high level of market power concentration represents an aspect of the *industry* element of the dairy regime.

Today, the UK dairy processing sector is split into three broad types in terms of their relationship to the producers that serve them and the nature of their own business. The first type are the private companies who process raw milk into the final products for sale; the second are the producer owned co-operative groups who act as 'brokers' for their producers' milk but process none of it themselves; and, finally, the third category are producer groups who have invested in their own processing capacity as well as continuing to act as a broker to sell to other dairy processors. This is a change from the mid 1990's when the principal broker, Milk Marque with 20,000 members (Banks and Marsden, 1997), was just a broker and did not possess its own processing capacity.

Milk Marque was broken up into three companies in 2000 by the government for fears of its monopolistic position as the single major broker of milk in the UK. Dairy Producer 2 explained what happened after this in discussing the major changes to the dairy sector in SW Wales: 'If you go back to 1994 when the Milk Marketing Board ended, there was one major co-op, Milk Marque; and then when that disintegrated around 2000, that split up into three, which was worse, and then when Dairy Farmers of Britain (one of the three) went bust it was worse because there were smaller groups and the whole structure is just groups competing against each other for the same market'.

All three of the successors to Milk Marque eventually acquired processing capacity. Two of these producer co-operatives, First Milk and Milk Link, are now the largest two buyers of milk as shown in Table 6.5. The third co-operative, Dairy Farmers of Britain, went bust in 2009, which was in part due to their buying plants that were not up to standard as Dairy Processor 1 explained in a discussion of the fate of Dairy Farmers of Britain: 'in short they bought a complete dog of a series of sites from the Co-op'.

In contrast to the processing capacity acquisitions of the producer co-operatives, UK dairy processing has also seen the rise of dairy processing businesses sourcing their milk directly from the producer much in the same way as suggested in Banks and Marsden (1997). Dairy Processor 1 highlighted that this is not a uniform process. He gave two examples, Dairy Crest and Robert Wiseman, during a discussion about the routes milk takes to market in the UK:

'So if you take a customer like [Robert] Wiseman, he will take milk off his farms seven days a week because he has got direct supplies, but he has a contract with First Milk where he buys, I think it is about a 60/40 ratio; 60% direct supply, 40% from First Milk... So First Milk needs manufacturing like cheese to put that 40% into those plants to balance their [producer] contracts.' (Dairy Processor 1)

'Then you have people like Dairy Crest, who I believe and I have heard it said, so it is not necessarily factual, that they are looking for 80-90% of their milk on direct supply... they are a big site, they have liquid [milk], they have got cheese, they have got butter, they have got powder, they have got Clover and whatever is they can balance within their business because they have got the products to do it.' (Dairy Processor 1)

Dairy processors have clearly taken an interest in securing their own milk supplies to a greater or lesser extent, which has placed pressure upon the producer co-operatives by reducing the reliance that processors have on them. In turn the producer co-operatives have themselves innovated by buying their own processing

capacity, which would reduce their reliance on processors. The final point of interest in these two quotations is that both First Milk and Dairy Crest have found ways to balance the use of their milk supplies through their processing. Ultimately, the acquisition of processing capacity by producer co-operatives and increased interest in securing dedicated milk supplies by processors represents a degree of vertical integration between producer and processors, albeit through differing routes, and is an exemplar of the *industry* element of the dairy regime in the UK and, by extension, SW Wales.

The final issue raised when studying the role of UK dairy processing in a deregulated market for the SW Wales dairy regime is that of inter-linkages between dairy processors. Market liberalisation was supposed to create competition and provide a market which helped producers realise a fair value for their milk. However, the loss of processing in SW Wales is a cause for concern in terms of the competition for the milk being produced. This concern for competition is common in any industry where the absence of fair competition distorts market prices. Whilst this thesis makes no claim regarding the UK dairy processing sector, the loss of processing in SW Wales is a concern. Dairy Producer 2 (as a result of leaving organic production) indicated, as an aside when talking about changing buyers for his milk supply, that there are also: 'lots of inter-linkages in the sector at the process level'. Inter-linkages are not necessarily harmful in a rural development context; however, as this section of an interview with Dairy Producer 3 shows, these inter-linkages seem somewhat elaborate:

Interviewer: 'Do you know who Fairfield's sell on to?'

Dairy Producer 3: 'Yes I do, to Wiseman's'

Interviewer: 'So that goes on to Wisemans does it?'

Dairy Producer 3: 'Yes. Well, my milk goes on to Wisemans I know that for a fact but I think they sell a bit to everybody, they are like a middle ground sort of a broker.'

Interviewer: 'So they are a bit like First Milk are they?'

Dairy Producer 3: 'Yeah like First milk. Well, First Milk actually picks my milk up.'

Interviewer: 'Really?'

Dairy Producer 3: 'I would not say First Milk. It is First Milks contractor then. It goes into the tanker with First Milk's milk.'

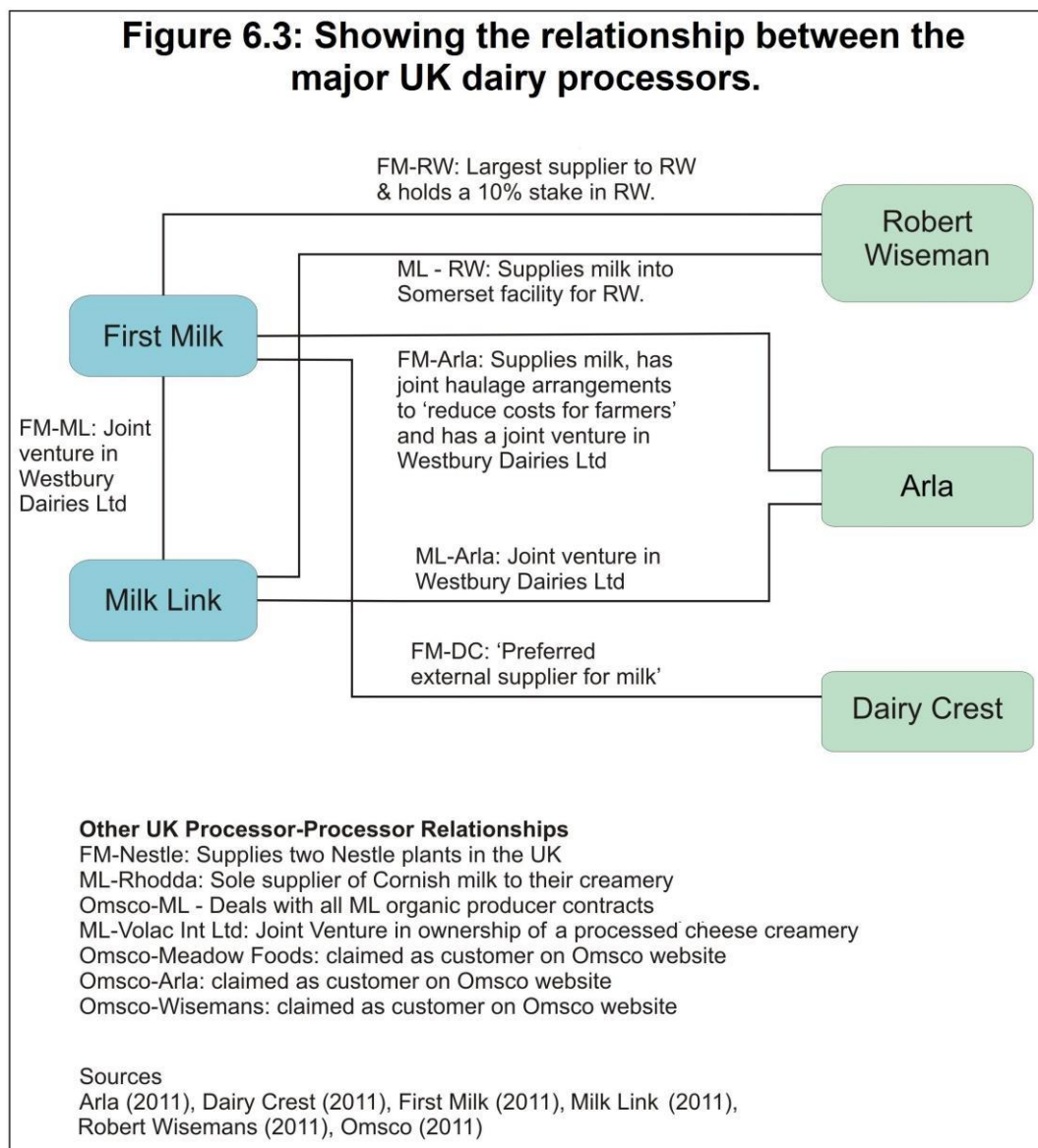
Interviewer: 'Then it goes on to Fairfield's?'

Dairy Producer 3: 'Well, I think Fairfield's just handle it on paper. It goes straight up to Wisemans.'

This section of the interview with Dairy Producer 3 appears to suggest a lot of collaboration between processors in the industry, which was born out when studying the publicly available records for the six major processors from their respective websites (including financial information). This information is summarised in Figure 6.3, which indicates the relationships between these processors and also where those processors are producing the retailer branded dairy products for the multiples.

One of the first things evident from Figure 6.3 about the UK dairy processing industry is the level of interconnectedness between the major processors. This interconnectedness in certain aspects stems from the First Milk and Milk Link's ongoing role as brokers for their respective producer groups, who are selling to the established processor markets in the UK. There are two key linkages of interest, which are: the 10% ownership of Robert Wiseman held by First Milk and the joint investment in Westbury Dairy between First Milk, Milk Link & Arla. The 10% holding in Robert Wiseman held by First Milk has probably enabled First Milk to secure the contract as the largest supplier of milk to the company outside of Robert Wiseman's own producer group. The joint venture in Westbury Dairies has probably assisted First Milk, Milk Link and Arla to build a large scale dairy processing facility that individually may have been too expensive to do but collectively allows all three processors to build processing capacity for their own milk pools through this strategic partnership.

Whilst on the one hand it is entirely reasonable for related businesses to have strategic partnerships (such as Orange/EE and T Mobile), it is important to ask: at what point do strategic partnerships become more than just a way of ensuring commercial success and might be viewed as more oligopolistic in nature? This is certainly not a question that this thesis can adequately address, but the example of the producer-processor arrangements given by Dairy Producer 3, with its three competitors active in what is effectively one movement of milk from farm to dairy, raises the question: who is benefitting most from these strategic partnerships between processors? These strategic partnerships indicate that, in addition to increasing vertical integration, we can also identify a degree of horizontal integration between processors as being an *industry* facet of the UK dairy regime.



6.3.2.2: Price setting in producer-processor contracts

The determinants of pricing structures and their availability to producers in SW Wales have been consistently touched upon throughout the preceding sections of this chapter. This section intends to bring together a summary of these, expanding where relevant on the more salient aspects.

One of the distinguishing features of the dairy industry is the array of measures used as determinants of price in the contracts. One of the core determinants of the pricing structure of milk agreements, which is a real driving element for producers up-scaling, is volume. Dairy Producer 1 summarises the effect that the volume of milk produced has on the price producers receive in a discussion about the nature of his own contract. Whereas he received the full 3 pence per litre bonus for volume because of the large size of his herd, 'a guy with 40/50 cows might pick up half a penny of that 3 pence, so there's a variation of 2 ½ pence there immediately'.

The regional aspects of pricing are particularly poignant to the SW Wales dairy regime as Dairy Processor 1 succinctly put it: 'the economics of milk is that, indirectly, the farm pays for their milk to be delivered to the factory door' which, as Dairy Processor 2 further elaborates: 'if you are two or three million litres on the side of a motorway you are laughing, if you are doing 1,000 litres up a long track in the middle of nowhere then you have two different milk prices'. Essentially, as Dairy Processor 1 put it: 'there is no point [producers in SW Wales] looking at what someone is paying in the Midlands because you are not going to get it'. This is a direct result of the re-spatialisation of the milk market as a result of deregulation of the Milk Marketing Board (as discussed earlier in Section 6.3).

The regional nature of contracts, when coupled with the differing demands of milk buyers, produces a range of contract types. Based on the interviews a typology of four principal contract types can be discerned: dedicated, liquid, balancing and processing. Dedicated contracts are liquid milk contracts which are tied into specific multiple retailers. A small number of producers across the UK hold dedicated contracts and

they receive a premium for their milk. Liquid contracts are generally the next most valuable contracts where the milk from the producer is processed exclusively into liquid milk but may be sold under a variety of brandings. Dedicated and liquid contracts represent the types of contracts which are the cream of the contracts available to UK dairy producers; assuming they are located in the right part of the UK as this comment from Dairy Producer 1 suggests:

‘We’ve seen the introduction of dedicated supply contracts, like the Tesco, Sainsbury’s and M&S contracts, for those who live where the chimney-pots are, in favourable locations and with minimal haulage.’

Balancing contracts are a little more complex. Milk from producers on this type of contract is destined for both processed milk products as well as liquid sales. The milk therefore attracts a slight premium over processing only contracts, which are generally considered the least valuable contracts by producers (an example of the rationale for balancing contracts is discussed in quotes regarding Robert Wiseman’s business activities in Section 6.3.2.1). Processing contracts are the final type of contract dairy producers can receive for their milk. The milk from processing contracts goes into processed dairy products including: cheese, yoghurt and powdered milk. It is this route to market that appears most prevalent in SW Wales which has implications, as Dairy Producer 1 explained: ‘What governs what we’re paid in this part of the world is the simple fact that most of the milk produced in this area goes into the cheese market, and the cheese market is immensely competitive in Europe and worldwide’. Based on interviews with both producers and non-producers, producers in SW Wales do not receive the premium contracts of dedicated or liquid but are more likely to be receiving the lower priced processing or balancing contracts. Institutional Actor 4 explains why being on processing or balancing contracts is an issue for producers in SW Wales:

‘So here we find ourselves in Carmarthenshire, and we are very much on what they call the balancing, the border of liquid which is premium which you can get about 25p for at the moment and manufacturing which here is

cheese which you will get about 22p at the moment and if the cost of production is 23 pence then you can quickly work out the importance of that.'

The quotation from Institutional Actor 4 suggests that dairy producers in SW Wales, at best, can receive balancing contracts for their milk, which has led to the impression that producers in the region are marginalised within the UK Dairy sector as this quotation from Dairy Producer 1 suggests: 'we are the poor relatives of the dairy industry, and unfortunately that seems to be getting worse, not better'. The overall indication from the interviews is that the majority of the milk from SW Wales is utilised for cheese or other dairy processed goods and that this means a lower price compared to liquid.

The global commodity price of milk is another element that has a bearing on the price of milk contracts, particularly for processed dairy goods. These comments from Dairy Producers 1 and 2 explain the link between farm-gate milk prices in SW Wales and the global commodity market in that:

'What governs what we're paid in this part of the world is the simple fact that most of the milk produced in this area goes into the cheese market, and the cheese market is immensely competitive in Europe and worldwide.'

Dairy Producer 1

'With the co-op that we supply, we're producing a lot of commodity products, which makes us very open to volatility in European and global markets.' Dairy Producer 2

Essentially these two quotations show that because producers in SW Wales tend to receive balancing or processing contracts they are exposed to a global, rather than national, market in terms of the final goods which is reflected in the farm-gate price received by producers in the region. Dairy Producer 3 also made the link between commodity prices and farm-gate prices. His comment is interesting because it

illustrates the direction of control regarding how milk buyers respond to shifts in the market price: 'it is quite frustrating as well because when commodity prices rise, the sort of time lag between purchasers paying farmers is possibly nine months, but if commodity prices fall, they seem to pre-empt it'.

Seasonality is another key element for certain dairy contracts and, in particular, for those processors who process milk for the liquid market. Liquid processors require a year round supply of milk for the UK market, whereas cheese producers need time to mature cheese allowing them to be less concerned with when they buy milk. Dairy Processor 1, when talking about the importance of seasonal pricing mechanisms summarises this well:

'It is like every dairy business, you will have a seasonality payment mechanism. So that is there to ensure that you can balance your supply. But it is there for the members' benefit as well. Essentially all seasonality is [aimed at] controlling your spring peak. If you had no seasonality you would have a lot of milk in the spring and none in the autumn depending on where you are in the country, who was producing your [the processors] milk. If your milk was predominantly in West Wales you would have a big spring profile and nothing in the autumn, which is fine, if you are going to put it all into commodity, but if your market demand is liquid, then you need that constant all year round. You are only as good as your lowest volume of milk to supply, so you have to have a mechanism that rewards autumn and to some extent penalises spring to bring more balance to your milk supply.'

Dairy Processor 1

The comments from Dairy Processor 1 highlight an interesting issue when contrasted with the discussion about Dairy Crest's plant in Section 6.3.2.1 in that processors have to balance their milk requirement with the availability of milk from their suppliers. This can be achieved by balancing within their business, as Dairy Crest does, so that during the spring peak when the incoming supply of milk from producers outstrips the demand for liquid milk in the UK, they place the excess into processing and, in

essence, balance the supply and use of milk within the dairy. The alternative is to provide incentives for producers to move towards a year round calving strategy which aims to have different heifers calving at different times of the year rather than in spring, essentially smoothing out a producers' spring peak. How moving towards year round calving affects producers in terms of additional costs was not addressed in the interviews but would represent an area for future research.

The other major determinant of milk price is the consistency of the milk itself. There are two key factors here: the first relating to the constituents of milk used by processors (butterfat and protein) and the second is the measures of the hygienic quality of the milk (bactascan and white cell counts). The following quotation from the interview with Dairy Producer 1 explains the relationship between the consistency of milk quality and its desirability by particular processors:

‘Because of our system being high-yielding, the composition of our milk at our peak milk times is quite low, particularly in milk protein. A cheese-maker would be looking for 3.3% protein; we run at just over 3% through most of the winter months, so we’re not ideally suited for a cheese-maker, and they pay on every percentage of protein, so we’re losing out. A liquid buyer isn’t really bothered about the composition of the milk; they’re far more interested in the hygiene of it, so they’d be looking for good somatic cell counts, bactascans, high butter fat.’

It is clear from the quotation that Dairy Producer 1 feels that he would be better off on a liquid contract rather than a processing one and, in fact during the course of the interview, he explained that: ‘my milk was going to the liquid factory and I was being paid a cheese price, so they looked at it and gave us the option to move onto a liquid contract’. What is interesting about the discussion regarding the change in contract with Dairy Producer 1 is the degree to which there was a lack of transparency for producers from processors about the fate of the milk that they are supplied. It is equally interesting that it was the producer’s suspicions and then his pursuit of the relevant information that brought about a change in the terms of his contract. In

essence, the actions of this producer meant that they became somewhat more of a price maker than a price taker relative to other dairy producers in SW Wales.

Although butterfat and protein are important for liquid and cheese producers respectively there are also some producers/contracts where volume alone is the sole concern, with this comment from Dairy Processor 1 being an example of comments within the interviews about this: ‘If you are a large herd with low butterfat and protein [you are] not bothered [with the bonuses because] you [still] get paid. You may have heard the term, I guess, of white water contracts i.e. as long as it is white they do not care.’ What emerges from the interviews regarding the nature of producer-processor contracts is that there is a significant degree of difference between contracts both in terms of what measures create an agreed milk price for producers but also which of those measures are given preference in a particular contract. Table 6.6 shows a summary of the measures commonly used in dairy contracts in the SW Wales and the UK that were mentioned during the interviews. There are, however, other qualities or methods of grading mentioned by Dairy Producer 1 that are (rightly or wrongly) not utilised in the pricing of UK milk contracts: ‘we have got measurements within the industry: MCV, milk for cheese equivalent, IMPE, AMPE there is all of these sort of figures that are industry, Europe based figures, yet there are not many, if any contracts in the UK that are linked to those’.

Table 6.6: Showing the range of measures used in dairy contracts in SW Wales

Measure	Reason
Volume	Bonuses for producing higher volumes of milk
Butter fat contain	Preference on some contracts
Protein	Preference on some contracts (cheese particularly)
Seasonality	Incentivise farmers to have a more regular supply (avoiding traditional spring peak)
Cell Counts	Hygiene measure
Bactascan	Hygiene measure
Market related bonus	Provides sensitivity to commodity prices
Pick up charges	Haulages charges are sometimes directly set out in contracts

This section alludes to the fact that we have a UK dairy producer-processor contract structure which has an array of measures that are used to determine the price that

producers get for their milk. These represent the private standards of the dairy industry and are indicative of a *market preference* element in terms of constructing the UK/SW Wales dairy regime. The other regime aspect of relevance that appears during the discussions regarding producer-processor contracts is the control that processors have in altering contracts and prices at will. There is, in the UK dairy regime, a *cultural* facet whereby processors dictate prices to producers, amending them to suit their needs, and producers are largely forced to accept these prices, which is having a clear effect on producers in the UK and in SW Wales in particular as was noted in Section 6.2.

6.3.3: Role of retailers in the UK dairy market

The role that the multiple retailers play in the UK agri-food system and the dairy sector in particular is increasingly coming under scrutiny by the UK government as this recent question to the Minister of DEFRA shows:

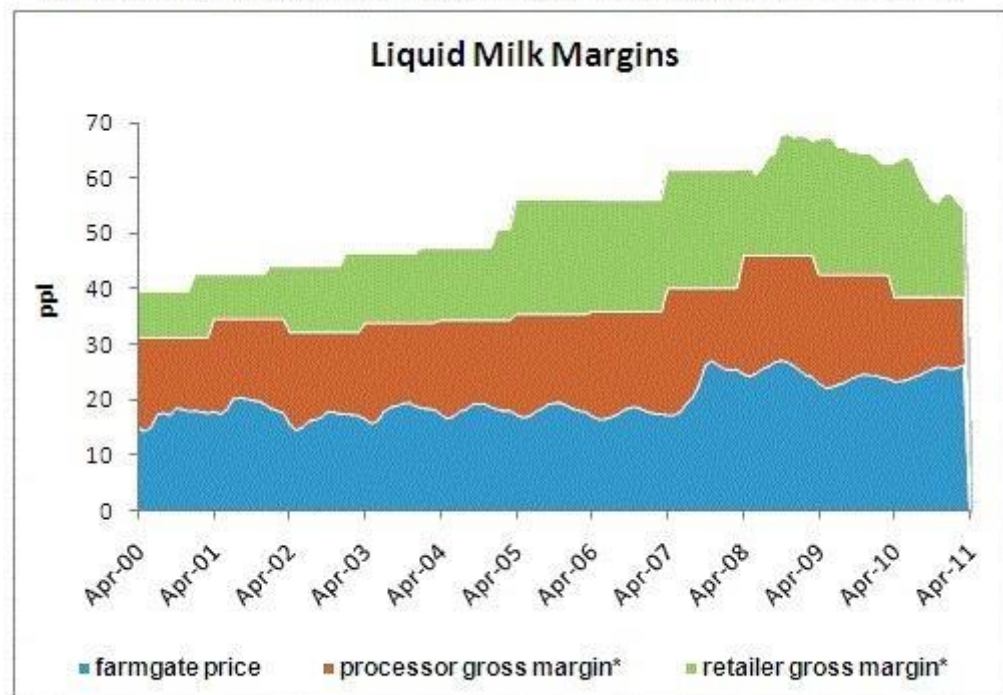
‘The groceries code adjudicator will be able to investigate abuses of the market by the big supermarkets. Preventing such abuse is very important to give farmers, particularly dairy farmers, a fair price for their produce. Will the Minister speak to the Government’s business managers and urge them to introduce the Bill as soon as possible?’ Mr Reid MP for Argyll & Bute, HC Deb (2012a)

The question posed by Mr Reid shows that there is concern about the impact that retailers have on the dairy producers in other parts of the UK. This section considers what role retailers play in the UK dairy industry.

Whilst there were numerous comments from interviewees in SW Wales regarding the role that retailers play in the dairy market, it is interesting first to see what changes there have been over the last 10 years to the average dairy prices received by retailers, processors and producers. Figure 6.4 is a graph produced by DairyCo that

shows average returns over the last 10 years for liquid milk. There are three observations regarding Figure 6.4 that can be made.

Figure 6.4: Showing the margins made in the UK liquid milk market



Source: DairyCo (2011a)

Firstly the areas shaded in brown and green represent the difference between what the processor/retailer respectively receive for the liquid milk and what they have paid for it from the producer/processor, it therefore shows their gross profit margin. Contrastingly the blue shaded area represents the gross farm-gate price that producers receive before taking into account any input costs and, as such, this graph skews the benefit that producers are gaining from the changes in the retail price of milk. Whilst this graph in the first instance seems to suggest that producers receive a sizable share of the retail value of the liquid, the difference between a gross margin and farm-gate price is significant as the farm-gate price takes no account of production costs.

The second observation is that the penny per litre (ppl) value of liquid milk has increased over the time series, which has benefitted producers particularly from 2007. Taking a time series from 2004 to 2011 the difference in the UK average farm-gate price is 8.9 ppl (18.45p compared to 27.35p), which represents a 48.2%

increase over whole time series or 6.8% average annual rise for producers. Table 6.7 shows changes in average UK prices for some key costs dairy producers face. It is interesting to note from Table 6.7 that most costs have risen faster than the average farm gate price over the period with the exception of pasture rent and one type of feed indicating that dairy producers are, based on UK wide averages, being squeezed. However, when we then factor in the comments from producers/processors within SW Wales regarding the lower farm-gate prices they typically receive and, although not confirmed independently⁷¹, it is likely that the spatial location on the periphery of the UK is going to mean that haulage costs for their feed and fertiliser means that these are at a higher cost as well, it is perhaps not surprising that producers in this region are subject to an intense cost-price squeeze scenario.

⁷¹ Although the regional disparities in actual farm-gate ppl and input costs for SW Wales relative to other regions in the UK has not been researched as part of this thesis it is an interesting question to investigate further.

Table 6.7: Price inflation in selected dairy input costs.

	Cost April 2004	Cost April 2011	% Change over period	Annual average percentage rise ¹
Pasture Rent²				
AHA 86	47	55	16.4	2.3
ATA 95	83	100	21.2	3.0
Feed cost				
Soyameal	199	287	44.2	6.3
Feed Wheat	104	187.5	80.3	11.5
Intensive Energy Dairy Feed	174	229.5	31.9	4.6
Maize Gluten	101	166.5	65.7	9.4
Brewers Grain	23	37.5	66.7	9.5
Fertiliser cost				
BLENDED 20.10.10 (Bags)	135	305	126.8	18.1
Urea (Bags) ³	134	371	176.9	25.3
Ammonia Nitrate (Bags)	129	325.5	153.3	21.9
Red Diesel cost⁴	37.40	70.79	89.3	12.8

Notes

- 1 The average annual rise is calculated by dividing the inflationary rise over the whole period divided by the number of years covered.
- 2 AHA 86 and ATA 95 relate to types of agricultural tenancy, the figures shown represent the average market rate.
- 3 Urea (Bags) 2011 price is as at June 2010, being the nearest price available to April 2011.
- 4 Red Diesel opening price is at December 2005 (earliest date available)

Source: DairyCo (2013b)

Thirdly, when comparing the change in the margin of processors and retailers it can be seen that the processors' margin has remained relatively static or even fallen over the period shown, whereas the retailers' margin has grown noticeably over the same period. This growth in the retailers' margin has been noted by interviewees: Dairy Processor 1 ties the changes to the deregulation of the milk marketing boards: 'When the milk boards finished and the deregulated companies took over, the margin that the retailers were making on milk was circa 4-5p a litre. Today, and these figures

might have changed I hasten to add, but they are circa 23p and that is nearly as much as some people are getting for their milk in its entirety’.

During the course of the secondary data research and analysis for this chapter two figures emerged which provide additional information regarding the nature of processor-retailer relationships in the UK dairy industry. The first is Figure 6.5, which shows the share of the liquid milk supplied to each of the major UK retailers from processors and was extracted from a set of Robert Wiseman Plc accounts. Figure 6.5 shows, unsurprisingly, that the major processors in the UK are the suppliers for the largest retailers in the UK. However, the other observation that can be drawn from Figure 6.5 is that there are clear strategic linkages between particular processors and retailers with some retailers sourcing all their liquid milk needs from one processor. With further investigation (London Evening Standard, (2002) and Barker, (2010)), it is also apparent that those retailers who have more than one supplier for liquid milk tend to organise their contracts with suppliers along regional lines, creating regionally integrated supply chains. These regionally integrated supply chains between processors and retailers do not necessarily benefit all dairy producing regions equally as a discussion about the provenance of milk from SW Wales and its route to market with Dairy Producer 1 suggests: ‘Why does milk go from here to Wiseman’s in Droitwich, then come back to Pembroke Dock as ‘Welsh’ milk.’

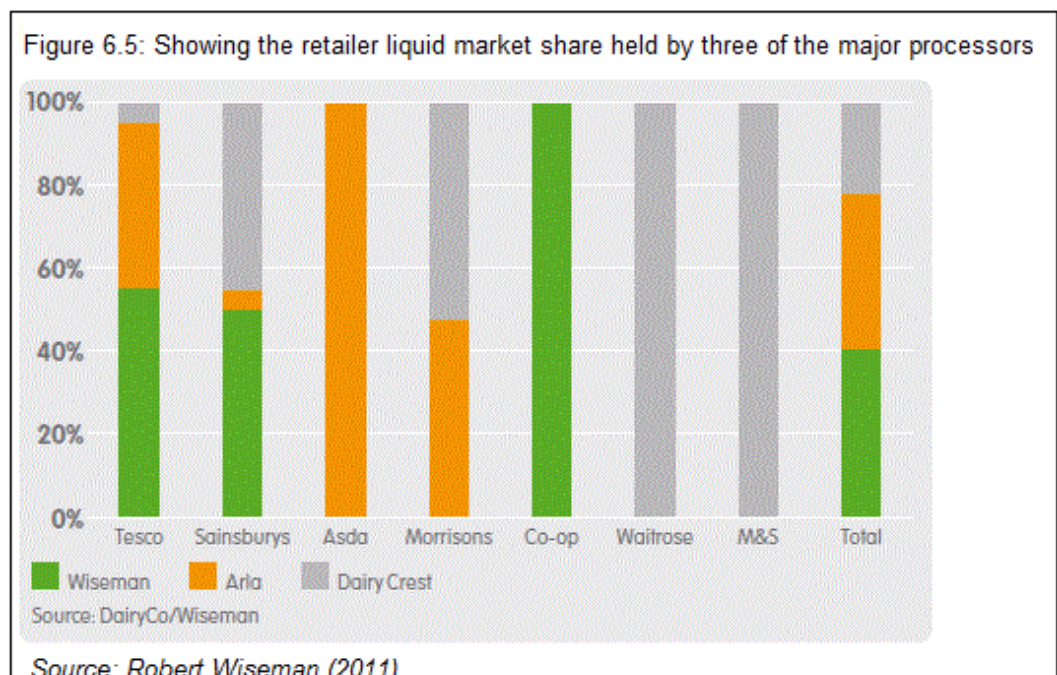


Figure 6.6: The processor-retailer relationships pertaining to the supply of retailer own brand dairy goods.

Tesco	First Milk, Dairy Crest, Milk Link, Wiseman's and Arla
Sainsbury's	First Milk, Dairy Crest, Milk Link, Wiseman's and Arla
Marks & Spencers	Dairy Crest and Milk Link
Asda	First Milk, Dairy Crest, Milk Link and Arla
Morrison's	First Milk, Dairy Crest and Milk Link
Waitrose	First Milk, Dairy Crest and Milk Link
Co-op	First Milk, Milk Link and Wiseman's
Iceland	Milk Link

Sources: Arla (2011), Dairy Crest (2011), First Milk (2011), Milk Link (2011a) and Robert Wiseman (2011)

Turning to the role that the retailers play in cheese and other processed dairy products' markets, both retailers and processors have their own branded products. Processors produce processed products on behalf of the retailers, such as Tesco's own brand butter, cream or cheeses, as well as producing their own brands. Figure 6.6 shows the information found within the processors' websites and financial statements linking them with specific retailers but which is unlikely to be comprehensive due to

the paucity of available data. Figure 6.6 shows is that retailers have multiple link-ups with processors for their own processed goods, however, who processes what and for whom was not clear from the available information. Overall, Figure 6.6 suggests that the retailers do not concentrate all their dairy supply chain in a single processor, which will foster a high degree of competition between processors to secure the large contracts for retailer own brand products.

It is much harder to trace the margins for cheese production because of the varied types of cheese with differing maturation lengths, flavours and brand identities. However, two quotations from the interviews stuck out particularly as they dealt with the role that retailers have in relation to processor-owned cheese brands:

‘Roll back is done unilaterally by Asda, but Tesco’s assume that you have given them [Asda] a better price than them [Tesco] in order that they can achieve the lower price point.’ (Dairy Processor 2 talking about the risks of dealing with more than one of the multiple retailers for the small processor.)

‘Unfortunately the thing we’ve seen there is that some brands almost disintegrate through massive promotions in the retailers. Cathedral City, Pilgrim’s Choice, they’ve all gone head-to-head on an immensely aggressive campaign to grow their business – two-for-one offers, and all this business – totally devaluing the value of their brand, and they’ll never see that value back again.’ (Dairy Producer 1 discussing the devaluation of major cheese brands.)

Both the quotation from Dairy Processor 2 and Dairy Producer 1 show that the actions of the retailers create a highly competitive cheese market for the processors. Where unilateral price changes on a particular cheese arise from one retailer these (as Dairy Processor 2 continued to explain) place pressure on the processor with the other retailers that they supply. This pressure creates an intense need for processors to remain competitive amongst each other and results in them translating the retailer price cuts down the supply chain into the dairy producing industry which, as

Dairy Producer 1 went on to explain, means that ‘rather than fixing the price from the bottom up, it comes from the top down, and we are basically left with what is left’.

The information in this section shows that the multiple retailers, through their own aggressive fight for market share, have squeezed prices and devalued brands for processors. In turn, this devalues the milk from their producers along the lines of the classic cost-price squeeze. What the retailers have achieved in the UK dairy market is to entrench a *culture* of top down competition within the UK dairy industry where the focus is on the lowest price per unit of the product rather than the quality.

6.3.4: Constructing the SW Wales dairy regime

In constructing the elements of the SW Wales Dairy regime, the very first point to make clear is that it is impossible to find an adequate quantum of elements existing in the SW Wales Dairy sector alone that, when combined, could be described as a dynamically stable regime. Instead, we find that elements of the regime are rooted in the architecture of the UK dairy system⁷² and hence it is in this section, rather than in Section 6.2, that we are able to construct the SW Wales Dairy regime for the first time.

Table 6.8 shows a summary of the regime elements identified in Sections 6.2 and 6.3. Table 6.8 helps to develop an overall narrative regarding the shape of SW Wales’ dairy regime. This regime has undergone a shift precipitated by the deregulation of the MMB, which can be interpreted as a UK regime level policy element shift. This shift in the higher regime level has caused a gradual re-orientation of the processing sector away from regions of production towards regions of consumption for locating their processing capacity. In effect what has happened has been the re-spatialisation of the UK dairy market, which has significantly affected the geographically peripheral region of SW Wales despite its importance as major milk producing region because of the processing shift from production to consumption.

⁷² This reflects the nested hierarchy of regimes discussed in chapter 3. However perhaps it is worth considering that the dairy sector in SW Wales may be particularly closely inter-connected.

The national reorientation of the processing sector, against a backdrop of fierce competition for retail market share, has led to top-down price pressure on producers in SW Wales, marginalising the smaller traditional farm holdings until they ceased dairying and forcing those who wish to remain in dairy production along a route of increasingly higher volumes of production. Despite the high volume production logic, the use of an array of private standards as pricing mechanisms for dairy producer-processor contracts has largely maintained high quality standards within milk producers despite the price pressures.

Table 6.8: Showing a summary of the properties of the SW Wales Dairy Regime.

User/Market Preferences	Policy	Industry	Science / Knowledge	Culture	Biophysical	Technology
<ul style="list-style-type: none"> - Wide array of private standards as pricing determinants for producer contracts. - Focus on lowest price per unit of produce whilst maintaining quality. - Relative lower farm gate price point compared to the rest of UK. - Spatially differentiated market access (liquid - UK/EU). 	<ul style="list-style-type: none"> - Dairy producers effectively excluded from higher level agri-environment schemes due to conditions. - Pro-active and engaged institutional actors within Wales. 	<ul style="list-style-type: none"> - Shrinking number producers (albeit that the loss of producers is not matched by an decline in milk produced). - Smaller producers marginalised by processor contract structures. - Remaining producers have reached or are reaching capacity in terms of farm holding infrastructure. - Loss of all but one major processor in the region as part of the wider rationalisation of the UK dairy processing sector. - Increased vertical integration throughout the supply chain. - Move towards horizontal integration of the UK processing sector. 	<ul style="list-style-type: none"> - Reliance on specialised breed genetics as the principal source of milk improvement. - Wide range of production methodologies employed from intensive 'shed' based systems to extensive grazing systems. - Government funded training centre which allows technical knowledge exchange for conventional producers. 	<ul style="list-style-type: none"> - Culture of price taking from producers. - Only way to 'grow' conventional businesses is to increase herd size/milk volumes. - Cost price squeeze at farm gate. - History of co-operative behaviours at producer and processor level. 	<ul style="list-style-type: none"> - Excellent attributes to produce grass fed systems suitable for a variety of dairy production. - Remaining dairy holdings are reaching or have reached their natural capacity. 	<ul style="list-style-type: none"> - High capital requirement for dairy producers. - High capital investment required for processing facilities.

6.3.4.1: Considerations for socio-technological systems arising from the SW Wales dairy regime

The SW Wales dairy regime highlights raised some interesting points regarding ST systems theory. The principal points of interest revolve around the interaction between the SW Wales dairy regime and the wider UK dairy regime.

The production methodologies found amongst the producers in SW Wales showed diverse configurations of biophysical-science/knowledge-technology in their socio-technological elements. On one level, the diversity could be explained by different production aims predicated by the particular market to which the producer is selling. The distinction in these markets between liquid, processing and balancing contracts at one point in the analysis suggested that the SW Wales dairy regime may comprise separate nested regimes split along production market lines. Producers are, however, able to switch whom they sell to and still utilise similar approaches in their production, albeit with incremental adjustments to cope with different market preferences, with relative ease. Furthermore, these producers had a high degree of consistency in how they viewed themselves, the wider dairy system in SW Wales and their interconnectivity with this system. Overall, the SW Wales dairy regime has shown that actors with slightly different logics can, nevertheless, be part of the same regime which follows Karltrap & Sandén's (2012) idea that firms in a regime are unlikely to be homogenous in their configuration and is also, in part, supported by Geels' (2005b) observation that the 'rules' of a ST regime can be adapted by actors in response to local conditions.

This diversity of production methodologies in SW Wales represents a series of decisions/options that are available to dairy producers in the region and, although it is relatively easy to alter farm management practices to suit the demands of the wholesale market, there was certainly evidence from the SW Wales region that some of these production methodologies (and hence some of the socio-technological configurations of the science/knowledge-technology-biophysical elements that can be

utilised at a farm level) are being dissuaded by market signals from the wholesale/processing sector. It is certainly the case that there is a preference towards larger volumes with greater consistency of supply throughout the year from the wholesale market, which operates at the UK regime level for the dairy industry. What is interesting here, from a ST regimes' theory perspective, is that there was a perception from production and some institutional actors that the UK regime level was preferencing other regions over SW Wales⁷³ which translates into the SW Wales dairy regime is as a destabilising pressure. However, what is also interesting is this selection of preference in practices/rules is dictated from a higher regime level downwards into the SW Wales region.

Two points emerge here that seem pertinent to ST systems research: firstly, do downward pressures from higher spatial regimes translate into a de-selection of optimal or suboptimal configurations for the regional regime's actors in terms of the economic, social and/or environmental sustainability of that regional regime and, more widely, the development of the rural region as a whole? The implications of this for ST systems research is one of an interactional nature, in that when researching smaller spatial aggregation regimes a researcher has to consider the higher level regime constellation changes and, moreover, how these pressures are translated to and acted upon by case study region actors. The SW Wales dairy regime case study has shown that these higher level pressures translate into differing responses from the regime's actors both within a single group (producers) and between differing groups of actors in the same regime (producers and processors). What has not been established in the case of SW Wales dairy regime is the degree to which these responses represent more or less sustainability in the system as this would require a greater degree of quantitative and qualitative research to benchmark the effects these responses have over time. This being said, the picture being presented from the empirical evidence suggests that the national level dairy regime is leading to sub-optimal choices being imposed on the SW Wales dairy regime with the concentration of dairy production on

⁷³ Partially backed up from DairyCo data but the spatial pattern for this 'preference' in the UK is neither fully explored nor understood in this thesis, other than its existence appears apparent.

fewer farms resulting in higher inputs which is further disassociating dairy producers from the biophysical and industrial resources of the region.

Secondly, are these pressures being uniformly translated across multiple regional regimes from higher level regime(s)? In this empirical study of only a single region such findings cannot be made. Whether such pressures are evenly or unevenly distributed and indeed how/whether differing regional regimes have the differentiated capacities to respond to such pressures has important implications for transition management approaches to ST research. This case study would suggest that there is a spatial unevenness, at least from the point of view of producers in SW Wales. However in order to address this, multi-regional research, where the case study regions have all been subjected to the same higher level regime change, is needed, which is posed in section 8.4.

6.4: Landscape pressures on the SW Wales dairy regime

Most of the pressures exerted on a regional regime will be transmitted from higher agri-food regime levels, as discussed in the previous section. However, there are some additional pressures which are external to the agri-food system. In discussions with the interviewees just one pressure became apparent: the issue of obtaining finance from the banking industry. Obtaining sufficient finance, at the right cost, is critical for all business types but especially so where those businesses are operating at high volumes and low margins whilst requiring high inputs of capital equipment to operate, such as dairy producers. Although not discussed specifically with interviewees in the dairy sector, access to credit and the relationship between the bank and the business did come up as something of importance. Whilst talking to Dairy Processor 1 about the producers in his group and the pressures they were facing he commented that: 'I have seen some letters recently that bank managers have written to farmers saying 'If you do not do something fairly radical to your style of farming then we are going to cut you off'.

It was not confirmed during the course of this research but is likely that borrowers are seeing increased pressure from the banking sector as a result of the banking crisis. Whilst this pressure may be caused due to a realignment of the UK banking regime, it nonetheless creates a landscape pressure exerted upon the agri-food system as a whole. The incidence and degree of pressure will not fall evenly across the entire system but instead may be falling more on dairy producers, as the internal pressures of the SW Wales Dairy are pushing for ever greater expansion as discussed in Section 6.2.

Ultimately, the banking landscape pressure combined with the pressure for producers to increase their production volumes is creating a destabilising effect on sections of the dairy producing community. Producers cannot meet the demands being placed on them by processors because they cannot get the finance to expand and, as a result, risk either receiving a lower volume bonus for their milk or losing their milk buyer altogether.

6.4.1: Considerations for socio-technological systems arising from the landscape pressures operating on the SW Wales dairy industry

The higher regime level pressures discussed in the previous section coupled with the landscape pressure discussed in this section present an interesting articulation of internal and external pressures to a regime which is an example of either transformation pathway or dealignment-realignment pathway for the regime as suggested by Geels & Schot (2007). Whether it is the transitional pathway of transformation or dealignment-realignment that is likely to unfold in the SW Wales dairy regime will largely depend upon how the regional regime's actors respond to these landscape and higher level regime pressures. However, it is interesting that, although there is strong connectivity between the regional and national level regimes, it appears in this case that the national regime operates both as a part of the regional regime and as a pressure upon the regional regime, destabilising it.

This apparent contradictory nature of a national regime's relationship and interaction with the regional regime is an example of what Lovell (2007), in part, alluded to as the messiness of socio-technological system change and, in part, questions the roles played by actors (such as national level policy makers), NGO's (such as the National Farmers Union), or trans-regional/national processors and retailers (which operate over multiple regional regime levels). There are a number of questions raised regarding the role of what can be defined as trans-regime actors. Do they operate in a uniform manner across all the regimes in which they are active? If the regional regimes that these trans-regime actors operate in have different ST configurations, are these actors required to interact with the rest of the regional regime actors/constellation of elements differently? Do these trans-regime actors foster the same rural development trajectories within each regional?

It will be apparent that these questions cannot be adequately dealt with based on the empirical data collected in this thesis as it has focused on a single agri-food region and a single case of a dairy regime. These questions highlight that further research and analysis is required to better understand the implications of trans-regime actors. However, these trans-regime level actors and their role in rural development is discussed further from the perspective of agri-food policy making in Wales in section 8.3 where additional findings from the SW Wales meat and horticultural sectors are considered together.

6.5: SW Wales dairy niche case studies

A number of 'alternative' dairy businesses operating in the SW Wales region were identified during the course of the interviews. Many of the businesses mentioned in the interviews, such as Trioni, Caws Cenarth, Kid Me Not and Franks Ice Cream, were identified by multiple respondents, thus suggesting that they have good brand identities amongst actors in the regional agri-food sector. Table 6.9 uses the food

directories maintained by the local county councils to give a sense of the range and number of non-conventional dairy businesses operating in SW Wales. Non-conventional dairy businesses are taken, in this context, to mean businesses that are not directly involved with the supply of milk through the conventional producer-major processor-multiple retailer supply chains that exemplify the SW Wales dairy regime. Whether all of these non-conventional businesses represent niche innovations to the regime does, however, remain to be seen and needs to be examined on a case-by-case basis.

Table 6.9: Numbers of dairy businesses mentioned in the food directories of the three study counties.

	<i>On Farm</i>				Producer Co-op	<i>Off Farm</i>			
	Liquid	Cheese	Ice Cream / Confection	Non- Bovine		Ice Cream / Confection	Cheese	Wholesaler	Dairy
Carmarthenshire	2	5	1	3	1	3	1		1
Ceredigion		4	2	1		1			
Pembrokeshire	2	3	1	2	1	2		1	1
Totals	4	12	4	6	2	6	1	1	2

Notes

Table excludes known large businesses.

Sources : CCC (2011), PCC (2011) & Ceredigion CC (2011)

Table 6.9 shows that there are more on-farm than off-farm businesses in the dairy sector sections of the directories. This is not to say that there are more on farm than off-farm processing businesses in SW Wales as it is noted that the Pembrokeshire and Ceredigion directories did not include entries for First Milk’s dairy at Haverfordwest or Saputo’s dairy at Newcastle Emlyn, respectively. These directories are certainly not complete and therefore the data shown in Table 6.9 should be considered only to be indicative of the range and types of dairy businesses operating in SW Wales, rather than a complete picture of activity in the region. Table 6.9, together with evidence from the empirical interviews, provides three points of further interest relating to non-conventional businesses: the provenance of basic commodities, product types and succession.

The provenance of the basic commodities that a business uses to produce their products is an important consideration from the perspective of rural development. When businesses source their basic commodities from within the region they are

supporting the region's producers and therefore the rural economy. In contrast, those who buy from outside the region, whilst supporting the regional economy by virtue of their presence in the region, are not supporting regional producers. Entries in the directories were reviewed to establish the provenance of the basic commodity for each business. Businesses that were located on-farm tend to self-supply their basic commodity from their own herds (bovine or non-bovine), whereas the picture was less clear for off-farm businesses with most not stating the provenance of their basic commodity. The issue of off-farm commodity supply is further complicated because of the current laws pertaining to regional branding which was highlighted with an allegation that a company was packing butter from overseas with Welsh branded labelling.

Whilst branded products offer an opportunity for producers to capture more value at the farm gate, Council Official 1 argued that this could be a threat to the food sector in the region because: 'it is harder to sell a food business that is based on a farm when the owners wish to retire for a number of reasons including location and suitability/availability of access'⁷⁴. Council Official 1's concerns seem to be borne out by the example of Llanboidy Cheese, a farmhouse cheese maker who retired, and whose recipes and brand names are now for sale (Llanboidy, No Date). The brands and recipes of successful farmhouse businesses, whilst possessing a geographic provenance and economic value to SW Wales, can both be lost by the retirement of the producer either through their sale to businesses outside the region or through their discontinuation due to retirement. Businesses are bought and sold all the time and, whilst this may represent an issue for the rural economy, it is not really an issue that would be in the purview of policy-makers. In contrast, succession is already an issue in the rural economy and very much on the agenda of agri-food policy makers in Wales. Succession, as an issue, becomes further compounded when the business has a heightened profile in the regional agri-food sector because their closure results, in effect, in the rural economy losing a recognisable part of its brand image.

⁷⁴ This quote is paraphrased from a series of statements and responses to follow up questions posed during a section of the interview on threats to the agri-food sector. The paraphrasing is necessary to provide clarity and also assists in preserving the interviewee's identity. An extract of the interview from which the quote was paraphrased can be made available upon request.

During the course of the fieldwork, three dairy businesses were identified as being potential exemplars of the niches in the SW Wales dairy sector as they appeared to exhibit differences from the dominant configuration or logics of the SW Wales dairy regime, based on information provided during the course of the initial interviews. The businesses selected are a producer co-operative, an on-farm cheese producer and an on-farm non-bovine processor. The following sections will discuss the nature of these exemplars and how they differ from the dominant SW Wales dairy regime.

6.5.1: Case study of Dairy Processor 2: An ethical producer co-operative

There were a number of interviewees during the first phase of fieldwork who recommended interviewing Dairy Processor 2 as an alternative processor in SW Wales. Dairy Processor 2's company has been in operation for approximately 10 years having been formed by producers in Wales to help 'secure the processing of organic milk in Wales'. The company is a producer co-operative active across Wales, specialising in branded liquid milk and cheese sourced solely from their own producer group. The products of this Welsh producer group have a distinctive provenance of being Welsh in origin but also as an organisation which is, as the interviewee said, 'inherently a company born out of principles so our objective is to process milk in Wales, to be ethical and to treat people fairly'. These principles of ethical business activities and fair treatment espoused by Dairy Processor 2, whilst similar to other dairy co-operatives, have a deeper meaning for this company and its producers as the rationale will show. Whilst Dairy Processor 2's business has an inherent ethical agenda, it is pragmatic in terms of its positioning in the market place: 'Having said that, you know that if you process the stuff in Wales you have got to sell it and 80% of food is sold through the multiples; so if you want to produce the stuff and sell it you have got to go main stream' (Dairy Processor 2). This pragmatism, in essence, has meant that the development of their customer base has ranged from supplying other large scale processors as well as developing its own brand products for sale to a multiple retailer and other retailer outlets both in the UK and within Europe.

6.5.1.1: Rationale for the ethical producer co-operative

The rationale for the Dairy Processor 2's business is twofold with the first aspect being the ethical nature of the business alluded to in the introduction to this niche. The second aspect is that the co-operative represents a group of farmers who 'were considering where they were going to sell their milk and they were uncomfortable about signing up with somebody who, whilst albeit were doing a good job, had a focus very much in [region in the UK] and not in Wales' (Dairy Processor 2). The narrative that the interviewee continued with is very much the common discourse heard from producers and other interviewees in SW Wales regarding the decline of the processing sector; and so, to some extent, this niche can be seen to be a creation born out of the destabilisation of the SW Wales dairy regime (and/or the Welsh dairy regime generally) precipitated by the actions of policy and processing actors in the wider UK regime.

6.5.1.2: Nature of innovation in the ethical producer co-operative

When interpreting the nature of the innovation for Dairy Processor 2 it can be argued that the ethical stand point of the business represents a divergence from the SW Wales and UK dairy regimes in terms of its *cultural* aspect from its volume and quality standpoint, seeking instead to think beyond the standard 'logics' of these regimes. But, as Arla's plan for a zero carbon dairy at Aylesbury in England (Arla, 2012) shows, it is not necessarily the case that this innovation differs markedly from the UK dairy regime's logics in terms of a shift in the cultural logics of the processing sector; therefore we have to look more closely at Dairy Processor 2's business to discover the nature of this innovation.

This thesis is not focused on the UK regime but on the SW Wales dairy regime. Dairy Processor 2's logics differ markedly from those seen elsewhere in the SW Wales dairy regime in that they are working towards buying/building processing capacity in the region to handle their organic milk supply themselves in contrast to other processors who have closed down and removed processing capacity from SW Wales.

Dairy Processor 2 indicated that 'it has been down to economic pressures that we have had to go down the route of getting our own processing; we would have always preferred to have used third party processors'. When asked to give details as to what the pressures were, he initially cited the loss of processing in the region but went on to expand that: 'what we have found is that the third party processors don't have the passion for the product as we do and therefore do not deliver the level of service and commitment that we want delivered'. This passion also meant that Dairy Processor 2 has 'come to the slow realisation that if we want to derive the value out of that supply chain then we have to control or own the whole supply chain', which interestingly runs counter to other processors who have operated in the region and who have been seen to be somewhat reliant on government grants to develop or expand their processing operations.

Dairy Processor 2 is radically different from other dairy processing businesses like Arla, First Milk or Robert Wisemans in their outlook on the dairy industry, the challenges that making it sustainable poses and the breadth of their ambition to achieving a sustainable business. Firstly, Dairy Processor 2 sees that 'there [are] four elements to sustainability: there is food, there is water, there is energy and there is equity'. They see equity through their co-operative structure working for producers; with water in SW Wales there is no perceived problem, although the interviewee did feel that it was something to be mindful of, whereas the food element was dealt with through the organic nature of their milk. It is energy which concerns Dairy Processor 2 who stated that: 'what we are looking at is trying to develop a business model that gives us a viable business at a £4 per litre fuel price' which is causing them to look somewhat differently at the type of facility they will build:

'what we are looking at creating is a bespoke dairy there ... rather than have a super dairy like Arla and Wisemans where they are trucking in milk from every corner of the country into one central point but very specialist in terms of liquid; what we are looking for is a dairy that will do liquid milk, yoghurt, butter and other dairy products, cream and alike; rather than

growing by travelling further but growing by creating more products and supplying those products in the local market.’

This last comment puts a clear distinction between Dairy Processor 2 and the regime-level processors. Regime processors might address some aspects of the sustainability by, in essence, picking and choosing what elements of their business model can be made sustainable (like a zero carbon processing facility) and ignoring others (such as the distance between their facilities and their milk suppliers). Whereas Dairy Processor 2, as far as it is able, is attempting to consider all aspects of sustainability in their business model including, as the interview went on to discuss, what scope there was for on-farm options for their producers.

The final element that seems interesting in Dairy Processor 2’s position is that, in looking to reduce power usage in their dairy, they are looking at what processes might be redundant in the production of their own branded milk. They have identified homogenization as one such process which Dairy Processor 2 explains that: ‘homogenisers themselves take cream off and then you fire it through a die and it breaks the cream down so that you end up with an emulsion and then you reintroduce it back into the milk so that when buy your milk you don’t get that cream line. The fact that it is under high pressure and uses masses of power so if you can strip that process out it means that you get a cream line but in our blind taste tests people say it tastes better and fresher’. Dairy Processor 2 then went on to claim that there are health benefits from not homogenising because the process breaks up the fat allowing it to be readily absorbed by the human body before it is adequately digested by the digestive system.

6.5.2: Case study of Dairy Processor 3: An organic farmhouse cheese maker

Dairy Processor 3 was chosen as a niche to the SW dairy regime because its products are organic and because it is a local artisan cheese maker, as both facets are seen as being alternative to the main regime. Dairy Processor 3 is a small scale organic cheese producer using milk from a herd of Ayrshire cattle, which is a non-standard

species for dairy production, and selling their cheese to a variety of different customers.

6.5.2.1: Rationale for the organic farmhouse cheese maker innovation

In looking for the rationale for why this niche came about, it was easy to see that the opportunity came from a suggestion by the interviewee's father that they should go into cheese and a meeting held by the Specialist Cheesemakers Association. However, this is more the catalyst for the business being set up rather than the rationale for why the business came about. The rationale appears to be much deeper rooted in the interviewee's ethics and sections of the interview were given over to discussions that revolved around the dilemmas they faced as an ethical producer/processor as this quote typifies: 'This is one of the fundamental problems because we are quite passionate about the morality of what we are doing and everything but the end product of what we're doing is really going to very wealthy people and it is a bit of a problem. Here we are arguing about local food to local people and we are producing a very expensive cheese that goes to rich people in London'. These ethical considerations extend right through their approach to life as well as the business model that Dairy Processor 3 uses and reflects some of their concerns for the rural region they live in:

'what is tending to happen is the more successful farmers are getting bigger and buying up the people who are going out so you get the classic situation where small holdings are being sold, land broken off, local farmer buying the land, houses sold to townies who want to escape into the country; never can that be put back together, this fabric of small farms. It is a very worrying situation as you will never be able to reform these farms so the infrastructure of the agricultural land is being changed forever as far as I can see.'

Ultimately the rationale for this innovation is a challenge to the dominant *cultural* dynamics of the dominant regime by positioning their business around a strict ethical framework. Dairy Processor 3's outlook demands a business model that

benefits society and the environment as well as themselves; a balance which is a challenge to find as the comments in the following section show.

6.5.2.2: Nature of the organic farmhouse cheese maker innovation

Although there is only a single cultural rationale for this innovation, it is this difference from the regime that has meant Dairy Processor 3 looks differently at the elements of their business and seeks to make them more sustainable and, as a result, differs from the regime. The first and most obvious aspect is the nature and provenance of the product itself, being both organic and a genuine artisan farmhouse cheese. But, as the interviewee states in a couple of interesting comments on the nature of artisan and farmhouse cheese makers during a discussion of DDC's role and the nature of the dairy industry as a whole:

'You know quite intensive and artisan then well what is artisan? Well they are not pasteurising their milk [i.e. it is artisan like] but they are making on an industrial scale [so can we still call it artisan].'

'There is no definition, you know like 'farmhouse cheese' what is 'farmhouse cheese'?''

Dairy Processor 3 calls into question how terms such as 'farmhouse' and 'artisan' are used in the dairy market. These terms are commonly used to brand cheese for sale to the general public and have a degree of credence with consumers; yet neither have clear definition nor did any interviewee provide one. However, the nature of Dairy Processor 3's product is that it can be considered to be genuinely 'farmhouse', as it is being produced on the farm; as for artisan, how exactly does one define a product as being artisan? It is certainly unusual being produced from Ayrshire milk as well as being organic and produced in small quantities rather than en-mass so one might claim that it is also artisan.

The routes to market for niche supply chains have been a subject of interest for red meat niches (Meat Producer 4's specialist meat production had many routes to market despite being comparatively small) and this is a theme that continues somewhat in a study of the dairy niches. Dairy Processor 3 is of interest because here we find a single farm's milk being processed as cheese on-site and then going into the supply chain in multiple routes. When discussing their routes to market, Dairy Processor 3 suggested that 50% of their cheese goes into the Welsh market (a 40/10 split between Welsh wholesalers and retailers), 25% goes to a specialist cheese wholesaler located in the UK, 15% goes to a multiple retailer and some non-Welsh based wholesalers in the UK with the final 10% being sold directly to the consumer; this is a very diverse spread of customers both in terms of their scale and locations. Dairy Processor 3, whilst discussing the presence of a multiple retailer in their customer portfolio, commented that: 'we don't want too many big customers. If [multiple retailer] wants lots more and we have got the cheese to spare then obviously we will sell it to them, but we are always nurturing new customers; we are never complacent about the fact that we have got enough customers'. This comment shows just how a small business can foster resilience by spreading risk between different outlets although, as was discussed earlier, the product is a 'very expensive cheese that goes to rich people in London'. Consequently, to some extent one might wonder whether the nature of the product allows the risk spreading by virtue of its high quality status and, furthermore, whether a similar model might be extended to produce that is more a commodity than a product.

Another element of interest is the fact that, as a small business, Dairy Processor 3 employs people which is increasingly rare on dairy holdings. Employment is important for the rural economy, particularly where so many agri-food related jobs have been lost in the producer and processing sectors. Whereas many dairy producers employ just themselves, or maybe an additional one or (at most) two staff, this business has created new opportunities to employ people by having the processing on site as the interviewee said: 'It is brilliant that we can employ people and we will employ more. The cheese will probably have the equivalent of four full time members of staff on its

own and the farm will have the manager, a part-time farm hand plus [name] so we'll probably be looking at seven people full-time on the farm'.

The final element to be considered as part of this niche returns us to the nature of what is produced and, more specifically, to the fact that they produce their milk solely from Ayrshire cattle. Whilst discussing the threat that TB poses to the business Dairy Processor 3 commented that: 'TB is very much relevant to us. We cannot buy Ayrshire milk. If we made our cheese with another milk it would be a totally different cheese, so even pasteurising the milk that we would end up with a different cheese'. Being a niche business that uses a non-generic breed of dairy cow exposes the business to a higher degree of risk than those who use any of the standard breeds to produce milk, because they cannot simply source their milk from another farm if there is a problem with the herd. The other observation of relevance here is that, based on Dairy Processor 3's claim, using a specialist breed's milk creates different 'taste' properties in the resultant cheese which, if more producers raised dairy herds of non-generic breed, would create secure supplies, building resilience in non-standard supply chains, as well as creating a more diversified **market** for producers and reducing the over reliance of the dairy industry on a single [species, genus] for dairy production.

6.5.3: Case study of Dairy Producer 4: a non-bovine dairy producer/processor

Dairy Producer 4 was originally selected for interview by recommendations and information garnered from the first phase of fieldwork. The business specialises in processing non-bovine milk into cheese and confectionary products for sale to the market which is, by its very nature, a niche sector. A further element that made this producer/processor interesting was the range of products being produced which included confectionary, cheeses and meat products. The core business is the confectionary and cheeses, which are sold through a variety of routes to **market** including direct sales, farmers' markets, regional distributors and retailers. There was, however, a 'caveat emptor' for all small scale producers who use intermediaries or 'turn-keys' to assist in accessing certain routes to markets, in that it is possible for a small producer to 'lose' its branding with a key supplier as Dairy Producer 4 suggests:

'I felt that I was beginning to lose control over what was mine.... I had that confirmed when [retailer] turned round and said that the only reason they were taking me from national to regional was to help [name of farm] manage their milk supply. Well I have been known as [name of company], we have never worked under the farm name ever. Then I was told by another company where I was trying to buy some equipment: 'oh [brand name] that is another arm of this other company' and I said no its not... my whole branding, everything was being taken over.'

'[Retailer] has been dragging their heels at putting us back in during which time this other guy has brought milk in and is doing our cheeses under a different name. So I think there is a bit of a fight as to whether we are going in or he is.'

The quotes suggest that whilst being small might allow innovation, the businesses involved need to be careful about aggressive activities of other businesses, such as passing off. This is a common problem in the business world globally with high profile copyright and patent law suits (such as Apple law suits for patent infringements against Samsung and other companies); the difference between Apple and Dairy Producer 4, however, is their capacity to defend against this kind of action which bears some consideration in thinking about how niches can develop and, moreover, how they could be supported.

6.5.3.1: Rationale for the non-bovine dairy producer/processor

The key rationale for this niche was clearly a set of lifestyle choices of the interviewee who wanted a career change but also wanted to 'do something with the [animal]'. Dairy Producer 4 is similar to Meat Producer 4 in terms of rationale in that they are both 'lifestylers' who are not from traditional farming families. In contrast, whereas Meat Producer 4 had clearly identified a niche in the local market that they could fill using a small scale farm enterprise, Dairy Producer 4's niche is perhaps somewhat less

focused on the local market, indeed the customer profile of the two businesses is quite different. Given this contrast, it is perhaps interesting that Consultant 1 highlighted incoming people who brought new skills to the region as being one of the real drivers of change in SW Wales.

6.5.3.2: Nature of the innovation in the non-bovine dairy producer/processor

The range of dairy products being produced on farm is a novel aspect of this niche. During a discussion of how their income changes over the year Dairy Producer 4 commented that: 'it can fluctuate, [but it is] different [depending on the] product, and that is why in some ways it is good to have different products because different products sell at different times'. The range of products gives some stability to Dairy Producer 4's enterprise by potentially providing multiple options for new **market** opportunities. Dairy Producer 4, however, intimated that it also gives differing peaks in sales during the course of the year and thus removes some volatility of income. In many respects, this diversity of products has helped retailers over the years through the increased ranges that they sell. However, the increase in products at the retailer end of the supply chain has been countered in the producer sector where, in general there has been a move towards increasing mono-functionality, which was something that Dairy Producer 4 mentioned as a concern stating: 'the only way forward really is to go back to mixed farming'

6.5.4: Summary of SW Wales dairy niches

Table 6.10 summarises the three niches discussed in this section into the ST elements heuristic model which gives us a comparison between the niches and also between the niches and the regime. One of the striking things about the dairy niches in SW Wales that were interviewed is that they all differ in their rationale from the regime in the **culture** aspect. This difference is particularly noted in the cases of the ethical producer co-operative and organic farmhouse cheese innovation, whose rationale stands in direct opposition to the current logics upon which the SW Wales dairy

regime operates. This has resulted in these niches departing in their nature from the regime configuration in a number of ways, as shown in Table 6.10.

One of the key questions that arose during the analysis of the three niche innovation case studies, however, was to what extent are these businesses/supply chains merely niches rather than niche innovations? A business/supply chain can operate in a small niche market relative to the conventional (regime level) market and not represent a significant departure from the underlying logics of the regime dynamic. Whereas a niche innovation does offer something different to the regime's logic which, given the appropriate opportunity, could change the trajectory of the regime in the region it operates in or potentially even higher level regimes.

The non-bovine processor is innovative because they are using a non-standard dairy product for this country. However, the only way that this business and others like it change the overall regime's logics is if there is a significant change in the market preferences for UK dairy consumption. The real innovation in the non-bovine dairy producer is that they are selling through multiple outlets, which for one dairy producer in the regime is unheard of, but this is a similar trait to the organic farmhouse cheese processor and all other small scale cheese producers.

The organic farmhouse cheese processor is quite similar to the non-bovine processor with the possible exception that they operate on an organic basis, which adds a level of environmental sustainability to their business. Organic products have, however, been in existence for some time now and, to some extent, a proportion of the organic dairy 'niche' has become industrialised and absorbed into the UK dairy regime logic but, as the organic farmhouse cheese processor case suggests, not all producers have moved towards being absorbed into the regime.

The ethical dairy producer group is also organic but its real innovation is the business's outlook that bucks the trend of processors moving out of peripheral rural regions. The other metric upon which the ethical dairy producer group is innovative

compared to the regime is their broad, inclusive interpretation of sustainability and how it can be embraced in a modern dairy producer-processor business.

Table 6.10: Showing the deviations in Rational and Nature of observed innovations compared to the SW Wales dairy regime.

	User/Market Preferences	Policy	Industry	Science / Knowledge	Culture	Biophysical	Technology
Ethical producer co-operative Innovation			- Lack of processing capacity.		- Desire to produce and process milk in Wales in an ethical and sustainable way.	- Desire to have as small a foot print on the regional biosphere as possible.	
	- More emphasis on quality and quantity to derive value.		- Local, integrated, multi product processing capacity.	- Engaged in the science of sustainable production and invests in it.	- Selling a positive message of sustainability as a powerful message for customers.	- Encourages producers to work more within the natural capacities of their land.	- Power down business for sustainability. - Removes "unnecessary" processes from production.
Organic Farmhouse cheese maker Innovation					- Desire to produce a genuine ethical, locally sourced artisan cheese		
	- Multiple routes to market for a single producer holding.	- Engages with government employment schemes to assist with employing workforce.	- Employs more people locally.			- Organic non-standard bovine herd milk.	- On farm creamery to provide processing for their cheese.
Non-Bovine dairy producer/processor Innovation					- Lifestyle producer.		
	- Multiple routes to market for a single producer holding.		- Wide product range for single holding fostering resilience at the holding level.			- Non bovine dairy herd.	- On farm creamery to provide processing for their products.

6.5.4.1: Considerations for socio-technological systems arising from the SW Wales dairy niche case studies

As with the meat niche case studies, the dairy case studies provide a further point at which to discuss the niche novelty-regime innovation concept from van der Ploeg et al (2004). Of the three case studies the non-dairy producer is a good example of a genuine niche novelty with a product being genuinely novel to the region, and therefore unlikely to have an impact on the dairy regime in SW Wales, but nevertheless that has an intrinsic value as part of the regional agri-food system. The remaining two case studies of the ethical producer co-operative and organic farmhouse cheese producer can both be found as being somewhere between niche novelty and regime innovation. These two case studies were interesting because one (the farmhouse cheese maker) represents a system of production that is still quite common in the UK dairy industry and relatively niche novel in nature which represented an example of an alternative configuration that is unlikely to challenge the main dairy regime in SW Wales. Whereas the ethical producer co-operative has many facets of the SW Wales dairy regime in its desire to upscale into larger production and sell to retailers, nevertheless its approach to sustainability can be seen to be radical when compared to the regional regime's configuration.

This approach is fostering a new culture between processor and producers that is aimed more clearly at working with the biophysical capital they find in the region and is generating new logics/rules that have driven the alternative socio-technological configuration shown in this case study. This suggests that the culture/rules/norms of niches are more interesting when looking for niches that possess socio-technological configurations that radically challenge incumbent regimes. The assimilative potential of these niches is discussed further in section 8.2 when the niche case studies from all three sectors are cross compared.

6.6: Conclusion

This section will summarise the main findings of this chapter. It will focus on three aspects of the chapter with the first being dedicated to the overall shape of the dairy regime in SW Wales and whether the intensity of the connection to the UK wide dairy industry makes it part of a UK dairy regime rather than a distinct regime in its own right. The next section comments on the future trajectory of the dairy regime in SW Wales and the final section discusses the findings relating to the dairy niche innovation case studies.

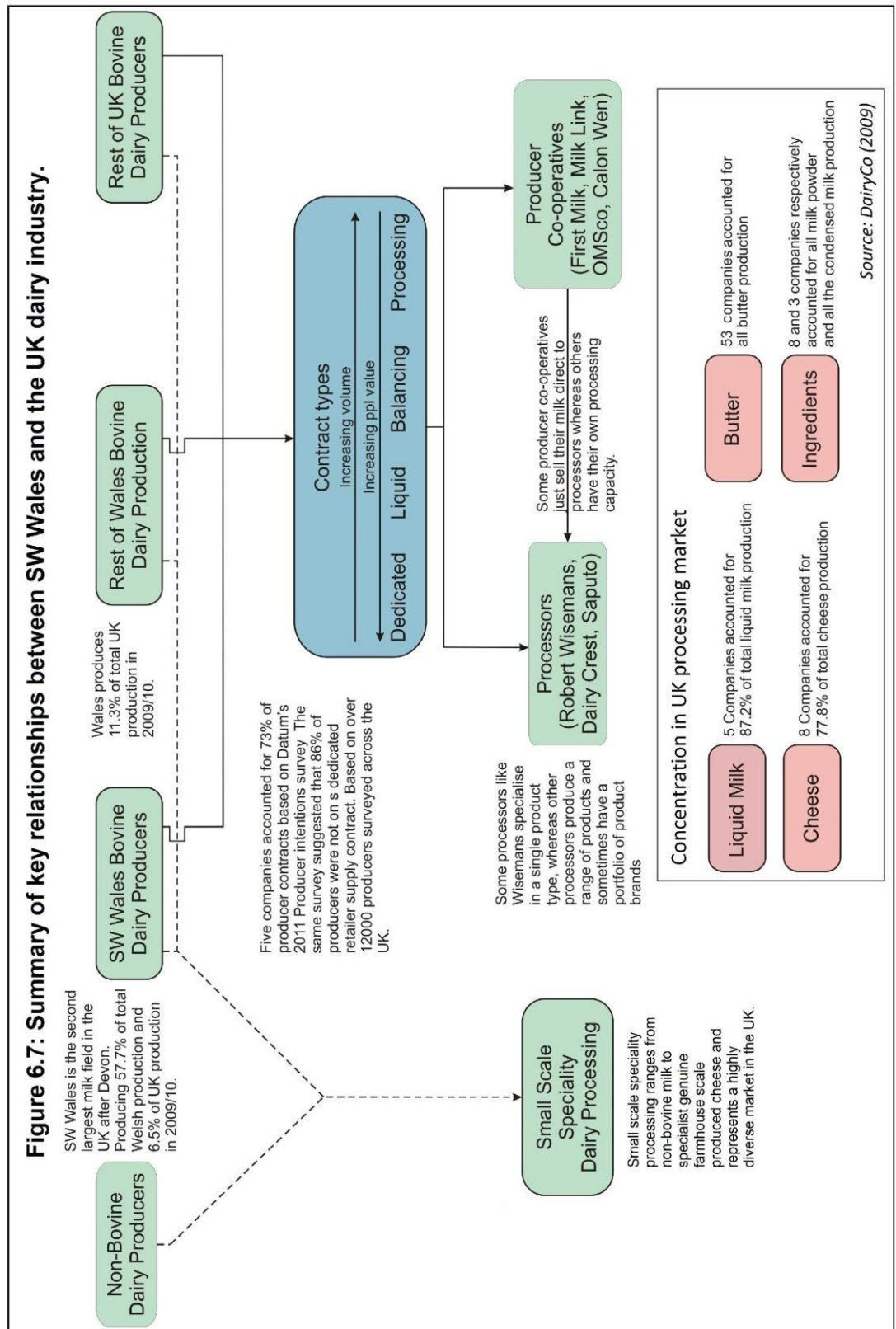
Throughout the chapter, observations were also made regarding the implications of the empirical findings on the ST systems theory and the application of the MLP. Where these implications are not dealt with specifically in this chapter they are discussed further in chapter 8, where the data from all three chapters can be considered together. It has also been noted, where appropriate, that some of the implications will require further research to investigate the questions raised in this chapter.

6.6.1: Nature of the SW Wales or UK dairy regime

The SW Wales Dairy sector is a region which is both significant in terms of its productive capacity and its appearance of a high degree of conformity to the rest of the UK dairy industry. The secondary data garnered from DairyCo seemed to suggest that its basic product is broadly similar with comparable averages of butterfat to other counties across the UK.

Figure 6.7 summarises the key aspects of the SW Wales Dairy sector. Firstly, producers in SW Wales seemed to be faced with the same pressures that producers in the rest of the UK are and, whilst a detailed study of the rest of the UK dairy producers was not undertaken, it appears to adopt a similar range of production methodologies employing comparable knowledge and technology. The dairy producers of SW Wales are connected to the producers in the dairy production sector of the rest of the UK by

virtue of their use of the same processors and are therefore co-existing/competing in a UK production market.



This naturally turns attention to the processing and wholesaling level which is highly concentrated, as shown in the market concentration data in Figure 6.7. Some of the main processors in the UK are inter-connected, as is shown in Figure 6.3, and are also connected to international markets with Arla, Glanbia and Saputo being examples of an international processors active in the UK processing market. The processing sector in SW Wales has been subject to the same developmental trajectories from the de-regulation of its market through to the rationalisation of processing capacity into larger units that the rest of the UK has experienced. So, if there is a broad degree of conformity and inter-relationship between the dairy sector in SW Wales and the rest of the UK, is it correct to claim that a SW Wales Dairy regime exists at all?

The answer to this question, based on the research carried out, is undoubtedly yes; because, whilst there is much similarity between SW Wales and the rest of the UK, the de-regulation of the MMB has had a re-spatialising effect on the UK dairy processing industry, which has been felt differently across the UK. There are two key aspects to this re-spatialisation. Firstly, the principal effect of re-spatialisation is the differential between the milk prices available in SW Wales and the rest of the UK, with the West Midlands being the exemplar region given in interviews. This difference in milk prices is driven through the availability of contracts and the relative amounts that producers are paid for their milk, as shown in Figure 6.7. Dedicated and liquid contracts attract the best pence per litre prices for producers but are not available to producers in the SW Wales region who are only able to get balancing or processing contracts. This has created a farm-gate price differentiation between producers in the core of the UK and those, like dairy producers in SW Wales, who are on the periphery.

The second aspect of re-spatialisation is the rationalisation of dairy processing facilities/capacity away from the SW Wales region and its concentration in more centralised areas of the UK. This has led to a loss of jobs in the SW Wales region and an increasing marginalisation of the region's producers, despite the size of its milk producing sector. Although this thesis is not intended to be a historical regional

comparative, it appears that the dairy regime in SW Wales has undergone different changes to those seen elsewhere in the UK and in comparison to the SW Wales meat regime.

6.6.2: Future transition of the SW Wales dairy regime

Given the falling numbers of producers in SW Wales, the continued cost-price squeeze on farm-gate prices and the hollowing out of processing sector in SW Wales, there is certainly a degree of uncertainty as to how the regime may reconfigure in response to these pressures. It is reasonably clear from interviewee responses and the available secondary data that the SW Wales dairy regime is becoming dynamically unstable in its current form. It was unclear from the evidence what the future ST regime configuration of the SW Wales dairy regime might be, however it is clear that, as a proportion of the SW Wales agricultural sector, it is likely to become a smaller proportion of the region's farming activity.

What was also striking about the dairy industry in comparison to the meat industry was the diversity of techniques, products and produce that are possible for producers and processors, particularly in terms of on farm production techniques. Producers have a range of options open to them. From a sustainability perspective, the reliance of some producers on external inputs is a concern both economically and in terms of exceeding the biophysical capacity of both land and beast in order to produce ever increasing volumes of milk for processing. But, as Dairy Producer 3 suggests, this might be a temporary move for producers:

'I think the industry is going to change, it is going to do a bit of a full circle. There will always be a few of those high flyers who want to do this. You cannot stop them and nor should you do so but the middle of the road guys are going to come round, they are going to stop using the feeder wagons or they are going to use less of it, they are going to use more of what they have available to them which is their grass land so and do it more effectively. To an extent they will get close to the organic guys in all but name.'

The quotation from Dairy Producer 3 suggests that we have a dairy regime in SW Wales that is one that is evolving. Currently the regime's milk production is disconnected from the biophysical capacity of the region, relying instead on external inputs which are rising in cost. One possible future trajectory for the SW Wales dairy regime's producers, foreseen by Dairy Producer 3, is that, given the focus on cost in the UK dairy industry, they will have to adjust their production methodologies towards what the region's biophysical capacity can sustain rather than use costly external inputs.

6.6.3: Niche innovations in the SW Wales dairy sector

Turning to the niches discussed in Section 6.5, there are two points of interest to be made here. The first point deals with the nature of niches; in that whilst some innovations succeed in up-scaling and assisting in re-shaping the regime, others do not; in fact some niches for a variety of reasons will probably always remain niches. The non-bovine processor in our study of the SW Wales dairy industry is innovative in terms of the multiple products and routes to market model that they use and their use of a non-bovine dairy herd. Whilst the business model might be something that could reasonably be part of a re-shaped SW Wales dairy regime, creating a more diversified market with more outlets (assuming a shift from a supermarket structure of consumer buying), it is unlikely that the development of an extensive non-bovine dairy model is viable or even desirable from a market preferences perspective, given the non-bovine nature of milk produced for which there is proportionately less demand. This reflects upon the discussion in chapter 3 regarding the nature of niches and their assimilative potential with respect to the incumbent regime and is considered further in section 8.2.1.

The second point relates more to the de-stabilised nature of the SW Wales dairy regime and is whether it is destabilisation or threats to a regime that create the desire for innovation or whether innovation is simply created? The interview with Dairy Processor 2 was informative and interesting in that here was someone who had

worked in the industry, seen its problems and wanted to see quite radical changes, which certainly informed part of his business outlook as an individual. In contrast, Dairy Producer 3 had a familial upbringing that espoused a more 'sustainable' attitude to living in general as well as than the wider agri-food system, which pre-dates his involvement in the business but nevertheless influences his business decisions. In essence the question here is perhaps can sustainable innovation behaviors be taught or are they a product of a de-stabilised regime?

Ultimately, what can be seen in this chapter is a SW dairy regime which is under intense pressure due to the re-spatialisation of the processing sector in the UK removing a large amount of the regional capacity. It is a regime which is exposed to global as well as nationally competitive markets depressing prices for producers in the region. Producers have been forced to adapt and have done so in order to meet the market preferences and follow what appears to be the national culture of the UK dairy regime. This pressure has created spaces within the regional dairy industry for innovation to develop, which some producers are taking advantage of as the ethical dairy producer co-operative shows. These ideas of regime destabilisation and formation of new niches are discussed in further detail within section 8.2 where the interaction between the three sub-sectoral industries together with their niches is considered.

Chapter 7

The SW Wales Horticultural Sector

7.1: Introduction

This chapter will examine the empirical and secondary data for the horticultural sector in SW Wales and will be arranged slightly differently to chapters 5 and 6. The reason for the difference in chapter layout is that unlike the meat and dairy sectors of SW Wales, where there was sufficient evidence for the existence of coherent sector-specific regimes, there is insufficient evidence from empirical and secondary data for the horticultural sector of SW Wales to support the idea that there is one single, coherent SW Wales horticultural regime. Despite the absence of a coherent SW Wales horticultural regime, there is a small but significant amount of horticultural production in SW Wales which supports a differentiated range of supply chains.

This chapter is organised into four sections. The first section will examine the historical and current disposition of crop production in Wales, which will show a significant decline in the acreage of crop production over time in Wales and that the remaining production is highly concentrated in a few areas of the country including, most notably for this study, SW Wales. The following sections shift the focus slightly, looking more specifically at the horticultural sector in SW Wales. The second section focuses on the public and private policies that have shaped the horticultural sector in SW Wales. The third section uses a set of case studies of horticultural businesses in SW Wales, which will exemplify the differentiated nature of the SW Wales horticultural sector. Finally, in the concluding section the reasons why there is not a coherent regime and the implications of this for this research will be further explored.

Finally, it should be highlighted from the outset that the ST regime's constellation of elements are used throughout the chapter to indicate the obvious aspects of the

existing sector in SW Wales, which suggest a regime's existence at this level (albeit that these are not sufficient together to conform to the idea that a regime exists), and to demonstrate the differentiated nature of the region's horticultural case studies.

The chapter is organised around the Socio-Technological Systems (ST Systems) framework as discussed in Chapters 3 and 4. Any item that is in bold and italicised text should be read as an identifying aspect of the SW Wales Horticultural Sector or the niche under discussion, which will later be summarised in the appropriate table.

7.2: SW Wales crop sector

This section will outline the historic and current perspectives for the SW Wales cropping sector. This should be understood to include a variety of agricultural production from small scale on-farm production, market gardening including the use of greenhouses and polytunnels, field scale cropping of potatoes, vegetables, floriculture and arable crops.

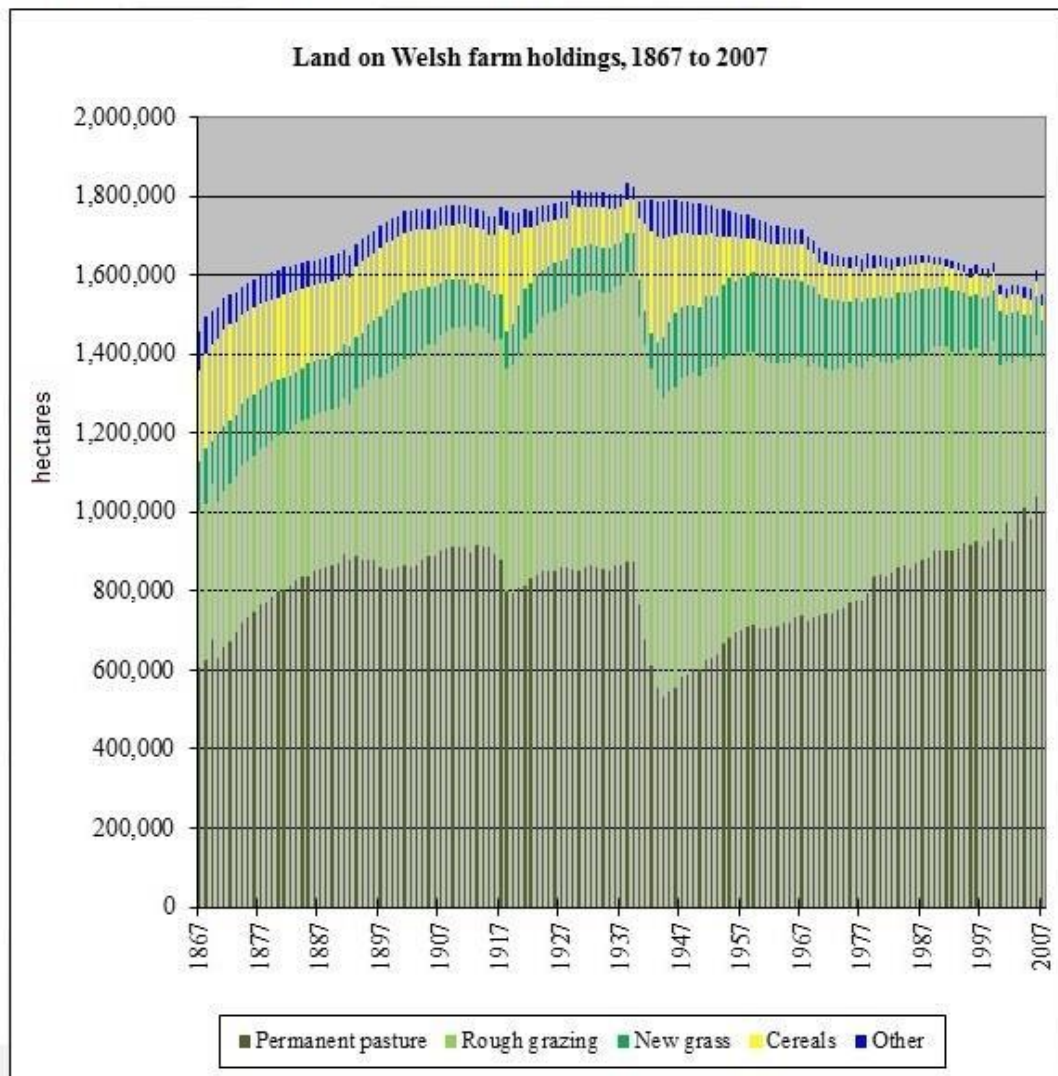
It will show that, as a region, SW Wales is a significant producer of crops in Wales, but that the areas of land used for cropping in its various forms have declined from the high levels seen during the 1940's. The section will go on to show the differentiated nature of crop production with, in particular, the spatial distributions of cereals and potatoes being particularly interesting. Ultimately this section will portray the SW Wales region as a region which has the potential to grow its crop/horticultural industry. The reasons why this might be difficult are posed in this chapter and considered more fully in the concluding chapter.

7.2.1: Historic trends

Figure 7.1 shows the historic pattern of agricultural land use in Wales (excluding common land) from 1867–2007, based on the results of the annual June Census data,

which gives a sense of the trend in overall agricultural production and, more specifically, crop production in Wales. Figure 7.1 shows that more land was consistently brought into agricultural production from 1867 until 1938 after which it declined steadily following World War II, almost back to 1867 levels. Grass, be it permanent pasture, rough grazing or 'new grass', is the principal agricultural land use type in Wales throughout the time series with a smaller amount of crop production, which is represented in figure 7.1 by arable (yellow) and other production types (blue).

Figure 7.1: Showing the historic trend in Welsh Agricultural Land use



Source: WAG Statistics Directorate (2009)

This predominance of grass based agricultural land uses in Wales can be explained by a combination of topography, climatic factors and soil types, which together define the overall suitability of a particular area to sustain agriculture and, in essence, define

part of the **biophysical** capacity of SW Wales to sustain horticultural based agriculture. The best composite measure of land use suitability is agricultural land capability (ALC), which categorises land into five grades from grade 1, representing land with 'no or very minor limitations to agricultural use', to grade 5, representing 'land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops' (MAFF, 1988, p.9-10). Figure 7.2 is an ALC map of Wales, which shows a high proportion of ALC grades 4 and 5, where crop based land uses would be prohibitive or at best would face extreme limitations. According to figure 7.2 there are very limited amounts of grade 1 and 2 land but there is also a reasonable amount of grade 3⁷⁵ land, which according to the MAFF (1988) guidelines, can be described as:

'Grade 3 - good to moderate quality agricultural land

Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.

Subgrade 3a - good quality agricultural land

Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

Subgrade 3b - moderate quality agricultural land

Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of

⁷⁵ The data set provided by WAG did not distinguish grade 3 land between the 3a and 3b subcategories but the overall grade 3 category can be inferred to represent land upon which horticultural activities, cereal cropping in particular, are possible.

crops or high yields of grass which can be grazed or harvested over most of the year.' (Ibid, p.9)

Figure 7.2: Showing the agricultural land capability map for Wales

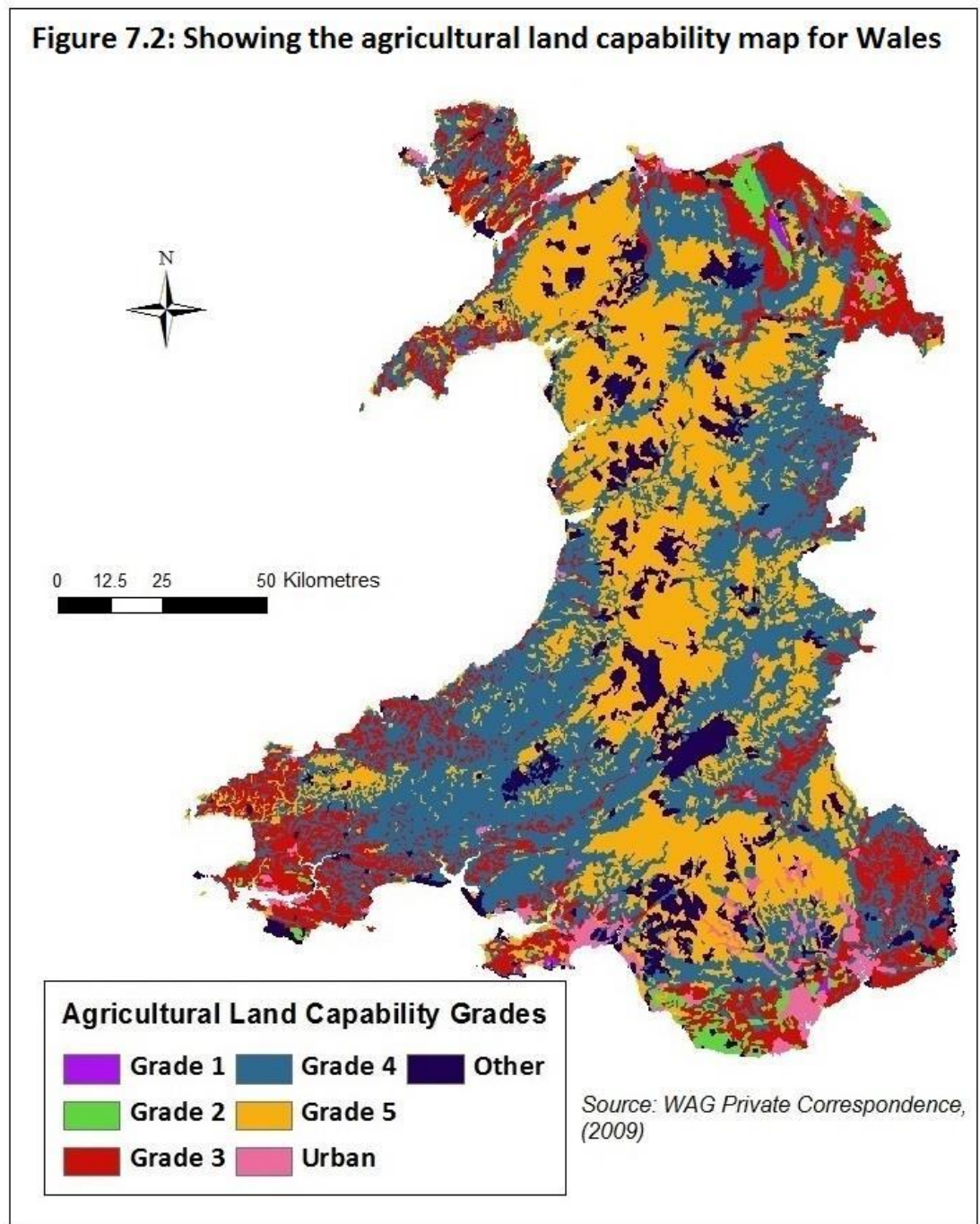


Figure 7.1 also indicates that there are changes to the relative proportion of agricultural land use types in Wales that are independent of the changes in the total amount of land used for agriculture. Tables 7.1 – 7.3 show the changes in agricultural land use for selected time periods and demonstrate the relative changes between the

land use types over the period. Table 7.1 shows the changes in hectares of the various agricultural land use types and illustrates that across Wales there has been a marked decrease in the cereal and other⁷⁶ categories between the years shown, whereas total grass based production increased from 1867 to 1938 and was matched by a marked decrease in crop production. Moore-Colyer (2011) attributes this decline in crop production to the lowering of fertiliser costs and soaring labour costs during this period. There was also an upsurge in the amount of land use attributed horticultural production and cereal production in particular during the Second World War period, which was as a result of state ordered policies for the ploughing of permanent pastures (Moore-Colyer, 2011).

The general pattern of changes in table 7.1 does not help to explain the relative changes in the ratio of different types of land use over the time period. However, table 7.2 shows the relative percentages of each land use as a proportion of the total agricultural land in Wales. The changes displayed in table 7.2 show that there is a consistent drop in cropping land uses (cereals and others) as a percentage of the overall amount of agricultural land in Wales. This drop in cropping land uses is unrelated to any shift in the total land utilised for agriculture in Wales. Table 7.3 indicates that, over the whole time period, Wales has been shifting away from cropping forms of agricultural production.

⁷⁶ The 'other' category of land use includes: non-cereal crops, stock-feed crops, horticulture, woodland (woodland is assumed to mean farmed woodland, rather than conifer plantations or other non-agricultural woodlands) and buildings.

Table 7.1: Areas covered by agricultural activities in Wales for selected years in hectares

Year	Permanent pasture	Rough grazing	New grass	Total Grass	Cereals	Other	Total
1867	605,027	395,392	129,099	1,129,518	228,251	99,961	1,457,729
1938	873,747	733,316	97,937	1,705,001	87,820	42,494	1,835,315
1970	738,982	628,904	182,520	1,550,406	82,559	33,590	1,666,555
2007	1,001,081	389,808	95,034	1,485,923	36,522	30,520	1,552,965

Table 7.2: Ratios of total farmed area in Wales by land use type for selected years

Year	Permanent pasture	Rough grazing	New grass	Total Grass	Cereals	Other	Total
1867	41.5%	27.1%	8.9%	77.5%	15.7%	6.9%	100.0%
1938	47.6%	40.0%	5.3%	92.9%	4.8%	2.3%	100.0%
1970	44.3%	37.7%	11.0%	93.0%	5.0%	2.0%	100.0%
2007	64.5%	25.1%	6.1%	95.7%	2.4%	2.0%	100.0%

Table 7.3: Temporal change in land use cover for the years shown in Table 7.1

Period	Permanent pasture	Rough grazing	New grass	Total Grass	Cereals	Other	Total
1867 - 1938	44.4%	85.5%	-24.1%	50.9%	-61.5%	-57.5%	25.9%
1938 - 1970	-15.4%	-14.2%	86.4%	-9.1%	-6.0%	-21.0%	-9.2%
1970 - 2007	35.5%	-38.0%	-47.9%	-4.2%	-55.8%	-9.1%	-6.8%

Source: WAG Statistics Directorate, (2009)

We can infer from the data shown in this section that Wales is capable of supporting a moderate amount of horticultural production and historically produced considerably more than it does today. There is more land that is biophysically suitable for some forms of horticultural production in Wales than is currently being employed and, if we were looking at the construction of a Welsh national level horticultural regime, we can infer that there has been a decline in the *Industry* element of such a regime regardless of that regime's *biophysical* capacity. Some of the reasons for this decline will be explored in later sections of this chapter.

7.2.2: Crop production in Wales today

The decline of crop production discussed in the previous section was from a pan-Wales perspective and could not give an indication of the spatial distribution of crop production in Wales. Section 7.2.1 shows that crop production, as an agricultural land use, appears to be a relatively minor part of the agricultural mix in Wales today. However it is important to investigate what is currently being produced, where that occurs and specifically what role crop/horticultural production plays in SW

Wales agri-food sector. This section reviews what data is available for the SW Wales region and primarily draws upon the June Agricultural Census data and the food business directories of the three counties within the study region.

Figure 7.3 shows the estimates of land used for crops, as a percentage of agricultural land use in the Agricultural Small Areas of Wales, based on the June 2009 Census data and shows clear concentrations of the crop land use in specific parts of Wales. The areas in red in figure 7.3 have between one fifth and one third of their agricultural land employed in some form of crop production and are clustered in Pembrokeshire, the Vale of Glamorgan, Cardiff/Newport city region, Monmouthshire (in SE Wales) and along the Welsh-English border in NE Wales. There are also additional areas where there is moderate⁷⁷ crop land use (7.98-23.71%) which are clustered around the existing areas where higher percentages of crop land use are present, along the SW Wales coastline and along the Welsh-English border. Figure 7.3, most interestingly, shows that there is at least some degree of crop based activity in most of the ASAs within the SW Wales study area.

⁷⁷ Relative to Wales

Figure 7.3: Showing the estimated percentage of agricultural land in ASAs, which was planted for horticulture or cereal crops in 2009

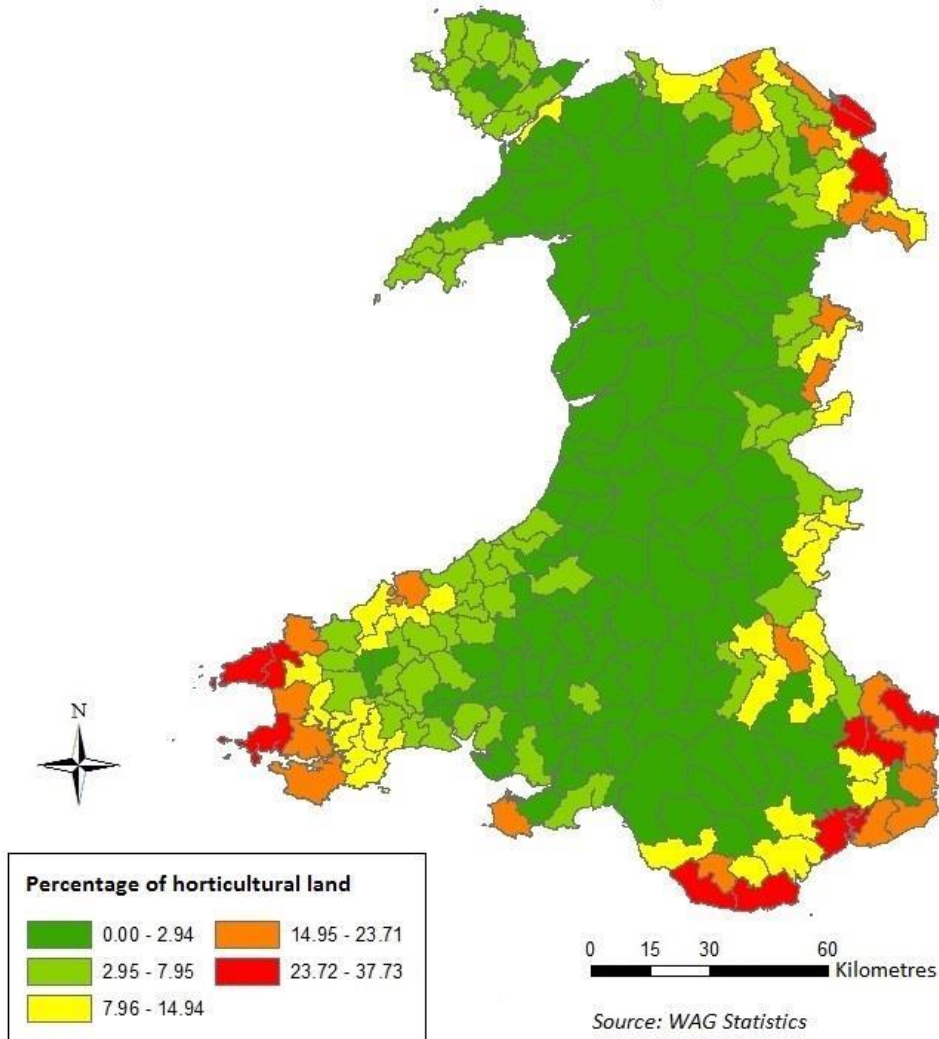
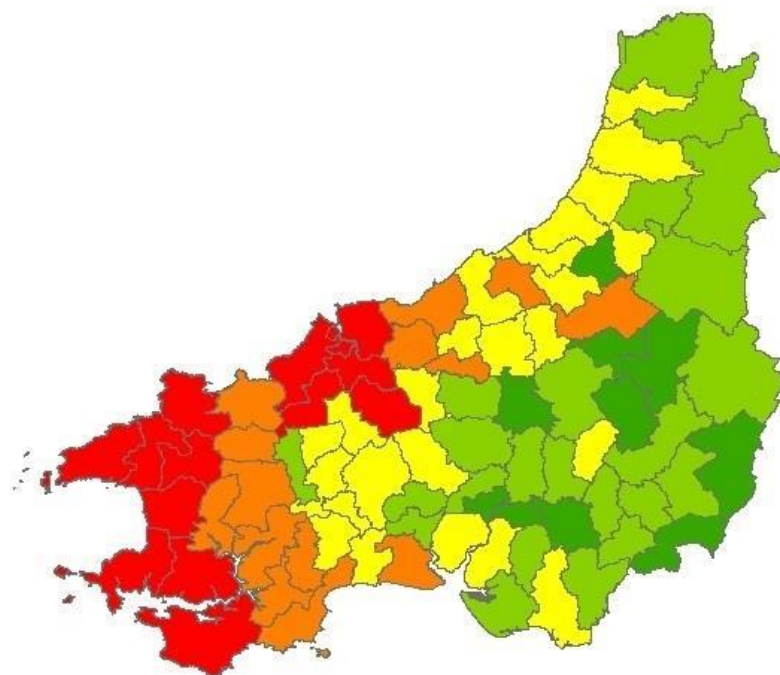


Figure 7.3 does not give an indication of how many holdings in the region are engaged in the some kind of crop based activity. There is also no sense in figure 7.3 of how much agricultural land there is in each ASA which might be suitable for different types of crop production. Figure 7.4 shows the estimated percentage of farm holdings in each ASA in SW Wales that were engaged in some kind of crop based activity in 2009 and shows two aspects of interest. Firstly, there is a higher concentration of holdings in Pembrokeshire and along the coastlines of the study area where, in some areas, up to two thirds of active holdings are estimated to have some kind of crop activity. This conforms with comments from interviewees about the disposition of agricultural activity in the region with Horticultural Processor 1 responding: ‘well,

three quarters of Pembrokeshire is beef and sheep but it's arable/cropping land really'. What is, perhaps, a little surprising is that in some ASAs a large percentage of holdings are engaged in some form of crop related activity, with estimated 1,790 holdings in the SW Wales study region engaged in some form of crop/horticultural growing, which is around twenty percent of the total number of active holdings in SW Wales.

Figure 7.4: Showing the estimated percentage of holdings in the ASAs of SW Wales that are engaged in some form of horticulture/crop growing



Percentage	
■ 0.00 - 8.65	■ 22.78 - 36.27
■ 8.66 - 14.29	■ 36.28 - 66.07
■ 14.30 - 22.77	



0 10 20 40 Kilometres

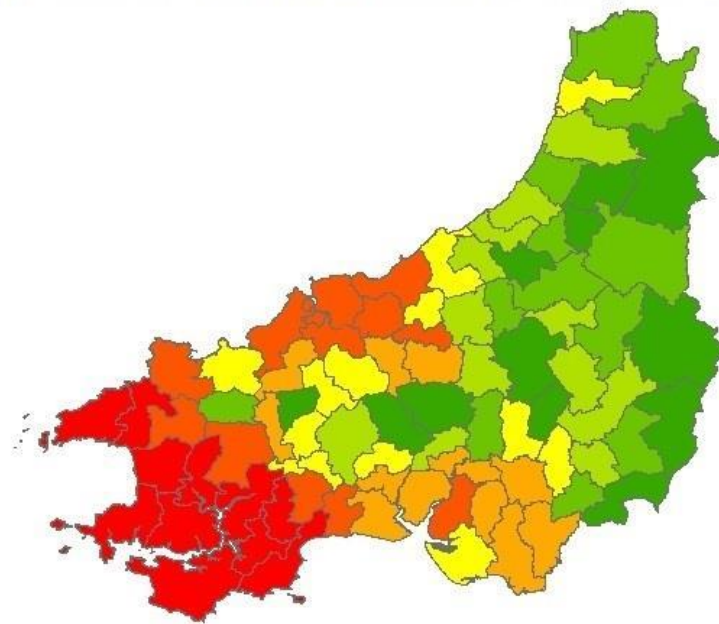
Source: WAG Statistics Directorate, (2009 and 2011)

Figure 7.5 shows the percentage agricultural land in each ASA, which excludes urban or 'other'⁷⁸ land that has an agricultural land classification of grades 1–3 in SW Wales. Figure 7.5 demonstrates that the areas with the highest concentrations of

⁷⁸ Visual comparatives using Google Earth imaging showed that 'other' land uses covered: military land, non-agricultural forest/woodlands and airfields.

land suitable for horticultural land use generally conform to the same areas where we see the highest concentrations of horticultural production in the SW Wales region, as shown in figure 7.3. Although strong comparisons cannot be drawn between the data shown in figures 7.3 and 7.5, as they are drawn from different data sets, there appears to be a marked difference in the percentiles between the two data sets. The comparison appears to suggest that there is land available in SW Wales that could be brought into some form of crop based production, which agrees in some ways with the historic trend of conversion of land in Wales away from crop production towards grass production.

Figure 7.5: Showing the percentage of agricultural land in the ASAs of SW Wales, which is graded 1 - 3



Percentage of agricultural land	
■ 0.00 - 1.00	■ 15.51 - 28.00
■ 1.01 - 3.20	■ 28.01 - 50.70
■ 3.21 - 8.90	■ 50.71 - 89.60
■ 8.91 - 15.50	



Source: WAG Statistics Directorate, (2009 and 2011)

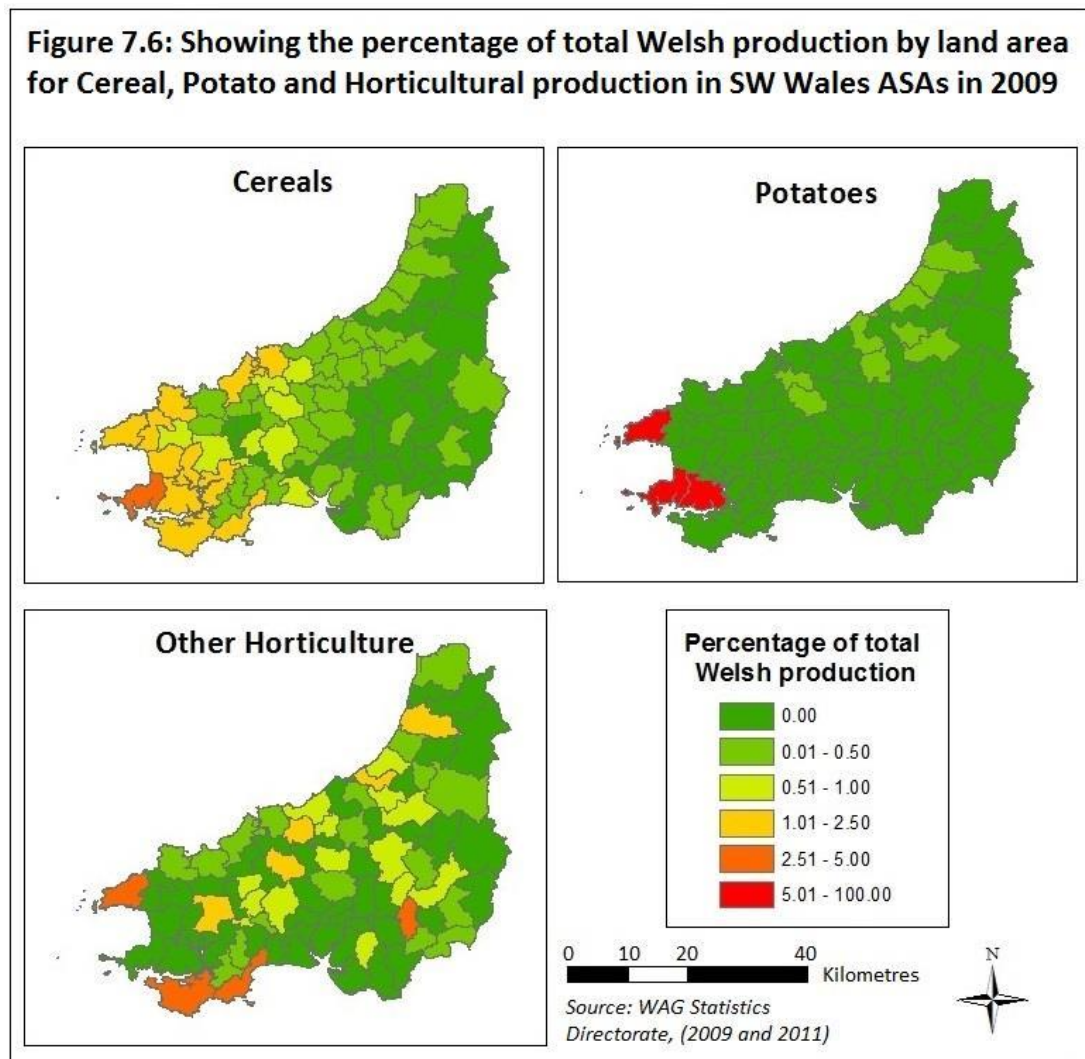
There is some data available from the June Agricultural Census that gives some differentiation in what is being grown in the ASA's of SW Wales⁷⁹. Figure 7.6 shows the percentage of total Welsh acreage for cereals, potatoes and other horticulture contained in any one ASA of SW Wales and, as a whole, SW Wales had 34%, 53% and 26% of the respective total Welsh acreages of these crops in 2009. This indicates that the SW Wales region represents a significant part of the Welsh crop based agricultural production, particularly in potatoes.

Figure 7.6 shows that the different types of crops grown in SW Wales are not equally distributed across the region but instead demonstrate very different spatial differentiations. What is clear from figure 7.6 is that potato production is highly concentrated in just three ASA's in SW Wales with some minor production elsewhere in the region. Whereas cereal production is generally more diffuse (albeit that there is a concentration in westerly ASA's) and other horticultural production being more randomly distributed across the region.

The dark green colouration on ASAs in figure 7.6 suggests that they do not possess any of that particular crop production type. However, as footnote 5 highlighted, some of the data is suppressed at the ASA aggregation level to maintain confidentiality. By comparing the aggregate production levels for the ASAs in each county to the total figures for that county, it is possible to find how much of the unallocated residual is attributable to each county and, moreover, what percentage of the county level production is unrepresented in the ASA's shown in Figure 7.6. Across Ceredigion, Pembrokeshire and Carmarthenshire the unrepresented percentage of land use within the ASAs for cereals is 27%, 20% and 46%, in Potatoes 80%, 21% and 100% and in other horticultural 86%, 30% and 89% respectively. What these percentages show is that there is a reasonable amount of the total crop land use not being

⁷⁹ The June census data is aggregated separately into regional areas and ASAs. Although it should be noted that where there is only one or two producers producing a particular crop in the ASA then the records are moved into an unallocated residual to maintain confidentiality. In contrast, there is no unallocated residual in the regional data.

represented in the ASA's, particularly in respect of other horticulture and potatoes in Ceredigion and Carmarthenshire⁸⁰.



Another route to understanding the crop 'mix' of the SW Wales agri-food industry can be found through its food business directories. The numbers of crop-based producers in these directories is low relative to the total number of producers who appear to be engaged with some form of crop-based growing. However, they do present a snapshot of a sub-section of the crop-based agricultural activity in SW Wales. Table 7.4 summarises the types of horticultural production mentioned in the food directories. The on-farm businesses in SW Wales have an array of different production types with multiple production type producers having mixtures of vegetables-fruit and

⁸⁰ Across the three counties in the SW Wales study region: 6,299 hectares of cereals, 377 hectares of potatoes and 1,114 hectares of other horticulture are unrepresented in the ASA level data.

potatoes-other vegetables. Furthermore, the vegetable only producers also appear diverse with some specializing in salads or herbs as well as others who were genuine mixed field vegetable producers.

Table 7.4: Numbers of horticulture orientated businesses mentioned in the food directories of the three study regions

	<i>On Farm</i>						<i>Processing</i>	
	Vegetables	Fruit	Potatoes	Multiple	Other	Market Gardens	Wholesale	Other Processing
Carmarthenshire	3			2			4	1
Ceredigion	2	1		4	1	2	1	
Pembrokeshire	11		2	6		1	3	1
Total	16	1	2	12	1	3	8	2

Notes

Table excludes known large businesses.

Sources : CCC (2011), PCC (2011) & Ceredigion CC (2011)

This diversity of production is borne out by discussions with some of the interviewees who were themselves engaged in producing a wide range of products, which as a group included: brassicas, potatoes, soft fruits and salad crops. Although in the previous section there was a suggestion that the **biophysical** capacity of SW Wales

land was, in some way, insufficient to maintain a diverse horticultural mix, Horticultural Producer 1 described a very different capacity and suggests a different reason for the lack of horticultural production when asked about the nature of the SW Wales region:

‘I think it is generally a very forward looking market place but again a lot of that is to do with the soil type. So if someone came into the county and wanted to grow daffodils or asparagus or anything else then there are farms available that you could grow that. I think it is really a case that the only problem that we do get is that the cost of production is higher in Pembrokeshire than you would get in Evesham you know some of the lighter flatter land of the East of England. You know we have similar land here to Cornwall and are happy to move if the market will pay the price for that crop really.’ Horticultural Producer 1

There are three things to highlight here. Firstly, there is the **biophysical** capacity to grow a range of produce in SW Wales. This is recognised by some of the region’s producers who have chosen to utilise some of their holdings for a diverse range of production. Secondly, there may not be large areas of contiguous land, a point which is supported by Horticultural Producer 3 who, when commenting on the perception of the region’s ability to support horticulture said: ‘We are actually in an LFA [less favoured area] here and it is the wrong perception really but you have got to know your land and choose your fields otherwise you break your machinery and you cannot grow. Some fields are best left as grass’. This issue of non-contiguous land suitability means that individual farm holdings are ill-suited to producing the volumes of produce that retailers demand, making it difficult to access conventional markets. However, in Section 7.4, we will see how some producers have overcome this issue. The difficulty in accessing the conventional agri-food supply chains is further compounded because of the increased costs of production associated with producing in the region, due to topography and the resultant smaller scales of production that this engenders, which is in contrast to other areas of the UK/world such as the East of

England where the *biophysical* capacity of the land is more congenial to horticultural production.

What this sub-section has shown is that the SW Wales region produces a significant proportion of the total Welsh horticultural production but that this production is small in scale relative to the UK and the SW Wales region's other main production types of meat and dairy. The range of produce grown is diverse, which can be explained because producers are engaged in crop based production for different reasons. Chapters 5 and 6 both discussed the production of cereal and fodder crops to feed livestock rather than to produce food for human consumption. It is notable that for all the cereal growing producers in the SW Wales region there was no mention of a cereals sector/producer by any of the interviewees or in any of the food business directories reviewed, which indicates that this activity is either largely or completely ancillary to other agricultural production, rather than being a business in its own right. Additionally, whilst it can be seen that there is land available for horticultural production there is, with the exception of a few cases, unlikely to be enough to satisfy a multiple retailer or possibly even a wholesaler. Even where horticultural production is possible, there are additional costs of production that potentially provide a disincentive for producers to diversify into this sector in SW Wales. Ultimately, what we can see is that there is a diverse horticultural production *industry* in SW Wales predicated upon the factors of *biophysical* capacity. It is potentially this diversity of production that causes problems for institutional *policy* makers trying to support the horticulture industry, which will be part of the subject of discussion in the next section.

7.2.3: Policy, perceptions and data of the Welsh horticultural sector

In the last section the basis for horticultural production in SW Wales, its decline and fragmented nature was presented. This section will primarily look at public and private policy and explore how tough private policy, in the form of high quality/conformity standards, coupled with a conflicting Welsh Assembly Government

public policy creates a difficult environment for further development in the SW Wales horticultural sector.

7.2.3.1: Private policy standards

The private policy standards of wholesalers and retailers play a significant role in shaping the horticultural production system. Quality standards for horticultural produce are governed through a class system set out in the Marketing of Fresh Horticultural Produce Regulations 2009 which divides most horticultural produce into three classes: Extra Class, Class 1 and Class 2 (DEFRA, 2011). Wholesalers and retailers must adhere to the regulations which insist that the labelling of horticultural produce includes its country of origin and class designation. However, as the discussion with Horticultural Producer 2 regarding their 'routes to market' shows, there are issues with the class system for produce:

'One of the key aspects of the horticultural sector, not just in SW Wales but across the UK, is that you have got to have two outlets: you have got to have an outlet for your class one and your class two and basically you can't sell class two anymore.' (Horticultural Producer 2)

Essentially Horticultural Producer 2 explained that producers have found that there is no commercial route for produce that fails to meet the private quality standards that retailers/wholesalers are demanding, which is a class 1 designation of quality and that they consequently had to retail their class 2 produce themselves. The issue regarding private quality standards is that they can place horticultural producers at a disadvantage; a report on food waste from the Institute of Mechanical Engineers (IMECHE) estimated that up to 30% of horticultural crops in the UK are never harvested due to the standards of the retailers driven, it is argued, by consumer tastes (IMECHE, 2013). This view that the consumer demands 'perfect' quality is counterpoised by the recent example of the UK apple crop; which was poor based on normal quality standards due to poor weather conditions and retailers relaxed their conformity standards in order that they had sufficient stock to market (English Apple and Pears Ltd, 2012).

There is a key question here, which cannot be examined within the auspices of this thesis, namely: who drives/decides what level of quality is acceptable for horticultural produce to be sold to the consumer? Is it a private *policy* standard or a *user/market preference* of the general public? Also, has the '24/7, 365 days of the year' perfect quality and availability removed consumers' ability to understand the relationship between variability of the presentational quality of horticultural produce and annual climatic conditions? Qualities, as defined by private standards, are based upon aspects of produce that can be easily quantified such as: shape, skin condition and consistency of size but this ignores the quality of taste which, arguably, is more important than how the fruit appears. Irrespective of the answers to these questions, the impact on producers in the horticultural industry is a complex choice of finding their own routes to market, investing in and developing ways of protecting their crops and risking a degree of wastage in a 'bad' year.

7.2.3.2: Welsh Assembly Government horticultural policy

It was suggested, in the previous section, that the diversity of horticultural production has in some way led to complications for the WAG in developing an effective strategy for the sector. This diversity, it will be argued, has led to difficulties in establishing a coherent SW Wales horticultural regime. Two questions arise that are pertinent, namely: how does the WAG define horticulture and where does horticulture sit in the wider WAG agri-food policy framework?

The 2010 Strategic Action Plan for the horticultural sector of Wales defines 'horticulture' broadly to: 'include fruit and vegetable production, ornamental plant production (including floriculture), novel crops, landscaping and turf' (WAG, 2010a, p.7). This definition of horticulture is much wider than the definition this chapter uses and includes the production of non-food based crops (ornamentals and turf) and non-farming based production (landscaping and market gardens/nurseries). This wide definition, though, does not appear to include cereals as a potential part of the

horticultural industry despite the fact that, based on Table 7.1, cereals make up approximately half of the estimated horticultural land use in Wales.

Furthermore, there is no central institution in Wales that deals with the horticultural sector. The most obvious institutional actor for the horticultural sector of Wales is the Centre for Alternative Land Use (CALU) which, up until September 2011⁸¹, was responsible for the delivery of a small part of the Farming Connect contract that advises producers on a wide range of agricultural issues (CALU, 2012). There are two aspects of note about CALU pertinent to the horticulture sector: firstly, its name as a centre of 'Alternative Land Use', which suggests that horticultural land use is in some way alternative or marginal compared to mainstream agriculture in Wales. Secondly, the range of factsheets CALU offers for producers includes: horticulture, woodlands, bio-energy, alternative livestock, arable crops and novel crops which demonstrates that horticultural production is part of a wider remit on alternative land use in Wales. This is in contrast to the dedicated centres for advice that the meat and dairy sectors possess. Interestingly, there are other institutions like HCC which also advise on horticultural production. An example of this is the 'Getting the most from your soil' guide released by HCC (2012a) which gives advice to meat producers on managing soils where brassicas and maize are being grown. This discussion on what horticultural production is really for is revisited in the conclusion of this chapter.

Turning to WAG's analysis of the horticultural sector; according to data used in WAG (2010b) there were 133 specialist horticultural producers in Wales in 2008. Whilst it is important to establish how many specialist producers of horticultural products there are in Wales, it does not fairly represent the size of the industry in Wales; as Section 7.2.2 shows there are over 1,500 producers in SW Wales alone for whom some kind of crop production is part of their production mix. The main point here is that, whilst looking at specialist horticultural producers may make sense in regions where there is an abundance of good agricultural land, it makes less sense in a country where such land is not found in large contiguous areas.

⁸¹ The contract for Farming Connect was held by a consortium comprising the development centres of Wales such as HCC, DDC and CALU until September 2011. After this date the contract passed to Mentre-a-busnes, who run a more generalised delivery system without dedicated advice centres.

The final aspect to consider in terms of WAG policy is those policies which directly affect producers. During the interviews, two points emerged: the first being the role that SFP⁸² support has played in the sector and the second being the issue of succession in the horticultural sector. The issue with SFP support for horticultural producers in the whole of Wales, rather than just SW Wales, is that until 2009 there was no entitlement to the SFP for land used for horticultural production. The following two quotes from interviewees discussing the SFP illustrate producers' mixed views about this:

'Worse than that 96% of the lamb is eaten outside Wales, so we are all paying to subsidise the lamb production.' (Horticultural Producer 2)

'I think the big difference for us has been that we have never been a subsidised sector of the industry and we have not thought: 'ah that will come in anyway'. This is the first year that we have had something and it is not the be all and end all of the business; it is still a very small part of that business.' (Horticultural Producer 1)

The two quotes show different attitudes to the position in which dedicated horticultural producers in SW Wales have been placed by their exclusion from the SFP mechanism. On the one hand the comment from Horticultural Producer 2 displays a degree of dissatisfaction and belief of unfairness of the position that horticultural producers are placed in compared to the principal agricultural activity in Wales. The alternative position from Horticultural Producer 1 shows that the industry has had to adapt to the financial constraints of not being in receipt of SFP and therefore developed as a business that is less reliant on state aid for its production in Wales.

Succession in the production side of the SW Wales agri-food industry is a pan, rather than sectoral, specific issue. However, in discussions with horticultural producers and processors, there emerged a narrative of greater concern with

⁸² Single Farm Payment

Horticultural Processor 1 noting that: 'The lack of succession [is an issue] not just within farms but within the whole sector'. The interview with Horticultural Producer 2 also followed similar lines by arguing that:

'They [WAG] are great on providing courses for hedge layering and fencing but where are the graduates? You actually need to have graduate training to get your head around the problems [of the horticultural sector] and if you put somebody who started this year they would be 3-4 years in university then by 2020 they would only have had six years practice in some way or another and they are the people who are going to have to pick up the pieces of this strategy period aren't they?'

Horticultural Producer 2 alludes to the technical complexities of horticultural production and the need for trained, specialist producers who understand the variety of growing conditions they might face in SW Wales in order to be successful. Whilst Horticultural Producer 2 suggested that the burden of training responsibility lay with the WAG, it is perhaps more accurate to suggest that the WAG's policies regarding training represent a further aspect of marginalisation that the horticulture sector experiences.

7.3: Meet the industry – Insights into the SW Wales horticultural sector

This section uses three different horticultural supply chains present in SW Wales to demonstrate the highly differentiated nature of these supply chains using the ST Systems heuristic as a model to compare each supply chain. This section focuses on the market, industry and biophysical elements as these best show the differences between the supply chains. The concluding section will draw on the evidence of this section to compare these different supply chains and then, together with the previous sections, will discuss the overall picture of the SW Wales horticultural sector and question whether a regime exists.

7.3.1: Pembrokeshire early potatoes – A regional producer-processor group

The supply chain for the majority of potatoes grown in Pembrokeshire was mentioned by a number of interviewees during the first phase of empirical interviews as a supply chain where producers, processors and a major retailer were all working together in a successful horticultural supply chain in SW Wales. The supply chain in question is held in such regard that it was cited as a reason why dairy producers in Pembrokeshire were reluctant to sign up to an independent processor-initiated contract for the region by Dairy Processor 2 who argued that they 'realised that they were isolated and out on a limb down there and they knew from their potato marketing experience that unless they had a [producer] co-operative looking after their best interests... they would have been individuals trying to sell into a very competitive market'. What these dairy producers realised is that it is better for them to have some control of the processing level in the supply chain because of the successful arrangement in the potato supply chain, in contrast to the continued issues in the dairy producer-processor-retailer relationships.

The processing company in this supply chain is part owned by the producers that supply it and part owned by a venture capitalist that has experience in the horticulture processing sector and, specifically, experience in supplying multiple retailers. The ownership structure of this producer-processor is an important facet of the overall supply chain logic as Horticultural Processor 1 explained the processing business is 'a farmer majority owned business, so that is the kind of message we are trying to get across is the trust and regional produce, but at the same time being of a scale and operation that is professional'. Horticultural Producer 1 argued that it was essential for the processing company to be part owned by the producers and for the producers to be directly involved themselves in the running of the processing company in the first instance so that 'it does not lose track from being a packing [facility] and an aid to getting our product to market to a profit making company, huge profit making company I should say'. Horticultural Producer 1 then went on to explain how this producer ownership structure in his view was more important in the SW Wales area compared to elsewhere in the UK: 'If it was privately owned then they

would have about two farmers left and have wrecked their grower base but be a major supplier. Well that is fine if you are in Cambridgeshire because you can go into Norfolk and Suffolk and you will find the growers. In Pembrokeshire we don't, if you lose a grower it is a genuine loss'. In essence what Horticultural Producer 1 is arguing is that the limitation in the horticulture producer/supplier base in SW Wales creates the necessity through which a symbiotic, rather than an abusive, relationship has been fostered between producers and their processor and retailers as a result of mutual needs. It is through this relationship that we can see the deep **industrial/cultural** model of co-operation that essentially has aligned the farmer and 'middle man's' interests by making the farmer the middle man.

The producer group has been incredibly successful in carving out a niche selling potatoes in Wales with a multiple retailer by exploiting the **market preferences** of the Welsh consumer, who Horticultural Processor 1 described as being: 'a very loyal consumer'. This focus on the Welsh consumer through regional branding has created a virtuous circle between the producer, processor and retailers as Horticultural Processor 1 explained: 'When we went into [multiple retailer] first of all and replaced English product on the shelves, essentially, we saw double digit increases in sales, just in like for like products'.

Moving from being an independent producer, to a member of a specialist producer group had multiple implications for the producers. During the interview Horticultural Producer 1 explained a number of changes as these extracts from the interview show:

'What we were doing, like most traditional Pembrokeshire farms were doing was little bit of everything, a few cauliflowers, a few cabbages, a few broccoli and really market garden type farming and now I think we have specialised a bit more.'

'We are thinking of going back into cauliflowers if the market demands us to do that. The only reason we pulled out is because it didn't at that time'

'It was easier to specialise in something and equip yourself for something than it was to just be doing a little bit of everything really and we wanted to play a bigger part in the supermarkets and now it comes to the stage where we are really involved with [producer group] and we are one of the largest shareholders. That group has gotten smaller and our shareholding has increased. So basically we are trying to equip ourselves to being more of a supermarket multiple supplier rather than a small farmers market type basically.'

These extracts show how producers like Horticultural Producer 1 have specialised their production because of both a push factor of falling demand for regionally grown produce at the time and pull factors that specialisation offered to them. This has meant adapting their business model. The first adaptation arises in Horticultural Producer 1's use of land, insofar as they rent additional land to reduce the amount of chemicals they use which Horticultural Producer 1 explained as being: 'still very very high compared to other crops but it is as low as you can possibly get with that kind of crop' stating that:

'If we rent land in then we don't have to [use] the chemicals to sort the diseases out ... You can try and cut diseases out but by renting fresh land instead of trying to sterilise the land you have got with chemicals; it is better to rent fresh land in on a bigger rotation. It sits better with us, it sits better with our customers and it gives us better job satisfaction as well.'

Essentially what Horticultural Producer 1 is able to do is take advantage of land around his holding which is under-used from a horticultural perspective by virtue of it being used for dairy or livestock production. By doing so, he reduces the need for excessive amounts of chemicals in order to enable him to constantly replant the same land. This allows Horticultural Producer 1 to continue to specialise his production to meet the 52 week a year demands that multiple retailers now make for the supply of potatoes which creates a *market preference*. In order to meet this preference the producer has adapted their *biophysical* constraints to have a single

main crop by renting additional land as well as having a livestock enterprise for use on his own holding when 'resting' fields.

Overall, what we can see in Horticultural Producer 1 & Horticultural Processor 1 is a system of vertical and horizontal integration. This has created a concentration of potato production sufficient to supply a multiple retailer and remove the producers from the vagaries of the horticultural wholesale market to some extent. One of the key benefits is that producer and processor interests are aligned and focused on the long term endurance of both businesses as Horticultural Producer 1 explains:

'The idea is that the grower is represented in [the processing company]. So any decisions that have to be made, rather than being making money orientated, it is the viability of the group orientated.'

This integration also required producers to specialise their production models, much in the same way that producers in other parts of the UK have done so in order to meet the technical demands of producing quantity and quality produce for a retailer. There have been benefits for the supply chain in the close working relationships between producer-processor and retailer in managing that demand and ensuring good returns on production for producers as Horticultural Producer 1 explains:

'If you take Desiree Reds, say, they don't really grow that well down here. They love deep silty soils of the fens which is what they were bred for really so you get problems here. They go all nobbly and you get these kinds of problems with them. But [the multiple retailer] demands them as a product so for the guys we have got growing them we have got to make sure that the price is right for that so therefore we balance the prices out of all the crops to make sure that our growers are covered we take a little bit out of one product and add a bit more for another. It is one of our hardest jobs really.'

One final point to consider is how Horticultural Producer 1 has minimised the inputs into the fields by using a rented, extended rotation model. However, this model of

production works only when there are other producers in the region who are not using suitable land for horticulture and are willing to rent it out at a price that is commercially viable. This does lead to the question of what might happen should more producers choose to move into horticulture.

7.3.2: Horticultural Producer 2 - The medium-sized, multiple products, multiple markets producer

This producer grows a range of horticultural produce focused principally on a floricultural business that has sufficient size and quality to supply a multiple retailer in Wales but also extends into a diverse soft fruit and vegetable business. They have been engaged in the business on the same holding for 29 years and grow their produce on a mixture of owned and long term rented land, which aids their rotation pattern for the floriculture business.

The first aspect of interest is Horticultural Producer 2's growing strategy. During the interview they named 8 varieties of horticultural crops that they were currently growing but it was how the main three crops came together into the 'growing year' of Horticultural Producer 2 that is particularly interesting:

'The daffodils start in December picking and we pick those until May, by which time we are cutting asparagus and we will be cutting that until June and by the time we finish cutting the asparagus we are already picking strawberries and as we pick strawberries in the summer we start lifting the daffodil bulbs and they dry during July and August. We then clean and grade them and plant back what we need to and then sell the surplus of the bulbs and that is the end of our year.'

As it can be seen from the previous quotation, Horticultural Producer 2 has designed a production system that allows them to operate a year round, rather than a seasonal, business. This addresses a *biophysical* issue of horticultural production where growing one type of produce may lead to peaks and troughs in the workload

on the holding. By doing so Horticultural Producer 2 has been able to: 'have the continuity to keep people employed' and thus optimise its *industry* practices. Furthermore, the choice of crops is significant, as Horticultural Producer 2 explained about their current choice of crops: 'they are crops which are fairly high value, which has suited us because our holding is not very big and to grow low value crops, well we did at first but we found that it was harder to get people to come and do the work with us than the crops that we have now settled to'.

Whilst some of the changes to their growing strategy have arisen out of a need to produce crops that matched their requirements, Horticultural Producer 2 has also had to make amendments to their growing strategy in response to changing conditions in the wholesaler/retailer *markets* in SW Wales and the wider South Wales regions. Specifically, Horticultural Producer 2 discussed the need to shift their main floricultural product supply chains explaining that: 'we had to change drastically the way we sold daffodils because we had been selling to independent retailers and those independent retailers have dropped out considerably in the last 6-7 years because the supermarkets have become more prominent'. Horticultural Producer 2 went on to comment that: 'we were either in the position of having to give up ourselves on the acreage that we had or increasing the acreage in order to satisfy a multiple.' Ultimately, this producer has aligned part of their production towards supplying a multiple retailer, thus shifting the focus of their *market* in response to changing conditions in the SW Wales horticultural sector. The balance of the different produce types (mainly soft fruits) that meet class 1 quality standards are partly sold to the remaining wholesalers in the region, whom mostly now collect rather receive deliveries. Class 2 produce is sold at local farmers markets alongside some of their class 1 produce, which is labeled it to show that it is a 'bit of a bargain for the customer'.

Another aspect of interest noted during the interview with Horticultural Producer 2 was their attitude to and relationship with the processor and multiple retailer with which they are involved for the greater proportion of their produce. There are a couple of aspects to this relationship that are worthy of note: firstly, the basis upon

which the price the producer receives is negotiated and, secondly, the degree to which information is shared from retailer to producer.

The producer explained that their produce was sold on a 'cost plus' basis, whereby the producer submits their estimated costs of production to their processor who uses them to negotiate with the retailer as part of a process of agreeing the price that the producer will receive. Horticultural Producer 2 felt that this gave them some leverage in the negotiations, contrary to most other producers, explaining that: 'I think that is a misunderstanding really amongst a lot of producers in their perception of multiples; they tend to think that they have no leverage whatsoever but they do; they [the producers] can submit their costs and they can say no'. Horticultural Producer 2 did identify that the cost plus basis required a particular attitude towards costs stating that 'the essential thing really is to be pessimistic about what you are going to produce'. The cost plus basis guarantees that producers cover their costs plus something extra should the retailer agree and is evidence of the type of *cultural* relations that govern the market relationships in this supply chain. This form of price 'negotiation' contrasts with the traditional wholesaler markets which Horticultural Producer 2 describes as: 'work[ing] on a firm price they do not want to fluctuate', which allowed the producer to view themselves as not being price takers.

The second element of the relationship between producer and processor/retailer of interest is the transfer of market knowledge between them. Horticultural Producer 2 discussed the nature of this at some length citing that: 'you do get a lot of information back, it is definitely a two way street... for instance we got the till data from [retailer] for all their South Wales stores before we started ... we knew exactly what they were selling ... and we could look at the fluctuation week to week, high days and holidays, which stores, what the potential was and it was a huge amount of information they supplied free'⁸³. Horticultural Producer 2 also discussed how the more open flow of information assists them:

'There have been times with [the processor] that you go through three/four/five days expecting, for example, to get higher orders day by day, not

⁸³ The quotation is paraphrased from a much longer description for clarity.

happening not happening. Ring [the processor] and say 'Look we are accumulating [product] like nobody's business, what is going to happen next week?' and he will do something. What he did do is that we got all the North Wales stores to sell to last year as well as the South Wales stores. And he negotiated that with [the retailer].'

As the quotation suggests, this ability to leverage support from your buyers and troubleshoot supply chain problems has helped Horticultural Producer 2 deal with sales issues. This flow of information and assistance contrasts with the conventional wholesalers, whom Horticultural Producer 2 had dealt with in the past describing the change as a being 'like a breath of fresh air', when dealing with one of the multiple retailers. Ultimately the *culture* of a more open relationship with their processor and multiple retailer has elicited a useful *knowledge* exchange.

What Horticultural Producer 2 shows is that it is possible for producers to have a foot in both the conventional and alternative supply chain worlds in horticultural production. They have achieved this by specialising in high value, seasonal crops. The cropping has been carefully selected to enable them to organise a year round work cycle (but not selling cycle) that allows the producer to employ a few workers throughout the year, thus ameliorating the pressures for seasonal labour to some extent, albeit not completely. Horticultural Producer 2 shows that with a sensitive processor/wholesaler in between themselves and the retailer they have been able to foster a meaningful and responsive relationship with the retailer they sell to. Their continued activity with mainstream wholesalers and farmers markets as well as the multiple retailer allows them to spread the risk, to some extent, as well as provide an outlet for otherwise un-saleable class 2 produce via the farmers market.

7.3.3: Horticultural Producer 3 - Farm shops and micro enterprises.

Horticultural Producer 3⁸⁴ was selected to be interviewed because they run one of a relatively small number of well-known farm shops in the region and were mentioned by a number of other interviewees. Horticultural Producer 3 is an interesting case because over time they have created a thriving local food business in the form of their farm shop, which has developed from an embryonic level in the late 1980's in response to pressures in the dairy market as Horticultural Producer 3 explained: 'The milk quotas affected us with the herd, so we started growing our own vegetables and we got a green top milk license⁸⁵ and sold our milk direct from the farm'.

Horticultural Producer 3 went on to explain that the farm shop business continued to develop over time and was: 'customer led really; people said 'oh why don't you do a bit of cream or a bit of yoghurt as well as the vegetables and [my wife] started cooking'. What appears to have happened, partially in response to market demands from the local customers and partly through their own innovation, is that Horticultural Producer 3 increasingly sought to extend their product range to create a wider marketability of their farm shop. Finally, there are three key aspects of Horticultural Producer 3's business which are of particular interest. The first is the arrangements which Horticultural Producer 3 has developed to supply the farm shop, the second is the range of outlets that they have for selling their produce and, finally, the approach the producer has to growing crops in the field.

The producer and his wife run the farm shop as well as a store cattle business and a 'haylage' business but, as they put it, 'what happened was that we got to the stage where we were just too busy to do everything ourselves'. This created issues for Horticultural Producer 3 in that they did not have enough time to grow the produce

⁸⁴ Horticultural Producer 3 is a husband and wife team who ran the farm shop jointly but who have slightly different roles. They were interviewed together as this provided greater insight into their overall business.

⁸⁵ Green top milk is a reference to semi-skimmed milk which universally comes with a green plastic screw top in the UK and is the most popular type of milk sold in the UK (DairyCo, 2012). Red top milk is skimmed milk and blue top milk is whole milk.

and sell it but, rather than engage a wholesaler to reduce the pressure on themselves for the production of what they sold, they instead:

‘turned to friends and neighbours initially and said you know ‘can you help me cook this or can you grow that’ and then as we got going we liked that idea and even to this day we have continued it, we try get as much local and Welsh’.

The farm shop enterprise is now the primary source of income and has re-shaped the agricultural activity of the farm holding, with the majority of the land being used for store cattle and grass production, 2.5 acres of potatoes and some vegetables, salads and herbs under poly-tunnel coverage. The farm shop sells a range of products including fresh fruit and vegetables, meat, fish, bread and staples sourced from ‘over 130 suppliers now’ most of which is sourced locally or from within Wales. Horticultural Producer 3 describes his supplying base as being:

‘like-minded people to ourselves really in the fact that it is small scale, it is unique to either us and them, so it is either sold to us or to farmers markets. We help a lot of small producers... because obviously if you can retail it yourself you make more money but farmers markets only give them an outlet once a week or even once a month sometimes so we will take the food on the other days and we do understand that on the farmers market days we won’t have it.’

During the interview with Horticultural Producer 3 it became apparent that these ‘like-minded people’ came from an array of sources including smallholdings in the region but also retirees who are growing their own vegetables which, as Horticultural Producer 3 explained, is: ‘another way that we get a lot of fresh vegetables... some people will sell us their surplus.’ Furthermore Horticultural Producer 3 explained that he has a teenager who grows some beans and salad crops for them and overall described that, regardless of who was selling the produce, if it is grown locally and: ‘if it is the right quality and consistency we will do, we certainly offer them a reasonable price for it, in between the wholesale and retail price’.

Overall, it is apparent that Horticultural Producer 3 has a large supplier base representing a diverse range of enterprises from small scale producers and local processors⁸⁶ to amateur growers and processors. This use of multiple, small scale or micro businesses as a supply chain network is an *industry* facet of their business. It also represents a *cultural* attitude of Horticultural Producer 3 in their philosophy of sourcing local and helping out multiple local businesses, which is exemplified in their attitudes to payment of their suppliers:

‘We try and pay a lot of them straight away in cash. It is important for them to have a cashflow. I think that is important when you are starting in business. We are not like a supermarket who will say that they will pay you in six weeks’ time.’

Whilst this attitude of assisting local businesses is laudable, the large number of potential suppliers creates a logistical issue, which Horticultural Producer 3 minimises by: ‘not actually fetch[ing] anything if we can avoid it’. Instead, what Horticultural Producer 3 does is buy from wholesalers, as well as the micro suppliers, but uses them in a novel manner by: ‘use[ing] them [the wholesalers] as couriers’. Horticultural Producer 3 explained that he often arranges for producers to meet these couriers ‘in a certain car park at a certain time’ in order that produce can be collected and delivered to themselves as the wholesalers’ delivery vans pass their farm shop. This cost sharing arrangement with local wholesalers, together with offering suppliers slightly better prices for delivery, is another example of the *industry* relationships that Horticultural Producer 3 has developed to deal with the *technological* issues of logistics.

Whilst the farm shop is the central part of the farm business it should be noted that it has a seasonal customer base. Horticultural Producer 3 observed that the farm shop had a cyclical trend with the clientele switching between local residents and tourists visiting the area. Horticultural Producer 3 explained that: ‘the other thing that happens in July – September is that, yes, you have got the tourists but the local

⁸⁶ During the interview a small consignment of bread was delivered by a local baker and it was apparent from perusing the produce on offer within the shop that they receive goods from a local smoker, several cheesemakers in the region as well as processed meat products from a smallholder and local butcher.

people are still growing their own and so we lose some of that local custom', which balances out with the rest of the year when they have more local and less tourist trade at the shop itself, thus reducing the seasonality in their *market*.

Horticultural Producer 3 has used the farm shop as a basis to link into other food service sectors within the area, most notably in the hospitality and public sectors. Horticultural Producer 3 commented that, for the hospitality sector, they: 'we do a little bit of trade, we sell to pubs and restaurants in the area and, in the last three years, we have started doing Welsh food hampers for holiday homes for people who come into the area to give them an experience of Welsh food. We did it because we used to get the comment 'oh, we wish we knew about you on Monday''. By contrast, Horticultural Producer 3 discussed their trade with local school, which is on a much smaller scale, explaining that: 'we deal with 3-4 small primary schools in the area supplying their healthy eating tuck shops. We supply them with fruit and healthy juices to sell in the break times'. Whilst this level of trade might seem to be too small to be of much significance for Horticultural Producer 3 they argued that it is significant because:

'It is a two way thing actually; it works well for us because we sell them British apples sourced from Hereford or Worcester, apples that you would not usual[ly] see in the supermarket, and they have this lovely apple at school and they go home and tell mum but she cannot get it in the supermarket so we see mum here as well then.'

What the above quote and previous paragraphs show is that Horticulture Producer 3 has become more than simply a micro local food orientated supermarket that serves the local and tourist trade in the area (although this on its own is impressive). They also supply the hospitality and public sector, albeit in a small but significant ways. Horticultural Producer 3, in essence, is more than just a producer and local retailer but also a local wholesaler, having multiple routes to market for the large range of local products that they carry, which is part of the *industry* facet. It is also apparent that by providing novel/non-standard varieties of products to the market, Horticultural Producer 3 has created a situation where they can offer a

uniqueness/point-of-difference in comparison to the multiple retailers in the area, thus influencing *user/market preferences*.

Horticultural Producer 3 is an intriguing producer and, more precisely, a producer and retailer within the context of the SW Wales region. It is an enterprise that has diversified its principal income stream from being a beef cattle producer into a farm shop that specialises in the full range of regional produce. Whilst producing for themselves and having a feed business has helped, both interviewees were emphatic that it was the farm shop that was the main focus of the business. The success of this enterprise rests on personal relationships with its suppliers from whom it sources the majority of its produce. However, this co-operation between wholesalers and suppliers appears to breed inter-dependence between them which is so successful that some wholesalers are happy to act as agents for Horticulture Producer 3 in collecting their supplies from other producer/processors. There is a sense of a network that breeds benefits for all involved and appears to foster development within the rural community. Were this a business model that could be adopted across more of the agri-food sector in SW Wales it could arguably foster greater internal sustainability within the social dimension of the region by building capacity through both the *cultural* and *industrial* elements of the regional agri-food system.

7.4: Conclusion

The core question posed at the start of this chapter is whether a regional horticultural regime exists in SW Wales? There are two things to consider here, firstly, whether a single, highly dominant horticultural sub-sector in SW Wales such as potatoes may be described as a regime. Secondly, whether the diverse nature of production types, routes to market and market relationships between producers and their buyers means that a single horticultural regime cannot exist due to the lack of coherency in the key regime elements of industry and culture in particular?

There are elements of the SW Wales Horticultural regime where there is a good degree of consistency based on both the interviews and observed secondary data. Firstly, the horticultural sector shares common public and, to an extent, private policy aspects. The public policy aspect has provided a relative disincentive signal to producers through a series of mixed messages including: the breadth of different businesses types included in the horticultural strategy group⁸⁷, positioning of advice historically through the Centre of Alternative Land Use and the setting of horticulture outside of the SFP framework prior to 2007. The private policy standards have driven the horticultural industry in the UK towards a high quality and high volume logic, which constructs quality as being homogenous perfection in shape and colour of produce. Some producers in the region have adapted their *market* orientation in response to this logic. This can be seen in Table 7.5, which provides a summary of the socio-technological configuration of the three horticultural case studies discussed in Section 7.3.

⁸⁷ This included market gardening, turf growers, ornamental (flower growing), landscaping and field crop growers.

Table 7.5: Socio-technological summary of the three horticultural industry case studies.

	User / Market Preferences	Policy	Science / Knowledge	Industry	Culture	Technology	Biophysical
Regional producer-processor group	<ul style="list-style-type: none"> - Uses regional provenance and the loyalty of Welsh consumers to foster demand. - Single key route to market. 	<ul style="list-style-type: none"> - Producers interests protected by joint ownership of processor. 	<ul style="list-style-type: none"> - Benefit of crop specialisation to focus producers time and skills 	<ul style="list-style-type: none"> - Horizontal producer co-operation and vertical producer-processor-retailer integration. 	<ul style="list-style-type: none"> - Producer ownership of processing operations to support producers businesses. - Can do attitude to retailer requests but subject to ensuring overall profitability for producers 	<ul style="list-style-type: none"> - Reliance on large scale refrigeration to ensure 365 day supply to retailer. 	<ul style="list-style-type: none"> - Rents land to reduce need for inputs to produce desired crop yields and allows producers to 'rest' their fields.
The Medium Sized, multiple products, multiple markets producer	<ul style="list-style-type: none"> - Multiple market outlets (multiple retailer, local wholesalers and local markets). - Reduced market for class 2 produce causes producer to create own route to market. 	<ul style="list-style-type: none"> - Cost-plus pricing policies used to agree the prices paid to producer by multiple retailer. 	<ul style="list-style-type: none"> - Absence of specialist horticultural advice in the Wales region. 	<ul style="list-style-type: none"> - Reliance on labour rather than large machinery. - Loss of regional wholesalers creates need to develop new routes to market. 	<ul style="list-style-type: none"> - Good working relationship with multiple and key-wholesaler. - Trust allows flow of key information both up and down the supply chain. 		<ul style="list-style-type: none"> - Core group of crops that provide as even a labour requirement throughout the year as possible.
Farm shops and micro enterprises	<ul style="list-style-type: none"> - Local and tourism market peaks reduces seasonality in demand. - Sells range of non-standard fresh produce (i.e. unlikely to be found in supermarkets). 		<ul style="list-style-type: none"> - Development of innate logistical knowledge/networking skills to deliver produce to store 	<ul style="list-style-type: none"> - Large network of small/medium producers and processors developed to supply farm shop. 	<ul style="list-style-type: none"> - Culture of co-operation with wholesalers and suppliers to optimise delivery of goods to farm shop. - Tries to look after suppliers by paying promptly (in contrast to industry standard). 	<ul style="list-style-type: none"> - Utilises cooking and refrigeration technology to minimise food waste. 	<ul style="list-style-type: none"> - Small amount of own crops grown, majority of land used for hay/silage to allow owners to concentrate on core farm shop business.

Some producer/processors such as Horticultural Producer 1 and Horticultural Processor 1 have adapted to this new logic by continued specialisation and adaptation to the specific growing conditions of the region. These horticultural specialists foster horizontal and vertical integration within their supply chains creating strong working relationships between all participants as Table 7.5 shows.

Other producers have innovated in different ways to Horticultural Producer 1 most notably by diversifying their routes to **market** as both Horticultural Producers 2 and 3 have done. There is a distinction between the Horticultural Producers 2 and 3; most notably in their market orientation. Horticultural Producer 2 focuses more on traditional routes to market (multiples, wholesalers and farmers markets) whereas Horticultural Producer 3's farm shop business has become a hub for a wide range of small scale regional produce that focuses on the local market in a more intense way than either Horticultural Producer 1 or 2. However, it is interesting to note that all three have used Welsh branding as part of their **marketing** focus.

The **biophysical** approach to production is different in all three producers with Horticultural Producer 1 using large rotations through a land rental approach to ameliorate against disease in his potato crop, which he then stores in refrigerated sheds to provide the year round supply the multiples require. Horticultural Producer 2, on the other hand, has a growing strategy using a mixture of field and poly-tunnel-based crops that allows for a year round labour requirement, with seasonal high value crops making up the majority of their planting. Horticultural Producer 3 produces most of his home grown horticultural produce within a few poly-tunnels, leaving most of his field acreages to grass for a feed growing enterprise; relying instead on a disaggregated production system sourced from third party growers for most of their horticultural produce.

7.4.1: To be a regime or not a regime? That is the question

The horticultural sector in SW Wales is the most difficult to analyse from an ST Systems perspective and in some ways challenged the appropriateness of using sector specific, regional level aggregations as the framing for the analysis of the SW Wales agri-food industry. There are a few possible approaches to interpreting what can be seen in SW Wales from a ST systems perspective. Firstly, we can consider that horticultural production can be differentiated into a series of semi-autonomous regimes (e.g. potatoes, field crops, soft fruit, top fruit etc) within the region. These regimes are then either nested together to become the SW Wales horticultural regime->UK horticultural regime->EU horticultural regime or are nested by production types into increasingly larger spatial regimes SW Wales potato regime->UK potato regime etc.

Potato production in SW Wales is the most likely sector to be considered a product specific sub-sector. The potato production sector of SW Wales was shown in Figure 7.6 to be highly spatially concentrated in the region and, through the interviews with Horticultural Processor 1 and Producer 1, it was further shown that this single dedicated supply chain probably incorporated the majority of the production from the region. The dedicated supply chain means that most of the potato production in the region is governed by the same set of standards/norms and will have a common set of ST elements. Does this conformity then translate into a SW Wales potato regime? The internal consistency generated by a single supply chain for potatoes in SW Wales does suggest a regime exists. However, the established literature (Geels, 2002 and Konrad et al, 2008) refers to firms in the plural when discussing them as actors within ST regimes and systems suggesting that a producer group, single processor and single multiple retailer does not equate to a regime.⁸⁸

⁸⁸ It is more likely that a UK wide ST regime for potatoes does exist, of which the supply chain located in SW Wales would be a part. This thesis does not, however, set out to research this but suggests that this would be a valid area for further research. Section 8.4 will discuss future research challenges for the using the ST systems theory in agri-food research.

What is apparent from Table 7.5 is that there is diversity in the socio-technological configurations within the horticultural supply chains case studies. This diversity extends not only to what they were producing but how the produce flowed through very differently configured supply chains. This diversity makes it particularly difficult to claim that there is coherence in the industrial or cultural configurations of these supply chains. An alternative view of the SW Wales sector is that the overall heterogeneity seen in the producer level of the horticultural sector in SW Wales may itself be indicative element of regime. If this is the case then there are still some common elements in the form of public and private policy standards, the non-contiguous nature of suitable land from a biophysical perspective and, possibly, user/market preferences for 'perfect' products influenced by the private policy standards. How these are then interpreted and adapted to by producers and processors within the region leads to a heterogeneous set of configurations for industry, culture, science/technology and, to an extent, biophysical elements depending on the individual interpretations.

A further consideration in terms of the application of the socio-technological systems framework arises from the empirical evidence seen in the SW Wales horticulture sector. This shows examples of both competition between industries/regimes⁸⁹ that are nested within the same geographic region and also how actors/norms at larger spatial regime levels can affect the interplay between nested industries/regimes within a region.

Chapter 3 discussed the idea of nested regimes/industries, arguing that it is possible for more than one regime to operate at a given spatial scale and, moreover, that multiple scales of regimes can exist within the same ST system. Chapter 3 highlighted that the challenge of nested regimes is in how to demarcate where one regime starts and another finishes. It was argued that Konrad et al's (2008) idea, that it is the density and strength of connections between the ST constellation of elements that can be used to create an internal consistency of a single regime, was a

⁸⁹ For this point regime and industry should be read to mean sub-sectoral industries within the same geographic region (i.e. meat, dairy horticulture)

useful approach for the demarcation of regimes. What has been not discussed, however, is the interaction between regimes occupying similar spatial scales. There is an example in the SW Wales case study of knowledge sharing between industries/regimes. In this case it was found that some dairy producers learnt best practice for co-operative arrangements from the successful potato co-operative. This raises a question that was not initially conceived as part of this thesis regarding whether the existence or lack of knowledge exchanges between regimes at the same spatial scale helps to foster/hinder rural development outcomes? This is an aspect that requires further research as is noted in section 8.4.

The degree to which an industry/sector/sub-sector must be homogenous in the nature of its constellation of elements and whether there is sufficient evidence to suggest that a horticultural regime exists in the SW Wales at all, can be better understood as part of an overall discussion of the utility of the ST Systems heuristic model. This is discussed further in section 8.2.2 and 8.2.3, where the three regional sub-sectors, and the interplay between them is discussed in terms of the SW Wales agri-food industry and how it can be seen as set of co-evolutionary regimes/sub-sectors existing within a single region.

Chapter 8

Conclusion

8.1: Introduction

Chapter 2 introduced an overview of the research conducted within the fields of rural development, agri-food supply chains and local food. There is much within these fields that frames and gives an understanding of the nature of how rural regions, their economies and, in particular, local food supply chains might be developed along the lines of fostering rural development. Whilst there was much utility to the existing research, a number of points were raised as to where there were gaps in the research field; principally the lack of comparative regional research between conventional agri-food supply chains and 'alternative' local food supply chains.

The Socio-Technological Systems framework developed by Geels (2004), Geels & Schot (2007) and Geels & Kemp (2007) was introduced in Chapter 3 and proposed as a framework that would allow a comparison between alternative and conventional supply chains as well as between different agri-food sectors within the same geographic region. The aim of using the ST systems framework in this empirical context is to bring new theoretical understandings to the role that agri-food systems play in shaping the rural economy and rural development of a region. These two literature review chapters generated the following set of four interlinked research questions:

1. What are the structural/network/governance characteristics of the SW Wales agri-food industry and is there significant differentiation between specific agri-food sub-sectors?
2. How can the heuristic model of Socio-Technological Systems be applied to the analysis of regional agri-food systems and the specific sectors within such regions? Does the ST framework allow us to develop a better understanding of changes in regional agri-food systems?

3. How has the SW Wales agri-food industry changed in response to developments in the wider national and international agri-food system? Can this change be understood as transitions in regional agri-food regime(s)?
4. Does an understanding of rural agri-food regions as differentiated Socio-Technological regime(s) help to analyse the transitional nature of regional agri-food systems, including the role that public policy plays in fostering their development?

This thesis sets out to provide, through answering these research questions, a contribution towards the understanding of regional agri-food systems, their evolution and how these systems can contribute to the development of rural regions. There are essentially two key strands to this research; the first strand focuses on whether a Socio-Technological (ST) systems approach can be used to understand the dynamics of regional agri-food systems and their development. The second strand of the thesis then asks whether the ST systems approach provides new insights into how regional agri-food systems transition from one configuration to another and, furthermore, what the implications are in terms of rural development and the role of public policy.

This final chapter is split into three broad sections. The first section examines the application of the ST systems framework to regional agri-food systems and the second section deals with what contributions this research makes to the field of rural development. The final section concludes this thesis with a discussion regarding where the author sees that the research needs to be pursued next to further develop our understanding of regional agri-food systems and considers what insights this thesis has produced regarding the application of the ST systems framework.

8.2: Utility of ST systems theory for regional agri-food research

This section of the chapter will review the application of ST systems heuristic model and how this can be used to interpret regional agri-food systems. One of the principal aims of Chapters 5 to 7 was to establish whether or not a regime existed at a sub-sector level in the SW Wales agri-food industry and, moreover, to ascertain the disposition of the constellation of elements for each agri-food sub-sector. To some extent it could be argued that these aims were the first hurdle of this research, because an appropriate application of the ST systems framework allows for a more systematic analysis of these regional agri-food systems. If a regime does not exist within a particular sub-sector, such as is found to be the case for the SW Wales horticultural sector, this is as much of a finding as locating a dynamically stable sub-sectoral regional regime.

The deployment of the ST systems heuristic model to the sub-sectoral level regional agri-food system was successfully achieved for the most part, albeit that there were occasional difficulties in fully populating the entire regime constellation of elements, particularly in terms of technology for the SW Wales meat regime⁹⁰. Whilst the multi-level perspective (MLP) of the ST heuristic model is split into the three levels: landscape, regime and niche, it is primarily the niche and regime levels of the model that this thesis is focused upon. This is because regime and niches largely exist within the geographic region, whereas landscape pressures arose more frequently from higher geographic level agri-food regimes rather than aspects that were genuinely outside of the agri-food system (as shown in Figure 3.4 in Chapter 3). There are a number of aspects to be discussed regarding the application of the ST systems heuristic model, principally: the nature of agri-food niches in SW Wales, the nature of the sub-sector level regimes in SW Wales and the future transitions in the agri-food regimes in SW Wales.

⁹⁰ The issue with technology is that it is largely a background aspect of this regime. Technology is used by the actors of the regime and is deeply embedded in production and processing practices but in such a way that it is not something that was discussed by interviewees. This is in contrast to the SW Wales dairy regime which has become increasingly industrialised with automated technologies and shed based dairying systems, which meant that actors in the dairy regime did discuss the technological aspects of their ST regime.

8.2.1 Characteristics of agri-food niches in SW Wales

How the niche level of the ST systems heuristic model could be applied to regional agri- food systems was discussed in Chapter 3. It was proposed that where businesses/supply chains within a particular agri-food sub-sector exhibited broadly similar constellations of ST elements to other businesses engaged in that same sub-sector within the region, they coalesce together and can be used as exemplars to analyse the form of that particular sub-sector's regional regime; whereas those that do not conform might be considered to be niches. Initially it was expected that the niches would uniformly represent those businesses or supply chains that would be considered to be producing locality or local food as these would present different overall production methodologies and business logics to the conventional sub-sectors in the region. As the empirical fieldwork progressed it became apparent that the distinction between regime and niche supply chains appeared to be blurred. In some cases exemplar supply chains for the regime had elements of their business that appeared to deviate from regime norms and therefore suggested potential niche businesses, whereas there were elements of niche case studies that closely resembled the norms of the regime.

This blurring of where businesses and supply chains represented niches or regime level actors largely concurs with van der Ploeg et al's (2004) assertion that these distinctions are not clear cut. It was not until a greater analysis of the all first phase and second phase empirical interviews, together with consideration of the available secondary data sources, was undertaken that clarity emerged regarding whether certain interviewees represented a regime or niche level actor. Overall, there are three points that need be discussed: what supply chains can be classed as being niches, what differences can be seen between the niches across the different sectors and to what extent are the niches seen within the empirical fieldwork likely to be absorbed as part of some current or future regime transformation (i.e. what is their assimilative potential).

Firstly, there is the question of when a particular supply chain or business can be considered to be a niche or part of the regime? This is a complex question to answer with respect to this particular application of the ST systems framework. Whereas in other previous works, such as Verbong & Geels (2007) on the Dutch energy system or Hillman & Sandén's (2008) on future transitions in alternative transport fuels, there are clear alternatives (renewable energy) to the incumbent energy regimes; with regional agri-food systems the alternatives existing within the same geographic region were less clearly defined. There were, in fact, a few cases during the empirical interviews when it was necessary to question where the particular interviewees' data would fit into the framework, either as a niche or a regime.

Meat Producer 2 is a good example of this as they grew their own feed/fodder crops, something which not all meat producers did⁹¹. At first glance, from the empirical data, it suggested that Meat Producer 2 might be an innovation in the meat regime of SW Wales. When reviewing the secondary data from the farm business survey provided by WAG and the evidence of forage growing advice from HCC (2012) it became apparent that cereal crops were more prevalent in the region than previously suggested based on just the fieldwork, suggesting that this sort of activity, whilst not widespread among meat producers in the region, was probably not a niche innovation.

This example highlights the strength of a mixed methods approach for researching agri-food systems but also shows the difficulty in abstracting the existence of niches in certain respects. In Meat Producer 2 we found a producer who appeared to have a different *knowledge-technology-biophysical* approach to production compared to the straight grass based meat producers of the SW Wales region. However, Meat Producer 2 had the same underlying logics in his business operation, sold through similar routes to *markets* and was exposed to the same *policy* infrastructure as the more grass based meat producers and therefore it was considered to be part of the regime.




⁹¹ In the case of the meat producers interviewed, Meat Producer 2 was the only producer that grew any fodder crops, although there were dairy producers that did grow crops for feed as well.

Conversely, it might be argued that the Meat Producer Groups seen emerging in the SW Wales region were not in fact niche innovations as they, like Meat Producer 2, also ran their businesses on many of the same logics as non-producer group meat producers. The reason that the Meat Producer Groups do currently represent a niche innovation in the SW Wales Meat regime is that they challenge the underlying logic that pervades the meat sector in that region where producers neither co-operate with regard to the sale of their produce nor negotiate directly with the retailer.

The differences that can be seen between the niches across the different sectors are best investigated with the aid of a summary analysis of the niches studied, which is shown in Table 8.1. There were four key dimensions that became apparent in how the niches within the three sectors could be contrasted: the processing arrangements for the supply chain, the extent of the location of their markets, the matrix of science, technology and biophysical capital used to produce the food products and the orientation of the market/industry dynamic.

Table 8.1 : Summary of the niches researched in the SW Wales agri-food system

	Processing	Market Location	Science/Know-Tech-Bio matrix	Market / Industry Orientation	Ability to be assimilated by the regime
Meat	Producer Groups Innovation	UK (principally England)	Similar to Regime	Similar to Regime but with increased producer negotiation	High
	Small Scale 'Alternative' Producer Innovation	Local region	Small scale logic with producer integrated processing knowledge	Local centric gap in market providing outlet for producer to supply	Low
	Conventional Wholesaler Innovation	Wales	Science based feed innovation to derive enhanced product qualities	Locality based (Wales) hospitality focused market	Moderate
Dairy	Ethical producer co-operative Innovation	Wales	Radically dissimilar to regime with divergent aspirations to overall regime logic	Locality based (Wales) multiple and non-multiple based retailing	Moderate
	Organic Farmhouse cheese maker Innovation	Global (principally UK)	Differentiated breed to derive higher milk quality	Locality based (Wales) multiple and non-multiple based retailing	Moderate
	Non-Bovine dairy producer/processor Innovation	UK (principally Wales)	Non-bovine dairy employing on farm based processing	Locality based (Wales) multiple and non-multiple based retailing	Low
	Regional Producer-Processor Group	Wales	Similar to regime - although consideration of regional biophysical constraints in variety selection	Locality based (Wales) multiple and non-multiple based retailing	High
Horticulture	Medium sized, multi-product producer	UK/Wales	Plant specific knowledge but similar production techniques to regime	Multi-level UK, Wales, South Wales and some locality based	Moderate
	Farm Shop	SW Wales	Micro-enterprise sourcing networking	Local based retailing, wholesaling	Low

 Largely similar to the regime
 Partially dissimilar to the regime
 Largely dissimilar to the regime

The processing aspect of niches is of interest given the hollowing out of the processing level of all three sub-sector regimes in SW Wales and, in particular, how the identified niches deal with the issue of processing. In three cases, the producer groups, the conventional wholesaler and the dairy producer co-operative all utilised processors which were located in the same region or elsewhere in Wales. The location of the processors was dependent, in all three cases, on the locations of the producers so that, in the case of the conventional wholesaler, two processors in Wales were used because this supply chain was served by producers across Wales. This preference for regional processors is distinctive for the dairy and meat regimes where these producers are increasingly reliant on non-regional processing capacity.

The remaining niches all had some form of processing on-farm or had developed some form of off-farm processing of their own. In terms of on-farm processing, this was either to prepare the product for sale (e.g. the alternative meat producer or the farmhouse cheese maker) or to lengthen the shelf life of existing products to reduce waste (micro hub farm shop). The regional producer-processor group and the ethical producer co-operative are particularly interesting as these groups have effectively built their own capacity in response to the absence of adequate third party processing facilities.

In terms of the spatial distribution of markets, the example niches shown in Table 8.1 supply a diverse range of markets from local/regional markets to global markets. When comparing the spatial distribution of markets together with the overall market/industry orientation we can see that niches generally leverage local or locality branding, which has allowed them to access small scale local retail markets and the local/regional hospitality sector as well as directly accessing multiple retail markets.

The science-technology-biophysical matrix is an important aspect of agri-food ST constellations at both regime and niche level. During the course of the empirical research it was apparent that these three elements of a ST system co-evolve together to create particular production configurations. All agri-food production is essentially the result of an intersection between: the biophysical capabilities of a specific area of

land, stock and plants; the availability of different technological tools, processes and techniques; and the extent to which producers and their advisors have the scientific knowledge and tacit knowhow to utilise biophysical capabilities and technological tools to successfully create produce for sale.

This is not to say that the science-technology-biophysical matrix is somehow separate to the rest of the ST constellation of elements; indeed the other elements (policy, industry, culture and market preferences) influence the decisions producers make as to how they employ science-technology-biophysical elements. This plays out on individual farms but also on groups of farms within regions as producers respond to similar stimuli from these elements, although not necessarily all at the same time. Some examples of these interactions found in the SW Wales case study region included: the adoption of EUROP standards, farm-gate milk price determinants influencing producers' choice of animal breeds and the public policy moratorium on genetically modified organisms limiting producers' access to technology.

There were interesting examples of the science-technology-biophysical matrix seen in an analysis of the sub-sector level niches. Niches, such as the dairy producer co-operative and the conventional meat wholesaler, place emphasis upon the *science* and *technological* parts of the matrix as the defining differences with the relevant regime. Whereas others, such as the non-dairy producer or the alternative meat producer, rely on the *biophysical* distinctiveness of their livestock as one of the parts of the matrix that differentiates them from the regime. Other niches relied, in part, on distinctiveness in the *knowledge* facet of this core matrix, such as the alternative meat producer which re-internalises knowledge within their business through the *knowledge/practices* of butchery or the horticultural farm shop whose business is reliant upon the *knowledge* management of a complex number of supply chains. Ultimately, how dissimilar a particular niche's science-technology-biophysical matrix is to the regional regime and/or higher level regimes shapes how likely these niches are to be adopted or absorbed by the regional regime. What can be seen here is a contrast between similar regime-niche configurations in the matrix (e.g. meat producer group), which can be readily absorbed or up-scaled as they represent

a near incremental adjustment to the regime level configuration, and those niche matrix configurations that offer radically different configurations from the regime (e.g. ethical milk producer co-operative).

The potential for these agri-food niches to be assimilated into the regime, either through the absorption of their business/supply chain or the wider adoption of the norms and practices of that niche into the regime, was a concept introduced in chapter 3 and is an important consideration of agri-food niches in any empirical setting. When studying the range of agri-food niches that were interviewed for this thesis, it became apparent that the niches had differing potentials to be absorbed/adopted into the regime. Table 8.1 indicates the perceived ability for individual niches to be absorbed/adopted into the regime in some way. This potential emanates from a comparative between the sub-sectoral regime constellation of elements and that of each niche, which is indicated in Table 8.1 by the highlighting in each cell. There is a juxtaposition here insofar as those niches that closely resemble the regime configuration offer little in the way of adjustment for the regime and little to address any of the embedded problems of the current configuration as a result. These niches may be readily absorbed into the regime with little or no significant adjustment in the regime dynamic as a result. Whereas more radical alternatives that may offer more extensive solutions to endogenous problems in the incumbent regime, should their norms/practices be adopted by that regime, are potentially too radical to be tenable to regime actors.

Table 8.1 shows that the meat producer group niche is the most likely to be absorbed into the regime due to the high degree of conformity that it has with the incumbent meat regime in the region and the relative ease that businesses could replicate this niche innovation. Those niches which were classed as having a moderate ability to be assimilated into the regional regime dynamic are classified as such either because the specific element(s) of their innovation could easily be absorbed into the regime should relevant regime actors choose to do so (e.g. the vitamin D, grass and feed monitoring of the conventional wholesaler innovation) or where the innovation

represents a coherent alternative to the incumbent regime configuration, which will be discussed later in this chapter.

Finally, those niches where there is a low probability of being assimilated into the incumbent regional regime typically represent those businesses/supply chains where the underlying products are such that they are likely to only have a relatively small market demand (e.g. Non-bovine dairy products or smokies⁹²) or those niche supply chain configurations that are too radically configured, compared to the dominant logics of large scale, standardisation and volume of the incumbent regime, to be adopted. On the latter point, the reason for the low potential of these types of niches to be assimilated is that the adoption of a particular niche would incur huge costs or be deemed impractical by the incumbent regime's actors.

This is not to say that these niches with a low assimilative potential are irrelevant within the context of an examination of regional agri-food systems but rather that they have to be understood within a context of their low assimilative potential into the regional regime. In understanding this context, it is worth noting that, because of the layout of the results chapters, it was not highlighted earlier that many of the niches in the region were linked to one another. These linkages spanned across the three sectors and were connected through common routes to market, with farmers markets, farm shops and noted hospitality venues serving as nexuses to these supply chains where the products made by some of these niches met. These links resemble a network of niches that operate at a regional level across the three sub-sectors and a network of small regional agri-food businesses in SW Wales appears to exist. This idea was further supported by a point raised by Horticultural Producer 3 who explained that: 'we looked at how many businesses would be affected if we went out of business; and on the farm it was about 60 but for the shop it was over 150', most of whom were small scale, niche local businesses. It is unclear whether this inter-connected network of businesses represents a regime of local food niches, which are tied together by virtue of their connectivity to one another through a wide

⁹² 'Smokies' are a lamb or goat meat product favoured by certain ethnic communities, most notably from the Caribbean. Smokies are prepared by leaving the fleece on the carcass, which is then removed using a blow torch and partially smokes the meat. It is currently illegal to prepare carcasses in this way but niche demand for this product is such that HCC is exploring a change in the legislation (HCC, 2009).

range of different markets and/or overarching cultural/logics/norms of operating at a small scale. This would require further research, the aim of which would be to first investigate this potential small scale local/locality food regime configuration and, more importantly, the nature of its connectivity to the regional agri-food system. If a regime of local food niches were to be found, this would pose significant questions about how agri-food policy making could be addressed to triangulate support for both a larger conventional set of sub-sectoral regimes and/or a local food centric regime of niches, which will be discussed in sections 8.3 and 8.4.

This section showed that niches have differing degrees of conformity when compared to their incumbent regime; there is in essence no black and white between the regime agri-food supply chains and niche agri-food supply chains but more varying shades of grey. As a result, some niches are more innovative than others, which can be assessed as a function of how much of the ST system constellation of elements is differently configured compared to the regime and to what degree they are different. Those niches that present the most radical innovations are the least likely to be absorbed or adopted into the incumbent regime. Although niches with the lowest possibility for absorption/adoption are not necessarily those that would foster longer term sustainability in the incumbent regime.

To conclude this section it should be noted that this thesis does not intend to provide a full examination of regional agri-food niches but merely advance the idea that the ST systems framework provides a useful heuristic tool to examine the niches found within a regional context. Some context for future work in applying the niche metaphor to local food niches in a regional context is suggested in this section. However, further research into developing a typological framework for classifying regional level niche innovations would also be useful in providing a greater understanding of these niches and their role in shaping regional agri-food regimes/systems.

8.2.2: Conventional agri-food systems in SW Wales: a regimes perspective

The use of the ST systems framework and the application of the 'regime' level of the MLP therein illuminates the distinctive differences between the meat, dairy and horticultural sectors in SW Wales. Chapters 5-7 utilised the ST systems framework as a heuristic device to frame the empirical evidence collected on the agri-food sectors of SW Wales. Each chapter abstracted a sense of whether there was a consistent overall system from the available evidence and contrasted a regional regime with any niche innovations that deviated from that regime.

This section will review the specific characteristics of the three sub-sectors and, more importantly, comment upon the spatio-temporal aspects of the regional agri-food system. Transitions occur, as was argued in chapter 3, in a particular space and time. Thus far the results chapters have presented evidence of what past transitions have occurred, but there is also some evidence which provides clues as to how these agri-food regimes might change in the near future.

Three sub-sectors of the agri-food system in SW Wales were investigated, namely: meat, dairy and horticulture at the regime level. Where there was a sufficiently coherent and internally consistent set of ST elements that could be abstracted from the empirical data, a dominant regime can be said to exist with the regional agri-food sub-sector. Furthermore, the examination of the ST elements allowed for an analysis of the relative stability of a regime. This sub-section will review the characteristics of the regime in each of the three sub-sectors and will also analyse their relative differences.

Chapter 5 on the meat sub-sector of SW Wales found that a dynamically stable regime exists at this regional and sub-sectoral level. The regime is typified by a strong *industry* element with many producers who are servicing a mainly UK, EU but also increasingly a global *market* demand for red meat products; lamb in particular that the Welsh market and WAG is seeking to exploit. These producers have a range of routes to market through livestock markets, and increasingly, abattoirs both in the

region as well as within the rest of the UK. The processing **industry** has become increasingly de-coupled from the SW Wales production base due to the twin effects of EU **policy** on export/food⁹³ standards and rationalisation in the abattoir sector.

The private **policy** standards of the industry dictate that producers must produce meat that is both lean and also conforms to a standardised shape, which is governed through the EUROP standard. Producers in the SW Wales region have utilised primarily the **science** and **technology** of breed genetics and grassland improvement to deliver red meat products to the market that consistently meet the rising private policy standards. There is a **culture** both within the producers and institutional actors engaged in the region that the **biophysical** capacity of SW Wales lends itself best to the extensive grass based production methods of agricultural producer. There is also a **culture** of dependency among the meat producers of the region with respect to the financial support that they receive from public policies, single farm payments in particular, and to some extent this led to a de-emphasis on production as older farmers 'live' off state support. This de-emphasis on production has created a perceived lower supply of lamb leading, in part, to increased prices for the remaining producers.

The dairy sub-sector of SW Wales was discussed in Chapter 6 and, in contrast to the meat sector, it is a regime that is under intense pressure and in some respects appears to be in a destabilising configuration. The causes of the destabilising configuration are three fold: first, the deregulation of the UK level **policy** from an aspatial state-wide marketing board which brought and marketed the entire UK milk supply to a competitive, spatially differentiated market. Second, the resultant intensity of competition in the dairy **industry**, whereby milk has become an even more volume-orientated commodity with processors putting ever increasing pressure, through changes in milk contract pricing structures, on individual producers to produce more milk. This has led to producers up-scaling their operations using various combinations of **science/knowledge, technology** and the **biophysical** capabilities of their holdings and herds to a point of maximum capacity.

⁹³ Whenever this issue was raised by interviewees they always referred to these standards relating to exportation regulations; however, they are more akin to food hygiene standards.

Finally, the destabilising pressures on the regional system have led to the rationalisation of the processing **industry** within SW Wales, resulting in most of the milk from the region being delivered into the UK. This exporting of milk to outside the region, together with the complex private **policy** standards that govern producer contracts, has led to the **industry** of production in SW Wales contracting sharply in terms of the numbers of producers engaged in the dairy sector with the remainder specialising and up-scaling.

Finally, Chapter 7 analysed the data for the horticulture sector of SW Wales and found a relatively smaller but diverse production and processing **industry** with many different businesses/supply chains, producing a diverse array of horticultural products, servicing different **markets** and operating under different logics. Despite the diversity seen in the interviewed businesses, the horticultural production **industry** has, based on acreages under production, decreased markedly over the period in preference to grass based forms of agricultural land use. There is also an apparent distinction to be made regarding the 'outcome' of production, with many producers engaged in crop production to feed livestock rather than for human consumption and, in this respect, parts of the horticultural production **industry** in SW Wales can be seen to be a support sector for the other sectors of agriculture in the region. Those producers still engaged in horticultural production in SW Wales utilised the **biophysical** capacity of their land in different ways, but nevertheless this utilisation often required expert **knowledge** of both specific plant species and the operation of the appropriate **technology** to grow and store produce. Despite the diversity in the horticultural production they all attempt to meet the demand for high quality standards that the **market** sets for horticultural produce.

There was a perceived lack of specific public **policy** assistance for producers and an investigation of the public policy infrastructure and strategy within Wales for horticulture shows a relatively unfocused approach. Advisory assistance is distributed between different institutions and very much possesses a sense of being bedevilled by diversity that can be seen in the sector. Taking all the ST elements together and the

lack of an over-arching regime logic; it is difficult to claim that there is a coherent horticultural regime operating within the SW Wales region but rather that there is a thriving but diverse sector.

Overall, it is apparent that the three sub-sectors studied in SW Wales have very different configurations. In some cases more than one of the sub-sectors has faced similar pressures/stimuli but they have not necessarily responded to the pressure in the same way, resulting in differences in their current configuration. The prime example of the differentiated response to similar events would be the loss of processing capacity, which has occurred within each of the three sectors. The meat regime has not been particularly affected by the loss of a number of abattoirs in the region, with producers finding outlets at livestock markets, abattoirs in the region and abattoirs outside the region, with little effect on the overall logics of their systems. Contrastingly, the loss of a majority of dairy processing from SW Wales and the resultant additional cost in terms of lower milk prices for the region's producers is having a corrosive effect on the dairy production industry in SW Wales. The potato marketing example of Horticultural Producer 1 & Horticultural Processor 1 contrasts again in the way that producers have been able to replace the older form of wholesaling with a vertically integrated supply chain that required changes to their own production strategies to make it work, but nevertheless has been highly successful to date.

8.2.3: Future transitions in the agri-food system of SW Wales

Chapter 3 discussed the transitional aspects of the ST systems framework and how this transitional nature has been used in prior research to investigate the way in which ST regimes have transitioned from one configuration to another (e.g. Geels & Schot, 2007). The framework has also been used to investigate future likely transitions and how these transitions may be supported/guided through effective policy (Markard et al, 2012 and Smith et al, 2005). There are a number of transition pathways with Geels & Schot (2007) describing the principal four as being transformation, technological substitution, re-configuration and dealignment-

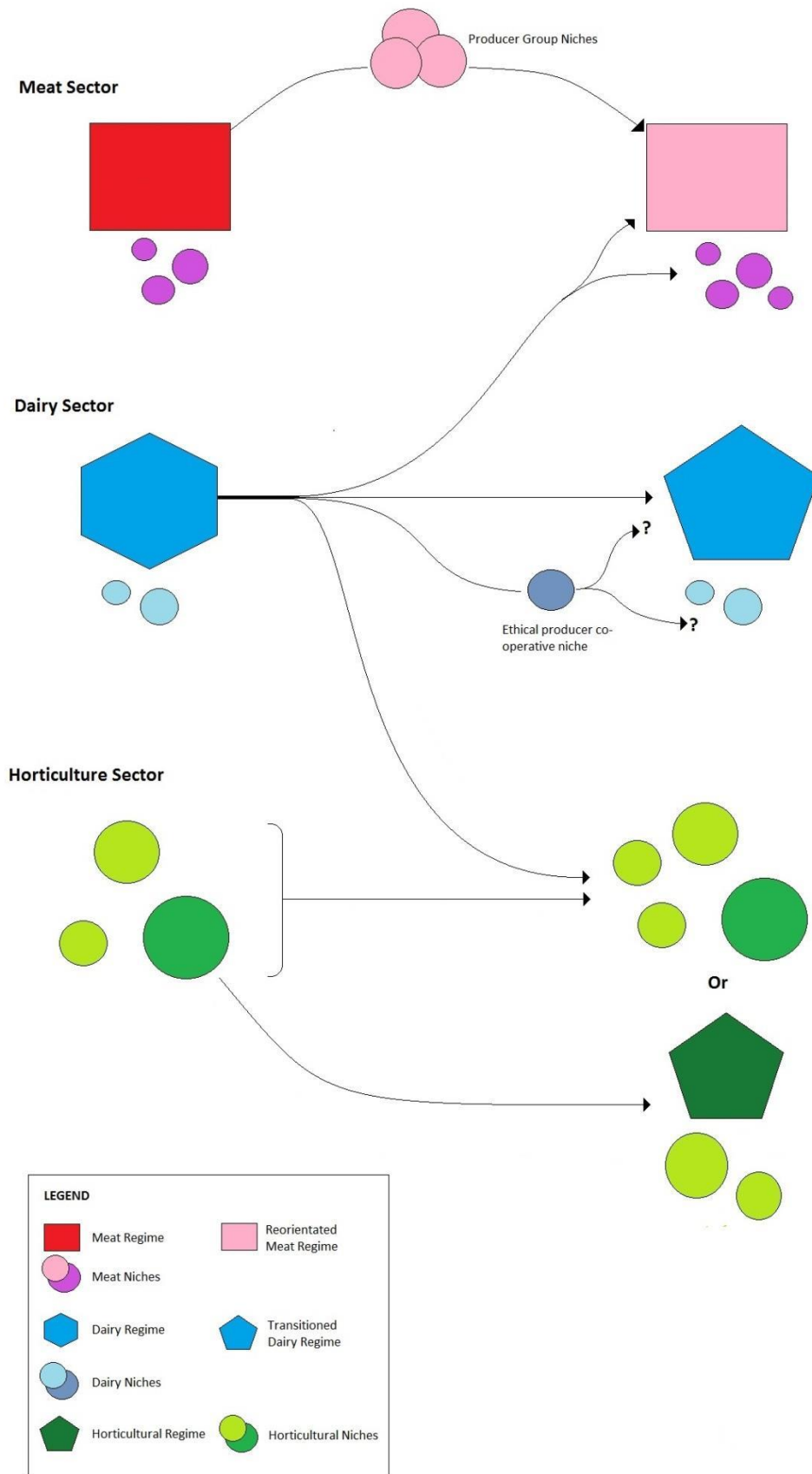
realignment. The idea of transition is a core aspect of ST systems theory and is to be used in this thesis to investigate the potential pathways along which the three sub-sectors in SW Wales may develop using the transition pathways theorised by Geels & Schot (2007).

Thus far in this thesis, the three sub-sectors investigated in SW Wales have been treated as being largely discrete entities without much discussion about how they interact within the same region. This is where the geographical application of the ST regime heuristic model becomes pertinent as these sub-sectoral systems do not operate within individual vacuums devoid of any knowledge of the issues and disposition of other sub-sectors within the region. Moreover, there is a finite amount of agricultural land available in the region to be utilised to produce various agricultural products, whether they are for intended for human consumption, feed production, bio-fuels or non-food based human consumption⁹⁴. Essentially, these sub-sectors do compete for land within regions and even, to some extent, at the farm level as well, with Meat Producers 2 & 3, Dairy Producer 2 and Horticultural Producers 1-3 all showing some evidence of mixed production.

Section 8.2.2 discussed the current disposition of the three agri-food sub-sectors as they could be seen in their current configurations in SW Wales. However, there were also suggestions as to where these regimes/sectors might transition in the near future given their current disposition, assuming that the current logics within the regimes are sustained and the absence of any significant changes to the landscape/higher regime level pressures. Figure 8.1 is a diagrammatic representation of the possible transitions that could occur within the three sub-sectors researched in SW Wales as suggested by the empirical evidence which will be discussed in the following sub-sections.

⁹⁴ Examples would be medicinal, clothing and floriculture production.

Figure 8.1 : The potential evolution of the agri-food regimes of SW Wales



8.2.3.1: The SW Wales meat regime

As indicated in Figure 8.1, the meat regime in SW Wales is likely to undergo some degree of transition in its regime configuration as more producers remove themselves from the open competitive market and form producer group niches. These producer groups carve out additional value for themselves through locality marketing, private standards and direct discussions with their retailers and, inter alia, differentiate producer group niches in the *industry, culture* and *user preferences* in comparison to the SW Wales meat regime. This movement away from the regime configuration by some producers through producer groups is likely to do one of three things to the SW Wales regime in the longer term.

Firstly, other producers in the region may be enticed to form or join existing producer groups because of the benefits they offer. This would re-configure the meat regime in SW Wales towards one where meat producers co-operate more, have greater contact with buyers/retailers, prices are more negotiated and livestock markets are increasingly of less importance in the finished animal market particularly. Alternatively, it could be conceivable that, whilst some producers will join a producer groups, others will remain within the open marketplace. There are a couple of possible reasons for this: either that some producers remain mistrustful of these types of arrangements, or that the private standards of producer groups create a barrier to entry for other producers, which was suggested during the interview with Meat Producer 2. The regime re-configuration here would create a two tier market (one tier which could be seen to be a volume based commodity market and the other tier based on a locality value commodity). This two tiered configuration would result in a dynamically stable regime, as long as the volume based commodity price obtained by producers remains sufficiently high to cover input costs. Where this is not the case then there is an increasing likelihood of a destabilisation in the overall regional meat regime.

The final possible reconfiguration in the regime dynamic will be as a result of the anticipated cuts to farm subsidies in the forthcoming CAP and RDP reforms. It was

found that livestock producers are the most exposed to changes in the agricultural policy from WAG and the EU on farm subsidies as it makes up a higher proportion of their income (WRO, 2010). If farm subsidies are to be cut, as is largely expected, then some livestock producers, who reduced their livestock numbers and effectively 'semi-retired', may be forced to return to higher stocking densities or sell their holdings if they do not wish continuing farming. Either way, this is likely to result in an increased supply of meat to the market as they or the new owners of the land return it to higher levels of productivity in order to cover the shortfall in their household income. The question then arises what this might do to the SW Wales meat regime? If there is continuing domestic demand and growing export demand for Welsh lamb and beef then there might be very little change as the demand and supply of red meat moves in concert. The reconfiguration of the SW Wales meat regime is more likely to be that livestock producers, and lamb producers in particular, find it necessary to develop more business acumen and better negotiating skills which would work in concert with either a more co-operative orientated producer sector or a two tier structure as suggested in the previous paragraph.

Regardless of which of the eventual outcomes emerges as part of the regime in SW Wales, there will still be a maintenance of the overarching rationale and logics to which the meat regime ascribes namely: the production of large quantities of red meat that conform to the needs of the retailers who exert a high degree of control on the overall market through strategic linkages with a key single abattoir or abattoirs. Hence it is suggested that the SW Wales meat regime will reconfigure internally, re-absorbing the producer group niches rapidly as part of its overall configuration as they become part of the norms of the SW Wales meat regime. This reconfiguration may slightly re-orientate the regional regime's constellation of elements, particularly in terms of the *cultural* attitudes producers have in dealing with processors and price negotiation. However, it is equally likely that the regime absorbs this niche if the number of producer groups increases across the UK to the point where there is significant competition between producer groups, which drives an eventual hollowing out of the benefits for these producers in the face of increasing competition.

8.2.3.2: The SW Wales dairy regime

The destabilisation of the SW Wales dairy regime described in Chapter 6 is likely to mean that this regime is undergoing a significant dealignment-realignment transition of some form. Figure 8.1 shows the dealignment-realignment as the principal transition pathway for the regime; however, there are a few observations from the empirical data that suggest that this process of dealignment-realignment in the SW Wales dairy regime has implications for other regional sub-sectors. Where pressures are placed upon one sub-sector specific regime to the point of destabilisation within that regime's ST constellation, then this may create opportunities not only for this particular system's niches to be absorbed or adopted and transform the incumbent regime. However, it is also possible for other regimes to acquire new actors and land as actors from the destabilised regime search for new ways to sustain their individual businesses/holdings.

The dealignment phase of the transition in the SW Wales dairy regime is on-going in the region and is influencing some dairy producers to consider changing their production system. For some producers, who have the requisite knowledge, availability of capital and sufficient biophysical capacity within their land there are options for what they may choose to do if they move out of dairy production, which is not necessarily possible for all producers. Discussions with Horticultural Producer 3 and Other Producer 1⁹⁵ show them to be exemplars of dairy producers who have left the SW Wales dairy regime already and moved toward other regimes, in their cases horticultural/other sectors, but conceivably others could move into any of the non-dairy regimes and niches in SW Wales or indeed diversify into multiple regimes/niche configurations. The question of what former dairy holdings are now being used for and the rationale for the changed use would be an interesting area for further research,. The research would examine the adaptive capacity of regime actors to landscape/higher level pressures, which is discussed in section 3.2.2, and

⁹⁵ This producer moved from dairy production to tourism and specialist other food-stuff production. They were interviewed initially because of this move away from the dairy sector but their current production type did not fit within the three sub-sectoral system case studies used in Chapters 5-7.

demonstrate how producers respond to changes in the constellation of regime elements when these cease to be dynamically stable.

Turning to the SW Wales dairy regime, the process of dealignment-realignment creates opportunities for new niches⁹⁶ to develop that may eventually be part of the realignment processes. There are two niche innovations that are potential candidates for aiding the realignment process being: the 'ethical producer-processor co-operative' and the shed-based dairying systems mentioned by some of the interviewees. These two potential niches are very different in their overall ST configurations particularly in terms of the **biophysical-technology-industry** parts of their constellation.

If the shed-based dairying systems model is what eventually emerges out of the realignment processes it will result in the number of dairy producers in the SW Wales region declining further with the remaining small number of producers utilising cutting edge shed-based dairying **technology** and **science** to produce high volumes of milk from large herds of housed dairy cattle. These dairy cattle will continue to be animals bred with the genetic predisposition to producing large quantities of milk with the maximum milk to feed conversion ratios possible. These shed-based producers are almost or completely reliant on off-farm sources of feed to sustain their herd, which Institutional Actor 4 suggested could come from 'satellite farms' that produce feed and rear the calves for the hub farm. The question that arises is whether these satellite farms will be able to sustain themselves on whatever income they could derive from this kind of arrangement or whether they would look to other supply chains, possibly within other regimes, to find an income. Finally, it is a moot point as to whether the milk produced in the region will be processed by a processing **industry** located within the region in this reconfiguration or, as is more likely, over the border in England. If transport costs are still placed upon producers it will mean that the remaining shed-based producers will have to ensure a higher degree of efficiency than their English counterparts in their production systems in order to remain competitive.

⁹⁶ The darker blue circle in Figure 8.1.

Alternatively, if the producer-processor co-operative niche, exemplified by Dairy Processor 2's model of re-regionalised processing capacity through producer ownership and made possible by the use of locality branding, is adopted across the wider SW Wales dairy regime this would see processing jobs return to the region. If the full **cultural** philosophy shown in Dairy Processor 2 was incorporated into a realigned regime, we would see a SW Wales dairy regime where sustainability has become highly embedded in the system, with producers and processors striving to cut costs through energy de-intensification which is contrastingly different to the current regime logics and indeed the logics of a potential shed based centric system which have a higher energy requirement (Meul et al, 2012). This energy de-intensification will involve the application of different **science** and **technologies** to the current regime but will also allow participating supply chains to market their products with additional messages of sustainable production.

Both of the two suggested realignment routes in this section would represent significant departures from the current regime's logics, albeit in very different directions. There is, however, a third possibility which is the transition of the UK wide regime. The price pressures that producers have experienced and the hollowing out of SW Wales' dairy processing sector has been a direct result of the UK regime level changes, which have placed pressures on producers across the UK with them recently protesting to the UK government about the state of farm gate dairy prices (BBC, 2012). If the pressure that is exerted on the UK wide regime is sufficient to create destabilisation in the UK level dairy regime then there will certainly be consequences in the SW Wales regime from any transformation that occurs. However, it is also entirely possible that price pressure in the UK wide regime does not destabilise the UK wide regime as a whole but, instead, drives economic efficiency types of innovation within dairy production and processing.

8.2.3.3: The SW Wales horticultural sector

Chapter 7 suggested that the SW Wales horticultural sector does not have sufficient coherency in the constellation of ST elements to maintain the idea that a horticultural regime exists in SW Wales. What is observed instead is a range of businesses/supply chains with very different configurations/logics. Historically, there was a greater proportion of agricultural land utilised for horticultural production than today which, based on the spatial distribution of grade 1-3 agricultural land, would suggest that at least some of that additional production would have been in the SW Wales region.

The likely interpretation is that we are seeing a longer term transitional feature in the horticultural sector of SW Wales, where historically from around the pre-1950's horticultural production was part of the fabric of the traditional family farm, as a number of interviewees mentioned during their interviews. Horticultural Producer 3, in particular, stated that: 'farming and horticulture ... if you go back 20 to 30 years ... were very closely linked and were part of the same thing. It goes back to specialisation again, horticulture became very specialised and so did farming but I think you have got to link the two in some way again'. This quote neatly summarises what has occurred in the horticultural sector where there may have been (up until the somewhere in the 1950-1970's⁹⁷) a model of farming in SW Wales such that most producers were engaged in growing and rearing a range of products to sell, as well as to consume themselves, including being more self-reliant in cereal production for livestock feed. Up until this point there were probably no particularly distinctive agri-food sub-sectoral regimes in existence in the SW Wales region but rather one, more generalised regime servicing local markets for the majority of produce and exported the balance.

Specialisation of agricultural holdings was driven by the advent of better transportation and supermarkets, along with advances in agricultural production

⁹⁷ The secondary and empirical data cannot point to a particular moment in time when the destabilisation processes would have occurred but rather that it is more likely to have been a gradual process.

science and *technologies*⁹⁸, that allowed producers across the country to specialise their production as their goods are able to be transported to markets further afield than was traditionally possible. This specialisation in production has meant that producers in other regions, where horticultural production is relatively easier due to a milder climate and/or the existence of large areas of land which are both relatively flat and have good soils (such as East Anglia), are able to leverage greater advantages in horticultural production both in terms of cost and the effort required to produce a crop of a particular level of quality relative to SW Wales. The specialisation of the UK horticultural sector, coupled with strong regimes in both the meat and dairy sectors of SW Wales, meant that producers in the SW Wales region, who traditionally would have produced some of their own crops for personal consumption/local sale, switched their production to grass and relied more on external feed inputs to support their livestock herds and sourced their own fruit and vegetables. Furthermore, the rise in multiple retailers with their own supply chains has also assisted in reducing the number of outlets in the form of greengrocers, which restricted the possible routes to market for the small scale supply of horticultural produce that the region's producers were traditionally growing.

All of these changes in the horticultural industry at a UK level have led to the regional horticultural sector in SW Wales undergoing a long term technological substitution transformation in its regime, moving away from a local centric production model to an increasingly national/international centric one, in which the evolution in refrigeration and transportation technologies and a shift in consumer demand for pre-prepared and frozen products are now part of the new socio-technological regime. This technological substitutional transformation has occurred slowly over time in the SW Wales region as part of a reconfiguration process where it became increasingly less feasible for regional horticultural production to occur in the form that it had been and was increasingly replaced by specialisation in the meat and dairy sectors.

⁹⁸ Principally machinery, pesticides and fertilisers.

The result of this transformation is a horticultural sector in SW Wales which, whilst diverse, is largely fragmented and, in many respects, represents a collection of differing niches rather than a single over-arching regime. Some aspects of the region's horticultural sector share commonality in their elements, for example they all face similar **public policy** frameworks and **biophysical** constraints (depending on the location of production). Other elements are radically different including: 1) the supply chain configurations (**industry**), 2) the attitudes within the supply chains (**cultural**) which have led to 3) radically different **science-tech-biophysical** configurations in production and processing, 4) differentiated **private policy** standards depending on the end retailer and finally 5) **user/market preferences** differentiated based on where the supply chains end (with differences between examples multiple retails, hospitality sector and farmer markets/shops all having different requirements).

There is, however, a potential for the emergence of a future horticultural regime in the SW Wales region. This SW Wales horticultural regime will not be predicated upon further technological evolution, which somehow makes it easier for producers in the region to produce certain types of horticultural produce thus gaining an advantage in the national horticultural marketplace, but is rather more likely to flow from the increased interest in locally sourced produce by the general public and, by extension, the multiple retailing and hospitality sectors. This interest is creating re-regionalised spaces of demand for produce which will benefit all agri-food sectors but this was most noted in the horticultural sector through the interviews with Horticultural Producers 1 and 3 particularly.

Certain supply chains are more able to take advantage of the re-regionalised demand than others because, whilst the **market** creates the renewed demand for local production to occur, certain **industry** sectors, most notably the multiple retailers, will still demand local produce in relatively large quantities as well as high quality of produce, which some producers/processors will not be able to service due to the required scale of supply. The producer-processor co-operative was, at the time of the interview, already investigating the potential of widening from their potato operation

to expand into mixed horticultural production at the behest of their retailer. The existing supply chains of the producer-processor co-operative with their well-established processing hub and relationships with retailers are best placed to take advantage of the re-regionalisation and may be able to recruit further producers to their groups, as they are seen to be successful in the region. Expansion of demand for locality horticultural produce, coupled with an ability to attract producers to horticultural producer co-operatives, may eventually lead to a large enough presence in the region for an over-arching regime to evolve from this supply chain. These successful supply chains may not be emulated by other actors forming similar relationships with other retailers, which is one of the suggested potential courses of the horticultural sector shown in Figure 8.1. The other possibility, in the short term, is that the horticultural sector continues very much in the same disaggregated configuration that we see currently with some supply chains supplying the large scale conventional markets, whilst others supply the smaller locality markets.

What determines whether the horticultural sector emerges into some realigned regime within the SW Wales is difficult to predict. Some of the likely determinants would be the continued interest in local/locality food as part of a regional demand for food being translated down the supply chain by the large retailers. A further determinant might be the rising cost of grain and fodder crops pushing meat and dairy producers to increasingly grow their own fodder which may mean, in some respects, a forced return to a similar form of what is described as 'traditional' farming in the SW Wales region to cope with the rising costs of off-farm feed inputs. Whether this would mean that these producers grow excess produce which is then sold into the local market remains to be seen, but is unlikely as those producers who already are growing their own feedstock do not do this at the moment.

8.3: Understanding rural development and the role of public policy in rural regions through transitions

Thus far this chapter has focused on: the efficacy of the ST systems heuristic model to analyse differentiated regional agri-food regimes and its application to the SW Wales

agri-food industry. It has also discussed the prospect of future transitions in SW Wales' sector-specific regimes and highlighted the different trajectories that each sub-sector specific industry might undergo based on the range of evidence gathered and reviewed in Chapters 5 to 7.

This section of the chapter focuses on the issue of rural development and the role that public policy making may have in supporting rural development within a particular region. The discussion is framed using the SW Wales case study region as analysed through the ST systems heuristic model and, in doing so, will address question 4 as posed in Chapter 4:

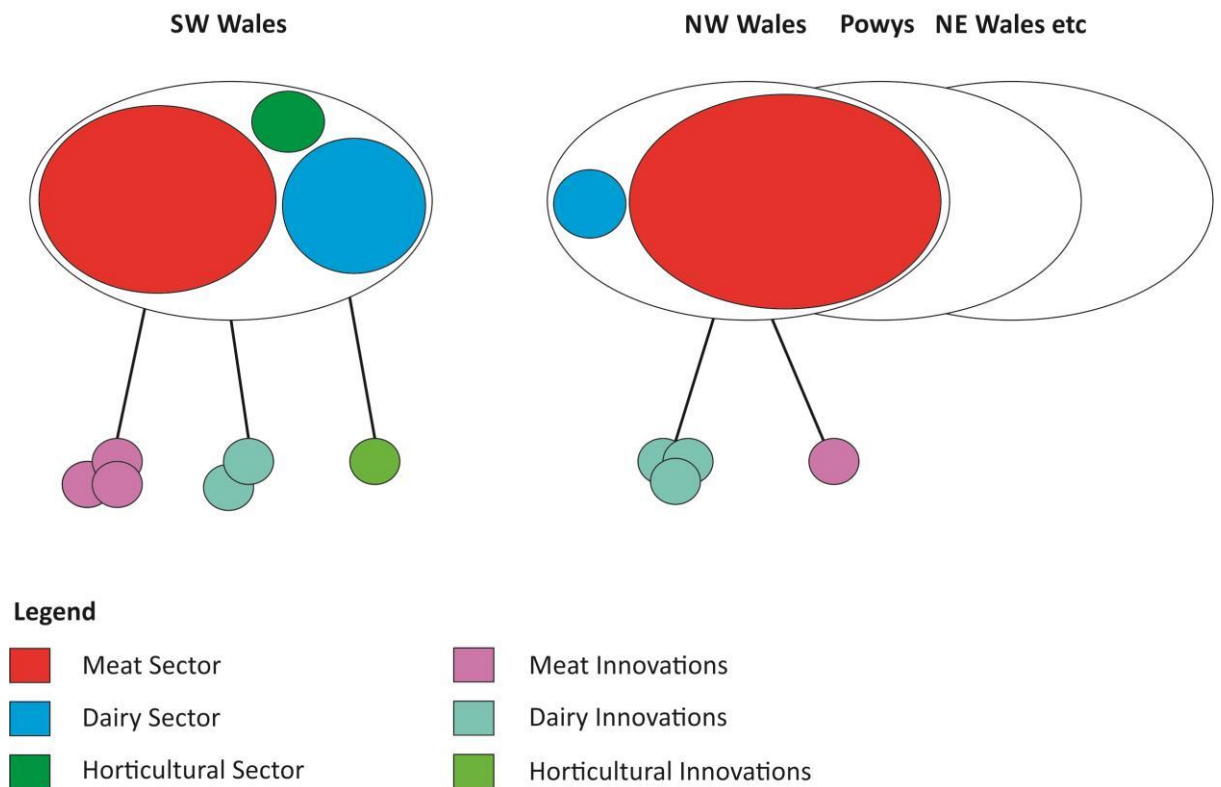
Does an understanding of rural agri-food regions as differentiated Socio-Technological regime(s) help to analyse the transitional nature of regional agri-food systems, including the role that public policy plays in fostering their development?

Before looking at this question in detail it is necessary to indicate the level of public policy institutions that will be focused upon in this discussion, which is the Welsh Assembly Government (WAG). The reason for this is that much of the public policy making for rural development and the agri-food system in SW Wales emanates from the work of the WAG; albeit through the framework of CAP and the rural development plans that the WAG negotiates with the EU. This meant that much of what the interviewees referred to in the context of public policy, during their interviews, was part of WAG's engagement with the agri-food industry whether this related to: institutions that WAG funds, policy initiatives/documents that WAG has written or how WAG has negotiated and administered CAP/Rural Development Plans for Wales.

There are a number of issues that the ST systems perspective has in relation to public policy for rural development. The most important one is what the role is/should be of public policy in the development of regional agri-food systems. The first point to consider is scale, which can be viewed from three perspectives: spatial, sectoral and

conventional/alternative (niche). Figure 8.2 provides a diagrammatic representation of these three scales in the context of SW Wales/Wales.

Figure 8.2: Diagrammatic representation of the purview of WAG agri-food policy



8.3.1: The spatial scale

The spatial scale aspect is of relevance to rural development and public policy because there is, in effect, one pot of money for agri-food initiatives across the whole of Wales. Wales is, however, made up of more than one agri-food region and how funding is directed across the whole of the area of public policy governance has the potential to lead to an uneven distribution of public policy resource allocation between rural regions. Unevenness in public policy resource application may be desirable in certain circumstances to support regimes that are facing extreme landscape or internal destabilising pressures, such as animal disease, or as a concerted effort to develop new capacity within a particular sub-sector in a region. Conversely, unevenness in how public policy resources are applied may be undesirable, if it supports one region excessively to the detriment to others. One key potential for

unevenness that emerged during the empirical phase relates to the placement of government funded facilities. In the case of SW Wales, the region is very well served with the presence of the Food Development Centre, Dairy Development Centre and the HCC, the red meat marketing board for Wales, all located within the region. The only sector for which there were comments about the lack of provision of facilities was horticulture; however this will be dealt with in the next section. The idea of spatial unevenness of public policy has not been investigated in detail in this thesis because the thesis focused in on a single region rather than undertaking a comparative study between regions. The use of and engagement with WAG policy initiatives in and between rural regions, in particularly those organised by WAG, is an area for which further research is required.

A further element that could not be investigated in this thesis, but which would naturally suit the ST Systems approach to the analysis of agri-food systems, is how differences in public policy approaches unfold in different regions with similar sub-sector specific regime configurations. A good example of this would be the differences in English and Welsh policy making towards upland sheep farmers, which was a recent topic of discussion on BBC Radio 4's Farming Today programme. An English upland farmer, commenting on the differences between Welsh and English upland farmers, explained how these differences are perceived by farmers:

'We stand there looking across the border with very green and envious eyes at the moment. We feel that the Welsh Government is feeling much more benevolent to their upland farmers than the English are at the moment.'

(Farming Today, 2013)

8.3.2: Sector scale

The sectoral scale needs to be considered from two differing perspectives. The first perspective is framed with the view of a single agri-food region whereas thesecond perspective considers the aggregation of sectors within all the regions that are the purview of the public policy institution (in this case Wales and WAG).

Within a specific agri-food region, such as SW Wales, differing sub-sectors of the agri-food industry exist. In the case of SW Wales there is a large, dynamically stable meat regime, a less stable but significant dairy regime and a smaller, diverse, yet disparate collection of horticultural supply chains that could not be described as having a coherent regime dynamic. It is apparent from the empirical evidence that these three sub-sector regimes faced different public policy influences. The level of support from public policy, in the case of SW Wales, appears to be most closely aligned with the relative size of each sector. The red meat regime has a public policy orientation that is most closely aligned to the prevailing interests of the regime and enjoys the largest levels of support from the WAG. The red meat sector's public policy support is such that it enjoys PGI status on both lamb and beef, which has been subsequently adjusted to include the industry's own private quality standards. Dairy certainly enjoys some moderate support from the WAG, whilst horticulture receives the least dedicated support.

However, there is a certainly a question of whether the red meat sector enjoys too much support. There were two points clearly levelled at the sector in which public policy has had a role namely: the historic basis for CAP direct farm payments, causing some farmers to 'farm the form' rather than farm the land, and the question of whether the generosity of CAP payments has led to a decrease in business acumen among red meat producers because of the financial cushion it has provided. This is not to say that the red meat sector does not require public policy support in Wales, but instead questions whether the support could have been better targeted to build capacity and thus strengthen the regime in the long term rather than ensuring shorter term stability.

Furthermore, as Chapter 7 discussed, there is more biophysical capacity for horticulture and crop production in SW Wales than is currently occurring. Whether this capacity should be developed or not is a difficult question. On the one hand there is the issue of comparative advantage, where other regions may be better able to produce similar products at a lower economic cost. On the other hand, widening the

range of produce that a region produces may also deliver several advantages such as: diversifying the routes to market for producers, widening the range of biodiversity in field production and, potentially, creating new regional processing and distribution businesses all of which could contribute towards the rural development of a region.

Turning to the situation with the dairy industry in SW Wales, it is clear that there is a process of rationalisation occurring resulting in a decrease in producer and herd numbers in the region. One argument about the reasons why the rationalisation has occurred is the peripheral nature of the region and the increased haulage costs resulting from transporting milk to the more centralised processing facilities, a factor which has been further exacerbated by increasing global fuel prices. This is clearly a process that is being played out within the regime, in the industry element in particular, and there is certainly a question whether additional public policy support could assist in helping the regime reorientate to ensure the loss of production and processing capacity within the region is minimised; and if it could, whether it should?

Moving away from considering a single region and taking the aggregation of sectors between all the regions within the purview of WAG adds a further layer for consideration. The data for Welsh agriculture discussed in Chapters 5 to 7 shows that Wales' agri-food industry is a predominantly an upland, red meat orientated industry, more so than the SW Wales agri-food region. This explains the rationale for the degree of assistance that this particular group of producers and related supply chains has received from the WAG as they are the largest constituency where WAG agri-food policy is concerned. From one perspective it might be reasonable to propose that the quantum of WAG efforts, be they financial or otherwise, are divided between the various sub-sectors of Welsh agriculture in some kind of proportion relating to the size of these sectors across Wales. However, there is a potential issue here with such a large part of the Welsh landscape being solely suitable for lamb production in that the degree of assistance they receive provides a barrier to entry for other sectors in some regions with greater biophysical potential, where targeted support from WAG may assist in strengthening or creating spaces for horticultural and dairy sectors to better develop.

8.3.3: The conventional/alternative scale

The conventional/alternative scale speaks to the question of where the public policy focus is in terms perpetuating existing (conventional) regime logics or supporting/nurturing (alternative) niches innovations. This scale, as chapter 3 discussed, needs to be read not as a binary scale, between the conventional and the alternative, but as more of a transitional scale for which dynamically stable regimes and radically configured niches represent the two ends. In between such ends of the scale we can find destabilised regime configurations, niches that so closely resemble the regime configuration that their absorption into the regime is likely and niche innovations that have the potential to assist in the transitioning of a regime constellation. It also should be recognised that, as part of the regime constellation of elements, policy has a role to play within the existing regime but also has agency in fostering new innovations within the agri-food sector. There is, therefore, a potential tension in the role of public policy and the use of its resources within regional agri-food systems, for which the SW Wales case study provided some salient points of interest for consideration.

On the one hand, there is evidence from the SW Wales case study of the WAG's extensive support of the conventional dairy and meat regimes in SW Wales through dedicated development centres, advice and technical courses/support, long term financial assistance for farmers through pillar 1 and pillar 2 of CAP, TB compensation schemes and, in terms of red meat, the securing PGI status for lamb and beef. This support, particularly of upland farmers, has added a stabilising element to parts of the Welsh industry and, ultimately, helped to provide a stabilising effect to these existing regime configurations.

There is also some evidence within the SW Wales dairy regime to suggest that WAG is taking a role in assisting with the re-orientation of this regime, offering advice to producers about the possibility of contracting to supply feed, rearing and other services to those farmers who continue to produce milk being one such example. This transition is very much industry led, but empirical phase interviews suggested that

WAG, through consultants and other third parties, is taking an active role in discussing options with producers interested in getting out of principally producing milk. These observations speak to questions about the wide role WAG has in maintaining and shaping pre-existing regime configurations.

Turning to the niche end of the spectrum there is a potential tension for public policy that the ST systems heuristic model, alternative food supply chains (AFSC) and regional agri-food systems together expose. Whilst there are certainly many examples of AFSCs that have the potential for either being absorbed or adopted into the incumbent regime configuration, there are also those AFSC configurations that are unlikely to ever be taken up into the regime because of their configuration. From a policy perspective there are two key issues to consider.

Firstly, where there are AFSCs that pose a radical alternative to the regime, which may be deemed to provide potentially more sustainable configurations in one or more of their constellation of elements, to what extent should they be developed/supported using public policy resources? The key example from the empirical case study is the ethical milk producer co-operative whose vision of more energy self-sufficient farms, processing and transport, together with a strong belief in organic processes and their benefits for farmers, livestock and the farmed landscape is radically at odds with the more industrialised/intensive vision of dairy production that appeared to be espoused as a solution to the cost-price squeeze for the region's producers from the regime's actors.

The second consideration relates to those forms of AFSCs which are unlikely to ever be adopted because they are too differentiated from the regime in terms of offering viable alternative configurations to the incumbent regime, regardless of their desirability from a rural development perspective. This class of 'niches' can include the farmers markets, farm shops and alternative/specialist food producers/processors. These AFSCs were highly prized in the SW Wales case study area because they added a distinctiveness to the region's food produce 'offer', provided alternative routes to market for a relatively small number of

producers/processors, created employment in alternative production/processing and provided enhanced tourism attraction for the region. These AFSCs are not, strictly speaking, alternatives to the incumbent sub-sector regimes and so, in the terminology of ST systems theory, cannot be considered niches. Nevertheless, these AFSCs are part of the whole agri-food system in the region and seemed to create their own loosely linked up network with farm shops and farmers markets being the nexus for a range of producers and processors to retail their goods; frequently utilising multiple nexuses to do so. The question that these AFSCs raise in the context of public policy resources and regional agri-food systems is: if these AFSCs are never likely to upscale into regime wide transitions, how much support should these AFSCs be given from public policy?

This question is a difficult one to answer. On the one hand these AFSCs provide clear rural development benefits including much needed employment opportunities in the SW Wales region. They also create a sense of a pseudo regional 'terroir' thus creating a brand for the area (usually differentiated by county but was also spoken of as the SW Wales region). On the other hand, given the user/market preferences and industry predilection towards the cheap and mass produced, the ST configurations that these AFSC's utilise are unlikely to ever become part of the regional sub-sectoral regimes.

8.3.4: The issue of proportional provision of public policy resources for rural development

Ultimately, the WAG uses its resources in a variety of ways, covering all the permutations discussed in this section (at different spatial scales, across different sectors and between conventional and alternative/niche supply chains) to differing degrees. The ST systems approach to regional agri-food systems provides a framework that questions the role of public policy in the context of rural development by using the transitional pathways concept to interrogate what the eventual likely effect of agri-food policy will be upon regional sub-sectoral specific

regimes. It is at this point that we can begin to unpick some of the underlying issues that policy makers' face.

It should not necessarily be seen to be an ineffective use of public policy resources for them to be directed to support incumbent regime structures found within their (WAGs) purview. However, the question should remain as to whether the support of regimes, particularly those that are so dynamically stable, is the most efficacious use of limited public policy resources, even where rural development benefits are being passed into agri-food regions as result. Conversely, there are benefits for regional agri-food systems, and therefore rural development, where public policy resources are used to support/develop those AFSCs that are unlikely to ever provide a significant impact in shaping the sub-sectoral agri-food systems. However, if these ASFCs remain a relatively small part of the regional sub-sectoral agri-food systems should public policy resources be used to nurture these non- conventional supply chains?

What is clear is that the SW Wales agri-food region and the sub-sectoral agri-food systems that make up this region's food supply chains find themselves facing a range of pressures. To a certain extent these pressures are dealt with by responses from within the agri-food regimes, with the SW Wales meat regime's lowering of production in response to: poor prices, aging farmer population, disease and public policy together with the eventual opening up of the opportunity for producer groups to emerge as an innovation and their likely absorption into the regime being an example of such pressure-responses. However, there is challenge, insofar as different regimes will consider only their supply chains/systems rather than the agri-food system as a whole. Changes in one regime may have knock on implications for other regimes within the same region, which can either be beneficial or detrimental. Public policy actors, because they are not tied to one particular agri-food regime or region, are able to see the whole of the agri-food system of a particular region within a wider context of sub-sectoral regional regimes and, by extension, are best placed to at least advise or manage the development of rural regions for the public good. The role of public policy within the context of agri-food

systems should be not just to perpetuate the existing regime structures within its purview but to assist in their transition along greater sustainability pathways than the incumbent regimes will allow through incremental transitions.

The question of how public policy resources can be most efficaciously utilised should be considered along the lines of rural development pathways. This is to say: are the resources of public policy actors being used to foster longer term sustainability of one or more elements of the current socio-technological regime configurations, without significantly undermining any other element? Alternatively, does the support of niche level configurations assist in nurturing nascent ST configurations that could assist in providing rural development benefits for regimes should they be adopted or absorbed? The WAG does engage in these kinds of support to a limited extent through their current work, however, greater scrutiny of how these limited resources are currently being used together with assessments of what role public policy can have in managing future sustainable transitions at regional levels requires further investigation.

8.4: Final remarks and the roads left to be taken

This thesis set out to investigate agri-food systems within rural regions, to identify if they could be differentiated from one another in a significant way and to ascertain whether the use of a ST systems perspective assisted in understanding what was unfolding in these systems at a sub-sectoral level and whether this approach could be used to consider the role of public policy has to play in these agri-food systems to sustain the development of rural regions. To a greater or lesser extent, this thesis achieved all of these aims and provided a contribution to the agri-food dynamics of the SW Wales region. This section will consider some of the reflections on the MLP that arose during the course of this research and routes of further investigation, in addition to those set out earlier in this chapter, that provide natural extensions of this thesis findings.

8.4.1: Reflections on the multi-level perspective in terms of agri-food systems

When studying regional agri-food systems, this thesis made some decisions about what was within the locus of study, that which remained outside the scope of the study and, specifically, what would be considered within the regime/niche levels of the MLP. These kinds of decisions are made during any research project that investigates natural and/or anthropogenic phenomena. Researchers must be aware of the limits of their research and the claims they are able to make as a result of their delimitation and this was the case with this research. The MLP framework and the methodological processes adopted in the thesis allowed a deep and nuanced understanding of the regional production and processing dynamics of the SW Wales agri-food industry and, moreover, how these regional industries were connected to the wider Wales, UK, European and global agri-food systems. As a result, it is possible to make observations and draw conclusions about how these dynamics affected the regional regimes/systems however, in terms of sustainability of agri-food supply chains, there are elements upon which this research was unable to touch. Two areas where the sustainability of food supply chains are largely missing from this research are the consumption patterns of society and the impacts, such as those generated from food packaging and transportation of goods, on the environment.

The impacts from food packaging and transportation, whilst part of the wider agri-food system, were excluded in the focus of this thesis. Packaging and transportation technologies are highly embedded into the socio-technological regimes that make up the agri-food system in the UK, including SW Wales, as evidenced by how little these were brought up by interviewees in both phase 1 and 2 of the interviews⁹⁹. By being so deeply embedded, packaging and transportation are more likely to represent landscape rather than regime level pressures, which aligns with Rip & Kemp's (1998) argument regarding pervasive technologies.

On consumption patterns, this thesis only gets as far as the market preferences dictated by wholesalers and retailers, which do define and shape the agri-food

⁹⁹ Note that the exception to this was the regarding the transportation of milk from producers in SW Wales and the issues arising as discussed in chapter 6.

systems with the SW Wales regime, as discussed in the empirical chapters. However, one element of producing a more sustainable agri-food system is to reshape consumption patterns to reduce the environmental impact of human behaviour, not just in terms of who is consuming what but the manner in which it is consumed. In part, this reshaping takes place at the level of wholesalers and retailers in terms of defining what they require from producers but, ultimately, the final consumer also has a significant role to play.

There is already existing research that utilises alternative methodologies to address these missing elements of consumption, transport and packaging, such as ecological foot printing (Collins & Flynn, 2007 and White, 2000) or life cycle analysis (Roy et al, 2009), that provide assessments/measurements of the impact that consumption activities have on the environment. It appears to be the case that such methodologies may be complimentary to ST systems research as tools that can help with 'visioning' the impacts of current and alternative socio-technological configurations. More detailed diagnostic/measurement tools are required to assess the impacts that agri-food regimes have and how transitions affect a measure of their overall sustainability.

8.4.1.1: Spatial ST systems

This thesis proposed that a greater consideration of the spatiality of socio-technological regimes and their niches was required to understand more clearly the nuances of regional agri-food systems. The effects of spatiality upon regional sub-sectoral systems was evident throughout the analysis of the empirical data, albeit that these effects manifested themselves differently across the three case study sub-sectors.

The relationship between the SW Wales agri-food regimes/industry and higher spatial levels is one area where there is some tension as to the role that higher level regimes played in regional regimes. It is clear from the evidence from the chapters 5 and 6 that regional agri-food regimes are closely linked to national regimes which are

reliant on the infrastructure and the routes to market that they provide. The rules and norms that govern qualities of food produced in SW Wales also emanate from the national level regimes. It is also apparent that the national level regimes placed a number of pressures upon regional regimes and was the source of pressures upon the SW Wales region, based on the empirical evidence. This leads to the question of whether national level agri-food systems should really be conceptualised as landscape elements within the MLP model when considering regional agri-food systems.

Given that the SW Wales regional sub-sectoral regimes have institutional actors that were interlinked with national regimes, it is evident that there is a degree of interaction between regional and national regimes. This interaction is unlikely to be uni-directional and it foreseeable that regional level actors are influencing the national level regimes of which they are a part. However, the dynamics of these interactions are not well understood and should form part of further research.

Furthermore, the nature of the interactions between the retailer and producers in the meat producer group innovation discussed in chapter 5 provides additional evidence to suggest that national level agri-food systems/actors can be influenced by regional actors. It was observed that the producers in the producer group were able to leverage influence upon a large national-level multiple retailer and change the rules/norms that formed the basis of the relationships through the entire supply chain from producer to retailer. This further supports the idea that, although national-level actors/facets of the socio-technological regime can negatively impact regional regime dynamics, they are not landscape pressures on the regional regime because landscape pressures are something that actors within the system under investigation cannot affect and to which they can only respond.

Spatiality, in terms of agri-food, is clearly an aspect that defines the nature of the ST regimes that make up agri-food systems; despite the overarching trends of globalisation with its integration and streamlining of food production/processing that have increasingly disconnected places of production from places of consumption. These trends, it was shown, play out different narratives within the differing agri-food

sectors in the same geographic region. The findings from the three different sub-sectors generated a number of significant questions regarding spatiality as a dynamic of ST systems:

1. How do changes in higher spatial level regimes translate into affects upon the smaller regional regimes of which they comprise? Are these changes responded to in a broadly similar manner across the relevant lower spatial level regimes? Where responses at regional regime level are not similar, what factors define the differentiation in response?
2. Can key indicators of regional regime 'health' be benchmarked and, where changes in the regional regime dynamic occur, can these be measured to show changes in the sustainability of regimes and the regions in which they are situated?
3. What processes interlink actors who operate at higher level regimes (such as policy makers or large businesses) with regional regimes and their actors? How do these actors understand their role and effects on regional regimes?
4. What kinds of knowledge exchange occur between sub-sectors existing within the same spatial level? How does the existence or lack of knowledge exchanges between sub-sectors assist in fostering rural development across differing sub-sectors?

8.4.2: Roads left to be taken

The author sees this thesis not so much as an end point but as a starting point. It has raised many questions, such as those in the previous section, that in turn provide further avenues for investigation. Some of these questions arise from the short comings of this thesis. Given the time and scope of a doctoral thesis only so much can be investigated to a certain level of depth and breadth which, given the systemic nature of the agri-food industry today, leaves areas that require further investigation.

Other areas relate to where there were apparent gaps in the available data that could help add a greater understanding of the underlying mechanics of the rural agri-food region under investigation.

One of the key areas that require further investigation is a comparison of agri-food systems to a sub-sectoral level within differing regions. This thesis was only able to compare sub-sectoral systems within a single region and found differentiation in how these systems are configured. One key question is whether the ST configurations of sub-sectoral systems are significantly different between regions. This would be further nuanced by a cross comparison between regions that have similar or dissimilar biophysical characteristics to uncover whether they share similar configurations. Furthermore, a cross regional comparison would also enable the examination as to whether the emergence of niche innovations is similar between regions.

Another area of consideration, particularly from a sustainability point of view, is the extent to which the incumbent agri-food regimes strengthen or weaken the capacity of various elements of the ST constellations either within their own regime or other regimes existing in the same regional area. The most obvious ST element to discuss in the context of the building or denuding of capacity of agri-food systems is the biophysical one. The production and processing of food in a region uses biophysical resources both from within the region (soil, water, biota for example) and from outside the region (fuel, fertilisers, feed for example). An example from the case study is the dairy regime where the reduction in producer and herd numbers is effectively starting to denude the industry element of the dairy regime as a result of the movement of processing away from the region.

Ultimately, there is a question (upon which further research is required) as to how the constellation of elements for a particular set of sub-sectoral regimes using the ST heuristic model can be effectively benchmarked. There is already growing research for some elements such as the degree to which energy is embedded within food supply chains. However, how we measure the cultural predisposition of a regime becomes potentially more difficult to achieve. Nevertheless being able to gain a

detailed overview of the status and trajectory of the various regional sub-sectoral agri-food systems within a particular public policy purview give a more nuanced understanding of differentiated nature of these systems and how and where they can best be supported by public policy interventions.

Quantitative and spatially collated data is another area where further research into agri-food systems and regimes requires greater collation and analysis. There are three areas which certainly require closer inspection: pricing, farm activity and spatial supply chains. Chapters 5 and 6 on the meat and dairy sectors in SW Wales, respectively, introduced perceived problematic issues for producers in SW Wales with regard to the pricing mechanics of their industry. In the case of the red meat sector there was a suggestion of an issue in price setting between the livestock markets and abattoirs. In the dairy sector the issues of regional price disparities, complex contract pricing structures and retrospective price adjustments featured in the empirical interviews. Gaining a detailed understanding of product price and price movement in both of these sectors will not only help to uncover whether the observations of some producers in the SW Wales region are correct, but also provide important data on the current movement of produce that could be used to investigate the efficiency of current transport networks for the SW Wales agri-food industry.

The farm activity point relates to several areas which would be of interest where the SW Wales region is concerned. Firstly, much of the farm level data is extrapolated from a survey which, whilst this gives a reasonable picture of the broad trends of farming, does not give a detailed picture of what is really occurring on the land in the SW Wales region; in particular, there is an absence of data from smaller holdings which are ignored by the survey. It would also be interesting to investigate whether areas most suitable for horticultural production are those currently being used for some form of crop production. Additionally, it would be interesting to investigate how intensively areas of farmland are being utilised to ascertain where potential areas of under/over utilisation of biophysical capacity are occurring in a particular region.

8.4.3: Final remarks

This thesis shows that the Socio-Technological systems framework provides a robust model for navigating the complexities of agri-food systems. This robustness is achieved through the explicit spatial application of the framework, together with the addition of biophysical factors into the constellation of elements, as argued in this thesis. Moreover, the application of the concept of assimilative potential provided a useful approach in analysing the manifold socio-technological configurations of niches and their potential to interact with their incumbent regimes. These theoretical innovations strengthen the use of the Socio-Technological systems model for examining regional agri-food systems and, arguably, agri-food systems more generally.

The mixed methodological approach of this thesis, using the Socio-Technological heuristic model, enabled the detailed investigation of the SW Wales agri-food system that allowed clear comparatives between regime and niche level supply chains to be identified. The combination of key stakeholder and supply chain actor interviews with secondary data produced empirically rich narratives and provided a detailed understanding of the nature and transitions of regional sub-sectoral Socio-Technological agri-food systems.

The approach outlined in this thesis could be utilised in many other ways to facilitate multiple assessments of agri-food regimes and rural development, as well as evaluating the impact of current and future policies, landscape pressures and internal de-stabilising factors. As such, this thesis constitutes a major empirical and conceptual contribution to the debates on sustainable agri-food systems and rural development.

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Appendices

Appendix A: Overview of interviewee composition for the two interview phases

First Phase

Independent consultants	4
Government funded consultants	5
Local authority officials	2
Welsh Assembly Government official	1
Supply chain businesses	2

Second Phase

Meat Producers	4
Meat Processors	3
Dairy Producers	4
Dairy Processors	3
Horticultural Producers	4
Horticultural Processors	2

Appendix B: Interview metric for the first phase of interviews

Survey Layout																																			
<p>Section 1 - Background information</p> <p><i>Before we start the interview proper, I would like to ask a few things about what you do.</i></p> <p>Can you briefly explain to me your role here at [name of organisation]? And more widely what does your department/organisation do?</p>																																			
<p>Section 2 - Changes in the last decade</p> <p><i>Now I would like to discuss how things have changed in Carmarthenshire</i></p> <p>If you look back over the last ten years, what do you think have been the major changes in the way that food is produced, processed and distributed in Carmarthenshire? Can you rank these changes in order of their magnitude? Now for each of these changes I would like you to give them a score from 1 - 5 based on the changes affect with 5 being for the better and 1 being for the worst? Can you explain the reasoning behind the scores you have given each of the changes?</p>																																			
<p>Section 3 - Specifics about sectors</p> <p><i>Turning from talking in a very general way about the food sector I would like to now talk more specifically about the different aspects of that sector.</i></p> <table border="1"> <thead> <tr> <th></th> <th>Producers</th> <th>Processors / Wholesalers</th> <th>Public Sector</th> <th>Hospitality</th> <th>Retailers</th> </tr> </thead> <tbody> <tr> <td>How have the changes you outlined shortly before affected ...</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>How would you describe the ... sector in Carmarthenshire</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>What affects have WAG policy making had on ... sector in Carmarthenshire?</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Are there any particularly dominant businesses in the sector (if so could you indicate on the map where these are located in the Carmarthenshire)?</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>							Producers	Processors / Wholesalers	Public Sector	Hospitality	Retailers	How have the changes you outlined shortly before affected ...						How would you describe the ... sector in Carmarthenshire						What affects have WAG policy making had on ... sector in Carmarthenshire?						Are there any particularly dominant businesses in the sector (if so could you indicate on the map where these are located in the Carmarthenshire)?					
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Section 4 - Actors and influence

I want to turn our attention now towards talking about key actors in the food sector in Carmarthenshire. The term actor is used here to represent individuals, institutions and organisations.

Who are in your opinion the most important actors in the food sector in Carmarthenshire?
 Can you rank these actors in their order of importance?
 On a scale of 1 - 5 can you rate these actors for each of the following:

	1	2	3	4	5
Ability to shape the food sector in Carmarthenshire	Not very influential		Same as most other actors		Highly influential
Engagement across the supply chain	Limited to a single sub-sector	Single sector	Through one principal supply chain	Engaged in a limited way across many sectors	Widely engaged across many sectors
Promotes a sustainable future for the food industry in Carmarthenshire	Less sustainable		Neither sustainable nor unsustainable		Greater sustainability

Have there been any particularly successful policy initiatives from the WAG in terms of the food sector?
 What did these initiatives set out to achieve?
 Why were they successful?
 Have there been any successful non-WAG led initiatives in terms of the food sector?
 What did these initiatives set out to achieve?
 Why were they successful?

Section 5 - SWOT and the future

Ok so now we have talking in a specific sectors of the food sector in Carmarthenshire and generally about how the whole industry has changed over the last decade I would like to talk about its strengths, weaknesses and the future of the sector.

What do you think the 3 most important strengths of the food sector in Carmarthenshire are?
 What do you think the 3 most important weaknesses of the food sector in Carmarthenshire are?
 What do you think the 3 most important opportunities for the food sector in Carmarthenshire are?
 What do you think the 3 most important threats to the food sector in Carmarthenshire are?

Imagine its 2025, just over fifteen years from now, what do you think the food sector in Carmarthenshire might look like?

Section 6 - Local food sector

Finally I wish to turn now to the local and locality food in Carmarthenshire. With the term local food we mean that which is produced and consumed within Carmarthenshire or the surrounding counties. Locality food we would describe as being branded in a particular way, be this Caerphilly cheese, Welsh lamb, True Taste brand or PDO marks for example. These two definitions may be both applied separately and together when we think about particular food businesses in Carmarthenshire.

Does it make sense to talk about either a local or a locality food sector in Carmarthenshire or do both exist?

How has the local food sector developed in the last 10 years?

What do you think is the potential for the development of a local (not locality) food sector in Carmarthenshire?

What is your reasoning for the your response to the last question?

Could you give me any specific examples of successful local food businesses in Carmarthenshire?

- for each could you locate them on this map and give a brief description of what the business does and its history

Are there any examples of local food businesses or initiatives that failed in Carmarthenshire?

Can you give examples and explain what happened and why they failed?

Section 7 : Wrap up

Are there any important issues with regard to the food sector in Carmarthenshire that we have not yet covered?

Thank you, continued contact and results

Appendix C1: Second phase producer interview metric

Survey design for case studies	
<p><i>Firstly I would like to discuss some general details about your business</i></p> <p>What is your role in XXXXX organisation? Can you brief describe your business?</p> <ul style="list-style-type: none"> - What size is the farm? <ul style="list-style-type: none"> under 20 Ha 20 - 50 Ha 50 - 100 Ha 100+ Ha - What are you currently growing/raising? (livestock numbers and acreage) - Has what you have grown/raised in the last 5/10 years changed? IF Yes: <ul style="list-style-type: none"> - How has it changed? - What was the rational for the changes made to production? - How is the business owned (sole trader, partnership etc. <ul style="list-style-type: none"> Sole trader (Inc. farmer & wife partnership) Partnership (other family only) Partnership (other) Farming company Other - has this changed at all over the last 10 years? - How long has the business been running? 	
<p><i>I would now like to talk about the wider XXXX sector in Carmarthenshire/South West Wales.</i></p> <p>What have the major changes been in the sector in the last 10/15 years? - Can you rank them in an order of magnitude - from biggest affect to the smallest affect? How would you describe your sector as it is now? How have the changes to the sector that you mentioned earlier affected your business?</p>	

I would like to now talk more specifically about the financial aspects of the business including the relationships between you and your buyers and in the first section I am interested in the proportions of your income.

Approximately how much of the farms income comes from the sale of produce?

How frequent is your income (Monthly, Weekly, Seasonal etc.)

What changes have there been to the income you have received over the last 10 years?

- Why have these occurred?

Approximately how much of the farms income comes from SFP/Environment Schemes etc.?

How frequent is your income (Monthly, Weekly, Seasonal etc.)

What changes have there been to the income you have received over the last 10 years?

- Why have these occurred?

Approximately how much of the farms income comes from non-farm/off-farm activities?

How frequent is your income (Monthly, Weekly, Seasonal etc.)

What changes have there been to the income you have received over the last 10 years?

- Why have these occurred?

Do you have any other sources of income?

- If so what?

How frequent is your income (Monthly, Weekly, Seasonal etc.)

What changes have there been to the income you have received over the last 10 years?

- Why have these occurred?

Overall income is made up of the four categories discussed above.

How do you expect your overall income to change over the next 10 years?

- What elements change?

- What do you perceive are the implications of these changes?

- Do you have any plans to address these changes?

This next section looks specifically at the relationship you have with your buyers, how much of your produce is sold to each buyer and how far this travels

- Are there many customers or just a few?

- Are your customers different for different products?

- What sort of customers do you sell to?

Note - Wholesaler, Retailer, Hospitality, Other

- Where are your customers mainly located?

Note - West Wales, Other Wales, Other UK, EU, Global

I would like to focus on the three most important customers to your business. Whilst it would be helpful to know who these customers are; I would of course understand if you would prefer not to reveal their identities

- Would you be willing to reveal who this customer is?

- What sort of business is this customer

Note - Wholesaler, Retailer, Hospitality, Other

- Approximately how much of your produce do you sell to this customer

- Where is the customer located

Note - If not specific ask for West Wales, Other Wales, Other Uk, EU, Global

- How long have you been selling to this buyer

- How would you describe the business relationship you have with this buyer?

- How are prices agreed?

Are there any other conditions within the agreements between you and the buyer?

- Can you estimate what margin of profit/loss that you receive from this buyer?

Where applicable (Not for direct sales)

- Do you have any idea who your buyer then sells their produce on to?

- What do you know about the business relationships between your buyer and their buyer(s)?

I would now like to talk about institutions, organisations and associations that are involved with in the agri-food sector

Firstly can you tell me which institutions, organisations or associations you are either a member of or have had dealings with?

- Have you ever had any dealings with these other institutions/groups:

- *After a while provide prompts for the following*

Menter a Busnes, Farming Connect

Organic Centre Wales, Centre for Alternative Land Use

Food Development Centre, HCC, DDC

Dairy Co>?, NFU, FUW

Could you rank these institutions in their order of importance to your business?

For each actor ask the following (Note type of benefit and type of interaction)

Can you briefly explain you relationship with XXX?

- How did you get involved with?

- How has relationship benefited/not benefitted your business?

Of those IOA's that you have not engaged with is there any particular reason for you not had dealings with them?

Agri-food policy and the government:

I would now like to briefly discuss agri-food policy and your views on it firstly can you tell me

Have there been any policies or regulations that have significantly helped or hindered your business?

- What were they?

- How did they affect your business?

What are your views on agriculture and food policy in general?

What priorities do you think the WAG should address with the next Rural Development plan?

Appendix C2: Second phase non-producer interview metric

Survey design for case studies
<p>Respondents business</p> <p><i>I want to start by talking about some of the basic elements of your business</i></p> <p>What is your role in XXXX organisation? Can you brief describe your business?</p> <ul style="list-style-type: none">- What products do you sell?- Is your business solely located in the Region/UK/Globally?- How many do you employ? (regionally/nationally?)- What was the profit/turnover last year?- Market share?- Is there/How would you describe the XXX brand? <p>How has the business changed in the last 10 years?</p> <ul style="list-style-type: none">- as a result of the sector changes you have previously mentioned- for other reasons- What was the rational for these changes? <p>What challenges and pressures do you think the business is going to face in the next 5/10 years?</p> <ul style="list-style-type: none">- What is the business likely to do to address these challenges/pressures?
<p>Sector history</p> <p><i>Before we talk about the specifics of your business I would like to take some time to discuss the wider XXXX sector in Carmarthenshire/South West Wales.</i></p> <p>What have the major changes been in the sector in the last 10 years?</p> <ul style="list-style-type: none">- Why did these changes occur?- How would you describe your sector as it is now?

Business relationships

This next section looks specifically at the relationship you have with your buyers, how much of your product is sold to each buyer and where they are located?

First of all can you explain who you currently sell to?

- Do you sell to many different buyers or just a few?
- Who are the main buyers?

For the main buyers only (3 if there are many):

Where are they located?

- Approximately how much of your product do you sell to them?
- How would you describe the relationship between you and this buyer?
- How long have you been selling
- How is the price for your products agreed between you and the buyer?
- Approximate what margins do you make on the products you sell?

I'd now like to discuss your relationship with your suppliers

How many businesses supply you with [primary product type]?

How were your suppliers chosen/sourced?

Where are most of your suppliers located? W Wales, Wales, UK, Beyond?

Can you explain the relationship between you and your suppliers?

Can you describe how you manage your suppliers to meet the demands of your buyers?

Agri-food policy and the government:

I would like to talk about the relationship your company / (processors/wholesalers/retailers) have with food policy makers

What are your views on agriculture and food policy in general?

Are there any specific initiatives that your business has been able to take advantage of?

Have there been any changes to laws or regulations that have substantially affected your business?